DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA5031

Establishing Cottonwood Plantations

Jon E. Barry
Assistant Professor/
Extension Forester

Cottonwood has some interesting possibilities as a crop because of its rapid growth rate and its potential marketability for several products. It can be used as a source of rough lumber, fiber and fuel. In recent years, cottonwood planting has increased in Arkansas as landowners search for profitable uses for marginal croplands. The intent of this fact sheet is to provide an introduction to establishing and managing cottonwood.

Introduction to Cottonwood

Cottonwood is a tree in the poplar genus (*Populus* L.). On a worldwide scale, poplars are found throughout the northern hemisphere but are not native to the southern hemisphere. Nationally there are seven native poplars, variously called cottonwoods, aspens or poplars. In addition to the native poplars, there are several that have been introduced from Europe and Asia. Two cottonwoods are native to Arkansas, the more common eastern cottonwood (*Populus deltoides* Bartram ex Marsh.) and the less common swamp cottonwood (*Populus heterophylla* L.). Eastern cottonwood is native to most of North America, with the exception of a few western states and the far northern states and provinces. Swamp cottonwood is native to most of the eastern half of the United States and Canada. In addition to these two native cottonwoods, a few cottonwood hybrids have been developed and are available to plant in Arkansas, but these have not yet been extensively used. This fact sheet deals with eastern cottonwood.

Eastern cottonwood is the fastest growing tree native to eastern North America. It forms a large tree that can approach 100 feet tall and 6 feet in diameter on the best Arkansas sites. More typically, the trees grow 80 to 100 feet tall and 3 to 4 feet in diameter. The alternately arrayed leaves are roughly triangular in shape (thus the name *P. deltoides*) and are approximately 3 to 5 inches long with toothed margins (Figure 1). The light gray bark on young cottonwood stems is smooth, but it develops bold ridges and deep furrows as the tree ages (Figure 2). Eastern cottonwood starts

FIGURE 1. Cottonwood leaves have a characteristic triangular shape and toothed margins.

Photo by Paul Wray, Iowa State University, Bugwood.org

FIGURE 2. Bark of mature cottonwoods has bold ridges and deep furrows.

Photo by Vern Wilkins, self-employed, Bugwood.org

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FIGURE 3. Cottonwood flowers are different male (left) and female (right) catkins, usually on different trees.

Photo by: Left – Richard Old, XID Services, Inc., Bugwood.org; Right – Robert Klips, Ohio State University at Marion, used with permission

FIGURE 4. Cottonwood gets its name from the fluff that allows the seeds to ride winds.

Photo by Troy Evans, Great Smoky Mountains National Park, Bugwood.org

to produce flowers and seeds at about 10 years old, although seed production can begin at earlier ages in plantations. The flowers are distinctly different for male and female catkins (Figure 3), which bloom in the early spring shortly before or at the time the leaves expand. The flowers ultimately produce seeds encased in the characteristic fluff that gives cottonwood its name (Figure 4). Eastern cottonwood seldom lives beyond 80 years.

Cottonwood Sites

Many trees, including cottonwood, are sensitive to site conditions. Eastern cottonwood grows best on alluvial sites that are moist but well-drained sandy or silty loam soils. This usually means river bottom soils that may flood frequently throughout the winter but do not stay saturated with water for long periods during the growing season. Cottonwood is common along major river systems. The best growth occurs on batture land – the unprotected areas between the river levees. Cottonwood also establishes on well-drained fronts, high ridges and other bottomland areas with adequate drainage. Poorly drained areas and low-lying new lands (e.g., bars) are often dominated by willow species (*Salix* spp.) instead of cottonwood.

Growth Rates

Cottonwood is a fast-growing tree (Figure 5). It can attain heights in excess of 175 feet on the best sites and diameters exceeding 6 feet. Well-performing clones planted on fertile alluvial soils can reach heights of over 100 feet and diameters of 12 inches by age 10. On the best of sites, cottonwood yields can reach 16-18 green tons per acre annually. However, as site quality decreases, yields will also decrease. For instance, yields on “marginal croplands” in Arkansas average 6-10 green tons per acre annually or less.

Rotation lengths for cottonwood plantations depend very much on the product one wishes to grow. Energy wood plantations may be harvested as often as every 2 or 3 years, while pulpwood and sawtimber rotations may last 5-10 years and 15-20 years, respectively.

FIGURE 5. This one-year-old eastern cottonwood sprouted from a cutting.

Photo by Jamie Schuler, Arkansas Forest Resources Center

Planting Cottonwood

Eastern cottonwood is dioecious – meaning male and female flowers occur on separate trees, with only female trees producing seed. Under natural conditions, cottonwood regenerates from the millions of seeds a mature female tree is capable of producing each year. While cottonwoods are extremely prolific seed producers, their germination requirements are very specific. Newly fallen seed remains viable for only a short period of time and requires exposed mineral soil that maintains high soil moisture levels (e.g., newly deposited silt). Seed germinates very quickly, but new germinants are very susceptible to desiccation.

Most large-scale artificial regeneration is accomplished using cuttings. Very little bare root nursery stock is available. The best cuttings come from younger stems. Cuttings are made from stems harvested during the dormant season and cut into 16- to 24-inch long pieces with diameters ranging from 0.5 to 1.0 inch (Figure 6). Currently, these are available from many state tree nurseries and several private growers.

FIGURE 6. Cottonwood cuttings readily sprout roots and shoots when handled properly.

Photo by Jamie Schuler, Arkansas Forest Resources Center

Unrooted cuttings are planted in cultivated soil during the dormant season. Often cuttings can be pushed into the soil by hand. Planting can be facilitated by using a dibble (made from rebar). Cuttings purchased from nurseries usually will have the top end painted to aid orientation of the cutting at time of planting.

Cottonwood Cuttings

In Arkansas, almost all of the cottonwood cuttings available will be eastern cottonwood, although some hybrid poplars are available. Even though early growth rates for hybrids can be excellent, their long-term potential is low because of disease problems. Various eastern cottonwood tree improvement programs have been underway for decades. The most commonly available clones were derived from the breeding work at Mississippi State University, designated as Stoneville clones (e.g., ST66), and others were derived from Texas sources (e.g., S7C8). New clones are being developed and slowly are being introduced to commercial nurseries.

Often it is not possible to select a specific cottonwood clone. Nurseries are, at times, reluctant to reveal the particular clone they are selling. In fact, the cottonwood cuttings sold in bulk by nurseries are often a mix of several cottonwood clones. Even if you could select specific clones to plant, information about which clone is most suitable for specific sites is not yet well developed. At this point, it is best to purchase cuttings based on reputation of the nursery to make sure you get good-quality cuttings. If they are not sure what they have, find another nursery!

Site Selection

There is a perception that cottonwood grows well in wet areas. To some degree this is true. On the alluvial unprotected lands between the levees, annual flooding is common. Many of these sites have soils that are well aerated, loose medium textured, adequately moist and deep. Soil pH should approach neutral but can range from 5.5 to 7.5. These are among the best sites for cottonwood. However, sites that hold water, drain poorly and have high water tables are not well suited for eastern cottonwood.

Soil conditions that are unfavorable to cottonwood growth include soils that are saturated and waterlogged for long periods during the growing season. Soils that are mottled or gleyed within 18 inches of the surface are typically less desirable. Well-drained sandy soils are droughty and have reduced survival. The best cottonwood sites have medium-textured soils (loams) with good access to moisture. Table 1 presents soil textures suitable or unsuitable for cottonwood.

TABLE 1. Soil texture and drainage characteristics suitable for cottonwood. Adapted from Stanturf et al., 2001.

Dominant Profile Texture	Well to Moderately Well Drained	Somewhat Poorly Drained	Poor to Very Poorly Drained
Fine clay (>60%)	good	fair	poor
Clay (40%-60%)	good	fair	poor
Clay loam and silty clay loam	good	good[1]	poor
Loam and silt loam	very good	good - very good[1]	poor
Sandy loam	very good	good	poor
Loamy sand	very good	good	poor
Sand	poor	fair[2]	poor
Sandy loam 35-100 cm over clay	very good	good	poor
Sandy loam 50-100 cm over clay loam	very good	good	poor
Sandy loam 50-100 cm over sand	good	very good	poor
Loamy sand 35-100 cm over clay	very good	good	poor
Sand-loamy sand 50-100 cm over loam-clay loam	very good	very good	poor
Sand-loamy sand 100-150 cm over loam-clay	good	very good	poor

[1]With good weed control.
[2]Fertilization can improve suitability.

Plantation Establishment

A sample prescription for establishing cottonwood plantations is given in Table 2 on the next page. In short, plantation establishment begins the year prior to planting to create soil conditions favorable for growth and to provide initial control of competing vegetation. Use a combination of chemical and mechanical treatments during the first year to provide optimal growing conditions for the cuttings.

Site Preparation

Site preparation can be the most difficult and expensive operation of any plantation establishment. At the cheap end of the spectrum, activities may be limited to a simple ripping and herbicide application if the site is a recently cultivated field or pasture. Most sites that have a history of farming require

TABLE 2. Prescription for establishing cottonwood on former pasture/farmland (after Stanturf et al., 2002).

Fall year 0	Kill existing vegetation with glyphosate (e.g., RoundUp, RazorPro). Two-pass disking and row establishment, or subsoiling, plus fertilizer injection (100 lb N/ac).
Feb./Mar. year 1	Plant cottonwood cuttings.
Feb./Mar. year 1	Band herbicide over dormant cuttings [e.g., Goal 2XL (64 oz/ac) + RazorPro (2 qt/ac) or Scepter 70DG (2.8 oz/ac) + Pendulum 3.3 EC (1.2-4.8 qt/ac)].
May/June year 1	One-pass disking followed by a second pass perpendicular to the first pass two weeks later.
June/July year 1	Basal application of Goal 2XL (32 oz/ac) or over-the-top application of Scepter 70DG (2.8 oz/ac). Additional grass herbicide may be required.
August year 1	One-pass disking followed by a second pass perpendicular to the first pass two weeks later. This may not be necessary depending on weed development.
May/June year 2	One-pass disking or shielded spray of RazorPro/RoundUp.
July year 2	If necessary, one-pass disking or shielded spray of RazorPro/RoundUp.

subsoiling to break up plow/traffic pans (Figure 7). This will also make planting much easier. Sites that are cutovers will require removal of all woody vegetation, which may entail harvesting or felling of residual trees, raking and burning debris, and sometimes disking, leveling or cultivating the site.

FIGURE 7. Subsoiling, also called ripping, breaks up subsurface plow pans that often result from long-term row crop production.

Photo by Jamie Schuler, Arkansas Forest Resources Center

The objective of site preparation is to ameliorate soil physical conditions to facilitate root growth and to remove any competing vegetation. The success of your plantation will depend on it!

Operational Planting

Unrooted cuttings are planted in cultivated soil during the dormant season – generally from January until March, or when flood waters recede. Cuttings should be dormant when planted because cuttings planted after the buds start to break are less likely to survive. Many growers recommend soaking cuttings for at least 12 hours before planting to ensure high moisture levels, although at least one large grower does not soak cuttings prior to planting and maintains good results. Some growers include an insecticide with the soak to reduce first-year damage from cottonwood leaf beetles.

If the site has been well prepared, it will be possible for the planting crew to simply push the cuttings into the soil. For the sake of planting efficiency, cuttings are usually pushed into soil softened by winter moisture and by cultivation. The need for crews to create planting holes (using dibbles fashioned out of rebar) slows the operation and often indicates inadequate site preparation. Make sure that the planting crew knows how to plant the cuttings. The cutting must be oriented with buds pointing up, and the cutting should be planted as deeply as possible but not completely buried. Cuttings purchased from nurseries usually will have the top end painted to aid orientation of the cutting at time of planting.

Plantation spacing will depend upon the intended product(s). For energy crops, cuttings may be spaced as close as 4 x 6 feet, or closer using double row techniques. If trees are being grown for fiber and sawtimber, a spacing of 12 x 12 feet or wider is typical. For energy crops in particular, row spacing may be dictated by the equipment that you must move through the stand. Set adequate row spacing to allow equipment to move through the stand without damaging trees or equipment. Plantations established for multiple products and tighter spacing will require timely thinning to maintain adequate growth rates on residual trees. Cottonwood trees under stress from competition will not respond well to release.

Weed Control

Competition should be monitored closely during the first year. Cottonwoods are especially sensitive to competition. In fact, the majority of plantation failures result from poor weed control before, during and after plantation establishment. Cottonwood stems that are overgrown by weeds have little chance of recovery. As a result, cottonwood plantation management includes intensive steps to minimize competing vegetation. Typically, fall site preparation prepares the soil to facilitate planting and root growth. This is also the first step in reducing the existing weed community. Additionally, a combination of pre- and post-emergent herbicides is used to control vegetation and delay new weeds from germinating. Both types of herbicide are commonly applied over the top of dormant cuttings (Figure 8). For example, prior

FIGURE 8. Banded herbicide application can be used to release cottonwood sprouts from weedy competition.

Photo by Jamie Schuler, Arkansas Forest Resources Center

to budburst, a mixture of oxyfluorfen (pre-emergent) and glyphosate (post-emergent) is applied in bands directly over the planting row. The glyphosate provides broad-spectrum control of most emerged and actively growing vegetation, while oxyfluorfen prevents new germinants from developing. In most cases, this type of treatment lasts through late May or early June. This initial herbicide application is very important because mechanical treatments such as disking are not reliable for controlling vegetation during the early spring due to wet soil conditions.

Following the breakdown of the pre-emergent herbicide, additional treatments are required to ensure cottonwoods remain free of competing vegetation. Site access for tractors is generally available by early summer, thereby allowing disking between planting rows. Depending on the type of vegetation, herbicides can be effective, but few herbicides are labeled for this use. Grasses are fairly easy to control when treated early, and several herbicides are available that permit direct application over actively growing cottonwood stems (e.g., clethodim, sethoxydim, fluazifop). Broadleaved weeds are more difficult to control without damaging cottonwood. Oxyfluorfen is labeled for use as a directed spray to the soil and base of the stem, using care to minimize contact to foliage (although most stems recover). Glyphosate products can also be used, but cottonwood is much more sensitive to damage from glyphosate; and this treatment will likely result in some accidental overspray to cottonwood, which would result in seedling death.

Second-year control is sometimes prescribed, especially when regrowth is excessive. However, disking treatments should be performed with caution. Keep disking shallow, and avoid deep tillage treatments as they will undoubtedly cut cottonwood roots and reduce growth.

A list of herbicides that are labeled for use in establishing or maintaining cottonwood plantations is given in Table 3. Many of these have very specific uses and are labeled for use in certain parts of the U.S. Always read and follow the label carefully. Also, while all of the herbicides listed in Table 3 have been extensively tested, they have not been tested on all possible clones. Therefore, large-scale applications to single clones should be tested on a smaller scale first.

Fertilization

Cottonwood has high nutrient requirements. On former agricultural lands, nutrients are often in low supply or out of balance; however, nitrogen is most often the nutrient that limits cottonwood growth. Other nutrients can be limiting, but there is often a residual buildup of most due to an agricultural legacy. Initial nitrogen fertilization is suggested to accelerate early growth and reduce the number of weed control treatments, although initial fertilization should be performed only if initial weed control can be maintained. Foliage sampling during July or August is used to determine if nutrients may become limiting later in the rotation. Foliar nitrogen levels are considered sufficient at 2.0%.

Thinning

Thinning cottonwood depends on the desired products. Thinning is not normally performed in stands established for pulpwood or fiber. Stands established to produce sawtimber or other large-diameter products can be thinned, but thinning should be done before growth slows and trees begin to lose crown. Stands established on 12 x 12 foot spacing or more may have pulpwood removed at around 5-8 years, usually accomplished as a row thinning that removes every other row. Subsequent thinning may be required to reduce side shading from adjacent trees and maintain high live crown percentages (>40%).

Cottonwood Pests

There is a wide array of pests exploiting cottonwood. These range from vertebrates such as white-tailed deer, to insects, to fungal infections. Some of these pests can cause serious damage to a cottonwood plantation while others are merely nuisances.

Vertebrates

The two main vertebrate pests are white-tailed deer and cottontail rabbits. White-tailed deer damage cottonwood sprouts by browsing the young twigs. Where deer populations are moderate, browsing is unlikely to destroy a cottonwood stand. However, where deer populations are high or are concentrated by some environmental factor such as flooding, browsing will stunt growth of newly planted cottonwoods and may result in significant mortality. Under such circumstances, cottonwood sprouts can recover quickly, but only if the white-tailed deer population is controlled or the sprouts protected from continued browsing.

Cottontail rabbits also browse cottonwood sprouts. Most of the browsing by cottontails consists of clipping lateral twigs; therefore, growth should not be greatly affected. Rodents sometimes cause damage to cottonwood sprouts by gnawing the bark at the base of the cutting, thus girdling the cutting. Complete girdling will kill the sprout.

Unfortunately, little can be done to prevent browsing by vertebrates. Deer fencing might keep white-tailed deer out of a stand (Figure 9) but may not be practical for commercial-scale stands. Smaller areas (~10 ac) have been fenced effectively with solar-powered electric fencing that costs around $800 and can be reused. Deer repellants have been tested, but

none have proven undeniably effective. There is no practical way to exclude rodents from the stand.

FIGURE 9. Electric fencing can be used to discourage deer browsing on small stands of eastern cottonwood.

Photo by Jamie Schuler, Arkansas Forest Resources Center

Insects

Insects can be a problem for cottonwood stands, as well. Insects that attack cottonwood can be grouped by the plant parts they attack. Many insects bore into the wood of stems and twigs and girdle the tree causing tree death or weaken part of the tree causing it to fall off. Another group of insects attacks the leaves causing defoliation. One-time defoliation slows tree growth, but repeated defoliation can kill a tree.

The cottonwood borer (*Plectrodera scalator* Fab.) is a large insect in the long-horn beetle family (Figure 10). It is 1 to 1.5 inches long with bold white lateral stripes on a black background. This borer's long antennae, which can be longer than its body, are distinctive. Cottonwood borers lay eggs in the bark at the base of cottonwood trees. When those eggs hatch, the larvae bore into the tree and feed on the roots.

TABLE 3. Partial list of herbicides for use in poplar plantations. Always check the label for current registration, rates and application timing. Most chemical companies provide downloads of their latest herbicide labels at their web sites. Adapted from Stanturf et al., 2001.

Active Ingredient	Product Name	Manufacturer	Application	Timing	Rates/ac
Clethodim	Select 2EC	Valent	Post-emergent grass control	Apply over actively growing trees to control grass	6-16 oz
Clopyralid	Transline	DowAgro Sciences	Selective post-emergent weed control	Apply as a broadcast foliar spray over trees or banded or directed	1/3 to 2/3 pints not to exceed 1 1/3 pints/year
Clopyralid	Stinger	DowAgro Sciences	Selective post-emergent weed control	Apply as a broadcast foliar spray over trees or banded or directed	1/3 to 2/3 pints not to exceed 1 1/3 pints/year
Dichlobenil	Casoron 4G	Uniroyal	Pre- and post-emergent	Early spring and late fall	98-150 lb
Fluazifop-P-butyl	Fusilade DX	Zeneca	Post-emergent grass control	Apply over actively growing trees to control grass	Split application (12 fl oz followed by 8 fl oz) application timing is critical
Glyphosate	Various	Various	Preplant site preparation, directed spray in older trees	Apply when trees are completely dormant or as a careful directed spray	3/4 to 3 qt
Imazaquin	Scepter 70 DG	BASF	Pre- and post-emergent weed control	Broadcast before and after bud break	2.8 oz
Oryzalin	Surflan AS	DowAgro Sciences	Pre-emergent weed control	Apply before weed flush. Will not control active weeds	2 qt Not more than 8/year
Oxyfluorfen	Goal 2XL	Rohm & Haas	Pre- and post-emergent weed control	Broadcast before bud break or directed spray after bud break	64 oz pre-bud break, 32 oz after bud break
Oxyfluorfen	Goal Tender	DowAgro Sciences	Pre- and post-emergent weed control	Broadcast before bud break or directed spray after bud break	2-3 pints
Paraquat dichloride	Gramoxone Inteon	Syngenta	Post-emergent weed control	Apply pre-plant	2-4 pints
Paraquat dichloride	Gramoxone Extra	Zeneca	Post-emergent weed control	Apply over dormant cuttings	2-3 pints
Pendimethalin	Pendulum 3.3 EC	BASF	Pre-emergent weed control	Broadcast before and after bud break	2.4-4.8 qt
Pendimethalin	Prowl 3.3 EC	BASF			
Sethoxydim	Poast, Poast-Plus	BASF	Post-emergent grass control	Apply over actively growing trees to control grass	1-2 pints
Trifluralin	Trilin 10G	Griffin	Soil incorporated	Pre-plant soil incorporated. Older plantation, incorporate to depth to not injure tree roots	5-10 lb

Ultimately they will bore into the heartwood and pupate in the wood of the roots. When the adults hatch, they chew out of the root and dig to the soil surface. Heavy infestations of cottonwood borers can damage small trees by weakening the stems of the trees and by feeding on tender branch shoots. Large trees are rarely harmed.

FIGURE 10. The cottonwood borer, a long-horn beetle, is a serious pest in young cottonwood plantations.

Photo by Charles T. Bryson, USDA Agricultural Research Service, Bugwood.org

Cottonwood leaf beetles (*Chrysomela scripta* F.) present a more serious threat to cottonwood (Figure 11). These beetles are lozenge-shaped and about 1/4 inch long. They are pale orange or yellow and marked with longitudinal black stripes. Ragged leaves are usually the first indication of these insects. They feed on the leaves resulting in defoliation when infestations are heavy. This will reduce growth and delay biomass accumulation and harvest. Severe infestations could result in tree mortality. Cottonwood leaf beetles pose a serious threat to biomass plantings.

FIGURE 11. Cottonwood leaf beetles can defoliate young trees and reduce growth. Repeated defoliation can kill trees.

Photo by Jamie Schuler, Arkansas Forest Resources Center

The cottonwood twig borer (*Gypsonoma haimbachiana* Kft.) is another serious pest of cottonwood (Figure 12). Their larvae bore into tender cottonwood shoots and prevent the shoots from elongating. The shoot is then overtopped by adjacent rapidly elongating branches which can become the new leaders. This results in a crook or forked top in the cottonwood, which reduces its commercial value. Heavy twig borer infestations can effectively stunt the growth of the entire tree and reduce its value.

The cottonwood twig borer moths are about 1/2 inch long and ash grey. Because of their camouflage and mobility, they will be difficult to find. The larvae are up to about 1/2 inch long and are pale brown with a dark head. Several generations of

FIGURE 12. Heavy infestations of cottonwood twig borers can damage a cottonwood stand.

Photo by James Solomon, USDA Forest Service, Bugwood.org, Upper insert – Whitney Cranshaw, Colorado State University, Bugwood.org, Lower insert – Steve Scott, Illinois Eastern Community College, Bugwood.org

larvae may be produced in a year. Infestation is best recognized from the stunted terminal shoots. If you see stunted terminal shoots, examine the base of the petiole of the two or three leaves closest to the end of the shoot. If you see small brown silk tubes or holes bored in the twig, you have cottonwood twig borers.

Clearwing borers (*Parathrene dollii dollii* Neum. and *Parathrene tricincta* Harris) can be serious pests of cottonwood in nurseries and plantations. Attacks from *P. dollii dollii* principally occur at the base of young cottonwood stems, while *P. tricincta* typically attacks terminal stems. The larvae of both species bore into stems and weaken them, which can result in either stem breakage or dieback. The boring activities of this insect also provide entry points for fungal diseases.

This clearwing borer (*P. dollii dollii*) is especially dangerous because it can be transported to new sites by moving infected cuttings. In cottonwood stool beds, it can be difficult to eradicate because it infests the base of the young stems. It may be necessary to remove the entire cottonwood stool to get rid of the pest. This will reduce cutting production until a replacement stool can be grown. Control in cuttings can be accomplished by a soaking treatment (e.g., with imidacloprid) prior to planting.

Many damaging insects are controlled via natural predation by other insects and birds. Therefore, light infestations oftentimes can be tolerated. Alternatively, cottonwood plantations can be treated with chemicals such as carbaryl, chlorpyrifos or imidacloprid to control the insects listed above, as well as many others. Judgment should be exercised when spraying insecticides because these natural predators are often killed as well, sometimes leaving pest populations without their natural controls. Check with your county Extension agent for information on currently labeled pesticides and application rates. Early detection of insects is essential to limiting damage to the stand. Routinely survey the stand for evidence of the beetles and other insects and spray for them promptly when they are identified.

Diseases

Septoria leaf spot and canker (Figures 13 and 14) and *Melampsora* leaf rust (Figure 15) are more common diseases in cottonwood. *Septoria* begins as small circular leaf spots that typically coalesce into large dark irregular spots, and ultimately the disease can progress to form branch and stem cankers. The cankers are blackened cracked depressed areas, usually forming toward the base of trees. *Melampsora* leaf rust is a major problem for cottonwood causing premature defoliation and reduced growth. Yellowish-orange pustules on the underside of leaves often characterize this fungal disease. Severe infestation is common for hybrid poplars and certain susceptible clones. The most effective control of *Melampsora* and *Septoria* is to plant resistant/tolerant clones coupled with sanitation cutting of infected individuals. *Septoria* can kill young cottonwood sprouts but usually has only minor impacts on older stems. *Melampsora* often causes leaves to drop prematurely. This can result in a 30%-40% reduction in volume growth.

FIGURE 13. Many cottonwood clones are susceptible to *Septoria* leaf spot.

Photo by William Jacobi, Colorado State University, Bugwood.org

FIGURE 14. *Septoria* leaf spot can progress to the stem and form stem cankers.

Photo by Jamie Schuler, Arkansas Forest Resources Center

FIGURE 15. *Melampsora* leaf rust can lead to cottonwood defoliation and reduced growth.

Photo by Jamie Schuler, Arkansas Forest Resources Center

Conclusions

Cottonwood is not difficult to grow, but successfully producing a profitable stand requires attention to the details. Be certain that your site is appropriate for cottonwood, be certain that a market exists for the products you plan to grow, and be vigilant about checking for pest problems.

Further Reading

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Acknowledgment is given to Dr. Jamie Schuler, former associate professor of forest resources with the Arkansas Forest Resources Center, for his contributions to this fact sheet.

This fact sheet is a project product from a Southern SARE grant. Project products are developed as part of SARE grants. They are made available with support from the Sustainable Agriculture Research and Education (SARE) program, which is funded by the U.S. Department of Agriculture-National Institute of Food and Agriculture (USDA-NIFA). Any opinions, findings, conclusions or recommendations expressed within project products do not necessarily reflect the view of the SARE program or the U.S. Department of Agriculture. USDA is an equal opportunity provider and employer.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

DR. JON BARRY is an assistant professor/Extension forester with the University of Arkansas Division of Agriculture and is stationed at the Southwest Research and Extension Center in Hope

FSA5031-PD-9-12N