Appendix Section 6:

Plant Resource Guide: Materials and Management

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Alfalfa *(Medicago sativa* L.*)*

Description

Alfalfa is an herbaceous perennial legume that can produce large amounts of nutritious forage material. It is a legume, with a tap-root, and can last up to 5 years if managed correctly. The energy and protein yield/acre rivals that of corn as used for silage purposes. It has the highest feed value of any commonly grown hay crop.

Habitat

Alfalfa is best suited to deep, fertile, well-drained soils with a pH of 6.0 to 6.5. However, with correct management it can be grown on differing soil types.

Management Considerations

Attacks by insects can be very problematic to alfalfa. The alfalfa weevil and potato leafhopper are the main insect problems in Missouri. By careful monitoring and management (chemical or harvest timing) can help control adverse insect problems.

High fertility is needed for establishment, along with proper levels of fertilizer and lime for successful competition of alfalfa and stand maintenance.

Harvesting Considerations

Alfalfa can be used as silage, hay, or pasture. Hay harvest can occur every 30 to 35 days during the growing season if weather permits normal rates of regrowth. Allowing livestock to graze for 3 days, then giving alfalfa 30 days for recovery, works well. Using this approach to graze alfalfa obviously involves partitioning the pasture area into smaller areas. Thus, fencing can be an added cost of using alfalfa in this manner. Intensive grazing is not much different than harvesting alfalfa for hay, where forage is cut, baled, and hauled away.

It is advisable to not cut or graze from September 15th to November 1st, allowing the plant to store over-wintering energy. However, following November 1st a final pre-winter harvest of the forage is permissible.

Propagation

Alfalfa exhibits autotoxicity, seed will not grow in existing stands of alfalfa. As old stands begin to decline, they must be plowed under before reseeding. Seeding of alfalfa can be done in the fall or late summer. If herbicides are not used for weed control, it is recommended to have a companion crop of oats (usually oats at 1/2 normal seeding rate) to help control the weeds and prevent erosion during the seedling establishment period. The oats should be harvested early to alleviate competition on the alfalfa. Depending on whether alfalfa is seeded alone, or with other legumes and grasses, approximately 10 to 15 lbs of seed per acre will

usually be needed. Seeding can be broadcast, no-tilled, or drilled into a prepared seedbed. With proper preparation, such as fertilizer and liming, the establishment of a stand in correct soil types should prove no problem.

Economic Uses

Hay, silage, and pasture are the most economic uses for the small landowner. Sprouts for human consumption are also a viable market, but the research for buyers must be thorough. Generally, local hay markets are readily available, and in bulk can often be sold to large corporations. Such marketing usually will require meeting with the buyer and addressing special considerations for product quality/appearance. Silage may be sold or used by the landowner as feed, just like hay. Pasture is mainly useful to the landowner, but cash-renting possibilities are available.

Notes

Uses in agroforestry for alfalfa include Alley Cropping and Silvopasture. Alley cropping can be implemented with rows of trees and strips of alfalfa for hay or silage lying in-between the tree rows. Silvopasturing can also be used, with grazed alfalfa providing benefits to both the trees and livestock. The same tree configuration, trees in rows, can be used in both alley cropping and silvopasture practices, or the trees can be managed in a grid pattern for the silvopasture practice. In either case, the only difference in forage removal is whether mechanical methods or animals are used. However, if livestock are used remember to protect the trees from browsing and/or rubbing.

Additional Resources

http://muextension.missouri.edu/explore/agguides/crops/g04550.htm

American Basswood *(Tilia americana* L.*)*

Description

American Basswood, also known as American Linden, is native to all of New England and the Midwestern United States. American Basswood is a favorite tree of bees as they extract nectar from its flowers, making a very high-quality honey in the process. Basswood is also a valuable timber tree. The stately appearance of American Basswood makes it a favorite shade tree for large areas, such as parks. Its leaves are the largest of any of the native basswoods. When found in the open, it may reach 80 feet tall by 40 feet wide, with its lower limbs pendulous but upswept at the tips. Basswood has alternate, ovate leaves that are about as wide as long, with a truncate (flattened) or heart-shaped base, finely serrated margins, and a short tip at the apex of the leaf.

Habitat

American Basswood prefers moist, well-drained, deep, rich soils and will grow on in a variety of pH levels. It thrives in full sun to partial sun.

Management Considerations

Basswood has a very fast growth rate. Consequently, it will also have a high site index associated with it, and may reach heights of up to 70 feet in 50 years in unmanaged forest stands. Management that reduces competition can provide improved growth rates. However, open grown conditions may result in sprouting. Basswood is less shade tolerant than most of its common associates, but vigorous sprouting and rapid sprout growth allows it to persist under competitive conditions.

In forested settings basswood is likely to develop a straight, clear bole. However, basswood may be easily damaged by fire. Caution should be used since this burn wounds will likely result in hollow or otherwise defective trees.

Harvesting Considerations

Many of the products gained from basswood include specialty wood products and markets for these should be sought out locally. These products can include soft wood for hand carving. Additionally, the bark has been used in weaving products like baskets. Little defect is noted in basswood when harvested before it reaches 120 years of age, but beyond this age decay and losses due to decay increase.

Propagation

Basswood will readily resprout from stumps of harvested trees. Futuristically, this can result in a clump of trees. Management of clumps as a result from cut trees should leave no more than 2 sprouts per stump. Ideally, management for a single stem is best for most species, but basswood is likely to be a prolific sprouter.

Seed and vegetative propagation can be used for establishing basswood. Basswood seeds show a pronounced dormancy and typically have poor germination rates. To enhance germination, and break dormancy, the seed coat must be penetrated. Use abrasion or acidic solutions to facilitate this process. Correctly treated seeds commonly average from 20 to 30 percent germination following stratification at 2° to 5° C (36° to 41° F) for 110 to 130 days. Seeds should be collected when it turns brown, but before they become dry and hard. It is desirable to have a moisture content of 20 to 40 percent (green weight).

Economic Uses

Basswood is a tree that has historically been used in a variety of ways. Its wood has been used for carving and in furniture. Its inner bark fiber has been used to weave rope and baskets. Its flower produces excellent honey. And, throughout the Eastern United States, basswood is frequently planted along city streets.

Uses

Its preference for moist, well drained soils, and its propensity to develop a spreading root system over time, makes it a good candidate for the agroforestry practice of riparian buffers. Additionally, it can provide farms with production potential as a timber tree, or a tree that produces top quality honey.

Additional Resources

USDA Silvics Manual on line at:
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/tilia/americana.htm.

American Hazelnut *(Corylus americana)*

Description

Hazelnuts and filberts are produced by species of Corylus. Commercial filberts (*C. colurna* L. and *C. maxima* Mill.) are cultivated in various parts of the world, particularly Turkey, Italy, Spain, China, and the US. Nuts of the native American species (*C. americana* and *C. cornuta*) are smaller but similar to the cultivated ones in flavor, and *C. cornuta* also is commercially cultivated for nut production. Edible brown nuts 1/2 inch in diameter are enclosed in a hairy, leaf-like husk with ragged edges; initially green, ripening to a brown in late summer. The nuts are sweet and may be eaten raw or ground into flour for cake-like bread. The nuts were used by American Indians to flavor soups.

Habitat

American hazel occurs from Maine west to Saskatchewan, south to eastern Oklahoma, east to Georgia, and north through New England. American hazel grows along streams, hedgerows, meadows, woodlands, roadsides, and forest margins. It grows best on rich, moist, well-drained soils.

A large, deciduous, thicket forming shrub that can grow 3'-10' in height. Straight trunk, with spreading, ascending branches. Roots typically in upper 6" of soil. Some smaller roots run vertically toward the surface and branch profusely into very fine laterals. Broadly oval leaves with a heart-shaped or rounded base are dark green above and paler below, 2 1/2 to 5 inches long, with doubly serrated margins. Light brown male flowers are 1 to 3 inches in length in clusters of two or three, inconspicuous gray-brown female flowers, appearing as short, thin, red threads in early spring.

Management Considerations

American hazel is a competitive understory tree. It often competes with hardwoods and pines for light and moisture. Because of shading and aggressive growth, it has long been recognized as a major restriction to the successful regeneration of land conifers. American hazel is shade tolerant. It can grow under a light intensity of 15 percent or less and in some places even as low as 1 percent. However, do not expect good nut production under heavy shade.

If the light and nutrient needs of American hazel are met, this tree could be used in agroforestry practices like alley cropping and maybe forest farming. American hazel produces a sweet tasting nut that has been commercially sold, eaten raw or made into other delectable treats. If desired to grow hazelnut for its nuts it should not be used in conjunction with animals. The leaves, twigs, and catkins of American hazel are browsed by deer and moose. The nuts are eaten by small mammals, northern bobwhite, ruffed grouse and other large birds, and deer. Even though American hazel likes to grow along streams, it should be advised that

beaver like to eat the bark. American hazel could persist well in an alley cropping design. Additionally, quail could use the bare ground that develops on the ground beneath. This design could include large deciduous trees that will provide American hazel with ample shade for superior growth and moderate light for nut development.

Harvesting Considerations

The flowers of American hazel are formed in the summer and open the following spring before new leaves emerge. The hazelnuts form from the fertilized flowers by late summer or early fall. While plants of American hazelnut may begin producing seed after the first year and produce good seed crops every 2-3 years, commercial production levels will likely be later, with maximum production reached at about year 12. At harvest time, usually in October, the area underneath the trees should be trimmed and kept clean. Placing a tarp under the tree before mechanically removing the nuts can aid in nut collection. Once nuts are collected, they should be dried to about 10% moisture. If the seed is to be planted rather than eaten, then seed dormancy will need to be overcome by cold treatment.

Propagation

Hazelnut can be propagated by seeds or cuttings. Propagation by seed will provide more genetic variability between plants, and requires seed stratification. Production from cuttings will demonstrate the genetics of the specific clone (the parent).

Economic Uses

Hazelnuts are a highly profitable nut used in cooking and confectionary items. Many niche markets exist that use hazelnuts in their products. Hazelnuts are sold dried and in shell around winter holiday season.

Notes

Turkey produces about 65% of the hazelnuts on the world market. In North America, the main area of production is Oregon. Eastern Filbert Blight, a fungal disease, is a threat to all hazelnut trees and needs to be managed for if trees are infected.

Additional Resources

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Bald Cypress *(Taxodium distichum)*

Description

Bald Cypress is a long-lived and wind-firm tree that is native to the Southeastern United States. This deciduous conifer is very majestic in appearance and is rarely blown over, even in hurricane winds. Life expectancy is 200+ with 500 yr old specimens cut throughout the 1970's. The largest remaining stand of old-growth bald cypress trees in Missouri can be seen at the Allred Lake Natural Area where the trees range from 500 to 1000 years old. Usually 50-70 feet in height but can easily reach 130 ft with roughly a 30 foot spread. Creates a heavy straight trunk, sometimes up to 13 feet in diameter, and becomes flat topped in maturity. On wet sites, Cypress will likely forms "knees" with age. These are root protrusions from the soil and it is believed that these knees provided for gas exchange.

Habitat

A misconception with Bald cypress is it's assumed that it has to have "wet" soils. In actuality seed must be in a source of constant moisture for germination to occur and this is most commonly found in a swamp. It is very adaptable to wet or dry sites but is not tolerant to high pH soils.

Management Considerations

Because of its adaptability to both wet and dry sites, it can be planted in a variety of situations. However, due to its habit of developing a widespread root system, it can be difficult to place into integrated tree-crop systems where roots will compete for water and moisture. But this habit can be useful for reduced wind throw within windbreaks and riparian zones. And because of its adaptability, it can be a great addition to either system because of its tolerance to any areas soil characteristics. Its usefulness in riparian areas can be recognized through greater stream bank stabilization as a result of the widespread root system.

Harvesting Considerations

Because of its slow maturity and slow growth, it is not likely that marketable sawlogs will be produced within 40 yrs. This can be a plus in riparian settings where a long lived tree provides many year of soil stability. And, when a marketable size is reached, the wood of cypress is valuable. It produces a wood that is very decay resistant.

Propagation

Because of its need of water to germinate, the bald cypress may not propagate well in every area planted. However, seedlings are readily available.

Seedlings require light for good growth, thus control of competing vegetation is necessary. Bald cypress will also produce vigorous sprouts from the stumps of both young and old trees, following disturbance such as harvesting.

Economic uses

Bald Cypress wood is noted for its insect and decay resistance. It is used for heavy construction, including docks, fence posts, railroad ties, barrels, caskets warehouses, boats; bridges as well as general millwork and interior trim.

Additional Resources

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Big Bluestem *(Andropogon gerardii)*

Description

Big bluestem was one of the more important grasses of the tall-grass prairie that formerly covered much of the state. Big bluestem grows to a height of between 3 and10 ft. Its roots can reach depths of 8 to 10 feet. It has tall, slender stems. The grass is green throughout much of the summer; the stem turns to a blue-purple as it matures. This is the reason for the name bluestem. The seed heads usually have three spike-like projections and resemble a bird's foot. This results in another common name for big bluestem -- "turkey foot."

Habitat

Big bluestem is adaptable to a wide range of soils; it thrives in light, porous soils as well as heavier, less well drained soils, even clays. It tolerates acidic or alkaline soils. It does well in dry or humid climates and tolerates cool as well as hot summers. The big bluestem grows in moist soils and lowlands and is not very plentiful in uplands. This native plant starts its growth in April and begins to flower in late summer with most growth occurring in August. Big bluestem can withstand short periods of waterlogged soils in summer, but not in winter. Of all the native grasses, Big Bluestem has one of the highest tolerances of acidity in the soil. It is useful for seeding of spoil areas and other poor sites where it has been known to thrive on areas with a pH as low as 4.5.

Management Considerations

Uses for Big Bluestem are many. Due to its rapid growth pattern, it is a top choice for erosion control on moderately to well drained soils. It is one of the most palatable warm season’s grasses, thus making it popular for forage. Wildlife management agencies use Big Bluestem as a primary component in plantings for upland birds and mammals, which use it for nesting and escape cover throughout the year. In addition, insects are attracted in large numbers to Big Bluestem, which insures the usage by many species of songbirds.

Harvesting Considerations

Big bluestem, the "King of Grasses" produces better quality and greater amounts of forage than any other Native American prairie grass. Big bluestem is excellent forage. It can yield two to four tons of hay per acre.

Propagation

Planting can occur in April or early May, mainly by no-till practices. For stands that are being planted for wildlife purposes, it will require 6-8 lbs PLS (Pure Live Seed) of seed per acre. If planting an area for forage a higher rate (10-12 lbs PLS) of seeding will be needed. If using bulk seed, rates should be doubled. Dormant plantings can be done from December through February.

Economic Uses

Although commonly recognized for its forage value, big bluestem has broad application in conservation plantings. It is often used in mixes of warm-season grasses to control erosion and benefit wildlife. Often, the outer zone of the forested riparian buffer will incorporate big bluestem. Additionally, it can be applied adjacent to tree rows in an alley cropping setting, or as an outside set of rows in a windbreak, both will help with make an effective conservation practice and enhance wildlife benefits.

Notes

Wildlife biologists and upland game managers use warm-season grasses for game habitat, nesting and holding areas. The stubble of the grasses remains erect over the winter providing nesting cover and protected "trafficways." Little bluestem, lovegrass and sideoats grama are usually in these seeding mixtures in addition to big bluestem and indiangrass.

Additional Resources

http://extension.missouri.edu/explore/agguides/crops/g04673.htm
http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Bittersweet *(Celastrus scandens)*

Description

A woody vine, bittersweet can climb over most trees and fence posts. Reaching a full length of 60 feet, this vine produces alternate, ovate leaves that 5-8 inches long and 3-5 inches wide. The flowers are lighter green in comparison to the leaves and bloom from May to late June. Colors of the pedals range from pale-green to yellow. Bittersweet is dioecious, implying there are separate male and female plants. Nurseries recommend 1 male plant to every 6-9 female plants. From the flowers, distinctive red berries are produced and linger on the plant throughout the fall and into the following spring. The berries emerge from spherical orange-yellow fruit that "burst" open when the berries are mature.

Habitat

In light preference, bittersweet is a full sun species that is most often found in well drained areas such as glades, limestone bluffs, forests, and fence rows. This vine species does not need a structure to grow on, rather, it can grow horizontally on the ground and also curl upwards from around old tree stumps. A word of caution, bittersweet is an aggressively fast grower, do not plant this species near young trees or around seedlings because the vine will girdle the younger specimens as it grows.

For growing conditions, the bittersweet thrives in moist environments, but is not able to survive in water logged areas. In terms of temperature, bittersweet can survive the "bitter" cold months of the Midwest and also thrive in the hot, humid conditions of the southeast.

Management Considerations

Well suited for any habitat that is well drained, bittersweet is a great addition to windbreaks, alley cropping, and forest farming. This species does not need to grow vertical, but make sure the plant receives full to partial sunlight during the growing season and is not at risk of being damaged by equipment. Along with being part of an agroforestry practice, bittersweet can also be incorporated into gardens and other landscape use to enhance natural beauty.

Harvesting Conditions

To harvest, simply take a handsaw or pruning shears and cut the desired stem(s). After pruning, the stump may sucker sprout or the root will sucker sprout for a future cutting. Along with using the stems, harvesting the seeds before wildlife has a chance to consume the berries is also another consideration. The seeds can then be used in birdfeed for urban birdfeeders or as a seed source for local nurseries.

Propagation

Regenerations can occur through planting new seedlings, seeds, and also through root suckering. Root suckers are not able to survive the process of being transplanted from one sight to another due to the lack of root structure. Transplanting a seedling on the other hand, is highly recommended and is a sure way to know the plant has a healthy root system to allow for maximal growth. Before planting, seeds should be kept in a cool, dark place at 3C for up to 3 months before planting.

Economic Uses

Bittersweet is harvested as a wood floral and can be an added touch to wreaths, floral arrangements, or indoor decoration. The berries attract many varieties of wildlife, especially during the winter months when food is scarce. Also during the winter, the deep red berries are a wonderful addition to the long, bleak winter months. The seeds within the berries can be harvested and used as a feed source to attract backyard wildlife or sold to nurseries as a seed source.

Notes

Other common names include American bittersweet, America's bittersweet, and climbing bittersweet. The leaves and stems have the potential to be poisonous to cattle. Use extreme caution and make sure livestock stay away from this species.

Additional Resources

Missouri Botanical Garden.
http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?code=A151

Oklahoma Biological Survey. http://www.biosurvey.ou.edu/shrub/cesc.htm

United States Forest Service.
http://www.fs.fed.us/global/iitf/pdf/shrubs/Celastrus%20scandens.pdf#search='Celastrus%20scandens'

Black Locust *(Robina pseudoacacia)*

Description

Native to Missouri, black locust, also known as common locust, yellow and white locust. It is a medium sized deciduous tree with an average lifespan between 60 to 100 years. Fast growing with an average height of 30-50ft, spread of 20-35 ft. and diameter average of 1 to 2 ft. Since this species is a nitrogen-fixing legume, the leaves are very high in nitrogen and have been used in animal feeding trials with mixed success.

Flowers are 3/4in. long, white, and extremely fragrant, in a dropping arrangement maturing in late spring. Black locust blosomes provides a good source of forage for honey bees, and makes good honey.

Habitat

This species grows best in full sun, on moist, loamy soils of limestone origin, but establishes on a variety of disturbed sites; and competes well on large forest openings. It is found in cove forests and open, upland slopes, fence rows, disturbed ground, and limestone soils. In natural settings, Deer browse the foliage, birds and small mammals eat the seeds.

Optimum soil pH is between 4.6 and 8.2 and can grow on almost any soil type (sandy and sterile) with the exception of those that are permanently wet.
Due to is shade intolerance, it is not found in dense woods except as the dominant tree. Habitat zones are between 3 and 9.

Management Considerations

During establishment, protection from weeds and deer are the main management priorities. Due to the rapid early growth, two years of protection are usually sufficient. Pre-plant site preparation to control weeds with tillage or herbicides is recommended, with continued weed control after planting. Where exceptional deer pressure exists, tubes or mesh sleeves may be required. Once established this species will not require active management unless straight trunks are desired for fence posts.

Harvesting Considerations

Although black locust is not an important timber tree in the United States, it is used for a wide variety of products and is planted for many specialized purposes. The wood of black locust is strong, hard, and extremely durable, it is extensively utilized for fencing, mine timbers, and landscaping ties. This tree also serves as a good erosion control plant on critical and highly disturbed areas, due to its ease of establishment, rapid early growth and spread, and soil building abilities. Pulp with satisfactory mechanical properties can be made and it has potential for use in fuel plantations.

Black locust is widely planted in the United States, Europe, and Asia for erosion control, reclamation of drastically disturbed sites, windbreaks, nurse crops, amelioration of sites, honey production, and ornamental use. Many early plantations on severely eroded old fields were failures, but establishment on spoil banks has been generally successful. Black locust is often broadcast or hydroseeded with a mixture of herbaceous seed. The most commonly used seeding rate is 2 to 3 lb/acre.

Because of its soil-improving properties, black locust is often planted in mixtures. Many species have been underplanted in black locust stands. Success of such planting has been variable and many factors have to be considered carefully. On mine spoil in Illinois, black locust was a valuable nurse crop for black walnut (Juglans nigra), silver maple (Acer saccharinum), and yellow-poplar (Liriodendron tulipifera), but not for cottonwood (Populus deltoides), sweetgum (Liquidambar styraciflua), or Osage-orange (Maclura pomifera). However, on surface-mined land in Kansas, survival, growth, and form of black walnut were impaired when planted with black locust (39).

Propagation

This species propagates easily by root suckers and stump sprouts and also transplants easily. Legumes or pods form and mature in mid September to October, dropping in late fall. It is a reliable seed producer beginning at age 6 with peak production at age 15 and production decline at age 40. As the leaves fall, decomposition is rapid releasing nitrogen, calcium and potassium into the soil. Due to the impermeable seed coat, the seeds should be scarified in sulfuric acid for 50 min, soaked in hot water or mechanically scarified. Germination rates are very high. If root cuttings are desired, use stock that is 1/4 to 1" diameter, 3 to 8 in. long.

Notes

There are 2 primary insects which inflicting damage on black locust: the locust leaf miner and black locust borer. The leaf miner attacks the tree in spring, turning the leaves brown by mid-summer or early fall. Overall tree growth is impacted, but not seriously. The larvae of the locust borer carve tunnels through the trunk of the tree, weakening it enough for wind breakage. Planting on good quality sites or in conjunction with other hardwood species and shading trunks will discourage infestation by locust borers. Heart rot is the only noteworthy disease effecting black locust.

Additional Resources

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm

Black Walnut *(Juglans nigra)*

Description

Black walnut, also called eastern black walnut and American walnut, is one of the scarcest and most coveted native hardwoods. Small natural groves frequently found in mixed forests on moist alluvial soils have been heavily logged. The fine straight-grained wood made prize pieces of solid furniture and gunstocks. As the supply diminishes, the remaining quality black walnut is used primarily for veneer. The distinctive tasting nuts are in demand for baked goods and ice cream, but people must be quick to harvest them before the squirrels. The shells are ground for use in many products.

Habitat

Black walnut is sensitive to soil conditions and develops best on deep, well-drained, nearly neutral soils that are generally moist and fertile. Walnut grows best on sandy loam, loam, or silt loam textured soils but also grows well on silty clay loam soils. Soils with these textures hold a large amount of water that is available to the tree during dry periods of the growing season. Internal drainage and depth to gravel are especially important site characteristics for black walnut. As a general rule, black walnut will do best on soils that are at least 3 feet to impermeable layer. Throughout its range, walnut generally reaches its greatest size and value along streams and on the lower portion of north- or east-facing slopes.

Management Considerations

Black walnut can be grown for a variety of reasons, including nut production and high quality timber production. Due to its leaf configuration it is also well suited to being grown, or managed for, in most all the agroforestry practices. However, there are several key things to remember as you become successful in agroforestry while working with Black Walnut trees.

Black walnut is a very intolerant tree. Planted in fairly dense stands or under forest competition the tree develops a tall and well formed, clear bole. This bole form results from the tree putting its resources into competing for sunlight and is ideal for wood fiber production. Logs 10 inches in diameter at breast height can be developed in 35 years under ideal growing conditions.

Weed control is essential in newly established plantings. In order for any tree to reach its growth potential, the tree must be placed on an appropriate site (soils, aspect, etc.) and have good control of competing grasses. This can be accomplished by a number of methods, including proper herbicides, weed barriers/mats, and the use of mulch.

Harvest Considerations

The best known use of black walnut is for its lumber and veneer, and for its nut production. The wood is used for fine furniture of all kinds, interior paneling, specialty products, and gunstocks. Usually markets in the Midwest for black walnut wood tend to be better from the late fall through early spring, after which prices tend to decline.

Black walnut grown for nut production may require the use of specialized equipment. There are companies that make tractor attachments for everything from shaking the tree (in order to cause nuts to drop in a timely fashion) to harvesters to collect the fallen nuts and hullers.

Propagation

The large edible nut ripens in September or October of the same year and drops shortly after the leaves fall. Good seed crops are produced irregularly, perhaps twice in 5 years. Stratification for 90 to 120 days is required for optimum seed germination but the necessity and duration of stratification may vary by seed source. Seeds should be planted in the fall in moist, well-drained, deep soil that is rich in organic matter. Black walnut prefers full sun.

Most seedling nurseries will also have black walnut seedlings available. Seedlings should be established early in the spring and be provided good weed control in order to maximize the sites growth potential.

Economics Uses

It is important for you as the landowner/Agroforester's to keep in mind what the desired results are to be. From the economic stand point Black Walnut has several desirable traits that can make it very profitable to you as long as proper management of these trees is taken. Historically, Black Walnut has kept ahead of inflation and remains one of the most valued hardwood species. Therefore with the proper care and management you can maximize your lands to bring you the most with little effort on your part.

By using grafted stock, in conjunction with proper management, nut harvesting can begin in 6 to 10 years.

Notes

Black walnut produces a toxin, known as "juglone", which inhibits the growth of other plants around it, thereby reducing competition. Juglone deprives sensitive plants of energy needed for photosynthate production. The symptoms of plants being affected by juglone include foliar yellowing, wilting, and eventually death. The largest sources of juglone on the tree are located in the buds, roots, and nut hulls.

Additional Resources

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm
http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi
http://www.centerforagroforestry.org/pubs/proppecbw.pdf

Blackgum *(Nyssa sylvatica)*

Description

Known as one of the most beautiful native trees in the Ozarks and Boothill of Missouri, it is known for consistent fall color changing to fluroescent yellow to orange to scarlet purple. Blackgum, also known as black tupelo, pepperidge, tupelo, tupelo gum, is a medium sized tree with an intermediate growth rate, that when young has a pyramidal shape with with densely set branches but in old age the numerous spreading and open horizontal branches form an irregularaly rounded or flat-topped crown. Large trees of this species are typically hollow due to various decay producing fungi and wood-boring insects.

Habitat

Having a wide range it can be seen along swamp borders and dry slopes in full to partial shade areas. Blackgum may be grown as an ornamental or used as a working tree in riparian forest buffers. Blackgum will tolerate brief spring flooding on alluvial sites and is common on the relatively dry upper and middle slopes in the Appalachian Mountains. On the drier uplands, it grows best on loam and clay loam. It is well adapted to fire. Its hardiness zone is 3-9. Optimum soil pH range is between 5.5 and 6.5.

Management Considerations

An easy tree to manage, it averages a growth rate between 12-15 feet over a 10 to 15 year period. This species does not tolerate high pH soils.

Insect and disease problems are common but have little significance to the health of the tree. Heart rot, leaf spots, rust, tupelo leaf miner scales and cankers are common ailments that can be seen but are not serious.

Since this species has been known to have a lifespan greater than 500 years in some areas, it typically hollows as it matures. If managing for wildlife is your main objective, it is known to provide several generations of wildlife species from insects to nesting birds, rabbits, squirrels, possums and hibernating bears due to the tree's usefulness for nesting and shelter.

As a working tree, this species can be used in the design of a riparian forest system since it can tolerate low oxygen sites, and may also be useful for its fall color in applications where aesthetic enhancement is desired.

Harvesting Considerations

In the past, the lumber was harvested for storage containers, pallet boxes, molding and furniture since the wood is tough. Presently, the lumber has low value and is commonly mixed with other low grade lumber at the market. It is difficult to dry and is probable to warping and twisting. It is also hard to split, has below average machining characteristics and is not durable to decay.

Propagation

The oval, soft black to purple fruit that ripens in September to early October is a favorite to deer and eaten by many birds and various mammals but not by humans. Seeds exhibit moderate embryo dormancy and require moist stratification for 60 to 90 days at 41F for optimum success.

Blackgum is usually found in a mix of other species including black cherry (Prunus serotina), dogwood (Cornus florida), hickory (Carya spp.), oak (Quercus spp.), eastern hophornbeam (Ostrya virginiana), and yaupon (Ilex vomitoria), it is shade tolerant and seldom grows as the dominant tree but it usually grows in the intermediate crown class on most sites.

Blackgum will sprout from the stump and from root suckers. Sprout numbers will typically decline as the tree gets large.

Economic Uses

These trees have moderate growth rate and longevity and are an excellent food source for wildlife, fine honey trees, and handsome ornamentals. Black bears, foxes, wood ducks, wild turkeys, robins, woodpeckers, mockingbirds, brown thrashers, thrushes, flickers, and starlings frequently eat the fruit, while white-tailed deer and beavers browse the twigs, foliage, and young sprouts. Additionally, it provides cavity and nesting sites for a variety of birds and mammals. Black gum is an excellent ornamental plant for its straight bole, shapely crown and attractive autumn foliage.

Additional Resources

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/nyssa/silvatica.htm

Blackhaw *(Viburnum prunifolium)*

Description

Blackhaw is a deciduous shrub or tree from the honeysuckle family. It grows 10 to 20 feet tall with a short trunk that has a diameter of about 6 inches. It has an irregular crown with stiff, spreading branches. The bark is reddish-brown to dark brown or black and has a distinctive blocky appearance. The twigs are smooth, slender, gray or brown, and have orange-colored lenticel. The buds are a ½ inch in length, gray or reddish-gray and sometimes covered with purplish hair . The leaves are oval with short, pointed tips, rounded or tapering to the base, darker green on top, paler green on bottom, and 2-3 inches long. The flowers are white and in clusters. The fruits are shiny, bluish-black, ovoid, berries that occur on bright red stalks.

Habitat

The blackhaw occurs in dry woods and thickets and on rocky hillsides from Connecticut to Florida and west to Michigan and Texas, but is found in greatest abundance in the South.

Management/Harvest considerations

Blackhaw prefers moist, well-drained soils of rich or average composition of alkaline, neutral, or acidic pH. It can tolerate dry soils very well and thrives in full sun to full shade as a native understory or woodland edge shrubs. Blackhaw is a very hardy plant, tolerating temperatures down to about –40 degrees C.

It can be planted densely for a barrier thicket that branches and suckers from the ground-up

In agroforestry, blackhaw has a potential to be used in windbreaks and riparian buffers as a source of habitat and food for wildlife. The bark is collected for medicinal uses. The branch bark can be harvested in the summer and the trunk bark in the fall. Dry the bark in the shade before using.

Propagation

The seed is best sown in a cold frame as soon as it is ripe. Germination is usually slow, taking more then 18 months. Stored seed will require two months warm then three months cold stratification. When the seedlings are large enough to handle they should be put into individual pots in a coldframe or a greenhouse. Blackhaw can be propagated from cuttings of softwood, half-ripe wood, and mature wood. Cuttings of half-ripe wood are difficult to overwinter and should be kept in a greenhouse or coldframe until spring.

Economic uses

Blackhaw is used as an ornamental because it possesses year-round ornamental qualities similar to those of flowering dogwood. The blackhaw is most widely

used for its medicinal properties and as some economical importance. The bark of the root and stems is abortifacient, anodyne, antispasmodic, astringent, nervine and sedative. The root bark should only be harvested in the autumn. Tea is used internally in the treatment of painful or heavy menstruation, prolapse of the uterus, morning sickness, and colic.

Notes

To make a tea from blackhaw bark, use 1 ounce of herb per pint of freshly boiled distilled water. Steep for 15 minutes, and strain. Drink a cup 2-3 times a day.

Bloodtwig Dogwood *(Cornus sanguineum)*

Description

A deciduous shrub that has a rounded form, bloodtwig dogwood is an ornamental shrub that is very hardy. The shrub's name comes from the blood color twigs that are very obvious during the winter months when leaves are absent. During the spring, white flowers bloom and during the fall, a black berry will form. Like all dogwoods, bloodtwigs have a tendency to sucker sprout, causing new shoots to emerge. This species can reach a height of 6 to 8 feet and measure 4 to 6 feet in width.

Habitat

Preferring partial to full shade, this understory species can be found in moist areas that are well drained. When it comes to soil preference, bloodtwig dogwood prefers a loam textured acid soil that is fertile to allow for vigorous growth. In concern with weather, bloodtwig dogwood prefers warmer climates that receive a fair amount of moisture throughout the year and not just in the spring.

Management Considerations

Often referred to as an easy going tree, dogwoods are self reliant and will not require much labor from landowners. Once the shrub has been established, the land owner does not have to worry about providing water or nutrients for the plant. The only precaution is to root prune specimens that you do not want sucker sprouting or else your one dogwood could turn into a whole colony of little dogwoods. Unless this is in your management plan, watch for sucker sprouts and use mechanical means to make sure your dogwood population stays under control. In an agroforestry setting, using bloodtwig in alleycropping, riparian buffers, forest farming, and windbreaks is recommended. It can be used to enhance habitat for bobwhite quail.

Harvesting Considerations

Harvesting bloodtwig as a woody ornamental is as easy as a hot knife going through butter, literally. Most harvest practices involve taking a sickle mower out to the field and simply running the sickle down the rows. The best time to do this is when the shrub is dormant during the winter months.

Growing specimens and then selling them to nurseries, or landscapers, as ball-and-burlap transplants is also an option. Dogwoods are easily transplanted when they are still young.

Propagation

Propagation of bloodtwig dogwoods is very easy to accomplish, especially when transplanting an established plant from one location to a new location. Before digging up a plant to transport it, make sure to prune the roots a season. A direct seeding can be used to establish the species; however, site and environment

conditions must be suitable for germination to take place. The most productive form of propagation comes from the fact the species is a notorious sucker sprouter.

Economic Uses

Woody ornamental species, such as dogwoods, are being incorporated into various floral arrangements to give a touch of the outdoors to any bouquet. Along with using the stems for floral designs, harvesting the seed as a seed source is also an economical benefit. Along with these ideas, some craftsmen enjoy using dogwood as a wood source for furniture and wooden figurines. In European countries, the extract found in bloodtwig is used to make various types of soaps.

Notes

A very beautiful ornamental tree, bloodtwig dogwood can make any landscape breath taking, especially in winter when the red limbs are visible against the bleak background. The market for producing large quantities of bloodtwig and any other dogwood that will be used in landscape design is huge and profitable.

Additional Resources

Dogwood's Internet Connection. http://www.bright.net/~dogwood/article.html

Michigan State University Extension.
http://web1.msue.msu.edu/msue/imp/modop/00001964.html

Placer County, California.
http://www.auburnweb.com/Destination_Dogwood/Classifications/

Bluebells *(Mertensia virginica)*

Description

A welcoming flower of spring, the bluebells ring their brilliant blue bells as a sure sign that spring is here. These showy plants that can't be missed on a spring walk grow up to 2ft. tall and are usually found in large clusters.
Native to Missouri, this perennial has loose clusters of trumpet-like blue flowers, up to 1in. long. The foliage, easy to identify before the flowers bloom, is smooth, oval and bluish green, averaging 4in. long. Foliage dies to the ground by mid-summer as the plant goes dormant.

Habitat

Found in moist, rich woods, along creek beds, gravel bars and river floodplains. They prefer southern slopes in partial to full shade. It's hardy in Zones 3 to 8.

Management Considerations

This is an easy species to manage since it is cultivated by fresh seed or divided in the spring. It is best left undisturbed. No threatening insect or disease problems are known to occur. As a spring ephemeral, it leafs out in early spring and can easily be identified for purposes of not harming the plant with mechanical equipment.

It prefers moist, cool soils, high in organic matter. If left undisturbed, this species will thrive and form large colonies.

Economic Uses

Pink and white-flowered forms are seen but rare in Missouri. Cultivation of this species could be handsomely rewarded toward sales of native ornamental gardeners. The blue flowers can be sold at local markets or simply be a beautification element on the farm. The seeds can be collected and sold with wildflower seed

Additional Resources

Missouri Botany Organization:
http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?code=L200
Missouri Plants:
http://www.missouriplants.com/Bluealt/Mertensia_virginica_page.html
Missouri Grow Native:
http://www.grownative.org/index.cfm?fuseaction=plants.main

Buffaloberry *(Shepherdia canadensis)*

Description

Native to North America, the buffaloberry is a shrub that can grow from 2” to 8” in height, depending on what pruning practices are implemented. Buffaloberry must have both male and female plants in order for fruit/seeds to be produced. Buffaloberry is known in different regions of the United States by various common names. Some of these common names include: russet buffaloberry, buffalo-berry, Canadian buffaloberry, russet red buffaloberry, soapberry, and soopolallie. Another species, Shepherdia canadensis var. xanthocarpa produces a yellow fruit in comparison to Shepherdia canadensis’ red fruit.

Deciduous in nature, the color of spring leaves ranges from a hunter green to a lime green. On the underside of the leaves, a silver lining can be seen and is a key feature in identifying buffaloberry. In the fall, the leaves will turn a neutral yellow and are not very showy. The flowers are very small and will appear shortly after the leaves have emerged. Similar in color to a dandelion, the flowers are not as showy as dogwoods and have no fragrance that can be detected by the human nose.

Habitat

Native to North America, the range for buffaloberry is from Nova Scotia to New Mexico. Understory tolerant, this species is commonly found growing under ponderosa pines, white spruce, balsam fir, and even cottonwoods or willows. Though understory tolerant, buffaloberry thrives in full sun and can grow to be a dominant tree in poor sites that have large amounts of sulfur. Buffaloberry is also a nitrogen fixer, similar to legumes such as beans or black locust.

In regards to soil types, buffaloberry can thrive in all three types: clay, sand, and loam. The site must be well drained since the species cannot tolerate being water logged for a long period. In contrast to nutrients that are available on the site, buffaloberry can thrive in areas that lack nutrients in the soil or have been cleared of all nutrients do to mining, aggressive agriculture practices, and over grazing of livestock.

Management Considerations

In the past, many government agencies have suggested this species to be planted in areas that had been stripped mined, over grazed, or a former dump site. This species is very aggressive once established and has been known to sucker sprout in areas where plenty of precipitation fell and where there was a lack of other competing vegetation.

In agroforestry practices, this species is ideal for areas that have been neglected or abused by being used as dump sites. In particular, this species can be used for windbreaks, silvopasture, forest farming, and alleycropping. A riparian buffer is another option, as long as the species are planted away from the water source. In a

silvopasture environment, cattle do not show any interest in buffaloberry twigs or their fruit, however, sheep and goats have been know to devour a whole thicket of this species. A word of caution, toxins in this species have been know to kill sheep, goats, and feral horses during years of severe drought when buffaloberry was the only vegetation available to consume. This toxin causes the plants to create a fowl taste and most animals (domesticated or wild) will not chew on the branches, but may browse the seeds.

Harvesting Considerations

Due to the size of buffaloberry, timber harvest is out of the question. However, this shrub can be used to make mulch or produce small pieces of wood that can be used by artisans interested in wood carving.

Propagation

The best propagation practices include direct seeding, transplanting young seedlings from one source to another, and using root cuttings. Through these propagations, the species is able to establish a healthy root system and not show any negative impacts of being moved from one site to another.

Economic Uses

The fruit of buffaloberry has been used in many Native American recipes from deserts to a form of fruit punch. Even today, many tribes across the Midwest hold annual pow-wows and will pay a large sum for the seeds to be used in drinks, foods, and decoration. A market can be found through Native American Tribes and also through organic markets that are looking for unique food ideas.

In the field of medicine, research has taken place to determine if an old remedy started by the Sioux Tribe can help calm irritated eyes. Today, many medicine men/women use the bark of buffaloberry to ease the pains of dry eye or cleanse eyes that are come in contact with dust, tree branches, or pollen. Modern medicine has taken an interested in this practice and research prototypes have been developed and are being tested in clinical trials.

Along with being an eye medicine, the Sioux also boiled the bark, leaves, and fruit to produce teas. These teas were used to help cure stomach problems, what we would consider stomach ulcers in today's society. The tea also is thought to have a healing effect on other parts of the stomach and intestines.

Additional Resources

United States Forest Service:
www.fs.fed.us/database/feis/plants/shrub/shecan
University of Connecticut:
www.canr.uconn.edu/plsci/mbrand/s/shecan/shecan1.html
USDA:
www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?33864

Butternut *(Juglans cinerea)*

Description

A relative of the Black Walnut (*Juglans nigra*), this tree is small to medium sized but with a short straight trunk and broad open, somewhat irregular, flat or rounded-topped crown. Butternut is called "white walnut" because of its light-colored wood, which has a natural golden luster that becomes satin-like when polished. Butternut is more valued for its nuts than for lumber. It may mature at 60 feet tall by 50 feet wide when it is found in the open. It's leaves are pinnately compound with 11 to 17 leaflets that have a yellow to brown color in the fall. It has elongated corregated nuts with flattened and shiny ridges. It has sweet-tasting nuts which gives the common name of Butternut. The Native Americans reportedly boiled the kernels to extract the oil, which was then used like butter. The kernels were also pickled in vinegar by the early settlers.

Habitat

Butternut grows best on streambank sites and on well-drained soils; it is seldom found on dry, compact, or infertile soils. However, it typically grows better than black walnut on dry, rocky soils, especially those of limestone origin. Butternut is found most frequently in coves, on stream benches and terraces, on slopes, in the talus of rock ledges, and on other sites with good drainage. It is generally considered to be more winter-hardy than black walnut.

Management Considerations

Naturally occurring Butternut trees are susceptible to butternut canker disease, but healthy trees found growing among diseases trees may be resistant to the disease. These trees could have potential value for propagation by grafting or breeding. Do not plant seedlings in areas with disease trees for they will not likely survive.

Young trees may grow in considerable competition, but they are shade-intolerant and mature trees must reach the overstory. Fire easily top-kills butternut and older trees rarely sprout from the root crown or stump. Competing vegetation must be controlled when planting seeds or seedlings to maintain vigorous growth. Properly prune and maintain good tree care to maintain vigor of the trees for seed and nut production.

If trees have less than 70 percent live crown and more than 20 percent of the combined circumference of the stem and root flares are affected by cankers, remove and discard these trees. The wood may be salvaged.

In agroforestry plantings butternut will most likely find application in the riparian forest buffers and/or alley cropping practices. However, due to its susceptibility to butternut canker, plantings are not likely to be long lived unless a canker resistant variety is developed.

Harvesting Considerations

Nuts quickly become rancid and therefore need to be harvested quickly. Butternut is closely related to black walnut so many of the recommendations for seed collection and storage and for planting are similar for both species.

Propagation

Young trees may withstand competition from the side, but will not survive shade from above. The minimum size opening needed to establish and promote early development is about 2 to 3 times the height of the surrounding dominant trees. Seeds germinate in the spring after seedfall and a cold period (34-410 F) of 90 to 120 days to break dormancy.

Economic uses

Timber can be harvested for cabinet work, furniture, paneling, carving and novelties. Butternuts were often planted close to the house on farmsteads for their use as food. Kernels were used in baking and cultivars have been selected for nut size and for ease of cracking and extracting kernels.

Additional Resources

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm
http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Canola *(Brassica napus)*

Description (Common names: rutabaga, Swedish turnip, canola, rape)

Annual or biennial, with a slender or stout, hard, long tuberous taproot; stems are erect, often many branched, and up to 1.5 m tall. Sometimes the stems are purple toward the base. The leaves are lobed, and the petioles are usually 10–30 cm long, with a few bristly hairs. The flowers are pale yellow, 1.2–1.5 cm long. Inflorescence can be many branched, and up to 1 m tall as an elongating raceme.

Canola is grown sparingly for young leaves used as potherb, but is more generally grown as forage for livestock feed, and as source of rapeseed oil. Rape oil is used in the food industry, as an illuminant and lubricant, and for soap manufacture. Residual rapeseed cake, though low in food value, can be used as livestock feed. Rapeseed oil has a potential market in detergent lubrication oils, emulsifying agents, polyamide fibers, and resins, and as a vegetable wax substitute. However, canola is probably gaining its greatest notoriety for use as a cooking oil because it has low levels of saturated fats.

Habitat

Canola requires fertile and well-drained soils. It responds favorably to nitrogen and phosphate fertilizers, but can be injured by direct contact with the fertilizer. Use only low rates of fertilizers in drills where both seed and fertilizer empty into same tubes. Sunny days and cool nights are favorable for growth; dry weather at harvest time is essential. Ranging from Boreal Moist to Rain through Tropical Dry to Moist Forest Life Zones, rape is reported to tolerate annual precipitation of 3 to 28 dm (mean = 8.3), annual temperature of 5 to 27°C (mean = 11.6), and pH of 4.2 to 8.2 (mean = 6.2).

Harvesting Considerations

Because fruit ripens evenly and shatters easily, to avoid shattering, it is recommended to harvest crop when yellow and windrow to ripen until seed inside is just changing from yellow to brown. Dry, mature seed may be harvested directly with combine. To combine standing crop, it is best to leave the crop until seeds are fully ripe, and with reel speed reduced to two-thirds normal speed for cereals, harvest crop during cloudy weather when plants are moist, thus reducing shattering. In some areas the crop is cut by hand and then flailed with sticks after drying in sun for a few days. In humid and temperate regions, artificial drying may be necessary.

Propagation

Seeds are sown in place. Plant canola 4-6 in (10.2-15.2 cm) apart in rows 30 in (76.2 cm) apart. Canola seed is either broadcast at 20 pounds (9 kg) per acre, or planted in rows 28 in (71 cm) apart at four pounds (1.8 kg) per acre.

References

General information:
http://www.hort.purdue.edu/newcrop/duke_energy/Brassica_napus.html

http://www.floridata.com/ref/B/bras_nap.cfm

Jefferson Institute:
http://www.jeffersoninstitute.org/overviews/canola.shtml

Catnip *(Nepeta cataria)*

Description

Catnip is an erect perennial herb that grows to three feet in height. The stems are whitish, downy, square in shape, with opposite leave arrangement. It has many small purple-spotted white, or pale lavender, tubular flowers which are tightly clustered at the end of the floral branches. The leaves are heart shaped with scalloped edges ranging from grey green to green color and are often crowded toward the top of the plant. The fruit on this herb is in the form of a nutlet.

Habitat

Catnip can be found along roadsides, near streams, hedgerows, borders of fields, dry banks, and waste ground, especially on calcareous and gravelly soils. It is native to dry regions of the Mediterranean, Europe, Asia, Eurasia and Africa, was introduced to America by the early settlers as a garden herb, and was later naturalized in North America (1).

Management/Harvest Considerations

Nepeta cataria grows well in well-drained soil with pH ranging from about 5 to 7.5. It grows best in full sun and with an annual temperature of 45-66 degrees F. Fields should be fertilized based on soil test recommendations for field crops, prior to planting. Catnip has very little insect or disease problems. Its major pest is weeds (competing vegetation), which should be controlled by cultivation because there are no herbicides labeled for use in catnip production. A stand of catnip will last for three years, after which time the weeds generally became a problem and a decrease in yield is expected. When growing conditions are good a yield of 4.4 to 6.7 tones/ha of dry weight can be harvested.

Catnip is harvested when it comes into full bloom, sometime in August. It is very critical that it is harvested at that time because after it blooms the aromatic properties of the volatile oils decrease. Plants are harvested by clipping the stems about 10 to 12cm above the crown. This allows regrowth from the adventitious buds. Plantings can generally be cut twice (mid-summer and fall) during the growing season. The thicker stems of the harvested plants can be removed to allow for a leafier, finer stemmed, and aromatic final product. The harvested plants are dried in the shade or with an artificial dryer. Depending on the buyer and its use further drying may be required.

Propagation

Catnip seeds are extremely small, germinate rapidly and produce healthy seedlings at temperature between 68-86 degrees F. The seeds are sown into warm seedbeds sixty to sixty-five days prior to transplanting, which should generally occur between March 1 and April 1. Daily management of the plantbeds is

necessary to produce strong, healthy seedlings. Seeds will typically remain viable for five years.

Economic uses

Catnip is marketed for cats in stuffed toys, catnip filled balls, and compressed pellets and in shaker bottles. The commercial catnip for toys is of lower grade, consisting of dried, ground up stalks, as well as leaves. Marketing possibilities include farmers markets, pet stores and higher-end retail stores. Growers should have an established market available before beginning production. Producers may be able to capture a niche of the pet supplies market, which comprises about 20 percent of the more than 30 billion dollars that the U.S. pet owners spend on their animals.

Catnip is also used in a number of pharmaceutical products and researchers have found a chemical that is highly effective as a natural mosquito repellant. Like other plants from the mint family, catnip has also been used to calm a number of digestive tract disorders.

Notes

Labor requirements per ¼ acre are approximately 75 hours for production, 64 hours for harvest and 8 hours for processing.

Additional Resources

http://www.sfp.forprod.vt.edu/factsheets/catnip.pdf#search='catnip%20pdf'

Kit L. Chin, Yadong Qi, Mila Berhane and James E. Simon, Biological Characteristics, Nutritional and Medicinal Value of Catnip, Nepeta cataria, No. 302

Chinquapin Oak *(Quercus muehlenbergii* Engelm.*)*

Description

Moderately tall, slow-growing deciduous tree reaches a mature height of 60 to 80 feet and often has wide-reaching lower branches when grown in the open. Bark is light grey or silvery-white and resembles the white oak (*Quercus alba*). Leaves are broad, flat, and simple (not lobed) with coarse teeth. The Chinquapin Oak is sometimes spelled *Chinka*pin Oak, and is also known as Yellow Oak or Yellow Chestnut Oak (among others). It is a member of the White Oak group and Beech family, and is therefore related to Oaks, Beeches and Chestnuts.

Habitat

(USDA Zones 5 – 8)

Native to most of the Midwest, Chinkapin oak is found in western Vermont and New York, west to southern Ontario, southern Michigan, southern Wisconsin, extreme southeastern Minnesota, and Iowa; south to southeastern Nebraska, eastern Kansas, western Oklahoma, and central Texas; east to northwest Florida; and north mostly in the mountains to Pennsylvania and southwestern Massachusetts. There are local populations in the mountains of southeastern New Mexico, Trans-Pecos Texas, and northeastern Mexico. Chinkapin oak is generally found on well-drained upland soils derived from limestone or where limestone outcrops occur. Occasionally it is found on well-drained limestone soils along streams. It appears that soil pH is strongly related to the presence of Chinquapin Oak, which is generally found on soils that are weakly acidic (pH about 6.5) to alkaline (above pH 7.0). It does well in most light conditions, and prefers upland sites.

Management Considerations

Chinquapin Oak prefers moist, well-drained, deep, rich, alkaline soils, but sometimes is often found near the summit of hills or uplands in dry soils that may be clay, sandy, or rocky. It can tolerate neutral to acidic soils. It thrives in partial to full sun. Moreover, it can withstand moderate shading when it is young but becomes more intolerant of shade with age. It is regarded as a species that performs best on dry, droughty soils, especially those of limestone origin. On more moist sites it performs moderately well. However, many oak-hickory stands on moist sites that contain chinquapin oak are succeeded by the beech, maple, and ash species (which are better suited to those sites). In an agroforestry application, chinquapin oak is especially suited for windbreaks, though it can also serve as an excellent wildlife food source for squirrels, mice, voles, chipmunks, deer, turkey, and other birds.

Because it is related to other Oaks, it is susceptible to vascular diseases such as Oak wilt and to insect pests such as the gypsy moth and acorn weevil. However, it is overall it has very few pest problems and does well even in urban settings.

Harvesting Considerations

Chinquapin Oak can reach 24 to 36 inches in girth at maturity, and is capable of producing a wide range of products in low-value to high-value wood markets. The wood of chinquapin oak is dark brown with a narrow, pale sapwood; it is hard, heavy, strong, and durable. These characteristics make it a valuable wood for many uses. It is commonly used as saw timber and is considered a member of the select white oak group. When properly dried and treated, oak wood glues well, machines very well, and accepts a variety of finishes. It is widely used for cabinets, furniture, pallets, and containers. Higher-value uses include staves used in making barrels. Oak wood was traditionally used for railroad ties and is commonly cut for firewood.

Despite the fact that the wood is of excellent quality, Chinquapin Oak is relatively uncommon over its natural range and moreover it is rarely found in cultivation because it is not a large tree. However, it would make a fine specimen for parks, estates and larger lawns. The sweet acorns are relished by wildlife and are even palatable to humans.

Propagation

Acorns will germinate without any pretreatment as soon as they are mature.

Additional Resources

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/quercus/muehlenbergii.htm

Chokecherry *(Prunus virginiana)*

Description

Chokecherry is a native, deciduous, thicket-forming shrub/small tree. Numerous stems, slender and branching at the base, or with upright spreading branches, form the majority of the plant. Average heights may range from 3 feet to 20 feet, Great Basin heights have been recorded to 40 feet with 8 inch diameters. Extensive root systems are common among chokecherry, extending as much as 35 feet laterally and 6 feet of depth. Fruits are a fleshy drupe, containing a stone. Although edible, this stone is toxic to humans and must therefore first be cooked or otherwise treated prior to consumption. This shrub is also an important wildlife plant that provides cover and food to many birds and mammals.

Habitat

Chokecherry is widely found throughout much of the United States, it occurs from a line through Newfoundland to British Columbia south to North Carolina, Tennessee, Missouri, down to northern Mexico. It is found throughout many forest types, including forest edge, under full canopy, and with a variety of species in the overstory. It is shade tolerant, but persists in high percentages of sunlight. Fast growth rates are associated with chokecherry in good sites. Moist soil is required for optimum growth.

Management Considerations

Wildlife values are great with chokecherry, including food and cover. Additionally, chokecherry is widely considered in watershed protection and plantings requiring a diversity of species. The leaves may be used as browse and the fruits can be utilized by small mammals, humans, and other fruit-eating animals.

Very acidic to moderately alkaline soils can support chokecherry. High shade tolerance has been noted, but great densities will be noticed near forest edges. Both open and closed forest canopies can support a stand of chokecherry. Heavy grazing of stands of chokecherry will eventually reduce the number of stems and perhaps cause the species to decline in an area. Fire can be used to top-kill the individuals, with rapid resprouting from surviving root crowns and rhizomes.

Environmental benefits other than wildlife value are for establishing riparian buffers, soil stabilization, early cover, etc. Due to the fast growth and extensive rooting ability of chokecherry, it is useful in Riparian Buffer Strips, areas for increased diversity, and Windbreaks.

Harvesting Considerations

Berry production is a possibility for Agroforestry applications, with berries ripening between August 14 and 22 on average. Ripe berries tend to lose the astringent properties associated with chokecherry, and can be used in wines, syrups, jellies, jams, and in some cases are used for medicinal value (including treatment of cold sores, colds, and rheumatism).

Propagation

Regeneration can occur, with chokecherry, by rhizomes (vegetative) or by planting. Rhizomes can be planted from individuals that are aged enough, lab experiments show about 11 years, and good sprouting should occur. Seeding requires scarification of seeds by acid and/or mechanical means, due to the stony endocarp that surrounds the seed. If not removed, or seeds scarified, some resistance to germination may be noted.

Economic Uses

Berry production is the highest value of chokecherry, economically. The fruit is used for jams, jellies, wines, etc. Some of the wood may be of value, but the reduced size, comparatively is a downfall to high income from wood products. Some traditional archers use chokecherry stems for arrows, but unless a known market is relatively close they are not economically viable.

Notes

Cattle and domestic sheep eat chokecherry and due to its toxicity, poisoning sometimes occurs, though normally fatal quantities are not eaten unless other forage is scarce. A noticeable drop in toxin (cyanogenic glycoside prunasin) seems to occur after first frost. Chokecherry is susceptible to attack by the fungus *Plowrightia stansburiana*, which causes knotlike cankers to develop on stems. This condition eventually kills infected stems. Afflicted plants usually have a shortened life span.

Additional Resources

http://plants.nrcs.usda.gov/plantguide/pdf/cs_prvi.pdf

Dill *(Anethum graveolens)*

Description

Dill is an erect, freely branching annual herb with finely dissected, lacy, blue-green foliage. "Dill weed" refers to the foliage, and the seeds are usually just called "dill." The leaves are about 1 ft (0.3 m) long and divided pinnately three or four times into threadlike segments each about 1 in (2.5 cm) long. The dill plant grows about 3-5 ft (0.9-1.5 m) tall and sometimes gets top heavy and falls over. The flowers are yellow and borne in large, rounded, compound umbels (umbrella-like clusters in which all the flower stems originate from the same point) on stiff, hollow stems. The whole inflorescence can be 10 in (25 cm) across, and several of them on a feathery blue-green framework can be showy indeed. The fruit is a flattened pod about an eighth of 1 in (2.5 cm) long. All parts of the dill plant are strongly aromatic.

Habitat

Dill does best in full sun, as it becomes leggy and prone to topple over in partial shade. This crop does best in well drained soil with adequate moisture and it may bolt quickly to flower during a prolonged dry spell. Dill is an annual that can be grown all summer in USDA zones 3-7, in spring and fall in zone 8, and in the winter in zones 9-11 (see references for map of hardiness zones). In hot weather dill flowers and goes to seed quickly. Again, the plant requires long days and cool weather, and is sensitive to environmental stresses, such as low moisture, hail, high temperatures, strong winds, and hard rains during the flowering and seed maturation period. Again, the plant grows best in deep, fertile loam soils.

Management Considerations

An easily grown plant, Dill prefers a moderately rich, loose soil and full sun. This plant requires a well-drained soil and shelter from the wind. It can tolerate a pH in the range 5.3 to 7.8. Dill is a commonly cultivated herb, especially in warm temperate and tropical zones. It is grown mainly for its edible leaves and seeds, though it is also used medicinally. The plant quickly runs to seed in dry weather and it often self-sows when growing in a suitable position.

Dill is a good companion for corn and cabbages, also in moderation for cucumbers, lettuce and onions, but it inhibits the growth of carrots.

Harvesting Considerations

Grown best as an annual crop, timeliness of harvest is crucial to maximize seed yield, because seeds tend to ripen at different times and seed shattering is a potential problem. Generally, harvesting for dill weed or the essential oil of dill weed is done before the plant flowers. Harvesting for seed is initiated when the bulk of the seed crop is physiologically mature. Plants used for essential oil

production are steam distilled on the day of harvest to minimize volatilization losses.

Additional Information

Dill and other members of the carrot family are the sole food plants for the caterpillars of the beautiful black swallowtail butterfly (see reference below for pictures). Dill flowers attract beneficial insects too. Lacewings and syrphid fly adults eat the pollen of dill and other carrot family plants, and their larvae prey on plant sucking insects such as aphids.

Additional Resources

Black Swallowtail Butterfly
http://www.fcps.k12.va.us/StratfordLandingES/Ecology/mpages/eastern_black_swallowtail.htm

General information (Florida State Extension)
http://edis.ifas.ufl.edu/MV060

Dogbane *(Apocynum cannabinum)*

Description

Perennial weed with extensive branched root system with vertical roots that can grow 8 feet or longer. Smooth stems can be 3-5 feet tall and have soft lance shaped opposite growing leaves that are bright green in the spring and summer and yellowish-orange to brown in the fall. Small bell-shaped flowers form from late June to August, which produce two seed pods each 3-4 in. Dogbane is frequently confused with common milkweed because both possess milky sap.

Habitat

Dogbane is native to North America. It occurs naturally along fence rows and roadsides. In Missouri it typically grows in the wild in dry rocky or open woods, glades and prairies. It grows more rapidly on moist sites than arid sites, but persists on both. Due to its capabilities of reproducing by seeds and vegetative buds in the crown region and on horizontal roots, dogbane has been establishing in crop fields and has become a problem. Wisconsin and Nebraska are two states that are under serious infestation.

Management Considerations

Dogbane should not be implemented in all of the 5 agroforestry practices due to its ability to rapid reproduction rate and invasive qualities. Riparian forest buffers could greatly benefit from dogbane because of its extensive root system. Nutrients from crop runoff like nitrogen and phosphorus could be efficiently trapped before reaching the waterway. Since agroforestry practices are intensively managed, the spreading of dogbane could be moderately controlled when practicing riparian forest buffers, but it is not guaranteed.

Dogbane is known to colonize crop fields in regions where no-till crops are grown due to extensive rooting systems that were already established in the soil. Major outbreaks were found in soybean and oat fields, and moderate outbreaks in corn and sorghum fields. Once colonized, the extensive root systems can take over and potentially reduce crop yields. The only known method for controlling outbreaks of dogbane is frequent moving. Since dogbane can reproduce via seeds and vegetative buds, intense tillage is not recommended when attempting eradication.

Dogbane outbreaks were least common where alfalfa and winter wheat were being cultivated. Alfalfa competes very well with dogbane due to frequent mowing which reduce root reserves, limit lateral root growth, prevent flowering, and avoid spreading root segments on tillage equipment. Winter wheat *()* establishes in the fall and grows rapidly in the spring before the soil is at an appropriate temperature for dogbane growth. Neither alfalfa nor winter wheat actually eradicates dogbane.

The milky sap of dogbane attracts butterflys. The milky juice contains a cardiac glycoside toxin but plants are unpleasant to livestock and cases of poisoning are unlikely.

Harvesting Considerations

Although dogbane is considered a weed, it is a very strong source of fiber. Native Americans called dogbane 'Indian Hemp' and used the roots to make ropes.

Propagation

Propagation of dogbane can be done by seed or by vegetative buds in the crown region and on horizontal roots. Germination is greater in light, but results can be poor if the seeds are not emerged ½ inch below the soil surface. Dogbane shoots will begin to emerge once soil temperatures reach 65 degrees F. After emergence, they grow and develop very rapidly. True seedlings are sensitive to soil disturbance so once seedlings have emerged, it is important to allow at least 10 inches of above ground growth before cultivation.

Economic Uses

Dogbane niches may be established all over. Dogbane can be used in craft projects such as necklace making. Dogbane roots can also be sold to rope makers. Presently, it is not as widely used as the Native Americans did.

Notes

Dogbane was a very important crop in Native American culture. Dogbane can be referred to as 'Indian hemp' or 'hemp dogbane'. The species *cannabinium* translates to hemp. Some humans considered this plant toxic, but the roots were still harvested in the 19th and 20th centuries for a variety of folk medicine and medicinal purposes.

Additional Resources

http://plants.nrcs.usda.gov/plantguide/pdf/cs_apca.pdf

Eastern Cottonwood *(Populus deltoides)*

Description

Fast growing and with a distinct triangular shaped leaf, eastern cottonwood is able to live over 100 years. Along with a long lifespan, this species is also able to achieve heights of 120 feet or more and a base diameter of 5 feet. The bark is a yellow-green color and smooth to the touch as a seedling and as it matures, the bark turns a dark gray and is deeply furrowed. The species is dioecious, meaning male and female trees exist and seed is dispersed through the wind in cotton bundles. In the fall, the leaves turn a pale yellow and are very attractive in the landscape.

Habitat

Found near streams and floodplains, eastern cottonwood is tolerant of both drought and rainy conditions. Eastern cottonwood spans from North Carolina all the way out to Montana and from Quebec down into Mexico and is found everywhere in between. In relation to soil types, this species can be found in sandy, low line areas to loamy conditions and even in clay soils. The only limiting factor in relation to soil that will cause problems with the growth and development of this species is bedrock or some other limiting factor that will interfere with root development. When the soil has no limiting factors, this species, along with others in the *Populus* genus has the ability to sucker sprout from the root and cause a new cluster of seedlings to occupy the base of the tree. Besides bedrock or another soil limiting factor, eastern cottonwood does not do well with fire and is very sensitive to the heat a fire can produce. Other species that are found in the same habitat are willow species, red mulberry, American sycamore, and hackberry.

Management Consideration

When it comes to management practices, this species will need little attention if planted on a good site that receives plenty of sunlight and water. Even though this is a drought or rainy resistant tree, young seedlings/saplings may be dramatically affected with severe drought or rainy conditions. If a drought should occur during the season you plant or a few seasons later, regular watering will need to be implemented for maximum root development. In the future, pruning lower or damaged branches will have to be done in order to keep the tree healthy and also maintain the value of potential timber that can be harvested. Along with eastern cottonwoods comes the cotton seed dispersal that can cause havoc on screens, air conditioning units, and allergies. If any of these factors are a concern to the landowner, seedless hybrids and varieties have been developed and can be used.

In agroforestry systems, eastern cottonwood can be grown in alleycropping to be harvested for timber, pulp, or other economical uses of the wood. Besides alleycropping, eastern cottonwood would be ideal for silvopasture since the species is fast growing and can inhabit various terrains. Windbreaks and riparian

buffers are the two big areas that this species is used in due to its ability to grow in wet areas and also be able to adapt to exist in different habitats across the mid and eastern sections of the United States. Forest farming can also be an option for a management plan consisting of eastern cottonwood because very few chemicals are leached out of the roots and into the soil that can cause damage to the understory crop(s).

Propagation

Mentioned before, eastern cottonwood has a tendency to have suckers, or new seedlings emerging from the roots of an already existing tree. These sucker sprouts can be a nuisance to keep under control. However, with proper equipment, sprouts can easily be detached from the main root and transplanted to another site. A word of caution, the new sucker sprouts are clones of the original plant and if the genetic makeup of the original plant is unable to ward off diseases, the suckers will have the exact same problem. Besides using sucker sprouts or a good seed source, taking recently pruned limbs and reducing them to a two foot stick and simply planting the stick in the ground is also a form of propagation. Also mentioned before, new technology has brought seedless varieties of this species that will not disperse the cotton in late spring/early summer.

Economic Uses

Since eastern cottonwood can grow very rapidly, it is used in the pulp and paper industry as a wood source for many mills across the eastern United States. Along with the pulp and paper industry, growing eastern cottonwood as a biomass source has become an interest to scientists and homeowners looking to produce cheap energy in contrast to the rising prices of fossil fuels. Several facilities across the country have started to use such biomass material as their energy source year round. New research projects are underway to determine if chipping the trees into fine particles and mixing these particles in with hay can be a source of cellulose for beef cattle.

The salicylic acid that is found in the wood is often used as a coupling ingredient in producing certain dyes for cloth. For carpenters, salicylic acid can be used as a currying agent for shell molding compounds. Along with these uses, this chemical can also be used in the production of latex paints, certain glues, and preservative for leather.

Additional Resources

Purdue University:
http://www.hort.purdue.edu/newcrop/duke_energy/Populus_deltoides.html

United States Forest Service:
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/populus/deltoides.htm

Eastern Gamagrass *(Tripsacum dactyloides)*

Description

Native to the eastern United States, eastern gamagrass is a warm season bunch grass. Since this grass is a perennial, with proper management it will come up year after year. A close relative of field corn, eastern gamagrass can have a vegetative width spread from 4-5 feet and reach a height of 5-10 feet. From June to September, the plant will produce orange-yellow flowers that will develop to produce seed.

Habitat

Gamagrass prefers light sands, medium loam, and heavy clay soils. This grass also prefers full to partial sun and will perform poorly in densely shaded areas. When considering where to plant this species, look for areas that receive large amounts of precipitation, riparian areas, or areas that retain good moisture, such as those areas close to woodlots.

Management Considerations

Weed control is very critical in the first year of establishment and can be accomplished using select chemicals or by manually removing weeds by such methods as cultivation. Burning areas with gamagrass is not uncommon and should be done every 5-8 years or so in order to stimulate vigorous new growth.

For riparian buffers, this grass is ideal and will flourish well in extremely moist areas.

Silvopasture and alley cropping are suggested only during the early stages of tree growth. Once the trees begin to shade and crowd out the grass, it may become necessary to establish another species that is more shade tolerant.

Inserting gamagrass in windbreaks may also be desirable, but make sure the shade produced by the dominate tree species in the windbreak does not interfere with the amount of sunlight the grass receives.

Harvesting Considerations

To harvest this species for hay or silage, wait for the second year of growth before going forwarding with harvesting. It is not uncommon to get 2 to 3 hay cuttings in a growing season. The ideal time for harvest is when the stems are 24 – 36 inches in height from the base to the tip of the tallest blade. Another harvest can take place 4-6 weeks following the first harvest of the year, as long at the same height criteria mentioned above is present. Leave about 6-8 inches of stubble to optimize regrowth for the plant.

Harvesting just the seeds can be a tedious job. Seed harvesting should be done around mid September when the seed heads are heavy and drupe from the plant.

Propagation

A down side to eastern gamagrass is the difficulty found in establishment. With new technological advances in the field of genetics, varieties that are much easier to establish in comparison to the original eastern gamagrass have come about with in the last 5-10 years and more are sure to come in the future. In any case, stratification of the seed is necessary. For improved success in establishment, place seeds in a wet environment at 35F for 10 weeks before planting. When planting the seeds, make sure soil temperature reaches around 65F. For planting the seeds a corn planter is the easiest method; however, new research has shown that drilling the seed can cause the seeds to germinate faster. Always control competing grasses.

Economic Uses

Seeds that are harvested can be sold as planting seeds for the next growing season. Along with selling seeds for production, the seeds are also edible for humans. The seeds are used in various backing recipes and in some cases, can take the place of corn in certain situations. The seed can also be popped and enjoyed as an alternative to popcorn. Other than the seed, the stems and seeds can be harvested in the fall and sold later on in the winter when pastures are low of forage for livestock.

Additional Resources

Other common names for gamagrass is “Sesame grass,” “fakahatchee grass,” “northern gamagrass” and “gama grass,”

Missouri Botanical Gardens:
http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?code=R220

Plants For A Future:
http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Tripsacum+dactyloides&CAN=LATIND

University of Missouri Extension:
http://muextension.missouri.edu/explore/agguides/crops/g04671.htm

USDA:
http://plants.nrcs.usda.gov/factsheet/pdf/fs_trda3.pdf

Common Elderberry *(Sambucus nigra ssp. canadensis* (L.)*)*

Description

Common elderberry is a large upright, deciduous shrub or small tree with multiple stems that are spreading or arching. This shrub/tree can reach up to 12 feet tall. The bark is smooth and brown becoming shallowly furrowed and rough with age. The twigs are stout, silvery-to yellow-gray with obvious, warty lenticls. The buds are very small, red-brown and pointed. The leaves are opposite, 6 to 11 leaflets, dark green above and much paler below. The flowers are small, white, and in flat-topped clusters that are up to 8 inches across. The fruit is a small, berry like drupe, purple-black, and very juicy, borne in flat-topped clusters.

Habitat

Elderberry can be found in Eastern United States-Nova Scotia to Florida, west to Manitoba and Texas. It can be found in rich moist soil along streams and rivers, woodland margins and waste ground. It is a nitrogen loving plant and thrives near places of organic waste disposal.

Management/Harvest Considerations

The common elderberry is adaptable to either wet or dry sites and prefers neutral to acidic soils. This shrub/tree can withstand extended flooding. It grows best in full sun but will tolerate moderate shade. Pruning is needed on a regular basis in order to keep it looking its best. Its tendency to sucker and the displacement of the stems, due to the weight of the fruit, is what makes it necessary to prune, if a formal appearance is desired. Its capabilities to spread out, tolerate competition, withstand extended flooding, and withstand high concentration of nitrogen makes it useful in riparian buffers.

The elderberries can be harvested by hand in late summer. They fruit more heavily when you plant two different varieties close together, such as Adams and York, as examples.

Elderberry makes a good shrub for wildlife plantings and may be planted in combinations with other trees in practices such as alley cropping or windbreaks. Game birds, squirrels and other rodents, and several kinds of browsers also feed on the fruit or foliage of elderberry. Bears love to eat the elderberry fruits while deer, elk, and moose browse on the stems and foliage. The elderberries are important sources of summer food for many kinds of songbirds. Additionally, when used in combinations with other trees elderberry provides a structural layer often used by songbirds for nesting.

Propagation

Elderberry produces a good seed crop almost every year. The seeds are dispersed by birds and other animals that eat the fruit. The seeds have a hard seed coat and embryo dormancy and may remain viable for up to 16 years in storage. Without pretreatment, seed germination may be delayed from 2 to 5 years after planting. Plants may flower and fruit after only 2-3 years and can reach full size in 3-4 years.

Although cuttings will have lower survival than otherwise planted, cuttings are an optional propagation method. Cuttings of half-ripe wood with a heel, or cuttings of mature wood of the current season's growth may both be used. Elderberry may also be propagated by division of suckers in the dormant season.

Economic Uses

Elderberry is most effective in shrub borders, roadside plantings, in wet or low areas, or as a screen. It is heavily used as a food source for all kinds of birds and other wildlife.

Its economic importance is in the production of the berries to make jellies and jams. Only the blue or purple berries of elderberry are edible. Edible berries and flower are used for medicine, dyes for basketry, arrow shafts, flute, whistles, clapper sticks, and folk medicine. It is well spoken of in ancient times for it medicinal values. The active alkaloids in elderberry plants are hydrocyanic acid and sambucine. Both alkaloids will cause nausea so care should be observed with this plant. Elderberries are high in Vitamin C. The red berries of other species are toxic and should not be gathered. The leaves and inner bark of young shoots are used as an insect repellent, the dried flowering shoots are said to repel insects and rodents. It has also been known to treat various fungal infections such as leaf rot and powdery mildew. Cattle tend to rub up against this shrub/tree to help repel insects. The bark, leaves and berries can all be used for making dyes.

Notes

To use elderberry as an insecticide follow the following steps; boil 3-4 handfuls of leaves in a liter of water, then strain and allow to cool before using.

Additional Resources

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

http://springvalleyroses.com/catalog/sambucus-york.html

http://sacredearth.com/Ezine/May2002/Beltain2002.html

Faba Bean *(Vicia faba)*

Common names

Broad bean, horse bean, English bean, tick bean, field bean

Description

Broad beans get their name from the seeds which are large and flat. The seeds are variable in size and shape, but usually are nearly round and white, green, buff, brown, purple, or black. Pods are large and thick, but vary from 2-12 inches in length. The plant is an erect, stiff-stemmed, leafy legume reaching 2-5 feet when mature. They are quite different from common beans in appearance because the leaves look more like those of English peas than bean leaves. The flowers are 0.4 – 1.0 inches in length, with five petals.

Habitat

The faba bean requires a cool season for best development and is usually grown as a winter annual in warm temperate and subtropical areas. It can be grown anywhere it does not winterkill, or except where temperatures fluctuate rapidly. It is well-adapted to wetter portions of cereal-growing areas of western Canada. The faba bean tolerates nearly any soil type, but it grows best on rich loams.

Moderate moisture supply is necessary since this legume is not drought resistant. Moisture requirement is highest at approximately 9–12 weeks after establishment. The faba bean is more tolerant to acidic soil conditions than most legumes and thus can be grown in nearly all parts of the United States without liming. Hardier bean species can tolerate winter temperatures of 14.0 °F without serious injury. Winter types fare well when kept within an average temperature of 35 °F, without severe frost. Growing season should have little or no excessive heat.

Because they can over-winter well, they are often grown as a cover crop to prevent erosion. Additionally because they are a legume, they fix nitrogen in the soil and make a good “green manure”.

Management Considerations

Beans mature 90–220 days after planting. Harvest can be delayed a little longer for hand than for mechanical harvest. In either case, crop should not be cut until the lower pods are matured and the upper ones fully developed. If harvest is delayed until the upper pods are ripe, loss from shattering is great. An ordinary mowing machine can be used, but the drop-rake reaper is more satisfactory and reduces shattering. Crop should be cut on cloudy day and maybe cut at night and shocked early the next day. Large-seeded types are threshed with a common bean thresher with special adjustments to the cylinder. Small-seeded types can be thrashed without difficulty. After threshing, seeds are cleaned with ordinary fanning mills. For canning, beans are allowed to swell and then are picked by

hand before they become hard. As a dried vegetable, they are prepared the same way as other common beans.

Propagation

In areas that do not have hard frosts, planting may be done in the fall. In areas that have hard frosts, planting can be done in the early spring. Seed size will dictate method of planting, with larger seeded cultivars sown with a lima bean planter and smaller cultivars sown with a corn planter. Other regions of the world will often had plant to cultivated fields. In any event, seed should be planted to a depth of 2-4 inches. Row spacing may be varied from 24 inches apart, to wider, with about 6 inches between seed in a row.

When used as a green manure, seed may be broadcast. In all cases if proper Rhizobia are not present in the soil, then it is desirable to inoculate the seed prior to planting. Weed control may be accomplished in a fashion similar to other bean crops, whether by chemical or by cultivation is a personal preference.

Economic Uses

Pollination is critical to optimizing yields. Faba beans may be grow for personal consumption or as feed for livestock. Opportunities likely include local farmers markets.

Additional Resources

General information
http://www.hort.purdue.edu/newcrop/cropfactsheets/fababean.html

http://edis.ifas.ufl.edu/MV017

USDA
http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=VIFA

Photographs of crop
http://www.fao.org/ag/AGP/AGPC/doc/gallery/pictures/viciafaba/viciafaba.htm

Market information
http://www.kitchengarden.co.za/favabeans.html

Gray Dogwood *(Cornus racemosa* Lam*)*

Description

Gray dogwood has a wide range and may be found across most of the northeastern United States. It is highly adaptable to a wide range of soil and climatic conditions. It is a low growing shrub that seldom exceeds 8 feet in height. Individual plants may be 5 feet wide, yet root suckering may initiate further spreading of individual plants. As a shrub that tends to form thickets, it is widely used by wildlife for summer food and cover. Fruit will typically develop by September or October from loosely clustered flowers that were formed in June or July. Often these white fruit are highly visible and set off as they are born on red to reddish-brown colored twigs.

Habitat

Gray dogwood grows well in poor soil. It is also quite tolerant of wet soils and is hardy to zone 3. It has intermediate tolerance to shade.

Management Considerations

Gray dogwood may be viewed as invasive due to its thicket forming/spreading properties. As with all tree and shrub plantings, the single best management that can be applied is control of weed competition. Most often herbicide or cultivation is used.

Uses for gray dogwood can include riparian buffers and windbreaks. Essentially it may be used anytime a hardy shrub is needed. Its medium height can effectively augment taller plant materials in zones of a windbreak. And, in all cases the fruit and twigs have been know to be used by several wildlife species including: robins, cedar waxwings, rabbits, and deer.

Additional uses may include urban screens and highway beautification projects.

Harvesting Considerations

The fruit matures between August and September and is a favorite for birds and mammals that eat the berries. Additionally, harvest of fruit laden stalks may be added to floral arrangements. Cut stems must be kept moist and fresh prior to selling. Although local markets should be considered prior to planting as a commercial venture, the wildlife values and rooting ability make this an excellent shrub selection for use in riparian area.

Propagation

Gray dogwood has fibrous roots and seedlings planted early in the spring should have good survival. Once well established, branches can be pulled and staked horizontally and covered with soil in order to encourage filling of a site. This may be especially useful where erosion concerns dictate filling an area with plant materials.

Although cuttings have been used successfully, they are much less reliable. To use cuttings, collect dormant material that is 3/8-inch to 1/2-inch in diameter on the small end and about 9 to 12 inches in length. These cuttings must be kept in cold storage, or planted right away. They can then be driven into the ground (or placed in preset holes) with about 2 inches protruding above the soil. Soil must be in firm contact with the cutting.

Economic uses

Primarily used as a conservation shrub for erosion control or wildlife enhancements, the gray dogwood also has additional profit opportunities when grown as an ornamental to enhance or create a naturalized look around buildings. It may also have opportunities within floral markets due to the color contrast of autumn berries on reddish brown twigs.

Additional Resources

http://plants.nrcs.usda.gov/factsheet/pdf/fs_cora6.pdf

http://plantfacts.osu.edu/pdf/0247-320.pdf#search='gray%20dogwood%20pdf'

Green Ash *(Fraxinus pennsylvanica)*

Description

Green Ash belongs to the Olive family (Oleaceae) and is a medium sized tree that produces an irregular to somewhat rounded crown, with heights of up to 70 feet. It is also know as red ash, swamp ash, and/or water ash. It is widely distributed across the Midwest and Eastern United States. Green ash and White ash have similar wood properties and are often marketed as the same. Ash are used by many wildlife species as browse and the seed is eaten by many birds and small mammals.

Habitat

The westerly range of green ash is dictated primarily by moisture limitations. Although a fairly successional tree that will grow on many sites, stands of green ash will most often be found in bottomland soils where good moisture is available. It is somewhat tolerant of flooding. The northern limits to its range are defined by frost free growing days. On average, green ash needs 120 to 280 frost free days per year.

Management Considerations

Green ash is relatively intolerant of shade and may be out-grown by other tree species associated with sites that have good soils and moisture. Therefore, without timely thinning of forest environments green ash typically begins to die out. Thin such that the crown of green ash has plenty of available light.

On the other hand, green ash has been planted with other hardwoods that have a higher value wood, such as eastern black walnut (*Juglans nigra*), and used as a trainer tree. In that case, as the trees develop the green ash assist in the upward growth and natural pruning of the lower limbs of the black walnut, and then begin to die back as the black walnut trees take over the site.

Green ash has been used in many windbreaks. It has a good crown, relatively quick growth, and is widely tolerant of many sites and soils. However, the greatest windbreak benefits will come by combining green ash with other species.

Propagation

As with most trees, the best growth and development of seedlings will occur when weed control is provided to eliminate competition from grass. Ash can be naturally propagated from seed of trees adjacent to a given site. Seed starts to fall from trees as soon as they ripen, and will continue into the fall and winter months. The seed is most often spread by the wind, but may also move with flood waters. Seed will naturally germinate in the spring. However, collected seed can be started through a process called stratification. Cold and moist conditions are

necessary in order to stratify and break the seeds dormancy, but they may then be started and grown in beds or containers.

Economic Uses

Primarily Green Ash is logged or used as a shade tree species. Therefore, most of the economical value for this species is tied up in lumber production. Such items as baseball bats, as well as tool handles, have in the past principally been made from Green Ash due to its strength, hardness and high resistance to shock. Another key fact is that Green Ash has excellent bending capabilities. However, when comparing Green Ash to White Ash in terms of durability as well as marketability White Ash is considered the better wood for such items that were just mentioned.

Interesting enough, Green Ash is now being used in the regeneration of spoiled banks that were created from strip mining. It is also often used as a species in riparian buffer plantings.

As previously mentioned Green ash is also very popular as a shade tree in residential, thus giving it potential as a nursery ball-and-burlap tree. Adding to its desirability is quick growth and the ability to adapt to its surroundings.

There are several diseases of green ash that limit its long-term use in most situations. However, its quick growth make it desirable from a marketing standpoint, as well as an environmental perspective where a site needs stabilization or protection that can be afforded by trees. For more on the diseases that might affect green ash please see the additional resources section.

Additional Resources

http://plants.nrcs.usda.gov/factsheet/pdf/fs_frpe.pdf

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/fraxinus/pennsylvanica.htm

Illinois Bundleflower *(Desmanthus illinoensis)*

Description

Illinois bundleflower is an upright, deep-rooted, warm season perennial, legume. It grows from two to tour feet in height with twenty to thirty seedpods curving to form a bundle or cluster. The stems are light green and angular. The leaves are alternate, bipinnate, and yellowish green or medium green, and narrowly ovate in shape. The bundleflower has small, white to greenish white flowers. The fruit is sickle-shaped, flat, many in dense clusters, dark brown and about 1/6 of an inch long.

Habitat

The Illinois Bundleflower can be found on pastures, rocky prairies, waste areas, open wooded slopes, stream banks, ditches, and roadsides. It is most abundant in clay or sandy soils. It occurs primarily in northeastern Illinois, along the Illinois River valley, and along the Mississippi River valley in southwest Illinois. Populations can be found in Kansas, Oklahoma, Alabama, Texas and north as far as Minnesota.

Management/Harvest Considerations

Illinois Bundleflower is rated by some authorities as our most important native legume and is included in range revegetation programs. The plant is highly palatable to cattle and other herbivores and has a high protein content that compares to that of soybeans. The plant prefers full or partial sun, and moist to average conditions. Illinois Bundleflower is an excellent reclamation species, adapted to harsh dry conditions. Fire, broken sod, or patches of bare mineral soil are necessary to maintain self-sustaining population's. The crop is quite easy to establish but requires early weed control to reduce competition with other plants, such as little and big bluestem and indiangrass. Bundleflower fixes high amounts of nitrogen in the soil, and can rejuvenate worn-out-soil. Its nitrogen fixation potential could reduce nitrogen fertilizer needs in perennial agroecosystem. When bundleflower is established it should be used as part of a rotation system and not continuously grazed bundleflower is harvested for its hay to feed livestock. Research is being done on how often it can be cut for hay and how well it yields. It's a very heavy seed producer, producing about 800lbs/acre.

Propagation

Bundleflower is best-grown in areas receiving fifteen inches or more of annual rainfall. Bundleflower should be planted at a rate of thirteen pure live seed pounds per acre, at a depth of ¼ inch to ½ inch in a firm seedbed. Once the seed is established it requires very little attention.

Economic use

Illinois bundleflower seed is being evaluated, by food scientist, for its potential nutritional and nutraceutical properties. The seed is being tested for both animal and human consumption. The research shows that it has high levels of anti-oxidants and a high protein content (30-38%). It could possibly be a multi-use species, grazed in some years and harvested as a grain crop in other year's. Its economic use is primarily as a hay/forage crop and has potential for use as a seed crop.

Notes

The common name "bundleflower" derives from the densely flowering, puffball-like heads. Livestock prefer it to any other plant, including alfalfa, often grazing it out of pasture (3).

Additional Resources

http://nativeplants.for.uidaho.edu/Content/Articles/5-2NPJ152-159.pdf#search='illinois%20bundleflower%20pdf'

http://www.forage.okstate.edu/text/ill-bundleflower.htm

http://www.mda.state.mn.us/ESAP/greenbook2004/cropsyssheaffer.pdf#search='illinois%20bundleflower%20pdf'

Missouri Department of Natural Resources, Warm-Season Native Grasses on Reclaimed Minelands-Landowners management guide, 7/2003.

Indiangrass *(Sorghastrum nutans)*

Description

Indian grass is a tall, bunching sod-former, 3-8 ft. in height, with broad blue-green blades and a large, plume-like, soft, golden-brown seed head. It is an important associate in the tallgrass prairies and is relished by livestock. It appears to be favored by occasional flooding and repeated burning and sometimes forms nearly pure stands in the lowlands.

Habitat

Indian grass is rather adaptable and once established as it will tolerate wet, dry, or poor soil. Best growth occurs in a moist soil where the plant is exposed to full sun. Found on open prairies, bottomlands, and open woods, in deep, moist soils. This grass is fairly tolerant to drought conditions, leading it to invade disturbed areas.

Management Considerations

Although it is good forage for livestock, Indiangrass, like any warm season grass, cannot tolerate heavy grazing for extended periods of time. It is best to use rotational, or management intensive, grazing and thereby let the grass respond following grazing sessions with adequate new growth prior to again grazing the area. Indiangrass is can also be rejuvenated with fire, and after times of grazing, it is good to prescribe burn these acreages.

Harvesting Considerations

Warm season grasses can provide more tonnage per acre than many other types of forage. Cutting for haying purposes can be done in over the summer and in the fall prior to flowering. Indiangrass mixed with Big Bluestem provides some of the best quality prairie hay.

Propagation

Indiangrass propagates from both seed and rhizomes, it is also known to self-seed and this will lead to volunteer plants. Planting practices similar to big bluestem are adequate for this warm season grass since they are co dominants in many tallgrass prairie systems. Planting can occur in late April and early May with no-till being the main practice. Dormant seeding can be done in December through February.

Economic uses

When practicing rotational grazing, it is shown that cattle will gain more weight in less amount of time when using warm season grasses as the primary forage.

Kentucky bluegrass *(Poa pratensis)*

Description

Kentucky bluegrass (*Poa pratensis*) grows 18 to 24 inches tall and is readily identified by its boat-shaped leaf tip. It spreads by rhizomes and tillers and forms a dense sod. New shoots (rhizomes and tillers) are produced primarily in the spring and late summer. Most shoots produced in the spring remain vegetative. Shoots produced in late summer often terminate in an inflorescence the following spring. The lifetime of a Kentucky bluegrass shoot that terminates in an inflorescence ends soon after the seeds mature. During late spring and summer, the shoots of Kentucky bluegrass grow in an erect, or upright, position; whereas, in early spring and fall they become more decumbent. This pattern of growth is a response to day length rather than temperature. During long days shoots grow upright; during short days they become decumbent. Day length also influences the number of shoots that develop. Significantly more shoots are produced during the short days of early spring than during long summer days. It is a cool-season grass.

Habitat

Kentucky bluegrass is found most abundantly on sites that are cool and humid. It has become naturalized across North America and often occurs as a dominant species in the herbaceous layer. Kentucky bluegrass grows best on well-drained loams or clay loams rich in humus and on soils with limestone parent material. It needs large amounts of nitrogen during active growth stages. The optimal soil pH is between 5.8 and 8.2. Root growth is greatest in fall and spring and slows dramatically in summer. Root growth of Kentucky bluegrass peaks at soil temperatures of 60°F and declines sharply as temperatures rise above 70°F. Root growth practically ceases at temperatures above 80°F.

Management Considerations

Begin mowing young grass when it grows above a 2-inch cutting height. Either rotary or reel type mowers may be used but blades must be sharp and reels properly adjusted to prevent pulling up young seedlings. The initial cutting should be at a 2-inch height. Subsequent mowing should be frequent enough so that no more than one-third of the leaf is removed at each mowing. At a 2-inch mowing height the grass needs mowing before it reaches 3 inches. Weekly mowing is usually satisfactory at the 2-inch mowing height. At lower mowing heights more frequent mowing is required.

Propagation

Where bluegrass is established from seed, plant 2 to 3 pounds per 1,000 sq. ft. of lawn. When seed is broadcast over the soil surface, they may take a longer time to develop. However, when seed is drilled into the top inch of soil, the seedlings will most likely develop faster. Kentucky bluegrass can be seeded year round, but best results are obtained in the spring and fall. New seedlings require light and

frequent watering (2 to 3 times per day for the first 2 weeks). After seedling emergence, watering frequency can be reduced.

Economic Uses

Kentucky bluegrass is suited for a variety of applications, though silvopasture and riparian buffers may be ideal. However, the market for bluegrass seed may also provide opportunities in the alley cropping practice where bluegrass seed becomes the product harvested.

Additional Resources

Turfgrass Specialist (Texas Cooperative Extension)
http://aggie-horticulture.tamu.edu/plantanswers/turf/publications/bluegrass.html

Basic information and pictures
http://www.fcps.k12.va.us/StratfordLandingES/Ecology/mpages/kentucky_bluegrass.htm

USDA
http://plants.nrcs.usda.gov/factsheet/pdf/fs_popr.pdf

Kentucky Coffeetree *(Gymnocladus dioicus)*

Description

Kentucky coffeetree may also be known as American coffee berry, Kentucky mahogony, nicker tree, or stump tree. It is a medium to large deciduous (max 100ft) tree with stout branches forming a narrow round-topped crown. It is intermediate shade tolerance, preferring full sun. Leaves are alternate and bipinnately compound (feather-like arrangement), 12 to 32 inches long; leaflets 2 ½ inches long by 1 inch wide. Leaf out early in the spring, turn yellow and drop early in autumn. Bark is gray to brown and shallow grooved with scaly ridges that curl away on the edges. Large uninspiring greenish-white flowers May to June. Fruit occurs in October persisting through the winter in pods 4 to 7 inches long and 2 inches wide. Pods contain 3 to 5 seeds inside; seeds ¾ inch blackish and hard-shelled. Pods drop unopened in late winter.

Habitat

Most often Kentucky coffeetree will be found in bottomland forests along streams, in moist woods at the base of bluffs, in mixed woods. Kentucky coffee tree is never common and has no common associates, but it does have similar site preferences as black walnut.

Management Considerations

In agroforestry applications, Kentucky coffee tree can be used in riparian buffers, alley cropping, silvopasture, and windbreaks. Prolific root sprouter. Very little wildlife uses this tree for food. However, it is used by nesting birds. The raw leaves and raw seeds are potentially toxic to mammals, but squirrels and deer have been reported to eat pods and seeds. Kentucky coffee tree grows best in rich, moist soils in full sunlight, but is very adaptable to heat, drought, basic soils, soil compaction, and wet sites.

Due to the structure and sparseness of the crown, Kentucky coffee tree may not need to be pruned much for alley cropping and silvopasture, but should be pruned to 17 feet or more if quality lumber is an objective. As with all legumes the tree bears root nodules containing nitrogen-fixing bacteria.

Harvesting Considerations

Kentucky coffee tree is considered an intermediate to fast growing tree and should reach a harvestable size of at least 16 inches in approximately 50 years. Growth is always site dependant. If thinning a stand the stumps of Kentucky coffee tree may need to be sprayed to reduce the likelihood of stump sprouting.

Ring shake (defect in quality; rings separate) in Kentucky coffee tree is a common problem.

Propagation

Root cuttings 4cm long and 1cm thick in a greenhouse in December. Plant the roots horizontally in pots.

Propagated primarily by seed. Seed is best sown in a greenhouse as soon as it is ripe. The seed can also be sown in early spring in a greenhouse. Scarification and pre-soaking the seed for 24 hours in warm water, especially if it has been stored, will improve germination. As soon as they are large enough to handle, prick the seedlings out into fairly deep individual pots and grow them on in the greenhouse for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts. Consider giving them some protection against the cold for their first couple of winters outdoors.

Economics Uses

Economic uses are limited in number as Kentucky coffee tree is not a common tree and has few regular markets other than propagation for use as an ornamental. The wood is used for cabinet work, furniture, construction, fencing etc… Not a primary lumber species, but can be sawn for high and low value lumber. Check with potential buyers (loggers and mills) before planting a monoculture of Kentucky coffee tree to produce lumber.

Notes

Although poisonous when raw, roasted seeds were once used as a substitute for coffee by native Americans and then European settlers, hence the common name.

First introduced into cultivation in 1748. 'Expresso', 'J.C. McDaniel' (Prairie Titan®) and 'Stately Manor' - At the current time, these cultivars are rarely offered in the trade. They are all male (fruitless) selections selected for their upright branching habit which is elm-like and much taller than wide (http://www.hort.uconn.edu).

Additional Resources

http://www2.fpl.fs.fed.us/TechSheets/HardwoodNA/pdf_files/gymnomet.pdf#search='gymnocladus%20dioicus%20pdf'

http://edis.ifas.ufl.edu/pdffiles/ST/ST28700.pdf#search='gymnocladus%20dioicus%20pdf'

http://plantfacts.osu.edu/pdf/0246-487.pdf

Lespedeza
Common *(Kummerowia striata)*
Korean *(Kummerowia stipulacea)*

Description

Annual lespedeza is an acid tolerant, drought resistant, summer annual legume useful for pasture, hay and soil improvement. There are two main types of lespedeza grown in Missouri, Common Lespedeza and Korean Lespedeza. They have broad to long, heart shaped leaflets that are distinctly veined and have small hairs on the stems.

Habitat

Korean is better adapted than common lespedeza in the North because of its shorter life cycle. Both types grow in a pH range of 4.5-7.0, but do best at 6.0-6.5. Seed early in the spring, and as with all legumes, the correct species rhizobial bacteria innoculant should be used. Germination occurs in early spring but grows very little until early summer. Dry conditions may reduce growth but recovery following rain is very quick.

Management Considerations

With proper management, annual lespedezas are easy to establish, and will reseed themselves, but should be mechanically reseeded at some point in order to maintain an adequate stand.

Used with grasses, lespedeza will produce nutritious feed for most classes of livestock. The forage from lespedeza is fine-stemmed, with a high percentage of leaves, and does not cause bloat. Proper management, plus some summer rain, will allow lespedeza to produce quality pasture during midsummer when companion cool-season grasses are of low quality and not very productive. Lespedeza pasture can be used by all types of livestock but is especially valuable for sheep and cattle operations. Lespedeza can be grown with all of the adapted cool season grasses but performs best with orchardgrass. It also has an added value where quail production is important because annual lespedeza seed is an excellent quail food.

Harvesting Considerations

Missouri farmers can produce 1-2 tons of lespedeza per acre depending on variations in weather and management. Some studies have been shown to have gains in steers grazing on lespedeza to have 1.8 lbs gain per day. Early Missouri grazing trials also reported more pounds of beef produced from lespedeza and orchardgrass mixes than from lespedeza-fescue.

Propagation

For pure lespedeza stands, seed 20 pounds of seed per acre. In mixed stands, seed 15 pounds per acre of either type as a dormant seeding into established cool-season grasses. When drilling as a companion legume with cool season grass, seed 10 lbs per acre with the proper amount of grass seed per acre. One pound of lespedeza contains about 236,000 seeds. Mow or lightly graze the lespedeza in summer to ensure that the seedling grass plants survive. Do not plant lespedeza in the fall. It may then be killed by freezing if it germinates too late.

Economic uses

The use of lespedeza may reduce production costs. Lespedeza will produce less forage per acre than properly managed alfalfa or clover but can be maintained with lower production costs. Feeding trials report that lespedeza hay is only slightly less valuable than alfalfa for wintering calves and dairy heifers. However, lespedeza hay is inferior to alfalfa when fed to lactating dairy cows. It makes excellent hay for sheep and all types of beef cattle.

Additional Resources

http://extension.missouri.edu/explore/agguides/crops/#Forages

http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Loblolly pine *(Pinus taeda)*

Description

Loblolly pine is a large, evergreen tree that can reach heights of 90-110 feet. It has a long, clear trunk (bole) that is sometimes buttressed and a round spreading crown. Self-pruning is common among this species, which helps to develop a clean, branch free, bole. Young trees retain low branches longer than slash and longleaf pine. The needles are 4 to 9 inches long, in fascicles (groups) of three, stiff, and a bluish-green color. Fruits are produced in large quantity, and consist of dark brown, oblong to cylindrical cones, from 3 to 6 inches long, and they persist on the trees for more than one year. The main problems associated with loblolly pine include fusiform rust, bark beetles, pine engraver beetles, and prolonged flooding.

Habitat

The native range of loblolly pine includes most of the southeastern United States, although it can be grown in Missouri, it does not produce seed due to cool winter temperatures. Acidic soils are preferred as well as full sunlight. Many different sites are adaptable, including fertile, upland fields, moist forests, mixed hardwoods, and in association with shortleaf pine *(Pinus echinata).* The main factor limiting northward expansion of loblolly pine is the low winter temperature that damages flowering, and the damage that may develop in association with ice, snow and sleet as it accumulates on the long needles (may result in trees or branches being broken).

Management Considerations

Full sunlight is required for best growth, and a moist site is desired, though drier soils are adaptable. Main cause of mortality in seedlings is drought, especially during the growing season. Silvopasture, Forest Farming, and Alley Cropping are all good agroforestry applications for loblolly pine. The main products produced by loblolly pine include lumber, utility poles and pine straw. Young trees are somewhat tolerant of shade, but increasing age reduces the shade tolerance. Understory invasion of pine stands, by more tolerant species, can allow for succession of more hardwoods, which can then share dominance with loblolly pine, but the numbers and basal area of the pine will decline over time.

The majority of the root system of loblolly pine is within the top 18 inches of soil, so consideration at the base of the individual trees must be taken, as the competition between the tree and any other crop at this root zone will be quite high.

Harvesting Considerations

If lumber is desired, maturation is considered 150 years with diameters between 36 and 48 inches and height of 90 to 110 feet. Mean annual board-foot growth culminates at about age 50. Growth during a shorter time period, such as 25 year

rotation, may allow for greatest economic benefits even with the reduced size. Trees with 9.6 inch and larger diameter at breast height at age 20, can range from 2,100 fbm/acre to 40,000fbm/acre(most likely plantation style growth). Some other applications, such as pulpwood growth, can lead to even shorter rotations, but the implementation in agroforestry must be carefully scrutinized. Control of competing vegetation and fertilization will allow for best growth and maximum results.

Other intermediate products, such as pine straw (used as a mulch), can be harvested as timber crops mature. Pine straw develops as needles are dropped/cast as a natural process of tree growth and development. Over time these needles accumulate beneath rows of loblolly trees, and the accumulated needles can then be raked into rows and baled into small square bales. These square bales, weighing approximately 30 lbs in order to facilitate transport and use by urban homeowners, can then be used in flower beds and other settings where pine straw is desirable as a mulch material. The soil acidity created when needles begin to break down is often desirable for flowering plants that do better with acidic soils.

Propagation

Seeds can be used for propagations, but a stage of dormancy after seedfall is normal. This dormancy lasts the longest of any southern pine. To break dormancy cold, moist stratification of the seed for 30 to 90 days is recommended. Vegetative reproduction can be accomplished with cuttings from seedling up to 3 years of age. Sprouting occurs from buds in the primary needle axils when the tops are clipped off, the rooting is related to a trees age so attention to this factor is extremely important. Seedbed scarification or burning, to open up direct mineral soil contact, greatly increases chances of seedling survival.

It is often most feasible to order seedlings from a nursery. Best growth is presented from genetically enhanced seedlings, available from most nurseries, although the increased cost may be prohibitive. Seedlings from specific regions react differently to certain conditions, such as east Texas loblolly pines are more drought resistant, northerly sources of pine result in more cold-hardiness, etc. A nursery in the local area should have plenty of options for different sources of seedlings.

Economic Uses

Loblolly pine can be implemented for a number of products, including lumber, non-timber forest products, low-value wood products, and sometimes Christmas/ornamental trees. Non-timber products could include pine straw, in conjunction with forest farming operations.

Additional Resources

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/pinus/taeda.htm

http://www.centerforagroforestry.org/profit/pine/pine.asp

Ninebark *(Physocarpus opulifolius)*

Description

Ninebark is a shrub that can grow from 3 to 10 feet tall with a widely spreading crown. Its bark is yellow, orange, or red-brown and appears shredded and exfoliating in long strips, especially on older stems. The twig is slender and red-brown. The young twigs have tight bark but on older twigs the bark splits and exfoliates in long strips. The leaves are alternate, deciduous, maple-like, and almost circular in outline, 1 ½ to 3 ½ inches in diameter, dark green above and paler below. The fruit is a ¼ inch pointed follicle that is in dense, upright hemispherical clusters and are red, turning into a bright reddish brown when mature.

Habit

Ninebark occurs on gravel bars, rocky banks and bluffs along streams and moist thickets, often overhanging the water. It is adaptable to a very wide range of soil and site conditions, from moist to dry, acid to alkaline, and gravelly to heavy clay. It will grow in partial shade to full sun. Its range is from Quebec west to Minnesota, South Dakota and Colorado, south to Oklahoma, east to Georgia and north to New York.

Management / Harvest Considerations

Ninebark is a shrub that is very adaptable to dry sites and is pollution tolerant. Because of these characteristics it is relatively a problem-free plant. It needs to be pruned right after flowering to remove crossed branches or dead wood. Thin out overcrowded stems by cutting stems back to ground level. In Missouri, fruits ripen from August to early October and are small, dry pods hanging in drooping, papery clusters that resemble bellows (1). Each pod contains 2 to 5 yellowish, shiny seeds. The seeds should be collected in late September. To allow them to further ripen and dry, they need to be placed in elevated wooden boxes with standard house screen on the bottom.

Ninebark's ability to tolerate pollutants makes it a valuable species in the development of riparian buffers. It is also selected for its rapid growth and its ability to reproduce vegetatively by stump or root sprouts.

Propagation

The seed should be sown as soon as it is ripe, if possible, in a cold frame. If sown in the spring it is likely to require a period of cold stratification. When they are large enough to handle, prick the seedlings out into individual pots and grow them in the cold frame for at least their first winter. Plant them out into their permanent positions in late spring or early summer, after the last expected frosts.

Economic Uses

Ninebark can form dense thickets, which provide good shelter and cover for a variety of wildlife species from small birds to large mammals. Ninebark's economic importance is in the production of seeds for sale. The importance of this shrub is for borders, massing, and bank covering. This shrub has no value for medicinal or timber production.

Additional Resources

Native Plant Network, http://www.nativeplantnetwork.org/network/view.asp?protocol_id=432,461

University of Arkansas, http://www.uark.edu/campus-resources/cotinus/plants3_html/physopul.html

Virginia Tech University, http://www.ext.vt.edu/pubs/forestry/420-153/420-153.html

Northern Red Oak *(Quercus rubra)*

Description

Northern red oak is a moderate to fast growing tree that can be found on a variety of soils and site conditions. It is easily transplanted and is one of the more important lumber species of red oak.

Habitat

Because of the wide range of the northern red oak, its growing season varies from on average of 100 days in the north to 220 days in the south. Its native range extends from Nova Scotia to Arkansas, and it can be found growing primarily on moist, well drained soils throughout Missouri

Management Considerations

While northern red oak grows on a variety of soil types and site conditions it will always grow best on deep, well-drained loam to silty, clay loam soils. Northern red oak requires less growing space than those of other oak species with the same diameter, which makes it a good candidate for use in agroforestry plantings.

Northern red oak should be considered as one of the fastest growing native oak species in Missouri. Other fast growing species that have more limited ranges in the state include shumard oak, nuttall oak, and cherrybark oak.

Major risks to managing northern red oak include its susceptibility to a number of defoliating insects and diseases, including Gypsy moth and oak wilt. In addition, the red oak stem borer can become a serious problem in older northern red oak stands in southern Missouri. The loss of northern red oak acorns due to insect and disease predation, especially in poor seed years, is an ongoing problem in the state.

Propagation

Northern red oak is easily planted and transplanted. It is also a very prolific sprouter. These new sprouts will generally grow faster than younger trees of seedling origin due to the presence of a previously formed, well-developed root system.

Northern red oak acorns can quickly loose viability if allowed to dry out. Timely collection of sound acorns that are fall free from their caps is of paramount importance. Newly collected seeds should be soaked in water overnight to insure their soundness. Defective acorns will float and can be discarded. Floated seeds can be stored in plastic bags in the refrigerator and sown in the very early spring, or can be directly sown following collection. If sown outside seeds should be protected from mice, squirrels, and other rodents. The seedling tree produces a fairly fibrous root system, which allow for improved transplanting success rates.

If started in a nursery bed they should not be left there for more then two growing seasons.

Economic Uses

Red oak is an important lumber species and is used in a variety of applications from lumber, firewood, flooring, etc. Heavy acorn production is also important for many wildlife species including squirrels, turkeys, blue jays, deer and other mammals and birds.

Osage-Orange *(Maclura pomifera)*

Description

Osage-orange can be either a shrub or a tree, depending on its surroundings. It grows between 10 and 40 feet tall, but can reach up to 60 feet. Standing alone in full sun it will become a multi-stemmed shrub; with neighboring competition it can become a single-stemmed tree. The bark, up to ¾ inches thick, is light gray-brown with slight orange. On large trees it separates into shaggy strips. The leaves of the osage-orange are thick, shiny, and simple, alternating along twigs, dark green on top and light green underneath. Branches growing in full sunlight have sharp, stout thorns. Twigs in the shaded portions of the crown of mature trees are thornless. The leaves of the osage-orange turn bright yellow in autumn. The trees are either male or female, and only the females produce a large fruit from their small flowers. Flowers are produced from May to June. The fruit, commonly known as a hedge apple, is a large, green-yellow wrinkled ball up to 6 inches in diameter. As it ripens in the fall (September to October), the fruit often hangs in the tree after all the leaves have fallen off. It does not have recognized associates, but can sometimes be found near eastern red cedar, hickories, black walnut, and elms.

Habitat

Osage-orange is native to a relatively small area in eastern Oklahoma and portions of Missouri, Texas, and Arkansas. Preferring open sunny areas, the tree can grow in a variety of soils and with a variety of species.

Management Considerations

Osage-orange can be used in windbreaks and provides valuable cover and nesting sites for quail, pheasant, other birds, and animals. The bitter-tasting fruit is hardly eaten by wildlife. It is a medium sized tree and will not reach the heights of other windbreak trees, but it can be planted very densely to increase wind filtering. Pole-sized and larger osage-orange trees are practically immune to deer browsing, but seedlings and tender sprouts are highly susceptible. Livestock should initially be kept out of the windbreak with fence, although osage-orange can become a fence itself with time and minimal maintenance. It does best on moist well-drained soils, but tolerates extreme drought. The tree is cold hardy to northern Iowa and Nebraska.

Harvesting Considerations

When harvesting from a windbreak, be sure not to create a wind tunnel where it is not wanted. Do not make corridors parallel to prevailing winds. Create corridors at angles or with crooks to curb and slow the wind.

Propagation

The best way to propagate osage-orange is through stem or root cuttings, although the seeds will grow and you can reproduce trees from root sprouts. To

successfully collect seeds and grow seedlings you must locate fruiting females with several neighboring males. Fruits can be collected from the ground anytime after they fall until just before spring. Natural regeneration requires exposed mineral soil and full sunlight.

In pioneer days, people used to crush a number of usage-orange fruits and make them into slurry that was then poured into a plowed shallow furrow and covered with about 1/2 inch of soil. This method was used to start hedgerows.

Economic Uses

Osage-orange produces no sawtimber, pulpwood, or utility poles. The heartwood, bark, and roots contain many extractives of actual and potential value in food processing, pesticide manufacturing, and dye making. Osage-orange heartwood is the most decay-resistant of all North American timbers and is immune to termites. Some places grow osage-orange specifically to produce fence posts. After the post material is harvested, the plants resprout and in five to 10 years produce more fence posts. Several male thornless varieties (*Maclura pomifera* var. *inermis*) of osage-orange are now on the market, used in home landscapes, along city streets, and in institutional settings. Osage-orange staves are used in bow making. The wood is valuable for firewood, rating almost as high as coal in producing heat.

Notes

Known also as hedge, hedge apple, bodark (from the French bois d'arc, meaning wood of the bow), and bowwood, the osage-orange's name comes from the Osage Indian tribe, which lived near the tree's home range, and from the orange-like aroma of the ripened fruit.

Passion-flower *(Passiflora incarnata)*

Description

Passiflora incarnata is a fast growing perennial woody vine that employs tendrils to grab hold of adjacent shrubs, structures and other supports to lift itself to heights of eight to twelve feet. This flower is also known as Maypop. It has large serrated leaves that grow five to six inches wide by six to eight inches long. The flowers are single, arising on stalks from the axils of leaves. The individuals are up to three inches across, with several petals and a purple fringe. The fruit is oval, smooth, yellow when ripe, up to two inches long, and contains many seeds with gelatinous coverings.

Habitat

Passionflower is native to southeastern United States and is often seen growing on the edges of fields, along side ditches and other sunny, moist and fertile places.

Management and Harvest Considerations

Passion-flowers are drought tolerant and can be grown in different soils. It prefers a light, rich soil, and does well in dry areas. The plant requires a position in the landscape that receives full sun for best flowering. This plant is noted for not having any serious insect or disease problems. The roots of this flower spread invasively. Root rot is one of the most common problems associated with the passion-flower. Root rot can occur in wet poorly drained soils, particularly in winter.

The leaves, stems and flowers may be harvested at any time. This is a good way to keep the plant from crowding itself. Each year before the frost kills it, the entire vine may be cut back to the ground, yielding great quantities of herb. It may be dried in the sun or at a low heat.

Propagation

Maypop is the hardiest of all the passion-flowers. If the roots are protected it will survive as far north as the Pennsylvania border. Maypop grows readily from the seed, but takes several weeks to sprout. It is best sown on the surface of light soil or peat moss with bottom heat. After six months the young plants may be planted in the open. It may be propagated easily by cutting off half-ripened growth. These should be about 6 inches long; they will root easily in sand and do not require bottom heat. The vines may eventually overgrow and tangle themselves. Thin them out by cutting branches back to their beginnings. Passion-flower dies back at the first frost.

Economic Uses

The primary economic value of the Maypop is its medical use. It is used to treat nervous restlessness and gastrointestinal spasms. It is also used as a sedative and

painkiller. The use of this plant for medical purposes did not begin until the late nineteenth century in the United States.

The passion fruit is edible but seedy. It can be used to make jelly, but its best usage is for being a food source for several species of butterfly and their larvae.

Notes

It derives its common name, Maypop, from the way it just seems to pop out of the ground in May.

Additional Resources

The Garden Helper, http://www.thegardenhelper.com/passion.html

Paulownia *(Paulownia tomentosa)*

Description

Native to China, paulownia (aka Princess tree) is a small to medium sized tree that may reach 30 to 60 feet in height, and up to two feet in diameter. The bark is rough, gray-brown, with olive-brown to dark brown stems that are hairy and flattened at the nodes. Leaves are large, oval to heart-shaped, and hairy on the lower leaf surface, arrangement is in pairs along the stem. Flowers are upright clusters of pale violet color with noticeable fragrance. Fruits consist of a dry brown capsule with four compartments that may contain several thousand winged seeds. The capsules mature in autumn and open to release the tiny, wind-borne seeds, though the capsule remains attached to the tree all winter, which is handy for identification.

Habitat

Paulownia can be found in 25 of the United States, from Maine to Texas, along roadsides, stream banks, and forested edges. It is a very adaptable species, tolerating infertile and acidic soils and drought conditions. It can be found in disturbed habitats, including previously burned areas, forests defoliated by pests, landslides, rocky cliffs, and riparian zones. It has an ability to sprout prolifically from adventitious buds on stems and roots, which help it to survive fire, cutting, and bulldozing.

Management Considerations

Quick to establish, paulownia can be used to establish a canopy in a considerably short time period, the ability of the species to sprout from stem and root buds, gives it an advantage in areas of increased disturbance. These factors can prove to be a problem with native competition, so care should be taken to consider all alternatives. Naturally seeded or planted paulownia survives and grows best on moist, well-drained soils of steep slopes or open valleys, but it will germinate and grow on almost any moist, bare soil. A highly adaptable Paulownia is found in many site, soil, and forest type conditions. Princess tree needs bare soil, sufficient moisture, and direct sunlight for good seedling establishment. Seedlings are very intolerant of shade.

Harvesting Considerations

On good sites royal paulownia grows rapidly. Plantation spacings of 4 by 4 or 6 by 6 ft have been recommended; saw logs can be expected in 15 years. Heights at maturity range from 30 to 70 ft. Heights of 43 feet in 11 years have been reported in Russia. On poor sites, such as surface mine spoils, growth is considerably slower. The ability of paulownia to survive, grow, and reproduce on such harsh, exposed sites, however, has made it a favorite for re-vegetating surface mine areas. The tree thrives on dry southern aspects, even though it generally has a shallow root system. The species is valued as an ornamental and for wood carving.

Propagation

When severely coppiced, paulownia can re-grow to a mature tree within a single season, and millions of small fluffy seeds can be produced. Difficulty in propagation has been noted, though the species can be found naturally occurring in degraded, exhausted soils.

Economic Uses

In China, paulownia leaves and bark are used to promote hair growth, reduce swelling in feet, and various other medicinal applications. Other uses include sawlog production, low-value wood production, and perhaps seed production, to be sold to nurseries. The quick growth of this species on good sites allows for fast production of biomass, and with the coppicing ability of the species, re-propagation may not be necessary. Future stands could be grown from the roots of established trees once they are harvested for pulpwood, etc.

Agroforestry Uses

Possible agroforestry uses for paulownia include windbreaks, alley cropping, and riparian forest buffers. The adaptability of the species makes it a valuable asset in situations requiring adaptive growth and sites that are unusable to many species. Care must be taken to keep spread of paulownia in check, it has become considered a highly invasive species in many states and without management to keep it contained, rare/endangered plant species may lose habitat to it.

Additional Sources

Forest Service Silvics Manual. Royal Paulownia Website, http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/paulownia/tomentosa.htm

Paw paw *(Asimina triloba)*

Description

Reaching a height of 15 – 23 feet, the paw paw is a native, deciduous species of the United States. This slow growing understory tolerant species produces 12 inch leaves that are a dark green color and droop, giving the tree a “tropical themed” appearance. In autumn, the leaves turn mustard yellow and begin to fall in mid to late October. After the flowers have bloomed and been pollinated, the tree leafs out in late spring.

The flowers are protogynous, meaning that the tree has both male and female reproductive organs, however the female organ will mature sooner than the male. This allows the tree not to pollinate itself. However, since many natural stands of paw paws are sucker shoots, self fertilization is possible. The flowers are chocolate brown in color and have a velvety texture to them. Fruit begins to form after pollination has occurred and becomes ripe between mid-August to early October. When fully ripe, the light green fruit can weigh from five ounces to one pound and be three to six inches in length.

Habitat

Primarily an understory tree, paw paws usually exist in clumps or thickets due to their ability to sucker sprout and the hardiness of the seeds to survive through animal digestive tracts. During the early years of life, paw paws must be placed in shaded areas. After five years or once they begin to produce fruit, they are capable of being in full sun and will actually produce more fruit in comparison to being in half to full shade. Even though it can survive in full sun, some form of a windbreak must be present because of the large leaves that are susceptible to being shredded from winds and severe forms of weather.

Surviving in temperatures of -15F, the paw paw requires hot, humid summers and 32 inches of moisture falling in spring and summer to survive. Even with the large amount of precipitation that is needed, paw paws are unable to live in waterlogged areas. In reference to soil types, paw paws thrive in all forms of soil, especially silty soils that are acidic.

Management Consideration

Irrigation is critical during the growing season. Fertigation, mixing a form of fertilize into the irrigation water when watering, is highly recommended and is very beneficial during seasons of drought. Irrigation can be enforced through drip irrigation or sprinklers.

Pruning is not required for paw paws, unless you wish to remove dead or damaged limbs. Due to the size of the species, pruning is not a factor and this can be beneficial to landowners who will not have time to do pruning on a seasonal bases.

In agroforestry settings, paw paws are ideal for forest farming, windbreaks, and alley cropping. Besides being part of agroforestry, paw paws are also a good addition to any garden or landscape.

Harvesting Considerations

In the timber industry, paw paw is not a prized specimen. The tree does not reach a tall height and the circumference around the trunk is too small to produce lumber. To harvest the fruit, picking the fruit while it is still on the trees is recommended. Fruit that has already fallen can be cleaned on the spot and the seeds removed for future propagation or to sell to a local nursery as seed stock.

Propagation

Paw paw can be grown from seed and seedling plantings. Seeds should be removed from the fruit, washed with a 20% Clorox Bleach mixture, rinsed several times with distilled water, and be stored at 2-4°C for 60-100 days. For the first three years of growth, the seeds and seedlings should be placed in a shaded area that receives around 20% direct sunlight during the summer. Paw paws are primarily an understory tolerant tree and extended periods of direct sunlight may cause the young seedlings to die. Taking trees from the wild and transplanting them into a new setting is not recommended. Most paw paws that are found in the wild are often sucker sprouts and do not have adequate root development to survive after they have been transplanted. The ideal time to plant seeds or seedlings is when the tree is dormant, such as early spring and late fall.

Economic Uses

With a low timber value, paw paw is redeemed for its fruit that has been referred to as having a blended cantaloupe and banana taste. The fruit, when refrigerated, is edible for up to three weeks. Due to the short shelf-life, paw paws are not a commercial importance to the United States as an edible crop. Many housewives and bakers use the paw paw as a substitute for bananas in many recipes and have found that the fruit makes a wonderful jam/jelly. Along with being an edible fruit, the plant naturally manufactures a natural chemical (annonaceous acetogenins) that acts as a pesticide to keep insects from colonizing or eating the tree. Not only does this chemical act as a natural insecticide, researchers have found that this chemical has a positive effect on reducing various forms of cancer in the human body.

Notes

Other common names for the paw paw include: Poor Man’s Banana, Indiana’s Banana, the Hosier Banana, and the Poor Farmer’s Banana. The seeds, when crushed, can cause digestive problems in mammals (humans and wildlife) but when left in tact, the seeds pass through the digestive system and cause no harm.

Additional Resources

California Rare Fruit Growers, INC. http://www.crfg.org/pubs/ff/pawpaw.html

Purdue University. http://www.hort.purdue.edu/ext/HO-220.pdf

Peppermint *(Mentha piperita* L.*)*

Description

The leaves of this kind of mint are shortly but distinctly stalked, 2 inches or more in length, and 3/4 to 1 1/2 inches broad, their margins finely toothed, their surfaces smooth, both above and beneath, or only very slightly, hardly visibly, hairy on the principal veins and mid-rib on the underside. The stems, 2 to 4 feet high, are quadrangular, often purplish. The whorled clusters of little reddish-violet flowers are in the axils of the upper leaves, forming loose, interrupted spikes, and rarely bear seeds. The entire plant has a very characteristic odor, due to the volatile oil present in all its parts, which when applied to the tongue has a hot, aromatic taste at first, and afterwards produces a sensation of cold in the mouth caused by the menthol it contains. Peppermint blooms from July through August, sprouting tiny purple flowers in whorls and terminal spikes. Peppermint is native to Europe and Asia, is naturalized to North America, and grows wild in moist, temperate areas.

Habitat

Peppermint thrives best in a fairly warm, preferably moist climates and in deep soils rich in humus and retentive of moisture, but fairly open in texture and well drained, either naturally or artificially. These conditions are frequently combined in effectively drained swamp lands, but the plants may also be commercially cultivated in well-prepared upland soils, such as would produce good corn, oil or potatoes. Though a moist situation is preferable, peppermint will succeed in most soils when started into growth and carefully cultivated. It flourishes well in what are known in America as muck land, that is, those broad level areas, often several thousand acres in extent, of deep fertile soil, the beds of ancient lakes and swamps where the remains of ages of growth of aquatic vegetation have accumulated.

Management Considerations

The area selected for peppermint growing should be cropped for one or two years with some plant that requires a frequent tillage. The tillage is also continued as long as possible during the growth of the mint, for successful mint-growing implies clean culture at all stages of progress. A rich and friable soil, retentive of moisture is selected, and the ground is well tilled 8 to 10 inches deep. The usual method of mint cultivation on farms in America is to dig runners in the early spring and lay them in shallow trenches, 3 feet apart in well-prepared soil.

Harvesting Considerations

The herb is cut just before flowering according to local conditions. With new plantations the harvest is generally early in September. Harvesting should be carried out on a dry, sunny day, in the late morning, when all traces of dew have disappeared. The first year's crop is always cut with the sickle to prevent injury to the stolons. The herb of the second and third years is cut with scythes and then raked into loose heaps ready for carting to the stills.

The growing crop is kept well cultivated and absolutely free from weeds and in the summer when the plant is in full bloom, the mint is cut by hand and distilled in straw. A part of the exhausted herb is dried and used for cattle food, for which it possesses considerable value. The rest is cut and composted and eventually ploughed into the ground as fertilizer.

Propagation

The plants are propagated in the spring, usually in April and May. When the young shoots from the crop of the previous year have attained a height of about 4 inches, they are pulled up and transplanted into new soil, in shallow furrows about 2 feet apart, lightly covered with about 2 inches of soil. They grow vigorously the first year and will generate numerous stolons and runners on the surface of the ground. After the crop has been removed, these are allowed to harden or become woody, and then farmyard manure is scattered over the field and ploughed in. In this way the stolons are divided into numerous pieces and covered with soil before the frost sets in, otherwise if the autumn is wet, they are liable to become sodden and rot, and the next crop fails.

Economic Uses

The main marketable use of peppermint is for distilled oils used in flavorings and fragrances. Peppermint also contains a form of menthol that is added to many medications for both its smell and for its effectiveness as a carminative.

Additional Sources

International information (England and France)
http://botanical.com/botanical/mgmh/m/mints-39.html

General information and history
http://www.diet-and-health.net/articles.php?cont=peppermint

Common Persimmon *(Diospyros virginiana)*

Description

Native to the United States and spanning in distribution from Connecticut to Kansas, Common Persimmon is a deciduous tree that will never grow above 50' in height and 18"in diameter at breast height when fully matured. The leaves are dark green and appear glossy. Mature bark is dark gray to black and breaks into blocks that are separated by deep furrows that are a dark red color at the bottom. Persimmon is dioecious, meaning separate male and female trees. The females will produce a flower that appears yellow to white in the early spring and edible berry fruit can be harvested from the tree in October or November the following fall. The fruit is red to yellow in color and averages about 1" in diameter.

Habitat

Persimmon can occur naturally along streams, in bottomland swamps, and upland forests. In consideration, it can withstand short periods of drought and flooding along with being in the understory of a forest during its germination, but after ten years, it will start to loose its understory tolerance. The ideal niche for persimmon is areas that will receive full sun and have adequate drainage properties. The roots of this species can grow very deep and may cause problems with underground pipes and wires.

Management Considerations

As stated above, the best site for this species is an area that will receive full sunlight and soils that are well drained. The first two to five years will be the most crucial for the seedlings and may require the owner to irrigate and do proper weed control.

From an agroforestry standpoint, persimmon can do exceptionally well in alley cropping, riparian buffer systems, and windbreaks. In alley cropping, the deep roots should not compete with shallow rooted grasses or forages. Harvest of the berries will take place after the crops in the alleyways have been collected as long as an alley crop such as summer wheat, alfalfa, or corn is chosen. With a deep root system, persimmon is a good addition to any riparian buffered area and will help control the amount of sediment movement from a field into a water source. Not only will the species aid in preventing soil erosion but will also be a great wildlife tree providing food for wildlife. The same is true in regards to windbreaks, the tree has deep root system that will allow for soil stability and the fruit that is produced will also provide wildlife food.

Harvesting Considerations

The fruit of persimmon is a delicacy in Asian communities that are established here in the United States. Outside of these communities, many rural areas have harvested this fruit for use in jams, cobblers, and homemade wines. Along with

using the berry, the seed is often dried and used as a substitute for coffee grains. Many Native American tribes brewed a form of persimmon coffee centuries before European settlers came to North America.

Along with the fruit, the wood can be just as valuable due to its strength, color, and sturdiness. At the turn of the 20th century, persimmon wood was used in manufacturing golf club heads and shuttles. Today, a market can be found for persimmon golf clubs, for enthusiasts who are more into traditional golfing. Along with golf clubs, persimmon wood was once used in the production of planes and in particular propellers and rudders.

Propagation

Seedlings can be obtained through seed source, grafting techniques, and also can be propagated through root cuttings. Cultivars of Persimmon are used in regards to characteristics that are desired in wood patterns and stability. Some cultivars have come about due to particular flavors in the fruit and also good fruit bearing traits. In regards to the deep root system, this species is not a good candidate for transplanting or hydraulic spading to new sites.

Economic Uses

As stated before, the wood and fruit are highly valuable in the right niche markets. Besides these uses, pharmaceutical companies use unripe fruit and inner bark as an ingredient for drugs that ease headaches, diarrhea, and stomach ulcers. The flowers that are produced by the tree are also useful in honey production.

Additional Resources

Henriette's Herbal Homepage:
http://www.ibiblio.org/herbmed/eclectic/kings/diospyros.html

North Carolina State University:
http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/trees-new/diospyros_virginiana.html

Ohio State University: http://ohioline.osu.edu/b700/b700_62.html

Purdue University: http://www.hort.purdue.edu/newcrop/ho/HO-108.html

Uncommon Fruits Worthy of Attention by Lee Reich

Plains Coreopsis (Calliopsis) *(Coreopsis tinctoria* Nutt.*)*

Description

Calliopsis belongs to the Asteraceae family and is an annual forb which usually germinates in late summer or fall (after the first frost happens). In spring, the height of calliopsis can reach up to 4 feet. The leaves are opposite and are deeply divided, with the top portion being narrower then the rest. The flowers of this species are numerous and are usually 1-2 inches in diameter, and generally are yellow with rays that have a base which are red-brown in color.

Habitat

Plains Calliopsis can be readily seeded and grows rather quickly. Germination generally speaking takes between 10-15 days after seeding. Best time to seed is between August and September. Calliopsis likes moist soils and therefore is ideal for hard to drain areas including roadside ditches. Plant this species in full sunlight; however, plain calliopsis can withstand partial shade once it's established.

Management Considerations

Stands will reseed prolifically for several years on their own. However, there will be a gradual decline in floral production if the area does not undergo any form of soil disturbance. Therefore, about every two or three years the site/area should be disked or mowed to help control the perennial weeds from becoming established and to help promote calliopsis germination.

Economic Uses

As for the economic importance of this species it comes in the form of aesthetical value rather than dollars and cents. Due to it's abilities to grow in areas that are hard to drain and its fibrous roots it also has the ability to aid in the prevention of soil erosion. Also plain calliopsis is an important Mid-Summer nectar source for many different butterflies as well as other nectarvores. A tea made from the root was used by Native Americans to treat diarrhea.

Notes

If your goal is to have a more serine and beautiful landscape then implementing these floral's into your system will work terrifically. If you were considering such an investment proper planting as well as management of these plants is highly recommended and should be monitored to maximize you benefits.

Additional Resources

Missouri Department of Conservation, www.mdc.mo.gov

Red Clover *(Trifolium pratense* L.*)*

Description

Red clover (*Trifolium pratense L*) is a short-lived perennial and is the most widely grown of all the true clovers. The classification of red clover is sometimes confusing, but the red clovers grown in the United States may be grouped into two divisions -- early flowering and late flowering. This plant is native to the north Atlantic and central Europe, the Mediterranean region, Balkans, Asia Minor, Iran, India, Himalayas, Russia from Arctic south to east Siberia, Caucasus, and the Far East. It spread to England around 1650 and was carried to America by British colonists where it is currently widely distributed and cultivated.

Habitat

Red clover is native to wet and to dry meadows, open forests, forest margins, field borders, and paths. It grows best on well-drained loam soil, but also adapted to wetter soils. Most soils that produce good crops of corn, tobacco or small grains will also produce a good crop of red clover. Loams, silt loams, and even fairly heavy soils are better than light sandy or gravelly soils. Some of these soils may need lime or fertilizer, or both. Red clover is most productive on soil that is within a pH range of 6.6 to 7.6. It also needs P and K to produce good yields; the amount needed can be determined by soil tests. Red clover is reported to tolerate annual precipitation of 3.1 to 19.2 dm (mean = 8.6 dm), annual mean temperature of 4.9 to 20.3°C (mean = 10.6°C), and pH of 4.5 to 8.2 (mean = 6.3). Maximum yields are obtained at pH >6 with adequate calcium.

Management Considerations

For seed production, most growing areas require pollination with bees, using 5 to 8 strong colonies of bees per hectare. Best seed yields occur when there is an abundance of bees, and soil fertility and moisture are adequate to promote good growth, and when the weather is warm and clear during the flowering period.

Harvesting Considerations

Harvest the seed crop when the greatest numbers of seed heads are brown, usually 25–30 days after full bloom. Cut seed crop with mower. Let it cure in the swath or in small windrows. During rainy weather, the mowed crop cures better in swaths than in windrows.

Economic Uses

Red clover is extensively grown for pasturage, hay and green manure, and is considered excellent forage for livestock and poultry. Compared with alfalfa, red clover has about two-thirds as much digestible protein, slightly more total digestible nutrients, and slightly higher net energy value. Red-clover flowers are reported to possess antispasmodic, estrogenic, and expectorant properties.

Additional Resources

Basic forage information
http://www.agry.purdue.edu/ext/forages/publications/legumes/red_clover.htm

Special usage in medicine
http://www.pdrhealth.com/drug_info/nmdrugprofiles/herbaldrugs/102330.shtml

UMC Extension
http://muextension.missouri.edu/explore/agguides/crops/g04638.htm

General to applied information
http://www.hort.purdue.edu/newcrop/duke_energy/Trifolium_pratense.html#Description

Red Maple *(Acer rubrum)*

Description

Red maple is also known as scarlet maple, swamp maple, soft maple, Carolina red maple, Drummond red maple, and water maple. Many foresters consider the tree inferior and undesirable because it is often poorly formed and defective, especially on poor sites. On good sites, however, it may grow fast with good form and quality for saw logs. Red maple is a subclimax species that can occupy overstory space but is usually replaced by other species. It is classed as shade tolerant and as a prolific sprouter. It has great ecological amplitude from sea level to about 900 m (3,000 ft) and grows over a wide range of microhabitat sites. It ranks high as a shade tree for landscapes. The flowers are small, with slender stalks, red or rarely yellowish, with petals; they appear from March to May depending upon elevation and latitude. Trees can flower and bear seed at an early age; 4-year-old trees have produced seed. Flowering occurs on all branches in the well-lit upper portion of the crown. Characteristically, the non-flowering branches are slow growing and lack vigor. The fruit, a double samara, ripens from April to June before leaf development is complete. After ripening, seeds are dispersed for a 1- to 2-week period during April through July.

Habitat

Red maple is one of the most abundant and widespread trees in eastern North America. It grows from southern Newfoundland, Nova Scotia, and southern Quebec to southern and southwestern Ontario, extreme southeastern Manitoba, and northern Minnesota; south to Wisconsin, Illinois, Missouri, eastern Oklahoma, and eastern Texas; and east to Florida. Red maple can probably thrive on a wider range of soil types, textures, moisture, pH, and elevation than any other forest species in North America. It develops best on moderately well-drained, moist sites at low to intermediate elevations.

Management Considerations

Red maple browse is toxic to cattle and horses, particularly during the summer and late fall. Red maple is relatively tolerant of landfill-contaminated gases, but ambient air pollution can damage the foliage. Red maple is often poorly regarded as a timber species due to its susceptibility to defects and disease, and poor form of individuals of sprout-clump origin. Red maple usually grows rapidly after heavy cutting or high-grading, and crop tree release may be a low-cost management option. Mechanical thinning of clumps can produce good-quality sawlogs on good sites.

Harvesting Considerations

Large enough quantities of low-value wood products, such as pulp wood, and biomass can be gained in a short amount of time. Sawlogs from soft maple are valuable enough to allow extended rotation periods for these products. Other harvest considerations include nursery stock, which would have a short rotation

time, about 3-5 years. The markets for nursery stock should be thoroughly checked before attempting to start growing.

Propagation

It is possible to stimulate red maple seed production through fertilization. The stimulation often lasts 2 years and may yield up to 10 times more seeds than an unfertilized stand. The seed does not require pre-germination treatment and can germinate immediately after ripening. Red maple has few germination requirements. The seed can germinate with very little light, given proper temperature and some moisture. Most seeds generally germinate in the early summer soon after dispersal. Shading by a dense overstory canopy can depress first-year germination; then second-year germination is common. Red maple stumps sprout vigorously. Inhibited, dormant buds are always present at the base of red maple stems. Within 2 to 6 weeks after the stem is cut, these inhibited buds begin to extend. Regeneration by seedling sprout may be especially successful. Generally, the species' great sprouting capacity makes it suitable for coppicing and accounts for its tendency to be found in sprout clumps. Red maple is difficult to propagate from cuttings and success varies considerably.

Economic Uses

Red maple is known in the lumber industry as soft maple. The wood is close grained and resembles sugar maple but is softer in texture, not as heavy, lacks the figure, and has somewhat poorer machining qualities. Red maple in the better grades is substituted for hard maple, particularly for furniture. Red maple lumber shrinkage from green to oven-dry moisture content is slightly more than shrinkage for hard maple. Red maple is widely used as a landscape tree. Low-value timber products and ornamental applications are the major products from Red Maple.

Agroforestry Uses

Red maple can be useful for riparian forest buffers, because of the adaptation of the species to moist sites. It is also useful in alley cropping, windbreaks, and forest farming. The adaptive capabilities of the species must be taken into account when planning an agroforestry application and used to the full benefit.

Additional Resources

Crow, T.R. Red Maple. Forest Service Website.
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/acer/rubrum.htm.

Red Maple. Website for Red Maple fact sheet.
http://www.fw.vt.edu/dendro/dentrology/syllabus/factsheet.cfm?ID=1.

Redtop *(Agrostis alba)*

Description

Redtop is a long lived perennial grass that grows to a height of 3 feet. It produces 1/4" leaf blades of 4 to 24 inches in length. Redtop has a shallow root system and forms a loose, coarse turf. It grows both by seed and by a creeping habit that can grow as much as 3 feet in diameter. Redtop grows from Canada to the Gulf Coast and from the East to West coasts of the USA.

Habitat

It does best in moderately well-drained loamy soils; tolerant to high water table and periodic irrigation. It will grow on acidic soils, and is moderately salt tolerant. Open disturbed areas, such as roadsides, old fields, and pastures; wet meadows; riparian habitats; open woodlands.

Management Considerations

Redtop is the most widely adapted commercial grass species used. Redtop is an excellent wet-soil grass and can even remain alive for short period of time within flooded areas. It also is adaptable to dry soil conditions on both acid and alkaline soils. Used for pasture mixtures, mixed-hay production and for erosion control as a nurse crop in low input turf areas. It also is occasionally used for over-seeding as a winter lawn grass in the South East.

Harvesting Considerations

Redtop provides fair to good forage for big game in the spring and summer. The dense cover can provide cover for small mammals, waterfowl, and other birds. It is an important commercial forage species, providing good to very good forage for horses and cattle, fair to good for sheep. The species is often cultivated as hay because of its tolerance to mowing and grazing, good cold resistance, and heat tolerance. Grazing usually favors this species.

Propagation

Redtop grows from both seed and by creeping and one plant can cover as much as 3 feet in diameter.

Economic uses

Because it provides good forage for cattle and horses, farmers can look to this as an alternate to fescue. This species also provides needed cover for wildlife and will also have some palatability for deer and other big game. Redtop forms a dense sod which provides good surface erosion control, but because the roots are shallow, redtop provides limited protection to streambanks.

River birch *(Betula nigra)*

Description

River birch is a deciduous medium to large-sized native tree. The leaves are alternate, double serrated, wedge-shaped, and sharp pointed. The flowers are unisexual, borne in separate male and female catkins on the same tree. The bark is light brown to buff, paper-like; exfoliating on young trees, turning to scaly bark on older trees.

Habitat

River birches are generally seen along side stream banks, wet floodplains, and in forests. River birch requires an acid soil pH 6.7 or less. Since it can tolerate wet conditions as well as full sunlight it can grow rather quick eventually reaching heights ranging between 40 to 70 feet tall with large canopies. River birch can successfully be grown from New York to the southern U.S to the Midwestern states.

Management Considerations

River birch can survive on drier soils, although it is best adapted to moist soils that are periodically flooded. Maximum development is reached in fertile areas with a pH of 6.5 to 4.0. It is intolerant of shade and requires full sunlight. Fertilize young trees in late winter before new growth begins to ensure faster growth. Don't prune this birch and other birches until summer because they are "bleeders" and should not be cut when the sap is flowing. River birch is quite disease resistant but has severe problems in early spring with aphids and is favored by gypsy moth larvae.

The principal leaf disease of river birch is anthracnose leaf blight caused by *Gloeosporium betularum*. Minor problems may exist with leaf miner and iron chlorosis which commonly occurs when grown on calcareous soils and other high pH soils. River birch has no serious insect pests and is considered borer resistant. The tree is not very vulnerable to deer browsing

Propagation

Seed ripens and sheds in the spring and should be directly sown. A seeding density of 25 to 44 per square foot is desirable, lightly covered or without covering if seedbed is kept moist. Stratification of birch seed is usually counter-productive. Seedlings have moderate growth rate and are usually outplanted as 2 year old bareroot stock. Given effective grass and weed control, river birch is easy to establish

Economic Uses

River birch sap can be fermented to make birch beer or vinegar. The wood is used to manufacture inexpensive furniture, woodenware, wooden shoes, basket materials, toys, staves, and fuel. The leaves were chewed, or used as an infusion

in the treatment of dysentery. An infusion of the bark was used to treat stomach problems and other medical uses.

Agroforestry Uses

River birch is a very attractive ornamental tree. It is a desirable specimen for estates, golf courses, parks, and public grounds. Many species of birds eat the seeds including wild turkey and grouse. The leaves are browsed by white-tailed deer. River birch is used for strip mine reclamation and erosion control. It is used in forested riparian buffers to help reduce stream bank erosion, protect water quality, and enhance aquatic environments.

Additional Resources

Virginia cooperative extension program
http://www.ext.vt.edu/departments/envirohort/factsheets/trees/rvrbir.html

USDA silvics manual volume 2
http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/betula/nigra.htm

United State Department of Agriculture Natural Resources Conservation Service Plants Database http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Sassafras *(Sassafras albidum)*

Description

Small to medium sized deciduous tree, but can grow to be 6 feet in diameter and 100 feet tall. Saplings have smooth orange-brown bark, while mature trees become deeply furrowed and reddish-brown in color. Leaves are polymorphic with three different forms of leaves: (1) Somewhat elliptical and unlobed (typical of older trees), (2) Right or left handed mitten shaped, & (3) symmetrically three lobed (Rarely 4-5 lobed). When leaves are crushed they have a distinct smell of fruit loops cereal. Small fragrant yellow-green flowers born on separate plants (dioecious) open in early spring before leaved emerge. Fruits are blue drupes on a thick reddish pedical. In autumn the leaves turn vibrant shades of orange, red, and yellow. All parts of the tree are spicy and aromatic.

Habitat

Sassafras native range in the United States extends from southwest Maine to Iowa and southeast Kansas, southward to Texas and central Florida. Sassafras can be found on virtually all soil types like clay loams, poor gravelly soils, and pure shifting sand, but grows best in open woods on moist well-drained, sandy loam soils. It is a pioneer species on abandoned fields, along fence rows, and on dry ridges and upper slopes. Sassafras is commonly associated with tree species such as sweetgum, flowering dogwood, elms, eastern red cedar, hickories, and American beech. In fields with deeper soils it grows with elms, ashes, sugar maple, yellow poplar, and oaks. Minor noteworthy trees associated with sassafras are American and eastern hophornbeam, and pawpaw. In the Appalachian Mountains, it is associated with black locust, red maple, sourwood, and several oak species. On the northern edge of its range, it makes up part of the understory of aspen and northern pin oak.

Management Considerations

Sassafras is classified as intolerant of shade at all ages. In forest stands, it usually appears as individual trees or in small groups and in best site conditions is in the dominant overstory. In the understory it may live along the edges of heavy stands, but generally does not reach merchantable size. In mixed stands if it becomes overtopped, it is one of the first species to die. Sassafras is also very susceptible to foliage diseases and fire damage. On a plus side the growing plant repels mosquitoes and other insects, so it is a beneficial companion plant in the garden.

Harvesting Considerations

Sassafras should be harvested for the roots. The soil may be cleared away from a portion of the roots and the root-bark peeled away. The inner bark should not be damaged, so that the roots can grow new bark. Another method is to harvest the entire root, as the pith of the root, although weaker, has the same properties as the bark. With any method the tree should be given time to recover and grow new roots before harvesting again.

Propagation

Propagation is fairly simple from seed. If you can obtain it, fresh seed will give the best results and this should be sown immediately in a cold frame. It should germinate in the spring. If you can only obtain stored seed then this will need four months cold stratification at 4°c. Soaking the seed for 24 hours in warm water and then mixing it with some damp compost and placing it in the salad compartment of the fridge for 3 - 4 months should suffice. As soon as they are large enough to handle, prick out the seedlings into individual pots and grow them on in the greenhouse for at least their first winter before planting them out. Give the young trees some protection for at least their first winter outdoors.

Economic Uses

The whole plant is saturated with an aromatic essential oil and it is still commonly used as a food flavoring with considerable health benefits. The dried root bark can be boiled with sugar and water until it forms a thick paste used as a condiment. The root and the berries can also be used as flavorings. A tea is made from the root bark, and is considered to be a tonic. Teas are made from various other parts of the tree. In spring the leaves and roots are used together and in early summer the flowers are used. Sassafras oil used to be used as the basis of root beer, now synthetic flavoring is used.

Notes

Native Americans within range of *Sassafras albidum* used it extensively for many purposes. Infusions were used to kill parasitic worms, to treat syphilis, colds and measles, to reduce fever, control diarrhea, and relieve constipation. The Cherokee, Choctaw and Chippewa made tea from the bark and roots and used the dried leaves as a spice to flavor foods. Early European settlers quickly adopted sassafras tea. Research in the 1960's showed that safrole, a principle constituent of oil of sassafras, caused abortion in pregnant women and liver cancer in mice.

Additional Resources

Plants for a Future, Plant Portrait – *Sassafrass albidum*
http://www.pfaf.org/leaflets/sassafra.php

Floridata Marketplace, http://www.floridata.com/ref/s/sass_alb.cfm

USDA Forest Service Silvics
http://forestry.about.com/library/silvics/blsilsasalb.htm

Scarlet Curls Willow *(Salix matsudana 'Scarcuzam'* or *'Scarlet Curls')*

Description

Reaching 25 to 30 feet height, this willow species will also measure 15 feet or more across from one side of its crown to the opposite side. Similar to a weeping willow, the golden branches will begin to droop but they also have a cork screw effect. The new twigs are a bright red and after the first frost of the season, fall or spring, the red twigs turn into a dark scarlet red that is very flashy and stands out from the rest of the tree. Scarlet curls is a fast growing species that is well suited to wet or moist areas.

Habitat

Similar to other members of the willow family, scarlet curls prefers environments that are moist and receive full sun. The ideal area for this species is in riparian areas or close to some source of water such as a backyard pond. This species is native to China and is not able to handle extreme cold temperatures or winter conditions such as ice storms or heavy, wet snow.

Management Considerations

A word of caution, never plant scarlet curls near any buried pipes or wires. The roots have a tendency to choke underlying obstacles, including other floral species. Keep a close eye on the conditions of the other plants that are close to the scarlet curls and perform regular root pruning. In an agroforestry setting, the best place to establish scarlet curls is in a riparian buffer area since the species is adaptive to wet growing conditions. Planting scarlet curls in windbreak and alleycropping management systems is also a wise management decision. In terms of soil conditions, scarlet curls can adapt to any soil texture but has problems with alkaline soils and extensive periods of drought. The branches are very susceptible to ice and extremely cold temperatures.

Harvesting Considerations

Primarily used as a decorative woody floral, the best way to harvest this product is by using a sickle saw or going in by hand and cutting each limb/twig individually. Scarlet curls are a very sensitive specimen and if a severe amount of damage occurs around the base the tree, the plant will die. When harvesting, make sure that all parties involved do not trample or compact the soil near the base of the tree because this may cause the roots to not be able to function correctly and cause stress on the tree.

Propagation

Never rely on a seed source as a form of propagation. Instead, use rooted cuttings that already have an established taproot. This species is also easily transplanted from site to site and can easily be grown to be used as a transplant tree that can be sold to landscapers and nurseries.

Economic Uses

The most popular economic use for scarlet curls is as a woody floral that can be added to any bouquet of flowers. Since the leaves are not present when the stems are harvested, to many people, the stem simply looks like a decorated piece of wire that has been added to the arrangement to add color.

Notes

This species is not native to North America so it is not resistant to some native cankers and insect interactions. If you do decide to use this in your agroforestry management plan, keep a close eye on the specimens during the first 3 years they are planted.

Additional Resources

Stadler Nursery and Garden Center.
http://www.stadlergardencenters.com/trees/trees.php?tid=1051

University of Nebraska-Lincoln Extension Forestry.
http://snrs.unl.edu/forestry/woodyfloralmarketcharacteristic.asp?cultivarnumber=22#top

Wisconsin Public Television.
http://www.wpt.org/garden/about/template.cfm?program_seg=URL1004

Scarlet Oak *(Quercus coccinea)*

Description

A member of the Beech family, scarlet oak is a deciduous tree growing 50 to 80 feet tall and 1 to 3 feet in diameter. It has deeply lobed, glossy bright green leaves with bristly tips. The 5 to 6 inch long leaves are alternate and simple and turn a brilliant scarlet color in the autumn. The fruit is an acorn that measures up to 1 inch in diameter which takes two years to mature. This species can be readily distinguished from other oak species by the presence of a distinctive set of 2-3 concentric rings at the base of the acorn. The thin bark is moderately ridged and shallowly furrowed, with a dark gray to black color. The upper canopy is spreading and opens at maturity.

Habitat

Scarlet oak has an extensive native range, stretching from southwestern Maine to southeastern Oklahoma. It can also be found in most counties in southeastern Missouri. Scarlet oak inhabits drier, upland ridge soils that are normally acidic. Because of its superior drought tolerance and hardiness it can be found on a variety of soils, especially dry ridges, bluffs, and hills.

Management Considerations

Scarlet oak in commonly planted in Europe and the United States as a shade tree. It thrives in full sun to partial sun and is shade tolerant when young. It grows well on poor, dry, sandy, or gravelly soils. It also likes moist, well-drained soils, but does not tolerate alkaline soils and does not do well in neutral soils. Chlorosis and stunted growth are consequences of being planted on soils that are neutral or alkaline.

The tap root system of the scarlet oak is quite coarse, which makes it very difficult to transplant successfully. Major risks to growing scarlet oak include its susceptibility to a number of defoliating insects and diseases, including Gypsy moth. The loss of scarlet oak acorns due to insect and disease predation, especially in poor seed years, is an ongoing problem in Missouri.

Harvesting Considerations

Scarlet oak wood is of inferior grade and commonly labeled with other red oaks as red oak lumber used for products such as pallets and flooring materials. Acorns are an important food source for numerous wildlife species, such as squirrels, chipmunks, mice, wild turkeys, white-tailed deer, blue jays, and woodpeckers. These trees are good for cavity-nesting species and are recommended for such use over hickories and white oak because of its high number of cavities.

Propagation

Scarlet oak acorns can quickly loose viability if allowed to dry out. Timely collection of sound acorns that are fall free from their caps is of paramount importance. Newly collected seeds should be soaked in water overnight to insure their soundness. Defective acorns will float and can be discarded. Floated seeds can be stored in plastic bags in the refrigerator and sown in the very early spring, or can be directly sown following collection. If sown outside seeds should be protected from mice, squirrels, and other rodents. The seedling tree produces a deep taproot and needs to be planted out into their permanent positions as soon as possible. If started in a nursery bed they should not be left there for more then two growing seasons.

Economic Uses

Edible uses- the seed can be cooked or dried, and ground into a powder and used as a thickening in soups and stews. The powder can also be put into the ingredients for making bread. The seeds contain bitter tannins, which can be leached out by washing the seed in running water. Washing whole seeds can take several days and an easier way would be to leach the powder instead.

Other uses-the mulch of the leaves repels slugs, grubs and many other bugs that are harmful to garden plants. The wood is used in construction and in the making of some furniture.

Serviceberry *(Amelanchier arborea)*

Description

Shadblow serviceberry belongs to the family Rosaceae. Serviceberry is a native shrub or small tree that grows to 10 meters tall, with a narrow, rounded crown. The twigs are often red-brown to purplish, becoming gray. The bark is smooth, grayish, "striped" with vertical fissures and very ornamental. Leaves of the serviceberry are deciduous, alternate, simple, oval to oblong, 5-13 cm long, glabrous above, pubescent and paler beneath. The white flowers are 3-15 in elongate clusters at the branch tips, before the leaves appear. The fruit is 6-12 mm wide, on long stalks, red-purple at maturity; seed 5-10 per fruit.

Habitat

Serviceberry is typically found in the upper regions of North America where it is found throughout areas that are considered as temperate forests and has higher elevations that are associated with them. Serviceberry grows in a variety of habitats – swampy lowlands, dry woods, sandy bluffs, rocky ridges, forest edges, and open woodlands and fields. It is a late successional to climax species in mixed-hardwood forests of the central U.S., commonly as an understory species. In the southern Appalachians, downy serviceberry grows in red spruce-Fraser fir forests at elevations of 1500-2000 meters with yellow birch, mountain ash, elderberry, and hobblebush. Flowering (March-)April-May, among the first of the early spring trees and shrubs to bloom; fruiting June-August.

Management Considerations

Maintenance for this species is rather low; however, one of the most significant problems that is associated with this species is the fact that the roots produce suckers which left unchecked can cause you more problems then benefits. Therefore, it is recommended that proper pruning and or wiring of these trees/shrubs takes place to prevent future problems. Fire top-kills downy serviceberry, but it can sprout from root crowns and stumps following fire. Gypsy moth larvae (*Lymantria dispar*) feed selectively on downy serviceberry.

Propagation

Propagation from seed is highly desirable and can be done successfully if you follow the directions that are given. Principal consideration for planting and establishing is to plant this species in full sun or, if desired, it can be planted in areas that are partially shaded. The overall height of the tree should also be kept in mind. This tree/shrubs species can reach as tall as 15 to 20 feet. Typically speaking these trees will bloom in between April-May time frame producing a white flower.

Economic Uses

Trees of downy serviceberry are generally not large enough for sawtimber but they have been used for pulpwood. The wood is extremely heavy and hard and is occasionally made into tool handles. Cree Indians prized it for making arrows.

At least 40 bird species (for example, mockingbirds, cardinals, cedar waxwings, towhees, Baltimore orioles) eat the fruit of *Amelanchier* species. Mammals that either eat the fruit or browse the twigs and leaves of downy serviceberry include squirrels, rabbits, chipmunks, mice, voles, foxes, black bears, deer, and elk. The fruits taste similar to blueberry – they are eaten fresh or cooked in pastries or puddings.

Additional Resources

United State Department of Agriculture Natural Resources Conservation Service Plants Database, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=fact_sheet.cgi

Shellbark Hickory *(Carya laciniosa)*

Description

The shellbark hickory is a slow growing long-lived tree that is sometimes hard to transplant because of its long taproot. It produces sweet, edible nut that is the largest of all the hickories. However, heavy crops are usually not seen until trees are around 40 years old and best crops are between 75-200 years. Good crops are usually every other year and can produce 2-3 bu of nuts per tree in a year.

Habitat

Shellbark hickory is widely distributed but not common. It grows best on deep, fertile, moist soils and generally on neutral or slightly alkaline soils. Mean length of growing season within its range is from 150-210 days. Precipitation varies between 30-59 inches per year including 3-35 inches of snowfall. Land that is subject to shallow flooding for a few weeks early in the growing season is favorable for shellbark.

Management Considerations

Shellbark hickory grows best on deep, fertile, moist soils, most typical of alfisols; but also grows well on heavy loams or silt loams. It is essentially a bottomland species and land that is apt to flood in early spring is favorable for growing shellbark. Good bottomland farm ground that is suitable for beans and corn is perfect for shellbark. Because of its deep taproot, it can be favorable in many agroforestry practices. Alley cropping and Silvopasture can implement the planting of shellbark because its deep root system does not interfere or compete with the companion crop or forage. Additionally, nut production can be enhanced by grafting, which should then cause trees to bear nuts sooner.

Shellbark hickory grows slowly in diameter, as do all hickories. When open grown, it can have a problem with epicormic branching but can produce a clear bole with careful pruning.

Harvesting Considerations

Because of its slow growth, saw logs would not be produced for about 40 years. But at this point, a harvestable nut crop could be obtained. On good sites, saw logs may be produced earlier and nut crop production can be improved.

Propagation

Shellbark hickory is most generally propagated from seed, but it readily sprouts with cut and coppice management has been recommended for this practice of regeneration. Otherwise, many nurseries produce shellbark hickory seedlings that may be purchased and out planted in the spring. However, good weed control is essential for enhanced early growth and survival, and do not plant if you suspect that flooding is likely to yet occur on a site.

Economic Uses

Most economic opportunities center on the wood or nut production. Because its wood is hard, heavy, strong and flexible, hickories are a favored wood for making tool handles. The nuts of the shellbark are the largest of all the hickories and are sweet and edible. Wildlife and people harvest most of the nuts.

Notes

Shellbark has the fastest height growth of all the hickories. This may cause some problems with alley cropping and what can be grown as a companion crop. But this could also be an opportunity to switch to a silvopasture practice and create a microclimate favorable for some forage production.

Additional Resources

http://plants.nrcs.usda.gov/plantguide/pdf/pg_cala21.pdf

http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/carya/laciniosa.htm

Skullcap *(Scutellaria lateriflora)*

Description

Skullcap is a member of the mint family. It is an herbaceous perennial with a four angled, smooth stem with many branches, attaining a height of between 30-cm to 160-cm when mature. Skullcap has small hairless leaves that are about two to five centimeters long by one to one and a half centimeters wide, ovate, with a rounded base, an acute tip, and the leaf margin acutely serrated. The flowers are on only one side. They are pale blue, blossoming in summer, comprised of a fused upper and lower sepal. The upper sepal has a raised appendage that looks like a helmet or hood. The flower has four small nutlets.

Habitat

Skullcap can be found from July to August on shores, stream banks, springs, meadows, swampy places, and moist woods. It is very common in the eastern and central United States. It can be found from Newfoundland to British Columbia, south to Florida and Ontario.

Management and Harvest Considerations

To grow to its full potential, skullcap requires areas of constant moisture, such as moist thickets or marshlands. It prefers a fertile soil, is hardy to zone four, and grows well in full sun or partial shade. When growing in a hot, dry area, shade and moisture must be provided. Once harvesting begins, fertilize with a high nitrogen compost. Once flowering begins the plant is cut with shears or a mower. A light cutting the first year is possible, followed by two cuttings each consecutive year. When harvesting skullcap, keep the freshly cut herb in the shade until harvesting is complete or take immediately to the drying area. Do not allow the plant material to heat up. Skullcap will grow in very select areas throughout eastern and central North America. There are natural areas in these regions that are suitable for cultivating high-quality skullcap. This crop may be a viable alternative for some growers who have land less suited for other crops.

Propagation

Skullcap can be grown through direct seeding, transplanting, or dividing the roots. The preferred method is to start seeds indoors. Skullcap seed requires a cold stratification period and light to germinate. Sow seeds shallowly in flats with a prepared soil mix. The seeds should be moistened and refrigerated at about 40 to 50 degrees F. for one week or they can also be placed outside where the seeds will be exposed to nighttime cold temperatures. After the stratification period, put flats in the greenhouse for germination. Seeds should be started six to eight weeks before setting out in the field. In late spring, transplant outside in well-prepared soil. Space plants eight to twelve inches apart in rows one and one-half to three feet apart or in three-foot wide beds. The plants will spread quickly when established. It is very important that the planted area should be keep weeded.

Economic uses

Skullcap is a very important medicinal plant. Buyers can be found worldwide for this botanical. Both wild harvested and cultivated material is sold for the medicinal trade. Small producers use established brokers to bring buyers and sellers together. Some customers will deal directly with growers and harvesters, but most have specific harvest protocols. Many buyers require that the material be harvested at a certain time of the year or during a particular stage of bloom.

Notes

The Cherokee Indians used skullcap as part of a concoction given to women to promote menstruation. It was also used for diarrhea and breast pain. In the early 18th century in America, Skullcap was used in the treatment of rabies and was given the nickname “Mad Dog”, though it is unclear as to its success for treating rabies.

Additional Resources

American Nutrition website
http://www.americannutrition.com/store/now_foods/NF9165.html

Alternative Nature Online Herbal, medicinal herbs descriptions, uses and pictures,
http://altnature.com/gallery/skullcap.htm

Smooth Sumac *(Rhus glabra)*

Description

The smooth sumac is more frequently found as a shrub 2 to 12 feet high, with smooth, brownish-gray trunk and branches. Its leaves are very long from 1 to 3 feet, and consist of from 11 to 31 leaflets, each leaflet being about 2 to 4 inches in length and about half as wide, lance-shaped, pointed, sharply toothed and whitened beneath. From June to August the plant bears greenish yellow flowers in dense clusters at the ends of the branches. These are followed by roundish, flattened fruits or berries, covered with short, crimson hairs.

Habitat

Smooth sumac occurs in dry soil thickets and waste grounds from Nova Scotia to British Columbia and south to Florida, Mississippi, and Arizona. Smooth sumac is moderately drought tolerant. Available water determines mature plant height.

Management Considerations

Smooth sumac is often used in naturalizing urban areas and for providing fast cover for bank stabilization. It lends a tropical effect in landscape because of its reddish fall color. It is also good for windbreaks and riparian plantings and is excellent for wildlife cover.

Harvesting Considerations

Smooth Sumac can have uses other than stabilization. Its leaves and roots are used in dyeing and tanning leather. The drupes are eaten fresh or processed into a lemonade drink. Its extracts are used as a tonic, astringent, and antiseptic. The drupes are also used as refrigerant and diuretic, and root bark as a tea to stop hemorrhaging.

Propagation

When planted, smooth sumac takes root quickly and develops a suckering habit. This helps with total use of the area to this unique plant. But it does shade out anything that is to grow beneath it.

Economic Uses

Because of its unique properties as an herbal medicine, possible markets may be found in areas that are to use them as such. It also is a cheap cover plant for erosion control and bank stabilization for riparian areas.

St. John's Wort *(Hypericum perforatum)*

Description

St. John's wort is a perennial non-native herbaceous plant 1-5 ft tall. Leaves are oppositely arranged no more than 1 inch long and elliptically shaped. Tiny characteristic glands are present on the leaves. Branches are rust colored and woody at the base. Flowers are bright yellow with five petals.

Habitat

St. John's wort likes well-drained sandy or gravely soils and open areas, like rangelands, with plenty of sun exposure.

Management Considerations

This plant has the tendency to kick native plants out of their natural range, a typical characteristic of non native species.

St. John's wort can be implemented as a specialty crop in a forest farming system, silvopasture, or in an alley cropping configuration. St. John's Wort is unappetizing to wildlife and livestock because it has a traumatic effect on their immune system. Wildlife and livestock may suffer severe blistering and itching on light colored areas, and may lose weight or even die of dehydration. St. John's wort crops have a good chance of high yields if the animals desired forage is present.

Harvesting Considerations

St. John's wort can be harvested for leaves and flowers. Flowers of St. John's wort can be harvested when in full bloom. Leaves can be harvested when needed.

Propagation

St. John's wort can be propagated by seed and cuttings. Plants can develop seed with or without pollination. Seed and capsules disperse with wind and water and adhere to machines, tires, shoes, clothing, animal feathers and fur. Seeds have thick coats, and if consumed by animals they remain undamaged and usable. Germination occurs fall through spring. Brief contact with fire can increase germination. In soil, some seed can remain viable for up to10 years. Seeds soaked in water can remain usable for at least 5 years.

Economic Uses

St. John's wort has not been proven yet as an anti-depressive plant. Homeopathic medicine and tinctures are made from the flowers and leaves. St. John's wort is highly consumed in Europe and is coming into fashion here in the United States. Future studies of St. John's wort may progress the plant to a higher economic status.

Notes

St. John's wort is also known as common goatweed or klamath weed. The native range for St. John's Wort was in Asia, Europe, and North Africa. It was introduced to North America in 1696 for its medicinal and ornamental properties. In 1893 it was recorded on grazing land in the west and is now growing in most of the greater 48 United States. In Montana alone, St. John's wort covers less than half a million acres.

Sugar Maple *(Acer saccharum* Marshall*.)*

Description

Sugar maple grows 75 to 100 feet tall and 2 to 4 feet in diameter. Trees grown in crowed woods have a long, branchless trunk with narrow crowns. Trees grown in the open have trunks that branch near the ground, forming crowns that spread 60 to 80 feet. The bark on young trees is dark gray, but as the tree ages the bark develops rough vertical grooves and ridges and may appear dark brown. The leaves are opposite of each other and are 3 to 6 inches long with 5 rounded lobes. The clusters of small flowers are light yellow-green, hanging from a long, slender (1-3inches) stem appearing with the leaves in the fall. The sugar maples seldom flower until they are at least 22 years old. The fruit is horseshoe shaped and matures in the fall. The sugar maple is the largest and most abundant American maple.

Habitat

Sugar maple in North America extends from Nova Scotia and Quebec at its northern edge, west to Ontario, southeastern Manitoba, and western Minnesota, south to southern Missouri, and east to Tennessee, and northern Georgia. It grows best in areas with cool, moist climates. Sugar maple can survive in a wide variety of sol types. It grows on sands, sandy loams, loam's, and silt loam. It grows on soils ranging from strongly acidic to slightly alkaline. Sugar maple is often associated with beaked hazel, redberry elder, American elder, red raspberry, blackberries, spring beauty, and jack-in-the pulpit.

Management Considerations

Sugar maple is rated as very tolerant of shade, exceeded among hardwoods only by a few smaller species. Even-age and uneven-age silvicultural systems are available for managing stands in which sugar maple is a principal component and desired species.

A sugar maple stand managed for the production of maple sap requires a different type of stand than that desired for timber production. For the production of maple sap the following characteristics should be considered; leaves exposed to direct sunlight, large stem diameters, and wide, deepcrowns. Therefore, in a closed stand heavy thinning is recommended.

A good sawtimber stand of sugar maple has trees with tall, straight stems and no branching below the growing crown. In dense stands of sugar maple the inferior trees need to be removed with out promoting open grown characteristics in the remaining trees.

Harvesting

The sugar maple is an economical importance both in the production of maple syrup and as a timber species. Natural regeneration through seed establishment and prolific sprouting is generally successful in replenishing the amount of growing stock in a stand even after heavy cutting. The harvesting season for the syrup can last anywhere from four to six weeks. Maple trees should be approximately 12 inches in diameter before they can be tapped. The sugar content of the sap is higher in late winter then late fall, so it is recommended to be harvested in February and early March. It is harvested in late winter because of the rising temperatures that creates pressure within the trees, which causes the sap to run.

Propagation

Sugar maple is propagated from seeds. The seeds have an extremely high germination rate, with averages of 95% or more. For germination to occur the temperature must be slightly above the freezing point and not any warmer then 50 degrees. The seed develops a very strong radicle that has the strength and length to penetrate heavy leaf litter. The seeds can be harvested green and sown immediately. When large enough to handle they need to be planted into individual pots and then transplanted into their permanent positions when reaching 20cm or more tall.

Economic Uses

Sugar maple is used in the production of maple syrup and timber. The wood is one of the hardest of the maples and is highly valued for the making of furniture and flooring. Bowling alleys and bowling pins are commonly manufactured from sugar maple. The sugar maple is a favorite street and garden tree, because it is easy to propagate and transplant.

Notes

The sap is mostly water (97% on average) and contains a small amount of natural sugar. The sap is collected and boiled to evaporate much of the water, concentrate the sugar content, and to produce the characteristic maple flavor and color.

Swamp White Oak *(Quercus bicolor)*

Description

A member of the Beech family, swamp white oak is a long-lived, fast growing species that can reach up to 70 feet in height and 2 to 3 feet in diameter. Its native range extends from Quebec into eastern Kansas, and can be found growing throughout most of the northern half of Missouri. Its botanical name is based on the two toned appearance of the foliage, which is a glossy dark green above and nearly white beneath. Another distinctive feature of this species is that it bears acorns on very long (3-5 inch) stalks.

Habitat

Swamp white oak can be commonly found growing with other species such as red maple and pin oak on more acidic soils that are very poorly drained. It is known to be tolerant of flooding even when young. It will also grow well on many soil types once established including upland sites and can be found in association with bur oak on such sites. Swamp white oak can be transplanted rather easily, and is relatively fast-growing especially when young. Maximum growth rate will be achieved when it is planted in full sunlight.

Management Considerations

Swamp white oak is intermediate in tolerance and seedlings can become established under moderate shade. As the tree matures, it will develop a high quality, straight bole with a narrow crown if grown in a forested condition. In contrast, open grown trees will normally produce a short bole with a broad, spreading crown. Lower branches tend to be persistent and will require pruning to improve stem quality.

Major risks to managing swamp white oak include its susceptibility to a number of defoliating insects and diseases, including Gypsy moth, oak anthracnose, and occasionally oak wilt. The loss of swamp white oak acorns due to insect and disease predation, especially in poor seed years, is an ongoing problem in the Missouri.

Swamp white oak can also used in landscape plantings, especially in urban areas where it can tolerant of both poor soil conditions as well as air pollution. It produces a large crop of acorns every 3-5 years, and this seed production is normally initiated at a fairly young age in comparison to other native oaks in Missouri. Therefore, this species is an excellent food base for whitetail deer, wild turkeys, woodpeckers, sapsuckers, wood ducks, squirrels and other small rodents.

Harvesting Considerations

Swamp white oak is similar to other oak species in terms of its growth and development. In general, white oaks reach economic maturity when they are about 16 to 22 inches in diameter at breast height depending on the quality of the

site. It will take 60 to 90 years to produce such trees on good sites and 90 to 120 years on poor sites.

Propagation

Swamp white oak is easily planted and transplanted. It is normally propagated by seed. Like other oaks, swamp white oak acorns can quickly loose viability if allowed to dry out. Timely collection of sound acorns that are fall free from their caps is of paramount importance. Newly collected seeds should be soaked in water overnight to insure their soundness. Defective acorns will float and can be discarded. Floated seeds can be stored in plastic bags in the refrigerator and sown in the very early spring, or can be directly sown following collection. If sown outside seeds should be protected from mice, squirrels, and other rodents. The seedling tree produces a fairly fibrous root system, which allow for improved transplanting success rates. If started in a nursery bed they should not be left there for more then two growing seasons.

Economic Uses

The wood of swamp white oak is of high quality and is normally labeled as white oak. It is used for furniture, cabinets, high quality veneer, and barrel staves. Poorer quality wood products would include fuel wood and fence posts.

White Oak *(Quercus alba)*

Description

Tall deciduous tree can grow 80 to 120 ft tall with a straight trunk and rounded crown. Its native range extends from southern Maine to east Texas. Some individual trees may exhibit fine fall colors of yellow, red, or purplish brown. Acorns ripen in autumn (September to October) of the first year and occur solitary or in pairs and do not require cold treatment before germination in late autumn.

Habitat

White oak occurs throughout Missouri over an array of sites from dry ridges to ravine bottoms. While it is found on many types of soils, white oak exhibits its best growth is on higher bottomlands where soils are deep and moist, with good internal drainage. It will commonly be found with hickories, other oaks, basswood, white ash, and black cherry. It is also known for forming even-aged stands after clear-cutting.

Management Considerations

In agroforestry applications, white oak can be used in alley cropping, silvopasture, windbreaks, and forest farming. With white oak's broad spreading crown, pruning or thinning of the stand will be necessary to sustain the light requirements of the ground vegetation in alley cropping, silvopature, and forest farming applications. Growers need to be aware of its tendency to sprout from the trunk when it is opened up to light after a pruning or thinning. Sprouts are a defect in the timber quality. White oak has an intermediate shade-tolerance becoming less tolerant with age, having best growth in full sun. Blue jay, woodpeckers, wood duck, wild turkey, ruffed grouse, bobwhite quail, mice, squirrels, raccoons, and white-tailed deer eat the acorns.

Major risks to managing white oak include its susceptibility to a number of defoliating insects and diseases, including Gypsy moth, to which it is especially susceptible. Other pest problems include oak anthracnose, and rarely, oak wilt. The loss of white oak acorns due to insect and disease predation, especially in poor seed years, is an ongoing problem in the Missouri.

White oak is a relatively slow growing in comparison to other Missouri white oak species such as bur oak and swamp white oak. Good site selection will expedite the time to harvest of this long-lived tree. The terminal buds may need to be protected from livestock a year or two longer than faster growing species. Wind damage is rarely a concern, as white oak is known for strength from its deep roots to its strong limbs.

Harvesting Considerations

White oaks reach economic maturity when they are about 16 to 22 inches in diameter at breast height depending on the quality of the site. It will take 60 to 90

years to produce such trees on good sites and 90 to 120 years on poor sites. Allowing white oak to reach 19 inches or greater can create a sizable jump in price due to the ability of the mill to saw it differently or veneer the wood.

If white oak is desired to replace harvested or dead oaks in forest farms or windbreaks then large enough openings (greater than ¼ acre) must be created with adequate light to fulfill the relatively shade-intolerant white oak seedlings/sprouts. White oak, unless very old, will sprout from the stump after harvest. Replacement may be as simple as choosing which stump sprout to leave. Seeds in the forest seedbed should not be relied upon to regenerate oak, due to shading and moisture limitations that can dramatically impact seed regeneration success rates of this species.

Propagation

White oak trees are normally propagated by seed. Like other oaks, white oak acorns can quickly loose viability if allowed to dry out, especially since the acorns will readily germinate immediately after seed fall. Therefore, timely collection of sound acorns that can easily be removed from their caps is of paramount importance. Newly collected seeds should be soaked in water overnight to insure their soundness. Defective acorns will float and can be discarded. Floated seeds can be temporarily stored in plastic bags in the refrigerator prior to sowing. While root elongation rates will be somewhat retarded if the seeds are place in the refrigerator, this root development cannot be arrested until spring. As a result, the acorns must be sown immediately and protected from mice, squirrels, and other rodents. Most seedling trees will produce a moderately fibrous root system, which allows for improved transplanting success rates. If started in a nursery bed they should be grown as a two year old seedling prior to outplanting.

Economic Uses

White oak is a very valuable timber species. Its wood is second only to black walnut in value. It is used for interior furnishings, veneer, cabinets, flooring, general construction, pallets, fence posts, railroad ties, fuel, and tight cooperage. Numerous overseas markets have a high demand for white oak. Some of the most important white oak exports from the Midwestern U.S. are used for high quality veneer and staves for wine barrel manufacturing.

Wild Plum/American Plum *(Prunus americana)*

Description

Grown as a shrub, wild plum has alternate leaves that are 2 – 4" in length. The full height can vary from 3 feet in the form of a shrub to over 20 feet when the plant is pruned as a tree. The twigs can appear spine like when the leaves have been dropped and the new buds for the coming season are present. In the early spring, before the leaves appear, fascicles of white flowers in groups of 2-5 are found at the end of spine like branches.

In the fall, red drupes form at the end of the spines. the size of the drupes can range from .5 cm to 2 cm in length and have a circumference of .5 to 1 cm. The drupe, or plum, has a thin edible layer on the outside and the inside is made up of a yellow, edible fleshy core that surrounds a cluster of hard, round seeds.

Habitat

Wildly distributed across America, the natural range of wild plum stretches from Maine all the way out to Arizona and has a wide range of habitats from dry sites to marsh areas. Even though this species can live in a range of habitats, it seems to do the best in areas that receive adequate amounts of rain during the early to late spring and possess soils that are well drained. With these well drained soils, wild plum can thrive in all three soil types (clay, silt, and sand).

In respect to what aspect the species should be planted on, the wild plum can thrive on all four aspects and can thrive on any part of a slope ranging from the shoulder all the way to the foot of a hill. Temperature wise, the wild plum can handle severe summer droughts and mid-winter blizzards. Even though the species can take a beating from Mother Nature, it will not handle repeated years of such abuse.

Management Considerations

Wild plums are the "mustangs" of the Prunus family. they are able to care for themselves and do not require constant attention from the landowners. With this said, wild plum would make a great addition to areas that are isolated from the rest of the homestead or are remote and hard to access via roads or trails. This species is also ideal for landowners who do not have enough time to devote to watering, weeding, or pruning the trees on their land.

In agroforestry settings, wild plum can be used in windbreaks, alleycropping, and riparian buffers. In a silvopasture setting, wild plum may be used, but be warned that the seeds can be toxic to livestock when consumed in large numbers. Also in consideration with silvopasture, the wild plum use to be used as a hedge between property boundaries due to the thick spines that are found on the branches.

For hunters, wild plums can act as shelterwood for many species of game during all four seasons. Along with providing shelter, the fleshy fruit and seeds can act as a food plot that would attract game to an area, especially during hunting seasons.

Harvesting Consideration

Due to the lack of height obtained at full growth, wild plum is not a timber tree. With this said, the small amount of wood that is produced from a grown tree can be sold in the niche market of wood carvers and other individuals who enjoy carving trinkets out of wood. However, with the beautiful flowers that are produced in early spring, these limbs may be harvested and sold to a local florist and be used in arrangements of flowers. The only drawback would be the spines and the danger of someone hurting themselves while harvesting the limbs or moving the floral arrangement around.

Propagation

A very aggressive sucker sprouter, wild plum is also a good species that propagates rather easily through grafting. Along with grafting, transplanting seedlings and saplings is very common and will cause no harm to the root system after the transplant has been complete.

Economic Uses

Wild plums are best know for being edible and besides eating the plum right off the tree, many people enjoy jams, pies, and turnovers with fresh picked plums. Along with these traditional ideas, wines, dried plums, and potpourri can be crafted from the fruits. Native Americans would boil the bark to produce a mild tea that was used to ward of colds, help fight diarrhea, and ease kidney or bladder aliments.

For medical purposes, medical research has been conducted using wild plum twigs as an ingredient in help people with asthma and other breathing problems. Many scientists believe the chemical cyanide or prussic acid that is found in the tree has the potential to help fight against lung diseases, influenza, and digestive problems that occur within humans and possible animals as well.

Additional Resources

North Carolina State University. http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/trees-new/prunus_americana.html

Oklahoma University. http://www.biosurvey.ou.edu/shrub/prun-ame.htm

Plants For a Future. http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Prunus+americana

United States Forest Service. http://www.fs.fed.us/database/feis/plants/tree/pruame/

Witch-Hazel *(Hamamelis virginiana)*

Description

Witch-hazel is an intermediate growing, coarse-textured, broadly rounded shrub with a short trunk and numerous crooked branches. It can grow into a 5 to 15 feet tree with a trunk diameter of up to 10 inches and a large, open crown. The smooth thin bark is light brown, developing rough patches and becoming scaly as the tree ages. The slender brown zigzag twigs arise from forked flexible branches. The alternate leaves emerge from scaleless, stalked hairy buds. The leaves are oval to nearly circular in shape, and irregularly round-toothed along their wavy edges. The leaves are 2-6 inches long, nearly as broad, and have 5-7 prominent veins. The upper surfaces are usually smooth, but both sides of the leaf may be hairy and the veins typically are. The leaves are a medium green above and paler below during the growing season, then turn a clear yellow in the fall. The fruits are hairy brown, half-inch oval capsules. After ripening the following summer, they split open explosively and shoot small shiny black seeds up to 30 ft in all directions. There are two botanical varieties of witch-hazel: the widespread *H. virginiana* variety *virginiana*, and the "prairie peninsula" form, *H. virginiana* variety *parvifolia*. There is also a horticultural cultivar called 'Rubescens' which has reddish flowers.

Habitat

(USDA Zones 3 – 9).

Witch-hazel is currently found in the Eastern half of the United States and Canada (and is a Missouri native). It occurs in a wide variety of wet to dry woodlands, growing on bluffs, steep ravine slopes, floodplains, and along boggy or rocky streams. It is commonly found along forest edges, often between the dry uplands and the wet slope forests. It sometimes forms a near continuous under story beneath the canopy on rich old growth sites. Vernal witch-hazel (*Hamamelis vernalis*), which is found in the wild only along rocky streams in the Ozarks, blooms in late winter to early spring.

Management Considerations

Although the most beautiful specimens are found on deep rich soil, witch-hazel is generally content with an ordinary sandy loam with moderate fertility. This species prefers a neutral to slightly acid soil pH, but will tolerate somewhat calcareous soil if it is kept moist. This is a mid- to late-successional species with a moderate growth rate. It is low in fire resistance due to its thin bark, shallow roots, and low branching habit. Witch-hazel prefers sun, but tolerates shade. Plants grown in heavy shade will have a more open form and less intense fall color. This shrub is shallow rooted and does not tolerate drought well, and thus can be hard to establish.

Witch-hazel can be used in a variety of agroforestry applications including alley cropping, forest farming, windbreaks (and to increase diversity of the forest).

Propagation

In the wild, reproduction is primarily from seed. The mature capsules burst open explosively discharging the seeds up to 30-40 feet from the parent plant. Some seeds are dispersed by birds. Witch-hazel seeds should be harvested as soon as the fruits mature in late summer to early fall and sown promptly. Fresh seeds may take up to 18 months to germinate. Seeds allowed to dry on the plant or stored after maturity will require two months of warm stratification, then one month of cold, followed by another two weeks warm and another four months cold - then a long wait for germination. Scarification may improve germination speed and percentage. When the seedlings finally appear, pick them out of the ground and place them into pots in a greenhouse for over wintering. They can be planted out late the following spring and will reach flowering size in about six years. Witch-hazel suckers freely and also can be propagated by layering in early spring or fall. Layering works well, but the process will take a year. Softwood cuttings can be rooted under mist in the summer. Volunteer seedlings can also be potted up and transplanted. It is also possible to purchase seedlings from nurseries.

Economic Uses

Beyond use as a shrub for wildlife, witch hazel has long been recognized as a healing herb. Its primary uses were for skin disorders, having astringent and anti-inflammatory properties. Both leaves and bark have been used. Use of herbal products may also cause adverse reactions in different people. So, find a good book explaining benefits and cautions that should be exercised prior to use of witch hazel. It can however, be stored as an alcohol extract for sale.

Additional Resources

http://www.floridata.com/ref/h/hama_vir.cfm

http://www.herbalgram.org/bodywise/herbclip/pdfs/101283-150.pdf