Hardwood Plantings and Cover Crops in the Midwest

Part II. Using Cover Crops to Improve Site Quality

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This is the second in a series of three articles about using cover crops. Part I: “Integrating cover crops into tree plantings” was in the January 2020 issue; Part III in the next issue will cover “Enhancement of pollinator habitats in tree plantings.” The below article includes references in parenthesis to information found in Table 1 (printed Jan 2020) for seventy cover crop species. Go to www.walnutcouncil.org to see the January bulletin and Table 1.

Cover crops have grown in popularity as landowners have become increasingly aware of declines in soil health with current cropping practices. The four basic soil health principles needed to reverse this trend are to (1) minimize disturbance, (2) keep the soil covered, (3) increase plant diversity, and (4) keep plants growing throughout the year to feed the soils. These four principles help achieve soil health by minimizing soil erosion, maximizing organic matter accumulation and storage, maximizing soil microbial populations and diversity, maximizing water infiltration, percolation, and retention in the soil, and minimizing soil compaction.

The top five reasons farmers give for planting cover crops include increasing soil organic matter, reducing soil erosion, reducing soil compaction, managing weeds, and providing an alternative nitrogen (N) source (Clark 2007). Other benefits include reducing fertilizer costs, increasing water infiltration and water holding capacity, sequestering nutrients that otherwise would leach into the subsoil, adding biological biodiversity, and providing an alternative source of income.

Figure 1. Seeded cover of hairy vetch, an excellent nitrogen fixer, in a black walnut planting that will suppress weeds in the spring and slowly release N as forage and roots decomposes during the summer (Photo courtesy of Earl Williams).

2020 National Walnut Council Meeting Cancelled

The board was preparing for a special national meeting July 26-29, 2020, celebrating our 50th year of Walnut Council, at the location where some of the original walnut research came out of the US Forest Service Carbondale, Illinois unit on the campus of Southern Illinois University. Although planning was well along, Covid-19 interfered. Based on many uncertainties and the age of our attendees the board voted to cancel the 2020 meeting, and to host the 2021 meeting at Carbondale, from July 25-28. We look forward to seeing you in person next year!
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First and foremost, I hope all Walnut Council members and friends are safe and well! The Covid-19 has surely caused a period of uncertainty in our normal lifestyles and behaviors. But, one good aspect of the stay-at-home behavior required by the coronavirus has been more time to work on and manage our walnut trees and plantations. Perhaps more time to plant, spray, and prune than in past springs. While my own walnut plantations are old enough to require little intensive management, I still welcomed the stay-at-home time to plant 1450 fir seedlings as future Christmas trees.

It is with regret and sadness that the Annual Meeting scheduled for July 25-28 had to be cancelled. This was a difficult decision as many of us look forward to the information and fellowship shared at annual meetings each summer. This is the first cancellation of an Annual Meeting that I can remember since the Walnut Council was established in 1970. And yes, we were to celebrate the 50th Anniversary of the Walnut Council at this year’s annual meeting. But don’t worry, we are planning to celebrate the 50th anniversary in 2021, at Carbondale, IL. With two years to plan the meeting, it should be the best ever. Be sure to mark your calendars to attend next year’s meeting the last weekend in July and help us celebrate.

In southwest Ohio we have had some late spring frosts that have “nipped” the young leaves of some early flushing walnut trees. Of course, the trees will flush out again but I do not know if the frosts will affect the fall nut production. I know the pawpaw crop will be less as most of the purple flowers are now limp, black, and dead.

One of the research recommendations to increase the growth rate (environmental gain) of black walnut is to plant seed sources located approximately 150 miles south of your planting location. Sources of seed or seedlings much farther south than this distance may cause the buds to flush too early and the buds “killed” by late frosts, as experienced in southwest Ohio this April. While the 150 mile range is recommended specifically for black walnut, it likely varies for other species. For example, a bur oak moved from Clemson, SC to Cincinnati, OH had terminal shoots 3 to 4 inches long when frost occurred around April 15th last month. Now, the young shoots are black and dead.

In conclusion, while this year’s Annual Meeting (and state chapter Spring meetings) had to be cancelled, let’s hope this is not the situation for state chapter meetings this fall. The field tours and meetings at the local state level are excellent opportunities to get involved, while waiting for the 2021 annual meeting next July in Carbondale. Check the state chapter web pages in early fall for local meeting updates: https://walnutcouncil.org/state-chapters/.

Bill Hammitt, National Walnut Council President
Part II. Using Cover Crops to Improve Site Quality  

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One of the best indicators of soil health is the organic matter content. Organic matter is composed of dead plant and animal matter in various stages of decomposition. Without organic matter, soil is essentially a mixture of ground-up, weathered rocks, and/or eolian materials. The importance of organic matter in managing soil moisture cannot be overemphasized as one pound of organic matter can absorb 18 to 20 pounds of water. Under intensive use of agronomic crops, organic matter in many soils has gradually declined from 4 to 6 percent to less than 2 percent. Use of cover crops is one of the more practical approaches to gradually increasing organic matter content (see soil builder in Table 1 in Part I). Although plant tops provide organic matter, it is actually the extensive root systems that contributes the most to building organic matter and soil improvement.

A second more easily observed indicator of good soil health in agricultural soils is the earthworm population. A healthy soil can have over a million earthworms per acre or about two to three earthworms per shovel full. Plant residues left on the soil surface serve as a mulch or protective cover. They reduce the impact of raindrops associated with soil crusting and reduce the loss of soil by wind and/or water erosion (Table 1: Erosion preventer). In addition, a cover of vegetation and plant residues decreases the daily amplitude of changes in soil temperature and moderates seasonal fluctuations compared to bare soil. Lower soil temperatures in the summer are beneficial because they reduce the rate of microbial decomposition of organic matter. Slowly decomposing cover crop residues also provide a long-lasting mulch to control weeds and potentially act as a slow release N fertilizer for the trees (Table 1: Weed suppresser and Nitrogen source).

Cover crops can also be efficient nutrient scavengers. Cereal grains or grasses with fibrous root systems are good at scavenging excess fertilizer and nutrients especially nitrate-N and potassium that might otherwise leach into the subsoil during a fallow period (Table 1: Nutrient scavenger). Grasses reportedly can take up more than 75% of any nitrate-N applied in water to soil within less than 24 hours. Grains like winter wheat, cereal rye, and even oats, seeded in the fall can sequester more than 70 pounds of N per acre within a three-month period. This N is slowly made available the following spring if the cover crop winter kills or is terminated with cultivation or herbicides. Grass cover crops have been shown to reduce by 75 to 95 percent overwinter nitrate losses that occur from fields left fallow overwinter.

While legumes do not have a fibrous root system, they do have an attribute that grasses don’t have. 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 dependent 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. Information is difficult to find on which perennial legumes as they mature retained the fixed N within their own roots and which slough off roots and nodules making fixed N available to other plants. High foliar N in walnut saplings planted with crownvetch would indicate fine

Figure 2. Excellent stand of cereal rye that has sequestered available soil nitrogen overwinter and will suppress weed growth by shading soil and release of phytotoxins as it decomposes (Photo courtesy of Jim Ball).
roots and nodules of crownvetch are sloughed off in the dormant period during the summer. If N fertilizer is added to the cover crop, legumes will utilize the available soil N rather than form nodules for N fixation in exchange for sugars.

Cover crops also provide other soil-related benefits. Biological activity in the soil is greatest if a ground cover with living roots is continuously maintained without a fallow period. A noticeable increase in biological activity in the soil can be seen within 2 to 3 weeks after cover crops begin growing. More than 80% of plants form symbiotic relationships on their roots with endo- or ecto-mycorrhizal fungi. Soil microorganisms play an important role in making soil nutrients more available to plant roots and catalyze the transformation of N to plant usable forms. In addition, mycorrhizae produce glomalin, a sticky water-insoluble glycoprotein that binds soil particles together to form the stable soil aggregates needed to improve soil tilth (Table 1: Soil builder). The resulting pore space between aggregates provides an improved avenue for soil gas exchange, holding water, and root penetration (Table 1: Topsoil loosener).

The upper roots of cover crops physically hold soil particles in place during storm events reducing sheet, rill, and gulley erosion. Estimates suggest it takes approximately 100 years to replace 1 inch of topsoil lost to erosion. Planting cover crops in tilled soil can reduce soil erosion by as much as 50 percent while no-till seeding of cover crops sometimes reduces erosion by 90 percent. Plants with deep roots may also penetrate compacted soil layers (Table 1: Rooting depth) improving soil permeability by producing deep channels and macropores that can be utilized by the tree roots (Table 1: Subsoil loosening). Cover crops that loosen the subsoil can also capture nutrients that have leached into the subsoil and return them to the topsoil (Table 1: Nutrient scavenger).

Cover crops assist with controlling weeds by shading the soil, overtopping and suffocating weeds, and/or producing phytotoxic compounds. Erect cover crops typically need to produce more than 3 tons per acre of biomass to suppress weeds while prostrate (i.e., white clover), semi-erect (i.e., cowpeas and crownvetch), and climbing (i.e., hairy vetch) plants require less biomass to be effective. Select varieties that have been developed for use as cover crops because they have high rates of nitrogen fixation or grow rapidly in the fall or spring reducing weed establishment by providing soil shading.

Productivity is also important because on average, 4 to 4.5 inches of precipitation are needed for each ton of forage produced substantially diminishing the amount of soil moisture available to the trees. Some cover crops like cowpeas, millet, and medics use less water per ton of biomass than heavy users like alfalfa and cereal rye (Table 1: Moisture use).

Cover crops especially those with very rapid growth (Table 1: Rapid growth) quickly shade the soil and change the ratio of red to far-red light reaching the soil. Without the correct light ratio, weed seeds remain dormant. A few cover crops produce phytotoxic chemicals that can chemically inhibit seed germination and seedling growth of other plants (Table 1: Known allelopath). Cereal rye and to a lesser extent the other cereal grains release toxic compounds as plant residues decompose that can slow the growth of other plants. Residues of rapeseed, mustards, radishes, and other Brassica species act as biofungitoxicants if tilled into the soil and can help manage soil-borne pathogens and nematodes that feed on plant roots. The Agricultural Research Service (ARS) Cover Crop Chart (Johnson and Leibeg 2016) suggests most annual species should not be planted in consecutive years in part due to phytotoxic compounds found in their plant residues.

Table 2 provides agronomic data for the seventy candidate cover crops that were listed in Table 1 in Part 1 of this series (Van Sambeek 2020). Table 2 provides information on whether cover crop has erect, spreading, or vining stems (Plant architecture); the average recommended soil pH range for each species (pH range); average height of the forage (Mature height); best time to seed in the Midwest (Time to seed); if seeding in the fall is recommended, how many weeks before your average first frost to seed (Fall seed); average minimum soil temperature for best seed germination (Soil temperature); the average of recommended seeding rates and sowing depths (Seed rate and Sowing depth); expected number of days for seedling emergence if soil temperatures exceed minimum (Days to emerge), how difficult it is to establish the cover (Establishment); the flowering period and value of flowers to bees and other beneficial insects to be covered in Part 3 in this series of articles (Bloom period, bee forage, and beneficial insects); and value and possible toxicity of the forage harvested as hay or for grazing (Livestock forage, grazing value, and toxicity issues).

There are conflicting opinions whether single species or a mix of species are better. Cover crops benefits are usually most closely related to the amount of biomass produced. Single species cover crops tend to produce more biomass per acre than will a mix of species. Penn State University published the results of a two-year study suggesting cocktail mixes are more likely to provide a wider range of benefits (Finney and Kay 2016). Their results suggest mixtures of up to eight species are likely to produce more rapid changes in soil health and expected benefits of using cover crops than single species. Another plus is cover crop mixes are more likely to contain species adapted to your soil. A major drawback of multi-species covers is that they are more
### Table 2

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<tr>
<th>Species</th>
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<th>Acceptable soil pH range</th>
<th>Times to seed in the Midwest</th>
<th>Fall seed weeks</th>
<th>Seed temperature (°F)</th>
<th>Seedling rate (lb/acre)</th>
<th>Sowing depth (in)</th>
<th>Days to emerge</th>
<th>Establishment</th>
<th>Bee forage value</th>
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<th>Bloom period</th>
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<td>Jun-Aug</td>
<td>C</td>
<td>A</td>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kura clover</td>
<td>SP</td>
<td>6-12</td>
<td>5.5-7.0</td>
<td>Es, Ls, Su</td>
<td>2-6</td>
<td>41</td>
<td>8-12</td>
<td>0.2-0.5</td>
<td>12</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>Aug-Jul</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Ladino clover</td>
<td>SE</td>
<td>40-50</td>
<td>5.5-7.0</td>
<td>Es, Ls, Su</td>
<td>5-6</td>
<td>40</td>
<td>1-4</td>
<td>0.3-0.5</td>
<td>D</td>
<td>A</td>
<td>C</td>
<td>Apr-Oct</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Flat pea</td>
<td>V</td>
<td>48-72</td>
<td>5.5-7.0</td>
<td>Es, Pf</td>
<td>0-2</td>
<td>40</td>
<td>15-20</td>
<td>1.0-1.5</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>May-Oct</td>
<td>D</td>
<td>B</td>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Red clover</td>
<td>E</td>
<td>12-36</td>
<td>5.5-7.5</td>
<td>Es, Ls, Su</td>
<td>2-6</td>
<td>41</td>
<td>5-12</td>
<td>0.2-0.5</td>
<td>9</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>Apr-Oct</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Sainfoin</td>
<td>E</td>
<td>18-36</td>
<td>6.0-8.5</td>
<td>Sp, Ef</td>
<td>2-6</td>
<td>20-35</td>
<td>0.5-1.0</td>
<td>5</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>May-Jul</td>
<td>A</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tick trefoil</td>
<td>E</td>
<td>36-72</td>
<td>5.5-7.0</td>
<td>Sp, Lf</td>
<td>----</td>
<td>68</td>
<td>3-10</td>
<td>0.1-0.3</td>
<td>B</td>
<td>A</td>
<td>A</td>
<td>Jul-Aug</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td></td>
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<tr>
<td>White clover</td>
<td>P</td>
<td>3-18</td>
<td>5.5-7.0</td>
<td>Sp, Ef</td>
<td>&gt;8</td>
<td>40</td>
<td>1-4</td>
<td>0.2-0.5</td>
<td>9</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>Apr-Sep</td>
<td>A</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>*Buckwheat</td>
<td>SE</td>
<td>24-60</td>
<td>5.0-7.0</td>
<td>Ls, Es</td>
<td>&gt;8</td>
<td>50</td>
<td>20-40</td>
<td>0.5-1.5</td>
<td>5</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>May-Sep</td>
<td>F</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>Forage radish</td>
<td>E</td>
<td>12-18</td>
<td>6.0-7.5</td>
<td>Es, Ls</td>
<td>3-9</td>
<td>45</td>
<td>4-15</td>
<td>0.2-0.7</td>
<td>6</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>May-Aug</td>
<td>B</td>
<td>C</td>
<td></td>
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<tr>
<td>Kale</td>
<td>E</td>
<td>12-30</td>
<td>5.5-7.2</td>
<td>Sp, Ls</td>
<td>3-4</td>
<td>45</td>
<td>4-8</td>
<td>0.2-0.8</td>
<td>12</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>May-Sep</td>
<td>C</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Mustard</td>
<td>E</td>
<td>24-60</td>
<td>6.0-7.5</td>
<td>Sp, Ls</td>
<td>4-8</td>
<td>40</td>
<td>5-10</td>
<td>0.2-0.7</td>
<td>6</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>Apr-Jun</td>
<td>D</td>
<td>C</td>
<td>P</td>
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</table>

**Table 2.** —Agronomic information of candidate cover crops for form, height, soil pH range, planting information, emergence, establishment rate, value to bees and beneficial insects, bloom period, and feed value for livestock.

**NOTES TO TABLE 2:**

1. (Species) gives the same frequently used common name listed in Part I, Table 1 in previous issue of the Walnut Council Bulletin. An * marks the top cover crop species for the Midwest.
2. (Plant architecture) describes if stems are primarily erect (E), semi-erect (SE), prostrate (P) or climbing vines (V).
3. (Mature height) describes how tall the plant is normally when flowering.
4. (Acceptable soil pH range) gives average recommend ranges found in the literature; however, if the range is below pH 6 for legumes, they may be able to grow but will show little N-fixation.

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**FOOTNOTES:**

1. (Species) gives the same frequently used common name listed in Part I, Table 1 in previous issue of the Walnut Council Bulletin. An * marks the top cover crop species for the Midwest.
2. (Plant architecture) describes if stems are primarily erect (E), semi-erect (SE), prostrate (P) or climbing vines (V).
3. (Mature height) describes how tall the plant is normally when flowering.
4. (Acceptable soil pH range) gives average recommend ranges found in the literature; however, if the range is below pH 6 for legumes, they may be able to grow but will show little N-fixation.
### GRASSES

| Species          | Plant architecture | Mature height (inches) | Acceptable soil ph range | Times to seed in the Midwest (wk) | Fall seed weeks (wk) | Soil temperature ($^\circ$F) | Seeding rate (lb./acre) | Sowing depth (in) | Days to emerge | Establishment | Bee forage value | Beneficial insects | Bloom period | Livestock forage | Grazing value | Toxicity issues |
|------------------|--------------------|------------------------|--------------------------|-------------------------------|----------------------|----------------------------|------------------------|------------------|--------------|----------------|-----------------|----------------|-----------------|----------------|----------------|
| Phacelia         | SE                 | 6-48                   | 6.2-8.0                  | 37                            | 0.1-0.5              | 8                         | C                      | A                | A            | Apr-Jul       | D               | D               |                |                |                |              |
| Rapeseed         | E                  | 36-60                  | 5.5-7.5                  | 4-6                           | 0.2-0.6              | 7                         | B                      | A                | B            | Apr-Sep       | D               | B               | P              |                |                |              |
| Safflower        | E                  | 12-48                  | 5.5-6.5                  | 40                            | 0.5-1.0              | 12                        | C                      | A                | B            | Jul-Aug       | B               | C               |                |                |                |              |
| Sunflower        | E                  | 36-72                  | 5.5-7.5                  | Sp - Esu                       | 10-1.0               | 4                         | B                      | A                | Aug-Sep      | D              | B               |                |                |                |                |              |
| Forage turnip    | E                  | 6-18                   | 5.4-6.7                  | Sp - Lsu                       | 0.2-0.5              | 5                         | B                      | B                | A            | F             | A               | P              |                |                |                |              |
| Goldenrod        | E                  | 18-48                  | 5.0-7.5                  | Esu                           | 0.5-1.0              | 1                         | C                      | A                | Aug-Oct      | D              | C               |                |                |                |                |              |
| Milkweed         | E                  | 24-72                  | 5.5-7.5                  | LF, EW                         | 0.2-0.5              | 1                         | C                      | A                | Jun-Aug      | D              | F               | T               |                |                |                |              |
| Perennial aster  | E                  | 18-56                  | 5.0-7.5                  | LF, EW                         | 0.1-0.3              | 1                         | B                      | A                | Aug-Oct      | D              | D               |                |                |                |                |              |

### Bee forage value

- A (excellent) to F (very poor)

### Beneficial insects

- E (early) or late (L) spring (Sp), summer (Su), fall (F), or winter (W).

### Bloom period

- May-Aug

### Livestock forage

- A (very rapid) and D (very slow)

### Grazing value

- A (very rapid) and D (very slow)

### Toxicity issues

- A to F (excellent to very poor)

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5 (Times to seed in the Midwest) gives the appropriate seasons to seed in plant hardiness zones 5 and 6 and is shown as early (E) or late (L) spring (Sp), summer (Su), fall (F), or winter (W).

6 (Fall seed) indicates when to seed in the fall for maximum cover crop benefits as the number of weeks before the average first killing frost (approximately mid-October in Missouri).

7 (Soil temperature) provides information on the average soil temperature needed for seed germination.

8 (Seeding rate) lists averages of the low to high seeding rates found in the literature for establishing a pure stand using the lower rates if seed is drilled or incorporated and the higher rates if broadcast over undisturbed soil.

9 (Sowing depth) indicates how deep seed should be drilled or incorporated (generally 2 to 4 times the diameter of the seed) into the soil which is heavily dependent on soil type, soil moisture, and seed size.

10 (Days to emerge) provides the average number of days before seedlings emerge from the soil if planted at recommended depth (column 11) and soil temperatures (column 9).

11 (Establishment rate) assigns values from A = very rapid and excellent for weed suppression to F = slow taking more than one growing season and normally established with a rapidly growing smoother crop for weed control.

12 (Bee Forage value) and (Beneficial insects) indicates the value of their flowers as pollen and nectar sources to bees and the value of pollen, nectar, and forage to other beneficial insects including butterflies, moths, predatory, and parasitic insects from A (excellent) to F (very poor).

13 (Bloom period) is the time interval when the species is normally in flower. Most plants flower heavily in the first or second month of the reported ranges but will flower over a longer period if mowed or grazed.

14 (Livestock forage) and (Grazing value) indicate value from A (excellent) to F (very poor) for each species to livestock if harvested for hay or grazed, respectively.

15 (Toxicity issues) indicate if precautions must be taken to prevent bloat (B) or nitrate poisoning (N) when grazing, to prevent poisoning from cyanide or prussic acid (P) in improperly cured hay, or to prevent poisoning from toxic chemicals (T) present in the forage or seeds or toxins created with improper drying of the forage.
Welcome New Members

Welcome Logan Wells as a new Life member of Walnut Council, we appreciate your long term support! We are pleased to welcome these new annual members to the Walnut Council since December 2019:

Mark Beard, Kansas City, MO  Julia Debrucker, IN  Daniel McGue, Michigan City, IN
Joe Bittorf, Rock Falls, IL  John Donaldson, Peru, IN  Ramone Ramerez, Magnolia, KY
Ronald Borman, Cody, WY  Hunter Fodor, Grass Lake, MI  Jeff Rodman, Sioux Falls, SD
Lindsay Calvert, Canton, GA  David Galat, Fulton, MO  Dawn Ross, Lafayette, IN
Fran Calvert, Yuca Valley, CA  Gems Hilltop Acres LLC, Columbia, MO  Bruce Schumacher, Philo, IL
Cameron Calvert, Asheville, NC  Mark Griffin, Cherry Hills Village, CO  Sam & Sara St. Clair, Larwill, IN
Danny Carrol, Magnolia, KY  Greg Lucey, New Berlin, WI  Jack Thurman, Springfield, MO

We would also like to welcome the following new one-year email members, thanks to those Walnut Council members who nominated them:

Rick Alexander, MO  Russ Hartman, IN  John Murtz, WI
Joe Alley, MO  Andy Hartman, IN  Eliot Protsch, WI
Maddox Angerenhofer, WI  Pat Hayes, IA  Mark Robinson, IN
Peter Angerenhofer, WI  Dwight Hendrickson, MD  Keven Schifferdecker, MO
Bill Boyd, IN  Greg Hoss, MO  Jason Schreiber, WI
Tanner Brundage, MO  Gary Johannsen, WI  Susan & Terry Shiflet, WI
Derek Bryant, MO  Rucha Karve, IN  Hannah Silverman, OH
Chris Cauley, MO  Jeri & Brian King, OH  Adam Smith, IA
Mark Cefalu, WI  Larry Krumrey, MD  Linda Stull, IA
Lori & Chris Christianson  Brenda Lamon, IN  Rich Tucker
Dan Dey, MO  Mark Lochuer, WI  Joshua Vinson, MO
Brian Gilbertson, WI  Sarah Lovell, MO  Amy Wagener, WI
Emily Graves, KS  Nancy Mathis  Lance Weatherwax, IN
Quentin & Lori Greene  Matt Millineg, WI  John Willy, IA
Pete Greenheck, WI  Jim & Trish Montag, OH

Updates from the Walnut Council National Office

From executive director Liz Jackson:

Things here at the national office have changed a bit since the COVID-19 outbreak, much as they have for the rest of the nation. As of mid-March I am working from home, I have set up an office in a spare bedroom. Current guidance, provided by my employer Purdue University who Walnut Council contracts with, is that we may be working from home through August. Although the view out the window is different, I am able to complete all of my usual tasks without any problems. Thanks to Purdue University for providing the computer support to allow this work to continue.

A new project I am planning is producing a regular email newsletter for members with a variety of information and resources which will be timelier than the printed bulletin. We also hope to produce webinars with information for members about growing hardwood trees. Watch future emails for both of these new products.

Membership update

Besides working on the winter and spring Walnut Council bulletins, I have spent time this year sending out 1st and 2nd dues notices. As of early May we have 479 annual members and 116 life members for a total of 595 paid members. Members nominated 45 new people for 1 year free membership, they will receive email information only. 105 members from 2019 have not yet paid their 2020 dues to retain their membership. Watch soon for another dues notice for those who are still past due.

2019 financial reports

Assets as of 12/31/2019, the end of our fiscal year, were $58,871, up $8630 from 2018. Net income for the 12 month period was $643. Our net income is commonly plus or minus $1000, has remained steady for the past few years. Each year the books are audited by the treasurer Bill Hoover and the Finance and Audit chair Hugh Pence.
National Board Updates

The spring national board meeting was planned for early April in Springfield, Illinois. Instead, the board met via conference call. Plans are to meet in the summer via video call and we are hopeful that the fall board meeting can be in person with adjustments.

Elections for two-year board positions are normally at the summer annual meeting but the board voted to postpone elections. Current officers and board members (see listing page 2) have agreed to stay on an additional year. Those who were up for election in July 2020 will now be on the slate in July 2021. A few board positions are open and those will be filled via appointment by the president per the bylaws. A big thank you to the board for their willingness to stay on an extra year!

State Chapters board position opening

Bob Ball, the current state chapters chair, has decided to step down and we are looking for a volunteer to fill that position. The State Chapters chair’s responsibilities per the bylaws are: “to assist in the establishment of new state chapters, serve as an information source for state chapters, maintain a file of program materials for state chapter meetings, and coordinate state chapter activities with the board of directors.” The chair has a mailing list of the 12 state chapter presidents and corresponds several times a year to share information and encourage chapter engagement. In addition, they attend 3 national board meetings per year and provide brief reports.

If anyone would have an interest in the state chapters chair position, please contact Liz Jackson at jackson@purdue.edu. We thank Bob for his many years in the State Chapters role!
State Chapter Reports

Missouri Chapter Report
By Dave Boyt, president of the Missouri chapter

The Missouri chapter cancelled the 2020 Spring field day, but the good news is that we have already made arrangements to visit Ralph Heck’s tree farm spring 2021. Wendy Akers has been doing a great job keeping our Facebook page active. You can visit and participate by searching for “Missouri Walnut Council” on Facebook. (Editor’s note- Iowa, Michigan, and national Walnut Council also have Facebook pages – like and share them all!) Lots of good photos, as well as links to technical information.

The Black Walnut Initiative, which encourages land owners to plant black walnut trees on idle land—mostly riparian areas and patches too small to be easily cultivated for crops—is an ongoing program. Several consulting foresters are offering their services at no charge, providing advice on planting and management, as well as assisting land owners in applying for MDC and NRC funding. A copy of our brochure can be found on https://walnutcouncil.org/mbwi/. We are all looking forward to returning to “normal” times and meeting in person!

Ohio Chapter Report
By Bill Hammitt, Ohio Chapter President

The Ohio Chapter of the Walnut Council had scheduled an April 18th Field Day at the Duckworth Farms, located near Greenfield, OH in Fayette County. The Duckworth Farm consists of 550 acres that has been under forest management for three generations of the Duckworth family. The Family was selected “Ohio Tree Farmer of 2016”. The Field Day was completely planned, we all looked forward to seeing many fine walnuts (see the below article “Reforestation on the Duckworth Farms”),...then the Corona virus hit! The Field Day was cancelled, but is re-scheduled for the Fall.

Reforestation on the Duckworth Farms Perry Township, Fayette County, Ohio, 1934-84
By Benton Raymond “BR” Duckworth, Forester

About fifty years ago, I planted three hundred sprouted black walnut nuts on a three-acre portion of a sixteen-acre field that borders a branch of Paint Creek that partly encircles a ten-acre [actually thirteen acres] island on the opposite side. The planted area is the south end of this sixteen-acre field.

About a year before I planted the nuts, this tract was fenced out of crop rotation because the upper half was seriously eroded—down to the bedrock in a small area. When the nuts were planted, the entire fenced-out area had a fair stand of seedlings and saplings—mostly elm, box elder, hackberry, silver maple, and sycamore.

For about ten years, I paid little attention to this planted area, until as I walked along the border I observed rows of small black walnut trees in the dense brush. As a result of this observation, I lost no time in working over the tract, cutting with an axe competing trees and saplings near the young black walnut trees.

The dense thicket in which these trees grew was beneficial in that it promoted growth of straight trunks and reduced the size of lower branches. When these trees were about ten inches in diameter, I used a twelve-foot ladder and handsaw to neatly prune them up to fourteen feet above ground.

At present, more than two hundred black walnut trees are on this three-acre tract, and I am quite certain that more than one-half of these will produce veneer logs.

This history of reforestation of this tract contrasts sharply with reforestation of the ten [actually, thirteen]-triangular island that lies on the opposite side of the creek branch, which together with Paint Creek, completely surrounds it.

In 1980, the Mead Corporation of Chillicothe clear-cut the island and paid me $8,000 for one-half of the timber and pulpwood. Sixty black walnut trees produced one-half of that total value. That crop represented about eighty years of growth following a typical sawmill operation in which all commercially valuable trees were cut. This occurred about six years prior to when I moved into this area. During this period, nature, without human interference, directed the development of the timber crop, which perhaps was about one-tenth of what it might have been with a small measure of attention and direction on the part of the owners.

Late in life, at about age ninety, I decided not to let “nature take her course.” Instead, I was determined to control the growth of timber on this very fertile tract and thereby increase its value not less than ten times the value of the 1980 crop.
Tales of a Tree Planter
By Phil Moore, Nut Culture Chair and past president

I have completed planting the trees that I have purchased so far this spring. As I keep seeing discount sales and the temptation is always there I may buy more! This year I ordered some trees from the Missouri Department of Conservation. This is not new since I have ordered some trees every year beginning in 1967, is that 53 years?

This year I ordered black walnut, pecan, shellbark hickory and a conservation bundle. I planted 200 of these and gave the rest away. So, I am slowing down! I am a lifetime member of the Seed Savers Exchange. I was looking through the yearbook and saw some antique apples that looked interesting, so I ordered eight cultivars of scion wood. Then, I decided I needed more trees to graft them to. So, that caused a trip to Forrest Keeling to purchase 10 of their Malus domestica potted trees for root stock which I have now grafted.

Over the years I have planted over 100 acres of trees under the CRP programs. I am closing in on 50,000 trees total! Have I made a few mistakes? Yes! In 1968 I planted 2,000 multiflora rose! They were from Missouri Department of Conservation! I have killed that many since then, but they still have descendants.

About 1990 I went to a community sale and Osage orange posts with a 4" top was selling for over $4.00. I figured on a 6-foot spacing that was 1200 trees per acre or $4,840 per acre! My dad always said of a hedge post, “If you put the small in the ground it would last a 100 years, and if you put the large end in the ground it would last forever”. Guess the jury is still out on that! Before the year 1900, thousands of miles of Osage orange were planted around here.

In my pastures it only takes 15 years to grow one that size. I planted 2,000, you don’t tell folks around here something like that now or you would be considered a few bricks shy of a full load. Anyway, I took my Sawzall pruner and made my way into the grove. Osage orange on 6 foot spacing do not grow as fast as they do in a pasture. Those trees are maybe 3 inches now, and I have the scars to prove it.

Later in the 90’s I planted pecan trees 40 feet apart on 65-foot rows. I thought 40 foot is a lot of wasted space, so I planted 3 oak trees between each one to sell as yard trees. In 2007 they were ready to sell, but the market was gone. By the time the market came back they were too big! I have yet learned to grow mushrooms.

One lesson I have learned is that planting trees is like real estate: location, location, location. I have a property on the south edge of Pleasant Hill, Missouri, google it if you wish. It is on the west side of highway 7 that has a stream called Big Creek running through it. Also, the Rock Island spur of the Katy trail is there. It floods often. I have determined that a walnut tree will not thrive over 100 feet from the stream bank. Even this is not completely true. As a stream floods the larger particles settle out first and the smaller, clay settles further from the stream. Great for the walnut trees. Then the stream decides to change course and goes through the clay it deposited years before. The site is not so good now. It is all about drainage. I have planted riparian buffer trees on the outside of the bends to keep Big Creek in place, but the walnut growth rate is not equal.

My best walnut planting resulted from an older lady bringing walnuts to sell to Hammons Products after the season was over. She had an older car and the walnuts had been in it for a while, husk maggots were everywhere! I felt so sorry for her I bought the 400 pounds, took them down by Big Creek and used the field cultivator to cover them up. The rate was about 300 pounds per acre. The silver maple seeded the area at about the same rate, 300 pounds per acre. Beaver like silver maple better than walnut so they took care of my thinning!

Here at home I planted 10 walnut trees dug out of the garden with a spade in 1978. I measured those trees four years ago and they averaged 24 inches DBH today. They average 24 inches DBH today, and the site is on top of a hill! In 1983 I planted a quarter of a mile of walnuts, 10 feet apart, along a road fence, on much lower land. I measured those trees four years ago and they ranged from 9 inches to 2-1/2 inches DBH. Of course, use your soil maps, but a tree doing well probably needs some friends nearby!

In closing, I am a collector of black walnut, pecan and hickory cultivars. If I can help anyone out in future years do not hesitate to ask, pecanman@centurylink.net.
HTIRC Tree Improvement Activities in 2019

Editor’s note: This article is one segment of the recently published 2019 Hardwood Tree Improvement & Regeneration Center (HTIRC) annual report. See the full report online in June at www.htirc.org.

Operational improvement of the Hardwood Tree Improvement & Regeneration Center (HTIRC) aims to develop improved planting stock for the Central Hardwood Forest Region of the U.S. We utilize classical breeding to select parents, test progeny, and evaluate growth rate and timber quality and to develop disease resistance in two native endangered species as well as new and emerging forest pests. Our germplasm and plant material are a valuable resource for our HTIRC colleagues who conduct wide-ranging basic research from forest health and ecology to genomics and silviculture.

For nearly two decades, our operational improvement program has been collecting and evaluating elite timber germplasm of black walnut, black cherry, and northern red oak. For each species we have collected between 120 and 700 accessions from the wild or previous plantings that exhibit above average growth and timber quality. American chestnut and butternut breeding mainly consists of screening each species to its exotic disease and then selecting the most resistant parents and progeny to develop new breeding orchards.

A novel feature of our program is the fact that our progeny test seed comes from clone banks and breeding orchards. Because these species are difficult to artificially pollinate (except for chestnut), our principle breeding technique is to create isolated orchards to naturally inter-mate and collect open pollinated seed. For each parent tree, we progeny test its family at six different sites over a minimum of two years.

Our progeny testing design has been primarily 8-foot x 8-foot grid spacing (680 tree/acre) with two progeny per family per block, in an “incomplete” manner. Progeny tests range from 12 to 36 blocks (each block has 48 trees) depending on the availability of seedlings and land. Thus, in every block, we have 24 families represented each with two trees. The incomplete block design spreads out progeny across the site to minimize soil variation effects and improve the evaluation of the genotypes. So, if we have 20 blocks in a given test, families with 24 or 20 seedlings will occur in just 12 or 10 blocks, not every block, initially as two seedlings per family.

Other important cultural features for our successful progeny testing are deer exclusion and weed control for the first three years. Finally, we minimally prune trees but achieve a single-stem status for all trees after three- and five-year data is collected.

We measure heights at 3, 5, 8, 10, 13, and 15 years, and include DBH and a subjective timber quality rating at five years and add in merchantable log length at 10 to 15-years. We achieve high stocking rates in all our plots with naturally high-survival or we add “filler” trees at three years to achieve 95% or better stocking. By year eight, we no longer need deer or weed control. Once tenth year data is collected and crown canopies are closed, we thin out half of the trees. Some tests were designed for row-thinning (paired progeny planted side-by-side) and others are selectively thinned down 50% - the poorer tree of each family pair is removed. This system has worked out very well to keep all trees and families free-to-grow until final measurements at 15-years.

Once a family has been tested completely at six sites and over at least two years, we conclude on the breeding performance of that parent (mother tree). Timber performance cannot be reliably evaluated until the trees are at least eight years old, and 10, 13, and 15-year data further validate genetic performance. In some cases, particularly northern red oak, we have added a feature of planting progeny much wider apart and utilizing trainer rows that are thinned after 10-years to develop long-term second-generation seedling improved northern red oak orchards. In disease resistance breeding of chestnut and butternut, resistant parents and progeny are identified after screening 5-years for chestnut and 10-years for butternut; resistant selections are propagated into new 2nd generation seed/breeding orchards at new disease-free sites.

2019 was a good year for Operational Tree Improvement at the HTIRC thanks to our new Research Forester (Mr.
Caleb Kell) and we have caught up on a lot of back-logged work. We will have much more to report in 2020.

MEASUREMENTS: We measured all three of our oldest (2009) black cherry progeny tests as well as two from 2010. In addition, we measured four walnut progeny tests, three from 2009 and one from 2008 at SEPAC. Finally, we measured two new butternut screening plots planted in 2008 and 2009 with progeny from both our clone bank/breeding orchard at Purdue and our colleague’s Melanie Moore and Mike Ostry’s (USDA Forest Service) Rosemont, MN grafted orchard. All trees had been inoculated in 2011-12 and now, are under a natural butternut canker epidemic. The results showed most of the resistance occurs in hybrids, but at this time we still have a number of healthy pure butternuts.

MANAGEMENT: Last year was a difficult one as the spring was the wettest in HTIRC history. The Illinois Walnut Council had a winter field day and thinned our 2010 Forest Glen butternut, hybrid butternut, walnut and red oak trees, one of seven such plots we planted in 2010-2011. That help was appreciated along with the Purdue FNR Martell Forest Crew who provided additional vehicles and help during that time. In February, we assisted Lee Eckart (Danzer Forestland) with the final thinning of seedling trainer trees in our select cherry, white oak, and walnut seed orchard. The grafted white oaks were suffering because many were severely shaded from their more vigorous seedling trainers the last few years. We collected scion wood from every healthy surviving select white oak clone to add into our breeding orchards at Purdue. We also thinned several black cherry and walnut test plots at Purdue and SEPAC, as well as a third northern red oak progeny test/orchard plot.

In the spring of 2019, we provided our HTIRC squirrel-proof walnut seed planting system to HTIRC researchers who planted seed for cutting-edge microbiome research in Indiana and Washington State. We also assisted a new deer impact study to optimize small deer-fence construction.

NEW PLANTINGS: We planted our largest butternut screening test plot with the USDA Forest Service and the WI-DNR Tree Improvement at Bell Center, WI in May. In one day, we planted just over 3,000 butternut from 37 families (4 hybrid families for the first time in WI). To achieve this, we pre-sorted all the trees at Martell over three days in February with help from the Forest Service Oconto River Seed Orchard in northern Wisconsin. The plot was designed by Dr. Paul Berrang, (USDA Forest Service, Region 9 Geneticist) based on our first two HTIRC butternut canker disease screening blocks at Martell Forest that utilize inoculations to start the disease and then rely on natural spread.

Grafted American chestnuts from our 2018 American Chestnut Foundation (TACF) grant with Nick LaBonte, Aziz Ebrahimi, and Jarred Westbrook were planted in the Duke American Orchard at Martell Forest in May. We painted these with a flat interior white latex paint with a fungicide to protect them from blight. These trees all survived and will provide a source of new American chestnut diversity for future breeding. Given the success of our 2015 USDA Forest Service State & Private - Forest Health Grant to test a new and very practical method of screening butternut for resistance to butternut canker disease, we added an additional 100 seedlings from more than a dozen new families not previously screened (pure and hybrid) into our oldest screening block at Martell. The first batch of such seedlings, planted in 2015 that we reported on in 2018, are separating out very well into highly and moderately resistant categories with the moderate to highly susceptible dying by six years.

SEED HARVEST / STORAGE:
In support of the Jacobs, Meilan, and Ginzel Labs, we collected black walnut from new regions of the native black walnut range – Maryland and Kansas. Both targeted areas of those states are at the same latitude as Indianapolis and represent the most eastern and western edges of the native range. We also harvested HTIRC Indiana walnut seed from our non-select and select/improved clones, with excellent help from the Martell Crew. Stratified seed in the spring of 2020 will be utilized to support drought/water stress research and TCD epidemiology/ microbiome work. A subset of improved clones from our most important breeding orchard were harvested for a new tissue culture clonal propagation project to begin this year, led by Rucha Karve and Rick Meilan.

See the entire HTIRC 2019 annual report in June at www.htirc.org.

White oak seed orchard.
Oak Tatters
As we move into the spring planting season, we need to be able to understand how herbicides affect our trees and how to properly diagnosis herbicide damage. In this article we will discuss oak tatters and plant damage due to 2,4-D, and dicamba spray drift.

Oak tatters affect emerging oak leaves which make them lacy or tattered. Leaf tatters has been reported from a number of Midwestern states since the 1980’s. Members of the white oak group tend to be more susceptible including white (Quercus alba), bur (Q. macrocarpa), and swamp white oak (Q. bicolor) (Figures 1 and 2). The red oak group, including red (Q. rubra), black (Q. velutina), and shingle oak (Q. imbricaria) may also be affected. Other species include hackberry (Celtis occidentalis) and redbud (Cercis canadensis). In the last several years, there have been reports landowners of severe problems with white, red, and black oaks, and redbud. Leaves appear cupped, curled, thin, and “sickly”. Field observations have indicated trees within ½ mile of the nearest farm field are often the ones affected.

Newly emerged leaves will have reduced interveinal tissues giving the leaf a lacy or tattered look (Figure 1). Affected trees make look chlorotic or yellow, have a thin canopy, or lack leaves when viewed from a distance. Leaf damage usually occurs just as the leaves are emerging in the spring. Within a few weeks, the trees will produce a new flush of leaves that may appear normal (Haugen, et al., 2000). Usually, a re-flush of leaves is not detrimental to the tree, but any event that hinders the tree’s ability to make food (i.e. conduct photosynthesis) is undesirable. Repeated flushes within a given year or over a number of years along with other biotic (i.e. insect defoliation, foliar diseases) and/or abiotic (i.e. drought, flooding, hail damage) events, may predispose trees to attack and colonization by lethal pathogens and wood-boring insects (Sinclair and Hudler, 1988).

Oak tatters appear to be caused by damage to leaf tissue contained in the buds or when the buds are just beginning to open. This suggests a correlation (relationship) between the pattern of damage observed on affected plants and the physiology of the plant at the time of exposure. For example, in a study reported in February, 2011 issue of Tree Care Industry by Samtani, et al. (2011), they found that chloroacetanilide class of herbicides, which includes acetochlor, dimethenamid, and s-metolachlor (active ingredients in Harness®, Outlook®, and Dual Magnum®, respectively) caused leaf tatter-like symptoms in white and red oak seedlings when they were exposed to the above herbicides at rates simulating drift when the leaves were unfolding. Leaf tatters were only observed on the seedlings when the herbicides were applied at the unfolding leaf stage. No damage was observed during the swollen bud or expanded leaf stages. Later, the seedlings produced a new set of normal leaves.

Herbicide Drift Damage
According to Illinois Department of Agriculture (IDA) records, dicamba damage reports increased 2.5 times from 286 in 2017 to 721 for 2019. Most of the damage occurred on agronomic crops (non-dicamba soybeans), but there were also a significant number of reports that involved woody and herbaceous plants particularly in areas bordering agricultural fields.

Types of Herbicides
In order to properly recognize and diagnose herbicide damage, it is important to understand how herbicides are used and their mode of action. In general, herbicides are classified based on the types of weeds they control (grasses, broadleaf plants, woody plants, etc.), when they are applied (i.e. pre or post emergence), and their...
mode of action (MOA). Post emergence broadleaf herbicides selectively kill actively growing broadleaf plants and include growth regulator herbicides containing active ingredients found in 2,4-D, 2,4-DP, MCPA, MCPP, and dicamba. These products have broad application including homes, farms, and industry. They are prone to drift and undergo volatilization. Injury symptoms associated with these herbicides include twisted and downward cupping of leaves, and narrow, strap-like leaves on the youngest growth (Figure 3). Root uptake of these chemicals is usually more damaging to the plant and on grape the leaves will cup upward (Figure 4). These herbicides are fairly soluble and can move through the soil as well as air. As their name implies, grass herbicides kill grassy weeds. They may be applied pre or post emergence. Common pre-emergence herbicides include trifluralin and DCPA. Post emergence herbicides include fenoxaprop, sethoxydim, and fluaziop-P. These products cause yellowing/bleaching of leaves and dieback of actively growing regions. Pre-emergent products are less likely to drift compared to post emergence herbicides. Non-selective, post emergence, broad spectrum herbicides are basically designed to kill a wide variety of plants and include paraquat, glufosinate, and glyphosate (Fraedrich, 2018; Hibbs, 1978; Ruhl et al., 2008).

A list of tree species sensitive to phenoxy herbicides (i.e. Butoxone, 2,4-D, MCPA, 2,4,5-T, silvex, and Banvel) is presented in Table 1.

**Herbicide Drift**

Like with all pesticides, herbicide drift can be a problem. Factors affecting drift potential include formulation, application method, air temperature, wind, and soil factors. For example, 2,4-D (low volatile ester formulations) can vaporize and be carried by the wind while 2,4-D (amine formulations) are less likely to vaporize. Granular formulations rarely move or volatilize. It is well known that the smaller the droplet size the higher the drift potential. To avoid drift issues, it is recommended to produce larger droplet sizes along with lower pressures or use sprayers with larger orifice nozzles. Weather factors such as air temperature, wind, and relative humidity (RH) may also contribute to herbicide drift. Some herbicides may vaporize at temperatures greater than 85°F during or immediately after application. Herbicides in a vapor state can move large distances and can cause plant damage considerable distances from the point of application. Producing larger droplets and applying them closer to the target plants can minimize wind drift. Soil factors also play a role in herbicide drift. The amount of uptake by a soil-applied herbicide depends on the type of herbicide, location of plant roots in the soil, soil type, and soil moisture. Some herbicides are mobile and move rapidly in sandy and/or porous soils while others may persist in the soil. As you can see, there are many variables that may affect whether a chemical will drift and how far it will move. There is a still a lot to learn and research to minimize drifting and damage to non-target plants.

**Diagnosing Herbicide Drift Damage**

Be careful not to jump to premature conclusions when attempting to diagnose for herbicide or other chemical injury. Correct tree diagnostics is all about “patterns, patterns, patterns”. For example, are several different tree species impacted, or just one species? Is only one part of the

### Table 1. Sensitivity of various trees species to broadleaf weed-killers (Taken from Hibbs, 1978).

<table>
<thead>
<tr>
<th>Sensitive</th>
<th>Intermediate /Unknown</th>
<th>Tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boxelder</td>
<td>Mulberry</td>
<td>Catalpa</td>
</tr>
<tr>
<td>Elm</td>
<td>Honeylocust</td>
<td>Linden</td>
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<tr>
<td>Ash</td>
<td>Silver maple</td>
<td></td>
</tr>
<tr>
<td>Hackberry</td>
<td>Oaks</td>
<td></td>
</tr>
<tr>
<td>Amur maple</td>
<td>Cottonwood</td>
<td></td>
</tr>
<tr>
<td>Sugar and red maple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hickory</td>
<td>Cherry</td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td></td>
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<tr>
<td>Sycamore</td>
<td></td>
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<tr>
<td>Redbud</td>
<td></td>
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<tr>
<td>Walnut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amur cork tree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birch</td>
<td></td>
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</tr>
<tr>
<td>Horsechestnut</td>
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</tbody>
</table>
tree impacted, or is damage more widespread? Possible factors contributing to leaf tatters and/or herbicide drift damage include low temperature injury, foliar diseases (i.e. anthracnose), insect feeding (i.e. aphid, plant bugs, leafhoppers), herbicides, chlorine gas, and air pollutants. Damage may vary in intensity and extent between different tree species. A question to ask is, is only the new growth affected or is the entire canopy impacted? If it is a one-time event, then subsequent new growth should develop and appear normal. In some cases, leaf tissue analysis may be required to determine which chemical is responsible for the plant damage. Are there other insect and disease issues present at the same time? Has there been any disturbance to the soil around or near the tree(s) (i.e. addition of fill, construction activity, soil compaction, etc.), are there of girdling roots present, and has drought or flooding occurred recently (Ruhl et al., 2008). Rememver, most of our problems we see with trees usually start below ground.

Managing Chemical Drift Damage

Unfortunately, for rural forested areas and woodlots, there is really no practical treatment other than to reduce stress factors (i.e. livestock grazing) in areas where tree symptoms are being observed. Trees growing in urban areas and home landscapes should be protected from predisposing stress factors such as construction injury, soil compaction, changes in drainage, competition from turf, and drought. Focus on tree health by mulching, watering during dry spells, and fertilizing where appropriate if nutrient deficiencies are present. Remember, older mature and over-mature trees do not react well to changes in their immediate growing environment.

In most cases, healthy trees will recover from chemical damage the following season, but chronic exposure to herbicides along with the aforementioned pre-disposing factors may be enough to cause the tree to begin to decline, begin the “decline spiral” and eventually die. If you have to apply an herbicide for any reason, avoid herbicide drift by not spraying on windy days, use lower pressure, and using spray nozzles that produce large-sized droplets (Ruhl et al., 2008). Of course, always read and follow the label and be sure to be current with your states’ specific regulations.

REFERENCES CITED AND SUGGESTED READINGS


Abstract

An experiment was conducted in 2017 and 2018 to determine the sensitivity of driftable rates of 2,4-D and dicamba with or without glyphosate on common ornamental, fruit, and nut species. Three driftable rates corresponding to ½, 1/20th, and 1/200th of the manufacturer’s labeled rate (1 × rate) of 2,4-D (1.09 kg ae ha−1), 2,4-D plus glyphosate (1.09 kg ae ha−1 plus 1.10 kg ae ha−1), dicamba (0.56 kg ae ha−1), and dicamba plus glyphosate (0.56 kg ae ha−1 plus 1.10 kg ae ha−1) were applied to apple, crabapple, dogwood, American elderberry, American elm, grapevine, hydrangea, red maple, pin oak, peach, pecan, eastern redbud, rose, red raspberry, strawberry, sweetgum, nannyberry viburnum, and black walnut plants. Visible estimates of injury were recorded 28 and 56 days after treatment (DAT). Plant measurements included leaf malformation, tree trunk growth, and shoot length. Across all species, the ½ × rate of 2,4-D plus glyphosate resulted in 61% injury 28 DAT, whereas the ½ × rate of dicamba plus glyphosate resulted in 51% injury. Across plant species and herbicides, ½ × 1/20×, and 1/200 × rates caused injury ranging from 3% to 100%, 0% to 66%, and 0% to 19%, respectively. Hydrangea was the least sensitive species; grapevine was most sensitive. Changes in plant measurements were dependent on the species and herbicide applied. Treatments at the ½ × or 1/20 × rate resulted in shoot length, leaf malformation, and trunk tree diameter differences for 11, 10, and 7 species, respectively, compared with nontreated plants. Collectively, the measurements and visual injury assessments indicated apple, red maple, peach, and pin oak were more sensitive to treatments containing dicamba, whereas black walnut, grapevine, and American elm were more sensitive to 2,4-D. Although the 1/200 × rates of 2,4-D and dicamba did not result in changes to plant measurements, obvious injury symptoms were observed, which could render these plants unsalable. See online at https://www.cambridge.org/core/journals/weed-technology/article/investigations-of-the-sensitivity-of-ornamental-fruit-and-nut-plant-species-to-driftable-rates-of-24-and-dicamba/73EACCF936DD92308C28D0AFD62EA2E1.
Update on Walnut Tree Improvement in the Midwest

Submitted by Phil O’Connor, Tree Improvement Committee to the April national board meeting

It seems to have been a quiet year in the black walnut tree improvement world. Compared to ten years ago, the number of programs working towards black walnut improvement of any kind has dwindled.

Wisconsin – The Wisconsin Division of Forestry in conjunction with University of Wisconsin-Madison has just released their 10-year "Wisconsin Forest Genetics Program Strategic Plan". They intend to maintain their current level of effort toward improvement and conservation of black walnut. They worked for 2006 through 2015 establishing a 10-acre grafted planting at the Bell Center in Crawford County. The first accessions have begun to produce seed and it is being collected for use at the Wilson Nursery in Boscobel. Wisconsin is also working with butternut. They established one orchard at the Bell Center in 2010 with cooperation from USFS Hardwood Tree Improvement and Regeneration Center scientists, and a second orchard went in at the Hayward Nursery in 2013 with the cooperation of USFS Oconto River Seed Orchard scientists. Long term plans are to replace trees lost to mortality and animal damage and to increase the total number accessions.

Indiana – There was an unusually small and late ripening crop of walnuts throughout the Midwest in the fall of 2018 which led to a somewhat limited crop in the nursery in 2019 and available for planting in the spring of 2020. The seed crop in 2019 was a little better, but not nearly as large as we would have expected in the alternate year cycle. Plans are underway to expand the state’s acreage of black walnut seed production orchards with the goal of producing all seed needed for planting “in-house” in the future. This year black walnut seedling sales included 160,000 wild collected bed-run seedlings and 3,200 orchard collected select seedlings.

Missouri – Missouri State University is working on a molecular marker assisted breeding project in the hopes of incorporating the anthracnose resistance and high nut yield from “Sparrow” into crosses with the more robust and better bearing “Football”.

Seedling availability – Select and improved black walnut seedlings are or have been available from the following sources this season: Advanced Tree Technology, ArborAmerica, Hensler’s Nursery, and the IDNR Vallonia Nursery.

Also of interest – This PowerPoint presentation put together by the UC Davis Walnut Improvement Program is only tangentially related to the black walnut most of our members are interested in, but it’s a fascinating look at the work they are doing with Juglans regia (English or Persian walnut): https://ucanr.edu/sites/WalnutShortCourse/files/296820.pdf.

News and Notes

Recent Retirement

Mark Coggeshall retired in February, he was most recently with the USDA Forest Service Northern Research Station unit at West Lafayette, Indiana but had also spent time at University of Missouri and Indiana Division of Forestry. Mark’s work focused on tree breeding, with interests in black walnut and nut culture. He has been active in Walnut Council, serving as president and nut culture chair. Mark and his wife Bettina have retired to Missouri. Best wishes!

Online Hardwood Manual

Silvics of North America: Volume 2, Hardwoods includes information on habitat, life history, and genetics for 15 genera, 63 species, and 20 varieties of conifers and for 58 genera, 128 species, and 6 varieties of hardwoods. These represent most of the commercially important trees of the United States and Canada and beyond. Find it online at: https://srs.fs.usda.gov/pubs/1548

Handy Tips: Keeping Track of Tools

Mark your chainsaw, pruning saw, hatchet, pruners and anything you use in the woods. Use flagging or tape or

Continued on page 19
New Program Seeks to Ensure White Oak Future

A new initiative has been organized with the mission of ensuring a future supply of white oak timber. Concerned by forecasts of long term supply shortages by the distilling and barrel industries, University of Kentucky has partnered with the USDA Forest Service, private industry, and various forestry organizations to look at methods to improve the growth and reproduction of white oak.

The White Oak Initiative works to ensure the long-term sustainability of America’s white oak and the economic, social and conservation benefits derived from white oak dominated forests. While currently white oak growing stocks are sufficient to meet demand, forest monitoring and long-term projections indicate problems in maintaining high-quality white oak regeneration.

This effort is similar to the efforts of the walnut industry in the late 1960’s, when a forecast of a shortage of walnut logs led to the creation of the Walnut Council in 1970. Industry and forestry representatives were concerned that without a conscious effort, stocks would not be available for the future.

Industry Update

Submitted by Logan Wells, Wisconsin DNR, Industry Representative

Editor’s note: This information was accurate as of April 2020 but subject to change.

Tariffs

US and China signed a deal in the middle of January to lift some of the tariffs and China committed to purchasing $200 billion worth of goods in the next two years. On February 28, the Chinese government lifted all tariffs on U.S. hardwood lumber and logs.

COVID-19 Impacts

Much of the anticipated uptick in hardwood markets has been halted due to COVID-19 outbreak. Manufacturing in China was significantly halted even after the Chinese New Year because of workers being sick. While conditions are returning to normal and manufacturing is picking up in China, the impact of the COVID-19 is being felt strongly in the US, as we all know. For the wood industry, many were fortunate to be classified as essential businesses thereby allowed to remain in operation.

A big part of why sawmills, in particular, were largely not impacted was because these firms are a critical link in the entire forest products supply chain. Without sawmills running, wood chips that help feed the pulp and paper industry would be cut off and could impact raw material supply for pulp mills. Also, pallet stock is necessary to keep the flow of goods moving as best as possible. Most states followed suit with the federal government and have classified their primary mills as essential although some states have placed restrictions on secondary wood manufacturing.

Real Hardwood Promotion Coalition

If you ask many seasoned members of the lumber industry, one of the biggest threats to lumber markets has been the changes of domestic consumers over the past 5-10 years and a lack of appreciation for real hardwood. Different substitute materials, from flooring and furniture to counter tops and cabinets, have all negatively impacted market share of the hardwood lumber. In response, a coalition of wood industry stakeholders formed last year to help promote Real American Hardwood to consumers, architects and other decision makers. The group has held some focus groups with consumers to determine key messaging strategies to educate people on the benefits of real hardwood products. If you would like to learn more about their efforts check them out at: https://www.appalachianhardwood.org/real/.

One goal of the initiative is to ensure white oak seedlings like these reach the sapling stage and to maturity.
Part II. Using Cover Crops to Improve Site Quality

Continued from page 5

difficult to seed and establish due to different seed size and planting times, seed sowing depth, and growth rates. Table 2 lists recommended seeding rates to quickly establish a dense stand of a single species using the lower rate if drilled in and the higher rate if broadcast seeded. In tree plantings seeding rates can likely be reduced by as much as 50 percent and still be effective. In a species mix the seeding rate for each species is usually adjusted proportionately to desired final composition.

The USDA Natural Resource Conservation Service (NRCS) has been actively researching the benefits of using cover crops to improve soil health. For example, the NRCS Plant Materials Center in Elsberry, Missouri established demonstration sites from 2014 to 2017 to measure the impact of fall planting date (late July to late September) on biomass production on more than 30 cover crop species alone or in mixtures. In general, cover crops seeded in August (6 to 9 weeks before first killing frost) produced the greatest above-ground biomass. Numerous technical reports are available on the NRCS state and national websites which I have fully utilized but did not cite to write this article.

CONCLUSION

The primary benefit of cover crops may be improving soil health which can result in improved growth of subsequent forage crops or interplanted hardwoods. In addition, the aboveground forage acts as a protective barrier against wind and rain erosion. As the dead forage and root biomass breaks down, it adds organic matter to the soil improving water storage and nutrient storage. Below ground, cover crop roots reduce erosion by holding soil in place. Species with deep taproots can open soils reducing compaction and improve nutrient cycling from subsoils. Overall incorporation of cover crops with minimal competition into hardwood plantings are likely to result in improved tree performance.

SOURCES OF INFORMATION

Application for Membership

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

Name___________________________________________________

Title or Business___________________________________________

Address___________________________________________________

City____________________State________ZIP_______________________

Email_______________________________

Phone_______________________________

☐ NEW MEMBER  ☐ MEMBERSHIP RENEWAL

___ Yes, please send me the newsletter as a PDF via email in lieu of a mailed copy.

Please make your check out for the appropriate dues category, as determined by your country or state of origin, listed below.

REGULAR MEMBERS - U.S.A.*

Illinois $50 Michigan $50
Indiana $50 Missouri $50
Iowa $50 Nebraska $50
Kansas $50 Ohio $50
Kentucky $50 Wisconsin $50
Maryland $45

* Includes state chapter dues, national dues alone are $40

INTERNATIONAL

Canada $55 US
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OTHER MEMBERSHIP CATEGORIES

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Supporting Member $100
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Donation to the Walnut Council Foundation $__________
Donation to combat Thousand Cankers disease $__________

I have contacted the following individuals and believe they are interested in becoming members of the Walnut Council. I understand that the Walnut Council will follow up with a formal invitation from our Executive Director.

Name________________________________________

Title or Business________________________________________

Address___________________________________________________

City____________________State________ZIP_______________________

Email_______________________________

Phone_______________________________

Send information to:
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John S. Wright Forestry Center
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West Lafayette, IN 47906-9431

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