

The WOODland Steward

Promoting the Wise Use of Indiana's Forest Resources

2016 Indiana Forest Products Price Report and Trend Analysis

By Jeff Settle, Chris Gonso, and Mike Seidl

Survey Procedures and Response

Data are collected twice a year, but log prices change constantly. Standard appraisal techniques by those familiar with local market conditions should be used to obtain estimates of current market values for stands of timber or lots of logs. Please note, because of the small number of mills reporting logging costs, "stumpage prices" estimated by deducting the average logging and hauling costs from delivered log prices must be interpreted with extreme caution and is meant to only serve as a guide. Actual stumpage values you may be offered depend on many variables such as access, terrain, time of year, etc.

Data for this survey were obtained by a direct mail/electronic survey to sawmills, veneer mills, concentration yards, and independent log buyers. Only firms operating in Indiana were included. The survey was conducted and analyzed by the Indiana DNR Division of Forestry. The prices reported are for logs delivered to the log yards of the reporting mills or concentration yards. Thus, prices reported may include logs shipped in from other states (e.g., black cherry veneer logs from Pennsylvania and New York).

The survey was mailed to 22 firms and emailed to 31 firms. It is estimated these companies produce close to 90% of the state's roundwood production. Electronic reminders, follow-up phone calls and additional mailings encouraged responses. Eighteen firms reported some useful data. Five mills reported producing 1 million board feet (MMBF) or more. Two mills reported production of 5 MMBF or greater. Total production reported for 2015 was 42 MMBF compared to 64 MMBF for 2014, and 147 MMBF for 2013. The largest single mill production reported was 21 MMBF. These annual levels are not comparable since they do not represent a statistical estimate of total production.

The price statistics by species and grade don't include data from small custom mills, because most do not purchase logs, or they pay a fixed price for all species and grades of pallet-grade logs. They are, however, the primary source of data on the cost of custom sawing and pallet logs. The custom sawing costs reported do not reflect the operating cost of large mills.

This report can be used as an indication of price trends for logs of defined species and qualities. It should not be used for the appraisal of logs or standing timber (stumpage). Stumpage price averages are reported by the Indiana Association of Consulting Foresters in the Indiana Woodland Steward, <http://www.inwoodlands.org/>.

cont'd on page 3



USDA FS Researchers inoculate an *Ailanthus* tree in Ohio with the *Verticillium* fungus. See article on page 12.

Photo by Gary Chauncey, Wayne National Forest.

In This Issue

| | |
|---|----|
| 2016 Price Report | 1 |
| Calendar of Events | 2 |
| Managing Forests for Birds in Indiana | 7 |
| The State Forest Timber Sale Process | 9 |
| Ask the Steward | 11 |
| A Native Soil-Borne Fungus Shows Promise in Controlling <i>Ailanthus</i> | 12 |
| Scout Oak Trees to Identify the Best Mast Producer | 14 |

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Calendar of Events

February 7

Forestry presentation: American Chestnut
6:00 PM
Southeastern Purdue Ag Center,
Butlerville
RSVP or Information: 812-689-4107

February 7-9

IHLA Convention & Exposition
Indianapolis Marriott Downtown
Contact www.ihla.org or 317-875-3660.

February 16 – April 20

Forest Management for the Private Woodland Owner
6:00 - 9:00 PM Thursdays, 8 week course
Southern IN Purdue Agricultural Center,
Dubois County
More information: 812-678-5049 or
ronr@purdue.edu.

February 23

Tree Planting Workshop
1-4 PM EST
Marshall County Building, Plymouth
Contact 219-843-4827 to register.

March 1 to April 19

Forest Management for the Private Woodland Owner short course
Wednesdays, 6:00 - 9:00 PM, 8 week course
LaGrange, LaGrange County
Contact Lenny Farlee 765-494-2153 or
lfarlee@purdue.edu.

March 7-8

Central Hardwoods Oak Ecology and Wildlife Management Conference
Nashville, Brown County
Register and more info at <http://indianasaf.net/>.

March 8

Timber Industry Meeting
6 PM
Southeastern Purdue Ag Center,
Butlerville
RSVP or Information: 812-689-4107

March 14

Southern Indiana Conservation Happenings
9 AM - 3 PM
Muscatatuck National Wildlife Refuge,
Jennings County
Contact susan_knowles@fws.gov or 812-522-4352 for info.

March 17-18

Indiana Tree Farm Landowners Field Tour and Clinic
Brown County State Park, Nashville
Call 317-409-8519 or kingwalnut@sbcglobal.net.

March 25

Ohio River Valley Woodland and Wildlife Workshop
Burlington, KY
See www.tristatewoods.org or call 859-257-7597.

April 4

Presentation: Wildflowers
6 PM
Clifty Falls State Park, Madison
RSVP or Information: 812-689-4107

April 22

Forest Nature Fest
9 AM - noon
Ferdinand State Forest, Dubois County

June 11 - 14

Walnut Council national meeting

June 13 - 15 Thousand Cankers Disease National Research Meeting

Lafayette, Tippecanoe county
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The opinions expressed by the authors do not necessarily reflect those of the Woodland Steward Institute. The objectives of the newsletter are to provide general and technical natural resource information to woodland owners of Indiana, improve information distribution and build support for responsible forest resource management.

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*Price Report (cont'd from page 1)***Delivered Sawlog Prices**

The number of mills reporting delivered sawlog prices remained fairly constant to those who reported in the 2015 winter report (Table 1). Sawlog prices for the premium species (specifically black walnut and white oak) were down slightly from the 2015 winter report. From an overall standpoint, prices were up for most of the other species. Generally soft maple markets are better than all other species. While not what they were a year ago, white oak and walnut markets are steady. Red oak demand is sluggish. Markets are trending down for poplar, hickory and ash.

Premium Species

With the exception of prime grade (up 15%), the remaining three grades of white oak sawlogs were slightly lower (-2.3%). The demand for stave logs has slowed for the time being, and this has put more white logs on the sawlog market. With the markets being so strong for veneer, stave and rift/quartered logs, finding larger, quality logs has become quite a challenge. In a complete reversal from the 2015 winter report, prices being paid for red oak were up across all grades, with prime leading the way at 14% higher.

Demand for black walnut sawlogs had slowed down when the 2015 winter report was completed, and that trend continues. Prices were down across all log grades with Nos. 2 and 3 both at almost 18%.

Black cherry sawlog prices have not changed much since the 2015 winter report. Prime logs were off almost 4%, while No.1 and No. 2 prices were just slightly higher, and No. 3 log prices were off less than 1%. Consumer demand for the darker-finished wood continues to hurt the cherry markets.

Hard maple sawlog prices were generally higher across the various

cont'd next page

Table 1. Prices paid for delivered sawlogs by Indiana sawmills, October 2015 and July 2016

| Species/Grade | 16-Jul Range (\$/MBF) | No. Responses | | Mean (s.e.)1 | | Median | | Change(%) | |
|---------------|-----------------------------|---------------|--------|--------------|--------|--------|--------|-----------|--------|
| | | 15-Oct | 16-Jul | 15-Oct | 16-Jul | 15-Oct | 16-Jul | Mean | Median |
| | | | | | | | | | |
| WHITE ASH | | | | | | | | | |
| Prime | 400 - 700 | 4 | 4 | 588 | 688 | 625 | 700 | 17.0 | 12.0 |
| No. 1 | 300 - 700 | 8 | 7 | 481 | 486 | 475 | 500 | 0.9 | 5.3 |
| No. 2 | 250 - 600 | 7 | 6 | 375 | 375 | 350 | 375 | 0.0 | 7.1 |
| No. 3 | 150 - 550 | 6 | 5 | 300 | 308 | 300 | 300 | 2.7 | 0.0 |
| BEECH | | | | | | | | | |
| Prime | 300 - 350 | 4 | 3 | 325 | 333 | 325 | 300 | 2.6 | -7.7 |
| No. 1 | 160 - 300 | 5 | 5 | 262 | 320 | 300 | 300 | 22.1 | 0.0 |
| No. 2 | 150 - 300 | 5 | 4 | 232 | 313 | 250 | 300 | 34.7 | 20.0 |
| No. 3 | 150 - 300 | 6 | 5 | 235 | 278 | 250 | 300 | 18.1 | -0.8 |
| CHERRY | | | | | | | | | |
| Prime | 600 - 800 | 4 | 4 | 770 | 675 | 700 | 650 | -3.6 | -7.1 |
| No. 1 | 400 - 750 | 8 | 7 | 556 | 557 | 550 | 550 | 0.2 | 0.0 |
| No. 2 | 350 - 500 | 7 | 6 | 418 | 427 | 400 | 400 | 2.1 | 0.0 |
| No. 3 | 250 - 450 | 6 | 5 | 308 | 308 | 300 | 300 | -0.1 | 0.0 |
| HICKORY | | | | | | | | | |
| Prime | 450 - 600 | 4 | 4 | 538 | 550 | 550 | 550 | 2.3 | 0.0 |
| No. 1 | 350 - 550 | 8 | 7 | 419 | 409 | 400 | 400 | -2.4 | 0.0 |
| No. 2 | 250 - 500 | 7 | 6 | 354 | 337 | 350 | 335 | -4.8 | -4.3 |
| No. 3 | 150 - 450 | 6 | 5 | 292 | 288 | 300 | 300 | -1.3 | 0.0 |
| HARD MAPLE | | | | | | | | | |
| Prime | 500 - 800 | 4 | 4 | 700 | 800 | 750 | 800 | 14.3 | 6.7 |
| No. 1 | 400 - 750 | 8 | 7 | 563 | 579 | 575 | 550 | 2.9 | -4.3 |
| No. 2 | 300 - 650 | 7 | 6 | 425 | 425 | 400 | 400 | 1.0 | 0.0 |
| No. 3 | 200 - 550 | 6 | 5 | 352 | 308 | 300 | 300 | -5.2 | 0.0 |
| SOFT MAPLE | | | | | | | | | |
| Prime | 400 - 600 | 4 | 4 | 488 | 513 | 475 | 500 | 5.1 | 5.3 |
| No. 1 | 300 - 450 | 8 | 7 | 369 | 393 | 350 | 350 | 6.5 | 0.0 |
| No. 2 | 200 - 400 | 7 | 6 | 307 | 317 | 300 | 300 | 3.1 | 0.0 |
| No. 3 | 150 - 300 | 6 | 5 | 258 | 276 | 275 | 250 | 6.8 | -9.1 |
| WHITE OAK | | | | | | | | | |
| Prime | 600 - 1100 | 4 | 4 | 825 | 950 | 800 | 1000 | 15.2 | 25.0 |
| No. 1 | 500 - 900 | 8 | 7 | 663 | 657 | 625 | 600 | -0.8 | -4.0 |
| No. 2 | 350 - 750 | 7 | 6 | 482 | 467 | 450 | 450 | -3.2 | 0.0 |
| No. 3 | 250 - 650 | 7 | 5 | 350 | 340 | 300 | 300 | -2.9 | 0.0 |
| RED OAK | | | | | | | | | |
| Prime | 550 - 700 | 4 | 4 | 613 | 700 | 600 | 700 | 14.3 | 16.7 |
| No. 1 | 400 - 550 | 8 | 7 | 478 | 514 | 500 | 500 | 7.6 | 0.0 |
| No. 2 | 300 - 450 | 7 | 6 | 379 | 404 | 375 | 375 | 6.8 | 0.0 |
| No. 3 | 200 - 400 | 6 | 5 | 308 | 348 | 300 | 300 | 12.9 | 0.0 |
| TULIP POPLAR | | | | | | | | | |
| Prime | 450 - 600 | 4 | 4 | 525 | 513 | 525 | 500 | -2.4 | -4.8 |
| No. 1 | 250 - 550 | 8 | 7 | 413 | 386 | 400 | 400 | -6.5 | 0.0 |
| No. 2 | 200 - 500 | 7 | 6 | 343 | 317 | 350 | 325 | -7.6 | -7.1 |
| No. 3 | 150 - 450 | 6 | 5 | 292 | 266 | 300 | 250 | -8.8 | -8.8 |
| BLACK WALNUT | | | | | | | | | |
| Prime | 1000 - 3000 | 4 | 3 | 1719 | 1667 | 1437.5 | 1500 | -3.0 | 4.3 |
| No. 1 | 800 - 2500 | 8 | 6 | 1319 | 1133 | 1150 | 1100 | -14.1 | -4.3 |
| No. 2 | 500 - 2000 | 8 | 5 | 963 | 790 | 775 | 800 | -17.9 | 3.2 |
| No. 3 | 350 - 1100 | 7 | 4 | 579 | 475 | 400 | 425 | -17.9 | 6.3 |
| SOFTWOOD | | | | | | | | | |
| Pine | 150 - 300 | 4 | 3 | 220 | 283 | 250 | 300 | 28.8 | 39.5 |
| Red cedar | 150 - 500 | 3 | 2 | 317 | 400 | 400 | 400 | 26.3 | 33.3 |

Table 2. Prices paid for delivered veneer logs by Indiana mills, October 2015 and March 2016.

| SPECIES GRADE LOG DIAM. | 16-MAR RANGE (\$/MBF) | NO. RESPONSES | | MEAN | | MEDIAN | | CHANGE (%) | |
|-------------------------------|-----------------------------|---------------|--------|--------------------|--------------------|--------------------|--------------------|------------|--------|
| | | 15-OCT | 16-MAR | 15-OCT (\$/MBF) | 16-MAR (\$/MBF) | 15-OCT (\$/MBF) | 16-MAR (\$/MBF) | MEAN | MEDIAN |
| BLACK WALNUT | | | | | | | | | |
| PRIME | | | | | | | | | |
| 12-13 | 2500-4750 | 7 | 6 | 2,971 | 3,542 | 3,000 | 3,750 | 19.2 | 25.0 |
| 14-15 | 4000-5500 | 8 | 6 | 4,219 | 4,333 | 4,500 | 4,000 | 2.7 | -11.1 |
| 16-17 | 5000-6750 | 8 | 6 | 5,563 | 5,792 | 5,750 | 5,750 | 4.1 | 0.0 |
| 18-20 | 7000-8500 | 7 | 6 | 6,750 | 7,417 | 7,500 | 7,250 | 9.9 | -3.3 |
| 21-23 | 8000-10500 | 7 | 5 | 8,571 | 9,300 | 9,500 | 10,000 | 8.5 | 5.3 |
| 24-28 | 9500 | 7 | 2 | 10,071 | 9,500 | 11,000 | 9,500 | -5.7 | -13.6 |
| >28 | 10000 | 4 | 2 | 9,875 | 10,000 | 9,500 | 10,000 | 1.3 | 5.0 |
| SELECT | | | | | | | | | |
| 12-13 | 2000 | 4 | 2 | 2,025 | 2,000 | 1,875 | 2,000 | -1.2 | 6.7 |
| 14-15 | 3500 | 4 | 2 | 2,825 | 3,500 | 3,000 | 3,500 | 23.9 | 16.7 |
| 16-17 | 4500 | 4 | 2 | 3,875 | 4,500 | 3,750 | 4,500 | 16.1 | 20.0 |
| 18-20 | 3200-6000 | 4 | 3 | 4,750 | 5,067 | 4,750 | 6,000 | 6.7 | 26.3 |
| 21-23 | 3500-6000 | 4 | 3 | 5,500 | 5,167 | 5,500 | 6,000 | -6.1 | 9.1 |
| 24-28 | 4000-6500 | 4 | 3 | 6,250 | 5,667 | 6,500 | 6,500 | -9.3 | 0.0 |
| >28 | 6500 | 3 | 2 | 5,883 | 6,500 | 6,000 | 6,500 | 11.4 | 8.3 |
| WHITE OAK | | | | | | | | | |
| PRIME | | | | | | | | | |
| 13-14 | 1700-2300 | 8 | 4 | 1,800 | 1,925 | 1,925 | 1,850 | 6.9 | -3.9 |
| 15-17 | 2300-2500 | 9 | 4 | 2,056 | 2,400 | 2,300 | 2,400 | 16.8 | 4.3 |
| 18-20 | 2700-3000 | 7 | 4 | 2,614 | 2,800 | 2,700 | 2,750 | 7.1 | 1.9 |
| 21-23 | 3500 | 7 | 3 | 3,050 | 3,500 | 3,150 | 3,500 | 14.8 | 11.1 |
| 24-28 | 4000 | 7 | 3 | 3,279 | 4,000 | 4,000 | 4,000 | 22.0 | 0.0 |
| >28 | 4000 | 5 | 2 | 3,960 | 4,000 | 3,800 | 4,000 | 1.0 | 5.3 |
| SELECT | | | | | | | | | |
| 13-14 | 1400 | 6 | 2 | N/A | 1,400 | 1,500 | 1,400 | N/A | -6.7 |
| 15-17 | 1800 | 6 | 2 | 1,675 | 1,800 | 1,775 | 1,800 | 7.5 | 1.4 |
| 18-20 | 2000 | 4 | 2 | 1,988 | 2,000 | 2,075 | 2,000 | 0.6 | -3.6 |
| 21-23 | 2500 | 4 | 2 | 2,138 | 2,500 | 2,275 | 2,500 | 17.0 | 9.9 |
| 24-28 | 2750 | 3 | 2 | 2,000 | 2,750 | 1,750 | 2,750 | 37.5 | 57.1 |
| >28 | 2750 | 2 | 2 | 2,500 | 2,750 | 2,500 | 2,750 | 10.0 | 10.0 |
| BLACK CHERRY | | | | | | | | | |
| PRIME | | | | | | | | | |
| 12-13 | 3000 | 4 | 2 | 1,900 | 3,000 | 2,000 | 3,000 | 57.9 | 50.0 |
| 14-15 | 3500 | 4 | 2 | 2,150 | 3,500 | 2,000 | 3,500 | 62.8 | 75.0 |
| 16-17 | 4000 | 6 | 2 | 2,417 | 4,000 | 2,250 | 4,000 | 65.5 | 77.8 |
| 18-20 | 4500 | 6 | 2 | 2,492 | 4,500 | 2,250 | 4,500 | 80.6 | 100.0 |
| 21-23 | 4500 | 5 | 2 | 2,600 | 4,500 | 2,000 | 4,500 | 73.1 | 125.0 |
| 24-28 | 5000 | 4 | 2 | 3,000 | 5,000 | 2,500 | 5,000 | 66.7 | 100.0 |
| >28 | 5000 | 4 | 2 | 3,000 | 5,000 | 2,500 | 5,000 | 66.7 | 100.0 |
| SELECT | | | | | | | | | |
| 12-13 | 2000 | 1 | 2 | 2,000 | 2,000 | 2,000 | 2,000 | 0.0 | 0.0 |
| 14-15 | 2500 | 1 | 2 | 3,000 | 2,500 | 3,000 | 2,500 | -16.7 | -16.7 |
| 16-17 | 3000 | 1 | 2 | 3,000 | 3,000 | 3,000 | 3,000 | 0.0 | 0.0 |
| 18-20 | 1500-3000 | 1 | 2 | 3,500 | 2,500 | 3,500 | 3,000 | -28.6 | -14.3 |
| 21-23 | 3000 | 1 | 2 | 3,500 | 3,000 | 3,500 | 3,000 | -14.3 | -14.3 |
| 24-28 | 3000 | 1 | 2 | 3,500 | 3,000 | 3,500 | 3,000 | -14.3 | -14.3 |
| >28 | 3000 | 1 | 2 | 3,500 | 3,000 | 3,500 | 3,000 | -14.3 | -14.3 |
| RED OAK | | | | | | | | | |
| PRIME | | | | | | | | | |
| 16-17 | 1200-1600 | 6 | 5 | 1,075 | 1,460 | 1,100 | 1,500 | 35.8 | 36.4 |
| 18-20 | 1200-1600 | 7 | 5 | 1,150 | 1,460 | 1,200 | 1,500 | 27.0 | 25.0 |
| 21-23 | 1200-1600 | 7 | 4 | 1,179 | 1,450 | 1,200 | 1,500 | 23.0 | 25.0 |
| 24-28 | 1200-1600 | 7 | 3 | 1,186 | 1,467 | 1,200 | 1,600 | 23.7 | 33.3 |
| >28 | 1600 | 5 | 2 | 1,240 | 1,600 | 1,400 | 1,600 | 29.0 | 14.3 |
| SELECT | | | | | | | | | |
| 16-17 | 1300 | 1 | 2 | 1,100 | 1,300 | 1,100 | 1,300 | 18.2 | 18.2 |
| 18-20 | 1300 | 1 | 2 | 1,100 | 1,300 | 1,100 | 1,300 | 18.2 | 18.2 |
| 21-23 | 1300 | 1 | 2 | 1,100 | 1,300 | 1,100 | 1,300 | 18.2 | 18.2 |
| 24-28 | 1300 | 1 | 2 | 1,100 | 1,300 | 1,100 | 1,300 | 18.2 | 18.2 |
| >28 | 1300 | 1 | 2 | 1,100 | 1,300 | 1,100 | 1,300 | 18.2 | 18.2 |
| HARD MAPLE | | | | | | | | | |
| PRIME | | | | | | | | | |
| 16-20 | 2000-3750 | 8 | 5 | 2,125 | 3,050 | 2,000 | 3,250 | 43.5 | 62.5 |
| >20 | 2500-4250 | 7 | 4 | 2,357 | 3,613 | 2,500 | 3,850 | 53.3 | 54.0 |
| SELECT | | | | | | | | | |
| 16-20 | 3000 | 2 | 2 | 1,000 | 3,000 | 1,000 | 3,000 | 200.0 | 200.0 |
| >20 | 3500 | 2 | 2 | 1,000 | 3,500 | 1,000 | 3,500 | 250.0 | 250.0 |
| YELLOW POPLAR | | | | | | | | | |
| PRIME | | | | | | | | | |
| 16-20 | 650-900 | 4 | 3 | 675 | 733 | 600 | 650 | 8.6 | 8.3 |
| >20 | 650-900 | 4 | 4 | 738 | 733 | 750 | 650 | -0.6 | -13.3 |
| SELECT | | | | | | | | | |
| 16-20 | N/A | 1 | 0 | 350 | N/A | 350 | N/A | N/A | N/A |
| >20 | N/A | 1 | 0 | 350 | N/A | 350 | N/A | N/A | N/A |

grades. Prime logs were 14% higher and Nos. 1 and 2 were just slightly higher than the 2015 winter report. No. 3 logs were the lone item that decreased (-5.2%). The summer and early fall months usually see less hard maple production due to the fear of stain. This may have played a large part in the price drops. Soft maple markets have been fairly steady due to strong lumber demand. Consumers are buying more painted wood materials, which play well into soft maple's hands. Soft maple logs averaged just over 5% higher across grades.

Other Hardwood Species

More ash timber is being harvested in an effort to stay ahead of the Emerald Ash Borer. Production is high right now. Still, prime ash sawlog prices, at 17%, were significantly higher than those from the 2015 winter report. The remaining three grades were only a combined 1% higher than the 2015 winter report.

Tulip poplar decreased across all grades. Prime sawlogs were reported to be only 2.4% less than the 2015 winter report, while the remaining three grades combined for a 7.5% decrease.

Softwood Logs

The price of pine sawlogs increased 22% to \$283/MBF. Red cedar prices were also up almost 21% from those in the 2015 winter report. It should be noted, however, that only three producers reported pine sawlog prices and two producers reported red cedar prices.

Veneer Log Prices

The number of mills reporting veneer log prices decreased slightly from the 2015 winter report (Table 2). Prices were reported by both veneer mills and sawmills. Sawmills resell their veneer-quality logs to veneer mills, exporters, overseas importers and manufacturers. On occasion, sawmills may produce specialty cuts like quarter sawing

Table 3. Prices of miscellaneous products reported by Indiana mills, October 2015 and March 2016, free on board (fob) the producing mill.

| | No. Responses | Range 16-Mar | Mean | | Median | |
|---------------------|------------------|-----------------|--------|--------|--------|--------|
| | | | 15-Oct | 16-Mar | 15-Oct | 16-Mar |
| Pallet logs, \$/MBF | 6 | 240-300 | 266 | 285 | 300 | 300 |
| Pallet logs, \$/ton | 2 | 36-50 | 43 | 43 | 40 | 43 |
| Pulpwood, \$/ton | 2 | 32-38 | 20 | 35 | 20 | 35 |
| Pulp chips, \$/ton | 5 | 12-34.4 | 20 | 26 | 21.8 | 27 |
| Sawdust, \$/ton | 3 | 7-35 | N/A | 22 | N/A | 23.7 |
| Sawdust, \$/cu. yd. | 2 | 7-13 | 16 | 10 | 11.5 | 10 |
| Bark, \$/ton | 2 | 2.5-10 | 9 | 6 | 8.8 | 6.3 |
| Bark, \$/cu. yd. | 3 | 4-23 | 9 | 11 | 7 | 5 |
| Mixed, \$/ton | 0 | N/A | 15 | N/A | 15 | N/A |
| Mixed, \$/cu. yd. | 0 | N/A | 3 | N/A | 3 | N/A |

marginal veneer logs. The variation in veneer log pricing is due to mix veneer mills, sawmills and loggers reporting their values. This difference in values could be reduced if prices were only from veneer manufacturers.

Demand was reported to be slower in the winter report. That demand has picked up slightly since the first of 2016, with most mills running at 70%-80% capacity. Conversely, veneer-quality logs continue to remain in demand, and overall pricing is higher than what was reported in the 2015 winter report. Additionally, weather conditions, like the economic environment, can play havoc on log pricing and volumes available.

Black walnut and white oak veneer remain in demand both domestically and internationally. Black walnut veneer log prices were generally higher, especially prime in the 12" small-end diameter all the way up to 23" small-end diameter, which are averaging almost 9% higher. Pricing for 24" and larger prime veneer logs averaged 3.5% less. Select walnut veneer logs averaged almost 6% higher across the various diameters.

White oak prime veneer log pricing was up significantly from the 2015 winter report, averaging an increase of over 11%, while select veneer logs were up 12% across all diameters. With stave log supply/demand ratio in better balance, there should be more logs available on the market.

Red oak prime veneer log prices were down an average of 19%, and select veneer log prices were down an average of 5%.

Veneer mills reported significantly lower prices for hard maple. Prime veneer hard maple logs were off an average of almost 16%, while select veneer logs were down an average of

20%. Additionally, a slower economic condition throughout the international markets also increased the pressure on export log value.

These economic conditions will also affect white oak veneer, but to a much smaller degree. White oak markets are improved due to the stave market cooling off in recent months. There is still good demand though for rift and quarter-sawn white oak. When you add the demand for quarter-sawn and export lumber to the mix, the pressure for logs increases exponentially.

Custom Costs

Costs of custom services increased from the spring report in the areas of sawing and logging (per/MBF). The high cost of diesel fuel usually plays a large role in logging costs (Table 4). Logging costs as reported in this survey indicate an increase in logging costs from \$160 to \$253 per MBF.

Indiana Timber Price Index

The delivered log prices collected in the Indiana Forest Products Price Survey are used to calculate the delivered log value of typical stands of timber. This provides trend-line

Table 4. Custom costs reported by Indiana mills, October 2015 and March 2016.

| | No. Responses | Range 16-Mar | Mean | | Median | |
|------------------|------------------|-----------------|--------|--------|--------|--------|
| | | | 15-Oct | 16-Mar | 15-Oct | 16-Mar |
| Sawing (\$/MBF) | 4 | 250-400 | 317 | 313 | 300 | 300 |
| Sawing (\$/hour) | 1 | 150 | - | 150 | - | 150 |
| Logging (\$/MBF) | 4 | 160-253 | 200 | 209 | 200 | 212 |
| Hauling (\$/MBF) | 4 | 40-70 | 85 | 55 | 85 | 55 |
| Distance (miles) | 1 | 50 | 47 | 50 | 45 | 50 |
| \$/MBF/mile | 0 | N/A | N/A | N/A | N/A | N/A |

cont'd on page 6



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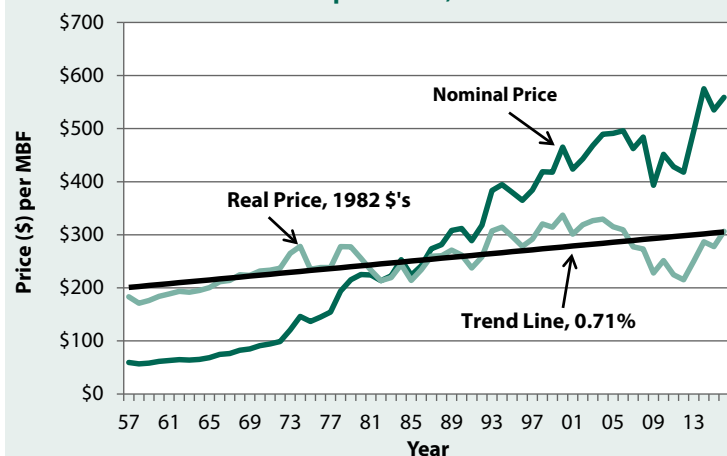
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Figure 1. Average stand of timber: nominal, deflated, and trend-line price series, 1957-2016.



information that can be used to monitor long-term prices for timber. The weights are based primarily on the 1967 Forest Survey of Indiana, with changes made to remove basswood, cottonwood, elm, black oak and sycamore in 2014.

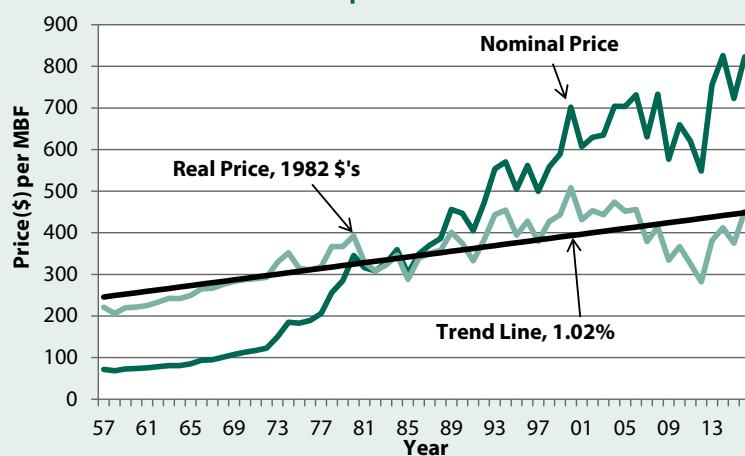
The nominal (not deflated) price is a weighted average of the delivered log prices reported in the price survey. The price indexes are the series of nominal prices divided by the price in 1957, the base year, multiplied by 100. Thus, the index is the percentage of the 1957 price. For example, the average price in 2016 for the average stand was 938.1 percent of the 1957 price. The index for a quality stand increased from 1,007 percent to 1,146 percent.

The real prices are the nominal prices deflated by the producer price index for finished goods, with 1982 as the base year. The real price series represents the purchasing power of dollars based on a 1982 market basket of finished producer goods. It's this real price trend that is important for evaluating long-term investments like timber and the log input cost of mills. Receiving a rate of return less than the inflation rate means that the timber owner is losing purchasing power, a negative real rate of return.

Note that each year the previous year's number is recalculated using the producer price index for finished goods for the entire year. The price index used for the current year is the last one reported for the month when the analysis is conducted—March this year. The index decreased from 1.93 for 2015 to 1.83 as of March 2016. Inflation in the 1 to 2 percent range is generally considered a sign of a healthy, growing economy. The change from 2015 to 2016 is about 2 percent.

The nominal weighted average price for a stand of average quality increased from \$535.1 in 2015 to \$559.0 this year. Again, this series is based on delivered log prices, not

Figure 2. Quality stand of timber: nominal, deflated, and trend-line price series 1957-2016.



stumpage prices. The deflated, or real, price increased from \$277.7 in 2015 to \$306.5 this year. The average annual compound rate of interest required to take the linear trend line from \$201 in 1957 to \$305 in 2016 is 0.71 percent (Figure 1).

The nominal weighted average price for a high-quality stand increased from \$722.9 in 2015 to \$822.7 this year. The average real price series for a high-quality stand increased from \$375.1 in 2015 to \$451.0 this year. The average annual compound rate of increase for the trend line is 1.02% per year (Figure 2).

Implications

The extent to which holding a stand of timber increases purchasing power depends on when you take ownership and when you liquidate. The 60-year period used in this analysis is much longer than the typical length of ownership. The rate of increase in the trend line doesn't include the return resulting from increase in volume per acre by physical growth, nor the potential increase in unit price as trees get larger in diameter and increase in quality. Maximizing these increases in value requires timber management.

The complete 2016 Indiana Forest Products Price Report and Trend Analysis can be read in its entirety at: <http://www.in.gov/dnr/forestry/>. Previous reports are available online through the Purdue University Library, www.lib.purdue.edu.

Jeffrey Settle, Forest Resource Information (FRI); Chris Gonso, Ecosystem Services Specialist for the Indiana Department of Natural Resources, Division of Forestry; and Mike Seidl, Hardwoods Program Manager for the Indiana State Department of Agriculture

Managing Forests for Birds in Indiana

By Kenneth F. Kellner, Patrick J. Ruhl, John B. Dunning Jr., Robert K. Swihart

Introduction

Indiana hosts a diverse community of bird species. As both predators and prey, birds are important elements of nature's food web. Many birds also play important roles as pollinators and seed dispersers. In addition to their ecological value, their beautiful colors and songs are enjoyed by birdwatchers throughout the state.

The diversity of bird species native to Indiana is matched by their diverse habitat requirements. For example, some species, like the Ovenbird and Red-eyed Vireo, prefer forested habitat with large, older trees and a closed canopy. Other species, like the Indigo Bunting and Ruffed Grouse, prefer forested habitat with dense, shrubby vegetation (these are often called "shrubland" species). More than half of birds found in the Midwest actually use a mixture of habitat types throughout their lifetimes - for example, Worm-eating Warblers are frequently found in mature forest but also make use of young forest habitat to find food and hide from predators.

Over the last several decades, scientists have observed declines in numerous bird species across the eastern United States. Many of these declines have been attributed to habitat loss as humans continue to alter the natural landscape, most recently with conversion of habitat for development. Many people focus their attention on the loss of mature, closed-canopy forest habitat. However, the loss of young forest habitat is of equal or greater concern. In fact, closed-canopy forest has increased by approximately 15% in Indiana since 1950, while the amount of young forest habitat continues to decline throughout the Midwest.

Loss of young forest habitat has resulted from changing patterns of forest disturbance. Prior to European settlement of Indiana, patches of dense, young vegetation were constantly created by natural disturbance events like wildfire, tornadoes, and insect infestations, as well as by fires set intentionally by Native Americans. Indiana forests are highly resilient to such disturbances. Thus, over time, these patches naturally regenerated back to closed-canopy forest, and birds that specialized on young forests moved on to the next disturbance opening. This cycle of disturbance, regeneration, and maturation ensured a diversity of habitat types across the landscape that were capable of maintaining a diversity of bird species.

As human populations have increased and technology has progressed, human influence has grown across the Indiana landscape. Forests that once spanned the entire state have now been broken apart into smaller pieces. Furthermore, natural disturbances (like fire) are perceived as dangerous or

unappealing to humans, and thus have been suppressed. As a result, the natural cycle of disturbance and regeneration has been interrupted the amount of young forest habitat has declined, and so have the populations of birds that depend on this habitat. Indeed, nearly three-quarters of young forest specialist bird species are currently declining in abundance based on North American Breeding Bird Survey data.

Conservation of the bird community of Indiana requires wise stewardship of our remaining Indiana forests including preservation of mature, closed-canopy forest and creation new patches of young forest habitat. Luckily, there is a flexible set of tools available for forest management, including timber harvesting and prescribed burning. But a key question remains: among the many options, which forest management approaches are likely to be most beneficial for birds and other wildlife?

The Hardwood Ecosystem Experiment

Careful research is necessary to determine which management approaches are most beneficial to the breeding bird community. The Hardwood Ecosystem Experiment (HEE) seeks to provide science that examines the effects of different types of forest management in Morgan-Monroe and Yellowwood State Forests.

Three forest management treatments occur at the HEE: No harvest (as a control), even-aged management, and uneven-aged management. The goal of the even-aged treatment is to create a future forest stand where all trees are of a similar age, using a mixture of 10-acre clearcut and 10-acre shelterwood timber harvests. In the uneven-aged treatment, smaller 1-5 acre patch cuts and single-tree selection are implemented with the goal of a future forest stand of mixed age.

In each treatment, we monitored bird abundance over a 10-year period both before and after the timber harvests occurred, which allowed us to account for any pre-existing differences in the bird community between sites.

Results

Prior to harvesting, our study sites were intact, closed-canopy forest. Unsurprisingly, the most common bird species present were those associated with this type of habitat including the Ovenbird, Red-eyed Vireo, and Worm-eating Warbler. In contrast, "shrubland" species associated with young forest habitat (like the Indigo Bunting, Carolina Wren, Yellow-breasted Chat, and Eastern Towhee) were relatively uncommon.

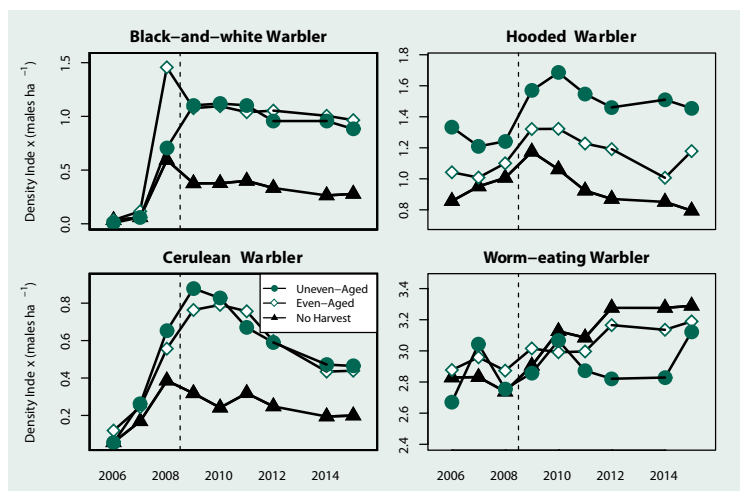


Figure 1. Changes in density of four bird species of conservation concern in Indiana, by management treatment before harvest (2006-08) and after harvest (2009-15).

Our results show that the young forest created following harvest provided habitat for shrubland species, increasing their abundance. Among the species that responded positively to timber harvesting were several species of conservation concern in Indiana, including the Cerulean Warbler, Hooded Warbler, and Black-and-white Warbler (Figure 1). Some species that preferred intact, closed-canopy forest habitat (like the Worm-eating Warbler) showed modest declines in abundance following timber harvest since they no longer had quite as much suitable habitat available. However, plenty of intact forest habitat remained and these species likewise remained abundant; for example, the Worm-eating Warbler remains several times more abundant than the young forest species in both management treatments (Figure 1).

When looking at the entire bird community, we found that both even- and uneven-aged management treatments increased the total number of bird species (that is, the “richness”) at those sites. Figure 2 illustrates that prior to harvesting, richness was similar among the three treatments. After the harvests were applied, richness increased quickly at the even- and uneven-aged management sites relative to the no-harvest control sites. By 2014, richness was nearly 20% higher in the even- and uneven-aged treatments relative to the no-harvest control.

Conclusions

In both the even- and uneven-aged harvest treatments, timber harvesting increased the diversity of habitat types available to the bird community by creating patches of young, dense forest. These patches provide valuable habitat for shrubland birds, and are used for food and cover by some mature forest species as well. Overall, timber harvesting resulted in increased bird species richness corresponding to increased habitat diversity.

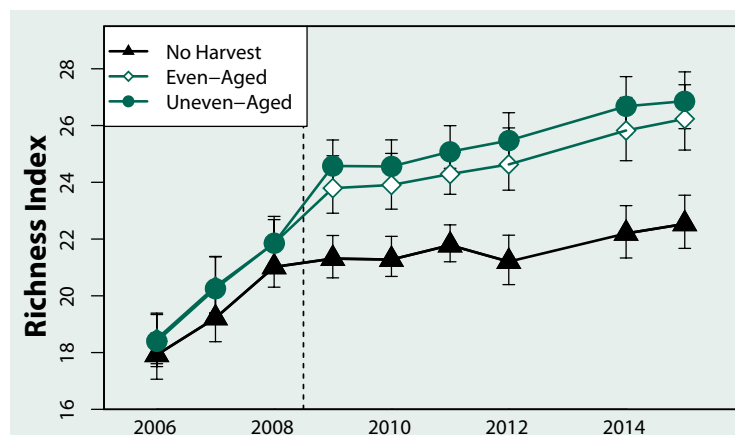


Figure 2. Changes in bird species richness at the HEE, by management treatment before harvest (2006-08) and after harvest (2009-15).

Forest landowners and managers seeking to promote a diverse community of forest bird species have multiple options. The largest, most intensive timber harvests in our study (10-acre clearcuts) resulted in the highest richness and largest increases in shrubland birds. In cases where openings that large may not be feasible, smaller patch cut openings (1-5 acres) were also used by many shrubland species. Of course landowners and managers should also strive to preserve patches of mature, closed-canopy forest habitat to maximize the diversity of habitats available to the forest bird community. This is especially true in fragmented landscapes that already contain abundant young forest habitat but little closed-canopy forest.

For more information about this study, see our recent paper “Multi-scale responses of breeding birds to experimental forest management in Indiana, USA” (Forest Ecology and Management 382: 64-75).

Ken Kellner is a post-doctoral research assistant at Purdue University. He is using the infrastructure of sites at the Hardwood Ecosystem Experiment to develop and parameterize multi-scale models of abundance and habitat use by breeding birds. Patrick Ruhl is a PhD student and is currently studying how song birds respond to timber harvesting. Barny Dunning is a professor of wildlife ecology at Purdue University. Rob Swihart is a professor of wildlife science at Purdue University.

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The State Forest Timber Sale Process

By John Friedrich

There are numerous steps and phases in creating a state forest timber harvest. A state forest timber harvest generally starts with a tract inventory. A tract is the basic management unit on the state forest where site specific management decisions are made. Tracts are generally 50 to 150 acres in size, and are contiguous landholdings with boundaries that follow physical features such as roads, streams, etc., or property lines.

Tracts are visited on a periodic basis to assess overall condition. Many tracts on state forests have records dating back over a half century showing the change in forest condition and past management impacts. The tract inventory is the primary tool in the assessment as it provides information on the composition and condition of the trees on the tract. A grid of inventory plots is established across the tract. Trees within each plot are measured and their condition is assessed. In addition, the inventory forester will take note of and record other information, such as overall condition of the forest, wildlife encountered, forest regeneration, and features.

This inventory information is then analyzed for a variety of factors. For example, by comparing the stocking level (the amount of area occupied by trees usually measured in basal area) to standard central hardwood stocking guides, it can be determined if stocking is getting too dense. When the density of trees gets high, competition for light, nutrients and water increases. Under high stocking, trees are stressed and high mortality is occurring or soon will occur. A check of species composition may also show large numbers of tree species that are susceptible to insect attack (such as ash) or drought stresses (such as yellow-poplar). Or it may show a non-native tree species planted to reclaim an old field that is rapidly declining (such as red pine). Stocking, tree species composition and age structure helps to determine if any management activities should be considered.

Landscape and regional level conditions also come into consideration when planning management activities. Federal inventories of the forestland in Indiana show a maturing forest. In the past half century, the amount of forestland in Indiana considered mature sawtimber has risen from half of the acreage to almost 80% of the acreage. In the meantime the

early successional seedling-sapling stage of forest has declined to 7% of the forest acreage, down from being a quarter of the forestland a half century ago. A recent article in Forest Science highlighted this lack of diversity in age and structure in forests in our region as a result of human influence. This has consequences for future plant and wildlife diversity. Ruffed grouse, one well known bird that is highly dependent on early successional forest for brood rearing and cover, has declined from a very common forestland bird three decades ago to being on the verge of extirpation from Indiana. With an increased emphasis on age and structure diversity and a maturing forest, more early successional forest is being created in the last decade using group selection openings and small clear-cuts. The current level of group selection openings and clear-cuts

being created annually on state forests is around 450 acres per year with an average size of just under 3 acres each. This comes to about 5% of the annual acres harvested, or about 0.2% of the total state forest acreage.

Planning a timber harvest not only includes looking at the big picture, but looking at site specific considerations. One of those considerations is rare, threatened, and endangered species that have a known occurrence in the area. This data is gathered from a review of the Natural Heritage Database which stores information on known occurrences of species and communities. The requirements of these species can vary. Some may need holding off of management. Some may not be affected by any management. Others may benefit from significant management.

Another consideration is looking at features that occur in the area. This

includes natural features such as streams. Riparian zone considerations regarding water quality and biological diversity guide management activities near streams. Cultural features are manmade items and sites such as structures and roads. Management activities would take into account the presence of any cultural features.

Once all the information has been gathered and analyzed, a recommendation on management needs for that tract is created. This recommendation is included in a report called the Tract Management Guide. This guide summarizes all the site specific



Foresters use current technology and traditional forestry tools to gather tree and stand data to help formulate management recommendations.

information listed above as well others that are considered such as the history of the tract, soils, recreational uses, and invasive species issues. Within the Tract Management Guide, recommendations include everything from letting the tract grow, controlling invasive plants, doing timber stand improvement, improving roads, managing recreational uses, protecting sensitive areas, conducting a timber harvest or any combination of these activities.

The draft management guide is then posted on the Division of Forestry website for public comment. The goal of this posting is to determine if there is any site-specific information known by the public that was not considered in the guide. Certain sensitive information about some cultural sites and sensitive plant/animal species is left out of the website posting to avoid providing location information that could facilitate unlawful collection or similar activities. Once the comments are reviewed for any relevant information that would require consideration or changes, the guide is finalized.

If management activities are recommended in a guide, those activities can then be completed. If one of those activities is a timber harvest, work on that harvest can be completed. Once a harvest is considered ready for sale, a review is done to ensure all the steps and considerations have been covered. The logistics of timber removal and hauling are always major considerations of the review. Once the sale has been cleared to proceed it is ready for advertising.

The timber sale is generally advertised three ways. First sale notices are sent out to around three dozen licensed timber buyers in the area. Second, the sale is listed in legal ads in two area newspapers. And third, the sale is posted on the Indiana Forestry Exchange website. This advertising may result in some buyers looking at the sales on the ground. Other buyers may be content with just reviewing the sale notices.

To ensure a fair market value, bids for state forest timber sales follow the standard government practice of requiring sealed bids. Bids for sales must be received by the date and time of the bid opening listed on the sale notice. These bids can be delivered in person or can be mailed in as long as they arrive in time. At the prescribed time the bids that have been received are opened. The highest qualified bid wins the timber sale. A bid may not be qualified if it arrives late or the bidder is not licensed. Timber sale contracts include provisions to follow established forestry best management practices.



On State Forest timber sales, each tree to be sold is marked and tallied individually to ensure timber buyers are all bidding on the same trees and only the marked trees can be cut according to the timber sale contract.

Once a timber sale contract is executed and a sale payment is made, a bidder may begin harvesting timber per the conditions of the contract. The harvest operation will receive periodic checks to ensure compliance with timber sale contract conditions such as ensuring only designated trees are harvested. Once the harvest is completed timber stand improvement work may follow in order complete management work. The tract will then be set to grow for many years.

The process to sell timber on a State Forest is more complex than for private landowners, but many of the same principles apply. Woodland owners should have a forest inventory conducted and a management plan written by a professional forester. The forester should mark the timber sale, conduct the sale using the sealed bid method and follow up to ensure compliance with the timber sale contract.

John Friedrich is a Property Specialist with the Indiana Division of Forestry. John's career with the Division of Forestry began in 1984 as Timber Specialist at Jackson-Washington State Forest, where he later became Property Manager. He assumed his current position in 1993 and has since taken on many additional duties including property accounting administration.

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Ask the Steward

By Dan Ernst



QUESTION: Will we ever see the return of American Chestnut trees to the forests of Indiana? Virginia P.

ANSWER: Yes, Virginia I believe we will. The American Chestnut was once one of the most abundant trees in the in the south Central and Appalachian hardwood region. It was highly prized for its solid, rot resistant lumber, wildlife value and its highly edible fruit. The Chestnut was considered ‘Lord of the Forest’ and undoubtedly was one of the most dominant trees in the forest for centuries. It could be found from Maine to Georgia and certainly throughout much of Southern Indiana. It had a fast growth rate and grew to large size, with trees over 100’ tall 3’ diameters not uncommon. Some trees were reported greater than 10’ in diameter which lead to the nickname ‘the redwood of the East’. That all changed in a matter of 50 years when the Chestnut Blight ravaged across the East after first being discovered in 1904 in a New York Zoological Park. The disease originated in Asia and within a few decades of its New York discovery the landscaped was forever changed. On the bright side- not all the American Chestnut died and there has been active genetic breeding and research to breed resistance to the disease. Most of this has been to cross the American Chestnut with blight resistant Chinese Chestnut. The American Chestnut Foundation and its members have been active for many years in these efforts and have lead the call for the species recovery. Some of the research is occurring right here in Indiana at the Hardwood Tree Improvement and Regeneration Center and is showing some promise. There is an expectation that blight resistant Chestnut may only be a decade or less away. There is real hope that American Chestnut will once again be a member of the Indiana forests to the thanks of many who have toiled decades pursuing this dream.

QUESTION: My Uncle used to witch for water with both a stick and 2 wire rods. Does this really work? What kind of wood works best?

ANSWER: I too had an uncle that did this and swore that witching for water really worked. In fact, some family members would have him come over to help pick the best spot for their water wells. Also known as ‘dowsing’ and ‘rhabdomancy’, water witching has been around for a very long time- millennia. The basic premise is that the witching wand (a ‘Y’ shaped branch, or two ‘L’ shaped wires) can be used to source underground water, including waterlines. When you feel the branch being pulled downward, or the 2 wires cross it is at this point where you stand above the water source. Does it work? I know of no scientific evidence that dowsing actually works any better than chance under controlled conditions, but there are many stories told to the contrary. The fact be told, these are just stories and have no real science backing. So maybe the two wires in my hands while searching for a waterline crossed because I subconsciously altered my grip. I did, after all know where the water line was supposed to be. Want to give it a try: Witch-hazel, peach and willow are commonly cited as species used for water witching. Some prefer the branches to be green and freshly cut. Just don’t bet the house on it- or much else.

Dan Ernst is an Assistant State Forester with the Indiana Division of Forestry. He oversees the state forests in Indiana and has authored the “Ask the Steward” column for years. Have a question for the column? Email Dan at dernst@dnr.in.gov.

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A Native Soil-Borne Fungus Shows Promise in Controlling *Ailanthus*

By Joanne Rebbeck

Because the non-native *Ailanthus* tree (commonly referred to as tree-of-heaven) is a prolific sprouter, it is very challenging to control by mechanical and chemical means. Cutting down a single tree can result in a proliferation of fast-growing sprouts. Herbicide treatments are costly and require follow-up monitoring and retreatment. However, an alternative control method for *Ailanthus* is being tested in nearby Ohio.

Penn State University Forest Pathologist, Don Davis, and graduate students identified a *Verticillium* wilt causing fungus as a potential biological control agent of *Ailanthus*. In 2002, they isolated *Verticillium nonalfalfae* from dead and dying *Ailanthus* trees within forested areas of south-central PA. After much rigorous testing and numerous trials in PA, this soil-borne fungus, *V. nonalfalfae* was found to be very specific and pathogenic to *Ailanthus*. Stem inoculations (a hack-n-squirt treatment) of *Ailanthus* seedlings with the isolate in the greenhouse and canopy trees in the field resulted in 100% mortality within 10-16 weeks. Stem inoculations of seedlings or canopy trees of the following tree species: northern red oak, chestnut oak, red maple, sugar maple, white ash and yellow-poplar did not induce wilt symptoms or mortality. Within forested areas of dead and dying *Ailanthus* trees, no non-*Ailanthus* trees exhibited any wilt symptoms.

Ongoing research continues to test other woody species as well as crop plants. The current list of tested non-susceptible species currently exceeds 70. The testing of staghorn sumac and devil's walkingstick which have shown some limited

susceptibility are currently underway. Since the fungus is native to North America, we are not introducing a new exotic organism. Once introduced into a stand, the fungus can spread from tree to tree through root grafting and naturally build up, so not every *Ailanthus* stem in a stand needs to be treated!

Since the fungus specifically kills *Ailanthus* and it can survive in the soil for many years, it has great potential as a biological herbicide. To date, the same fungus was found at multiple forest stands in Virginia and Ohio – an effort that required many informed sets of eyes out looking for large patches of wilting, dying and dead *Ailanthus*. Unfortunately due to federal quarantine regulations, we are not permitted to transport the fungus across state lines.

Efforts are currently underway to find the fungus in Indiana but we need your help! If you observe large areas of rapidly

wilting and dying *Ailanthus* trees, please investigate further and contact me at jrebbeck@fs.fed.us. A downloadable factsheet showing symptom development is available at http://www.nrs.fs.fed.us/units/sustainingforests/local-resources/downloads/wilt_handout.pdf

If the *Verticillium* wilt is found in Indiana researchers may have the opportunity to provide answers that could lead to the reduction or elimination of this exotic invasive tree.

Here is an outline of the symptoms to be looking for next summer:

Rapid or sudden wilting foliage throughout the entire tree showing symptoms followed by defoliation as leaves die.



Dead and dying *Ailanthus* trees in Pennsylvania as a result of infection with the *Verticillium* fungus. Photo by Don Davis, Penn State University.

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Box 1: Identifying Tree-of-Heaven (*Ailanthus altissima*)



Figure 1. Bark of mature tree-of-heaven is pale gray and smooth with vertical streaking that develops into light tan fissures with age.



Figure 2. The fruit of tree-of-heaven are winged samaras. They can be green, red or brown in color. Numerous clusters of fruit are easily observed on tree-of-heaven during the summer. Tree-of-heaven have pinnately compound leaves with 11 to 27 leaflets. Each leaflet has one to several glandular teeth near the base. These are lacking on other trees and shrubs.

Tree-of-heaven may be confused with similar-sized sumacs or even black walnut to the untrained eye. Because tree-of-heaven can grow very rapidly, they will often have several feet between branching along the main trunk. Some have also described the strong odor from tree-of-heaven similar to rotting peanuts. Others even think it should be renamed, "Stink Tree" – just crumble the leaves or break off a branch and smell.

The leaflets and fruit are also good ways to identify them. Each leaflet has one or more glandular lobes or teeth near the base. This is the best feature to differentiate it from similar species of similar size. On older trees, numerous fruit clusters will begin to form towards the end of June and will be present throughout most of July or longer. Black walnuts and other native trees with compound leaves lack these seed clusters.

1. Check for signs of vascular discoloration by peeling away the bark. Infected vascular tissue will be an orange-brown color compared with a white to cream color tissue in healthy vascular
2. Large distinct areas of declining, dying, and dead trees. It is uncommon to find isolated single infected or dead trees. Tree death is rapid. Areas increase over time as infection spreads, typically through root-to-root

transmission from infected to healthy trees. The fungus can persist in the soil for many years, which is typical of other *Verticillium* species.

Dr. Joanne Rebbeck is a plant physiologist with the USDA Forest Service, Northern Research Station based in Delaware, Ohio.



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Scout Oak Trees to Identify the Best Mast Producer

Every hunter knows the importance of acorns for game and non-game species alike. When acorns are plentiful it can alter the movements and patterns of game species and when acorns are absent wildlife must rely on alternative food sources to meet their nutritional needs during the fall, winter, and early spring. Knowing the importance of acorns to many wildlife species, it is beneficial to identify which trees are the most reliable and best producing in the woods.

Intro to Oaks

Oak trees in Indiana fall into 1 of 2 groups, white oak (e.g., white, swamp white, and chinkapin) or red oak (e.g., northern red, black, and pin). White oaks produce acorns in 1 growing season (acorns falling in 2016 are from flowers that were pollinated in the spring of 2016) and red oaks produce acorns in 2 growing seasons (acorns falling in 2016 are from flowers that were pollinated in the spring of 2015). This means a late frost in the spring may result in poor acorn production in white oaks in the fall of the same year, but will not influence red oak acorn production the same fall. However, a late frost in back-to-back years may result in a mast failure from both groups.



White oak acorns are clustered at the end of the branch - this year's growth, like on this swamp white oak on the left. Whereas, red oak acorns are farther down the branch at the end of last year's growth, like the northern red oak acorns on the right. (Photo by B. MacGowan)

White oak acorns tend to be selected by wildlife more than red oak acorns because they contain less tannins resulting in a less bitter and more digestible acorn. Check out the Native Trees of the Midwest to learn more about oaks, their value for wildlife, and help you learn to identify different species.

Oak trees can be split into production groups based on their relative acorn production capabilities. Some individual oak trees are inherently poor producers and rarely produce acorns even in a bumper crop. Whereas other individuals are excellent producers and may produce acorns even in the poorest year. Research from the University of Tennessee reported poor mast

producing trees represented 50% of white oaks in a stand and produced only 15% of the white oak acorn crop in a given year, whereas excellent producing trees represented 13% of white oaks, but produced 40% of the total white oak acorn production. When you included excellent and good producing white oaks together (31% of trees), they accounted for 67% of the total white oak acorn crop in a stand. This means a minority of the white oaks in a stand may produce a majority of the acorns!

Scouting Oak Trees

Understanding that some individual oak trees are poor producers, some are excellent, and some fall between poor and excellent, surveying oak trees can help identify important mast producing individuals. The late summer and early fall, just prior to or at the beginning of acorn drop, are perfect times to identify the best and worst producing oaks in your stand of timber. Scouting can be as formal as conducting a mast survey or as informal as taking mental notes of oak trees with heavy crops of acorns on the ground while you are walking to and from your tree stands in the fall. Either way, scouting oaks for acorn production capability can provide more information when determining where to hunt in the fall or which trees to retain and which trees to remove during a timber harvest. If wildlife management is an objective on your property, trees that you identify as the best acorn producers in the woods can be retained during a timber harvest, while poor producing trees can be removed with little detriment to overall acorn production. It is important to remember to retain a balance of oaks from both the red and white oak group, favoring red oak, to help safeguard against complete mast failures.

Forest Management is Insurance for Mast Failure

Annual acorn production in a stand of oaks is highly variably and can be dependent on environmental conditions. For example, late frosts, poor pollination, and insect infestations all can be culprits for poor mast production across a stand of oaks. Because of these factors, white oaks tend to only produce reliably 2 out of every 5 years, meaning 3 out of 5 years (60%) there is poor mast production or a failed mast crop in white oaks. Red oaks may produce a good crop as frequently as 2 to 5 years, but only produce a bumper crop an average every 5 to 7 years.

The extreme variability in acorn production underscores the importance in considering alternative food sources for fall, winter, and early spring for wildlife. In most mature forests with few canopy gaps there could be as little as 50-100 lbs of deer selected forage per acre in the understory. However, with some management, like thinning and prescribed fire the



The photo on the left is of a mature forest with very few canopy gaps resulting in very little cover or food for wildlife. The right picture is of a forest stand where undesirable trees have been girdled (tree on the right-hand side of picture) to increase light to the forest floor and where multiple prescribed fire have been conducted to increase forage production and cover.

amount of deer selected forage can be increased to almost 1000 lbs/ac! Additionally, forest management also increases the amount cover throughout the year for species like white-tailed deer, wild turkey, ruffed grouse, woodcock, and many forest songbirds. Contrary to popular belief, cover can be more of a limiting factor for many wildlife species compared to food availability. Forest management could include girdling undesirable trees to expand growing space for mast producing

trees or conducting a timber harvest removing undesirable trees and poor producing oak trees while retaining good producing trees. For more information on conducting a timber harvest for wildlife on your property contact a professional wildlife biologist or professional forester in your area.

When spending time in the woods this fall take the time to look up and down to see which oaks in your woods are the best producers.

Save the Date • March 7-8, 2017

Central Hardwoods Oak Ecology and Wildlife Management Conference



Please join us March 7-8, 2017 at the Seasons Lodge in Nashville, IN for an Oak Ecology and Wildlife Management Conference. The conference is structured for landowners and professional resources managers. We will have presentations by local and regional experts on the ecology and management of oak forest with an emphasis on regenerating and maintaining oaks in mesic forest conditions. Discussions will include the importance of oak communities to sustain healthy



forests, associated wildlife species, and forest management. This conference will be open to natural resource professionals, foresters, wildlife biologists, consultants and land managers interested in increasing their knowledge of forest management techniques to sustain oak communities. The Conference will include plenary session, concurrent sessions with emphasis on forest management and wildlife management topics and an optional half day field tour. Registration will be open in January at <http://indianasaf.net/>.



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Every county in Indiana has a Soil and Water Conservation District (SWCD) whose mission it is to provide information about soil, water and related natural resource conservation. One way SWCD's accomplish this mission is through the support of the Woodland Steward Newsletter. The counties listed above contributed funds for the printing and mailing of the Woodland Steward Newsletter to the landowners in their county. The next time you visit your local SWCD, thank them for their support of the Woodland Steward Newsletter or encourage them to support the newsletter in future years.

Thank you to all the supporting SWCD's. Without your support many landowners in Indiana would not receive the Woodland Steward Newsletter.

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