Cottonwoods

A study of cottonwood trees in the Mississippi National River and Recreation Area and best planting practices

By Maria DeLaundreau

Acknowledgements

Thank you to our partners: National Park Service, City of Saint Paul Natural Resources Division, Minneapolis Park and Recreation Board, and Plantra.

Additional thanks to the volunteers who have donated their time to this project.

Special thanks to:

THE McKNIGHT FOUNDATION

MORTENSON FAMILY FOUNDATION

National Fish and Wildlife Foundation

Plantra.

Photos courtesy of the National Park Service and Mississippi Park Connection, unless otherwise stated. Design and layout by Amy Miller.

Table of Contents

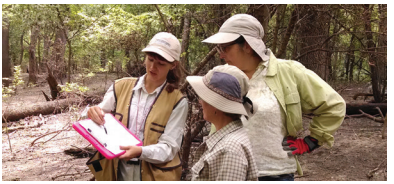
About the Project

In response to research conducted by the National Park Service, Mississippi Park Connection began studying cottonwood tree regeneration and how to best plant them in 2013. This report is designed to share what we have learned about cottonwoods along the river and how to plant them.

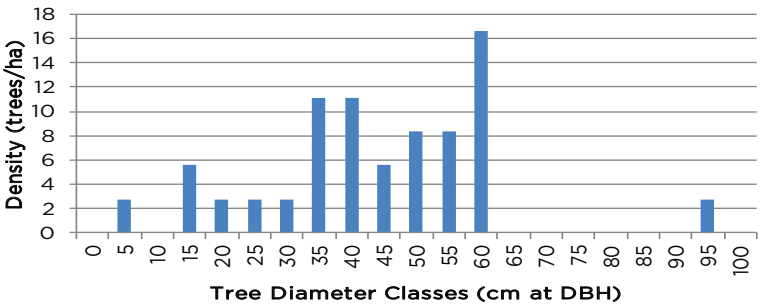
To start, we learned that there are many large, mature cottonwoods approaching the end of their lifespan, but few young ones growing to take their place in the forest canopy. The National Park Service did not find any young cottonwoods in their 2011 vegetation survey of the Mississippi National River and Recreation Area. This trend has also been observed by many other scientists studying rivers in the United States.

Cottonwood seeds covering the ground of a floodplain.

In a 2015 survey of the areas most suitable for cottonwood regeneration within the national park, seeds and germinants less than half a centimeter tall were found abundantly in early spring.



As the season progressed, nearly all of the germinants died. Only one transect had seedlings bigger than 15 centimeters tall. These seedlings were growing with bush willows on an island shore in Pig's Eye. The fact that neither the 2011 or 2015 vegetation surveys were successful in finding many young cottonwoods underscores the importance of helping these populations by planting these trees in the floodplain.

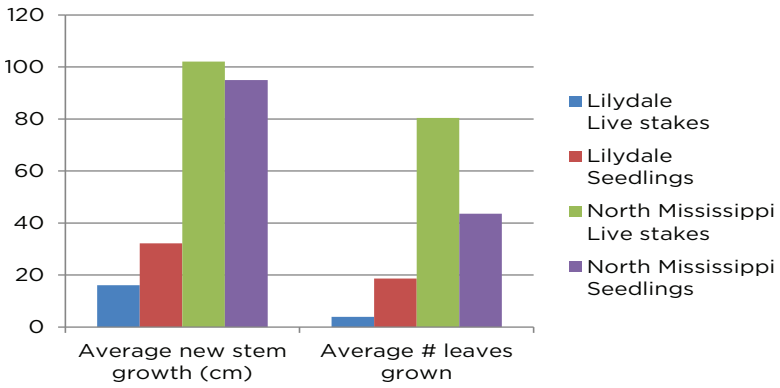


Few young cottonwoods were found in the floodplain.

Cottonwoods may not be reproducing for a number of reasons including changes in the intensity and timing of floods and increased browsing by animals, such as deer and beaver.

Since cottonwoods are vital to the health of the floodplain ecosystem, we investigated the best locations and techniques for planting cottonwoods along the river to help their populations.

We used the methods outlined in this manual to plant cottonwoods at two different sites, Lilydale Regional Park in Saint Paul and North Mississippi Regional Park in Minneapolis. Lilydale trees were mostly planted in a forest opening that had silty soil and received partial sun. North Mississippi trees were in a silty loam and received full sunlight. Both had been disturbed recently. The site at Lilydale had several trees fall, making a gap in the canopy, and received flooding that killed ground layer plants. North Mississippi's planting location was the site of a tornado in 2011, which cleared the area of larger trees and brush.



Trees recieving full sun at North Mississippi performed better than those planted in canopy gaps at Lilydale.

At both locations, we cleared space for seeds to fall, and planted live stakes and bare root seedlings. Seeds did not grow in either location, so we recommend using other propagation methods. We found that the live stakes performed much better with full sun than partial sun. The fenced live stakes at Lilydale had 13% survivorship vs. North Mississippi's 42%, and the live stakes at North Mississippi became much taller and grew more leaves than those at Lilydale.

Nearly all seedlings survived their first year, as long as care was taken not to damage them while tending to the plantings, so in this regard they may be worth the investment. In the ideal conditions present at North Mississippi, there was little difference between the average amount of new stem growth in seedlings and live stakes, though the number of leaves grown was greater on live stakes. In partially shaded sites, the investment in seedlings may be worthwhile, since these performed better than live stakes in survivorship, new stem growth, and number of leaves grown.

Value of Cottonwoods:

Cottonwoods are critical to the floodplain forest ecosystem. They provide benefits to wildlife, plants, water, and air, including:

- Preferred nesting tree for bald eagles
- Provide nesting for many birds, including woodpeckers, owls, herons and song birds
- Protect bees with antimicrobial resin
- Facilitate forest succession in floodplains
- Reduce sediment load and erosion in rivers
- Increase water quality
- Shade water and reduce water temperature
- Enhance fish habitat
- Sequester carbon from the atmosphere
- Filter pollutants out of the air

Cottonwood Planting:

To help planting partners be most successful in establishing healthy cottonwood stands, Mississippi Park Connection spearheaded efforts to learn more about optimal site selection and planting techniques.

Ideal planting sites include large, open areas near water.

Site Selection:

Cottonwoods are specially adapted to grow in dynamic floodplains. Plantings will grow best in areas that retain many characteristics of the floodplain, including:

- Full sun
- High water table
- Bare sand or other soils (often disturbed)
- Space to grow large (mature trees often grow 100’ tall, 6’ in diameter with a 75’ canopy width)

⚠ Caution: Planting in an area with deer or beaver activity will require protection from browsing.

Using cottonwoods to control weeds:

Cottonwoods need to be shielded from weeds to grow optimally, but they can also be used to control weeds, such as invasive reed canary grass. Research has shown that if cottonwoods taller than the surrounding reed canary grass are planted, they will shade and control the invasive grass. Alternatively, shorter cottonwoods can be planted, but then the weeds around them will have to be controlled until the cottonwoods surpass the weeds in height.

Depending on the site selected, little site prep may be required.

- Ensure that there are no or few weeds that will shade the trees.
- Tubing will protect young trees from browsing and may also improve the growth of trees.
- If not putting tubing around trees, installing fencing to protect them from deer and beaver is recommended.

What to Plant:

There are several kinds of cottonwoods available for planting. The main types are defined below.

Definitions:

Live stakes: cuttings from trees or shrubs that when planted become independent clones of the parent material. Often this is the cheapest option.

Bare root: developed trees transplanted with no soil around the roots. This option is becoming very popular due to high value.

Balled & burlapped: developed trees dug up from the ground with the soil around the roots intact. Roots and soil are covered with burlap to hold soil and moisture in.

Container: developed trees grown in containers, often made of plastic. These trees are often at risk of being root bound and may require root pruning.

	Advantages	Disadvantages
Live stake	• No roots to disturb • Cheap • DIY option • Compact • Volunteer opportunity	• Require storage, if cut yourself • Lower survival rate
Bare root	• High survival rate • Compact • Easy to transport	• Disturbs roots • Higher risk of dried roots
Balled & burlapped	• High survival rate • Roots in soil • Often larger trees	• Disturbs roots
Container	• High survival rate • Roots fully intact	• May require root pruning

Cottonwoods trees are either male or female. When planting in natural areas, keep in mind that natural populations tend to be 50% female and 50% male trees.

It is also important to consider the source of your cottonwood trees. For restoring natural areas, it is best to use local unhybridized propagates. Check with state, county and local natural resources departments to see if they have tree sales coming up. Some commercial nurseries will also have unhybridized cottonwoods, but you will have to ask to ensure that they are natural varieties.

How to Plant:

An easy and effective way to help cottonwoods do well where you want to plant them is to mimic the conditions where they might grow naturally. The following steps are informed by cottonwood biology.

Each propagation method needs to be planted differently. Planting protocols are outlined below.

Preparation:

Live stakes: You can collect your own live stakes either within 24 hours of planting or in winter when the tree is dormant. Find a young cottonwood that has a diameter the width of your thumb. Use a lopper to cut the tree down near the base. Use a hand pruners to cut small branches and twigs off of the main stem. Use the lopper to cut the main stem into 2-foot segments. Paint the top side of the stem to keep track of the cutting's directionality.

Collection of live stakes and soaking prior to planting.

Repeat as necessary until you have as many live stakes as desired. If collecting within 24 hours, leave the cuttings vertically with the painted top pointing upward in a bucket with water not more than half submerging the stem. If collecting during dormant season, bundle the live stakes (keeping the painted tops on the same side of the bundle) and store in a damp burlap bag in cold storage. Plant live stakes before June 15.

Bare root: Carefully untangle roots and soak the roots in water for 3-6 hours. Keeping roots moist-wet is critical, so it is advisable to keep them in water while preparing the hole the tree will be planted in.

Container: Containerized trees will need to be checked to see if they have circling roots. If so, gently remove the tree roots and soil from the pot and use a soil knife to cut into soil about ¼ inch in lines that divide the potted area into quarters along the sides and bottom of the compacted soil. Then gently pull outer roots away from the center of the plant to encourage them to grow outward. Follow directions below to plant the tree in the ground.

Balled & burlapped: Cut the wire and burlap from the root ball once the tree is placed in the ground. Follow directions below to plant the tree in the ground.

Installation:

Live stakes: Live stakes should be ⅔ buried perpendicularly in the ground, not less than ½, with the top painted end out of the ground. If you are planting 2 foot live stakes, only 8-12 inches of live stake should be above ground. Hammer a piece of rebar the same width as the live stakes into the ground 12-16 inches. Insert the live stake. Water and press the earth around the live stake. Roots will not form in air pockets, so firmly pressing soil around it is critical. Expect 20-30% of live stakes to grow and 70-80% mortality.

Container, bare root and balled & burlapped:

1. If you have access to a rototill, till an area five times the diameter of the tree's soil and as deep as the soil the tree comes with.

2. Dig a hole with sloping sides 2-3 times as wide as the roots and just as deep as the tree's soil.

3. Set the tree in the center of the hole. Check the planting depth to make sure the root collar is just above ground level; if it is not, change the hole depth to align the root collar appropriately.

4. Once the tree is in position, remove the wire and burlap.

5. Firmly pack the dug up soil around the roots while ensuring the tree remains straight and that

there are no air pockets around the roots. Keep adding and packing soil until the soil level is just below the root collar.

6. Water the tree until all the water has seeped into the ground.

7. After water has seeped into the ground, spread 2-4 inches of mulch around the tree in a donut shape that is as wide as the area of backfilled soil. Keep the mulch 4 inches away from the trunk of the tree.

Volunteers planting containerized trees and watering.

⚠ Caution: Wood nettles (*Laportea Canadensis*) commonly grow in floodplains. Be sure to wear protective gloves and coverings when working.

First year maintenance:

- Remove tags and labels from the tree
- Protect trees with tubing or fencing
- Water generously every 7-10 days
- Prune broken or dead branches

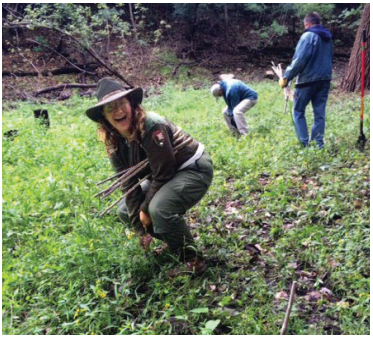
Protecting your trees:

Browsers such as deer, beaver, and voles all browse on cottonwoods, especially when the trees are young. To protect the investment you've made in your young trees install either fencing or tree tubes. Putting up fencing that is sized appropriately to the browsers in your area will keep them out. Tubing is another way to block browsers and this technology, depending on the tube, may have other benefits for a young tree as well.

How to incorporate volunteers:

Volunteers can be incorporated into almost every step of this process, and often find planting and caring for cottonwoods particularly rewarding.

- Cutting/preparing live stakes for storage
- Planting the young trees
- Monitoring trees during the growing season
- Watering



About Mississippi Park Connection

We are the nonprofit partner of the Mississippi National River and Recreation Area.

Mississippi Park Connection provides opportunities for people to get to and on the river – and have a national park experience in the Twin Cities. We do this through youth education, community engagement, and environmental stewardship programs that connect people to the Mississippi River's only national park.

Mississippi Park Connection has enabled the park to lead these programs throughout the corridor, from wildlife monitoring to shoreline restoration to formal education. The National Park Service provides the leadership to bring together the many organizations in our community dedicated to specific facets of the Mississippi River. By providing support for the park and its partners, Mississippi Park Connection boosts the activities of all of the park's partners, thereby increasing community engagement in the Mississippi River watershed.

Mississippi National River and Recreation Area Map

Photo by Jim Campbell-Spickler

MISSISSIPPI PARK CONNECTION

Discover your river

NATIONAL PARK SERVICE