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Forest & Wildlife Research Center
July, 1997 • Volume 2, No. 4

WETLAND RESERVE PROGRAM

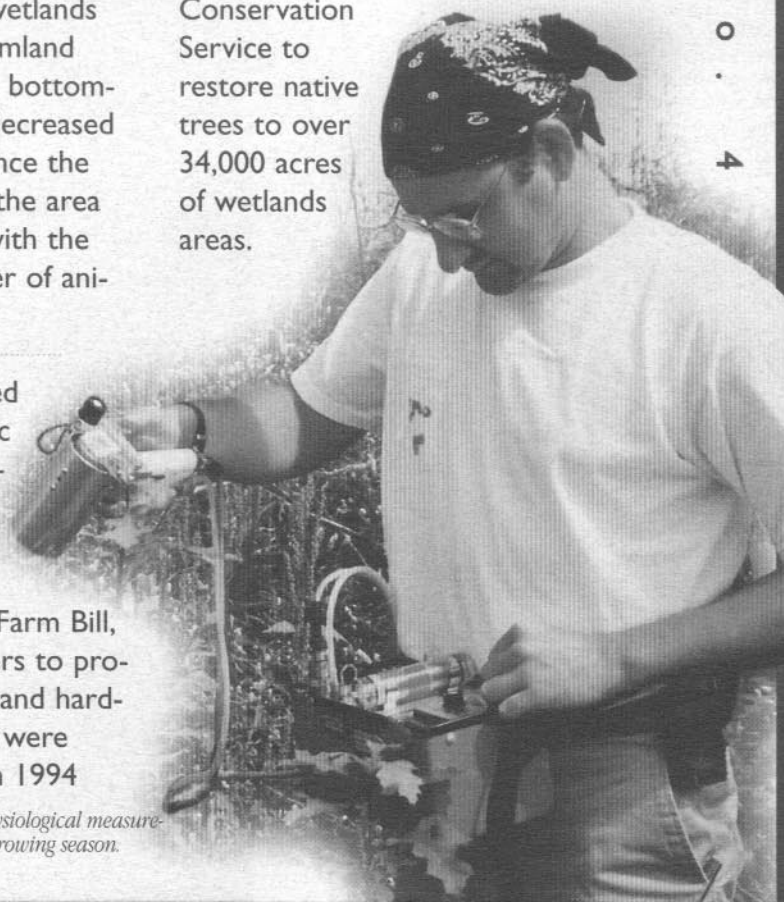
The Mississippi Delta has a rich and colorful history, with often-romanticized tales of wealth and extravagance, strangely at odds with the wailings of poverty and loss in the songs of Delta bluesmen. The two ends of the spectrum are symbolic of life with the Mississippi River. The river can either be a friend or a foe, depending on the season. Since the Mississippi River floods its banks frequently, those left in its delta will either reap benefits or suffer destruction. While the moisture from the river is essential to crops such as cotton and soybeans, it can be devastating to areas which retain too much moisture for crops. These farmed wetlands could be termed "wasted lands" because little can be gained from them ecologically or financially in their present state.

Nuttall oak planted in December 1995 in the Winter/Spring No Crown flooding regime.

RESEARCH

Previous research indicates that a major factor in the Delta's wetlands problem is the lack of bottomland hardwoods. The amount of bottomland hardwood forests has decreased approximately 50 percent since the Europeans began settling in the area over a century ago. Along with the dwindling forests, the number of animal species also declined.

Reforestation in these farmed wetlands provides economic help through timber production and hunting and fishing revenues. Additionally, the Wetlands Reserve Program, established under the 1990 Farm Bill, provides incentives to farmers to protect and reestablish bottomland hardwood forests. Mississippians were allocated over $15 million in 1994 and 1995 by the Natural Resources Conservation Service to restore native trees to over 34,000 acres of wetlands areas.



Parker Day, graduate student, recording physiological measurements on Nuttall oak seedling during 1996 growing season.

Sharkey Research Site on Yazoo National Wildlife Refuge inundated during the early growing season.

Sharkey Research Site after levee construction completed with the Winter/Spring Flooding regime adjacent to the No Flooding regime.

Mississippi State University forestry students laying out the research planting sites with flags in order to relocate the seedlings during the 1996 growing season.

The goal of the Wetlands Reserve Program is to restore 975,000 acres of wetlands across the nation by the year 2002. Under the guidelines of the program, landowners may recoup up to 100 percent of their cost of restoration depending on the number of years landowners allow for easements. In Mississippi, wetland restoration will consist primarily of restoring bottomland hardwoods and reversing all in-field drainage systems currently in existence.

With a need to replant, and the funds to do the work, farmers first need to establish the answers to some basic questions, such as: What should I plant? When should I plant? Should I plant from seed or seedling? These questions are made more difficult to answer when faced with the effects of flooding.

In order to answer these questions, graduate student C. Parker Day III, under the advisory committee of Forestry Professor Dr. John D. Hodges, and Associate Professors Dr. Keith Belli and Dr. Stephen H. Schoenholtz, entered into researching red oak reforestation in farmed wetlands. In particular, the two species of red oaks studied were the Nuttall oak and the willow oak. Both species are naturally occurring in the area. Would one species be more successful than the other, given such variables as flooding times and planting times? The research was begun five miles from the small Mississippi Delta town of Anguilla, in Sharkey County. A tract of land, known as the Sharkey Research Site, owned by the U.S. Fish and Wildlife Service was divided into four flooding regimes in order to mimic conditions imposed by flooding at various times of the year. Levees were constructed to create these separate zones:

1. No flooding- The only water received was from precipitation.
2. Winter and spring flooding- This zone was flooded, but not past the crown of the seedlings, January 20- May 10.
3. Winter and spring flooding- This zone was flooded at the same time, but with the crown inundated.
4. Spring flooding- This zone was flooded May 10-25, after trees had started to grow.

Seedlings of both species were planted in each zone. Seedlings were chosen over seeds, because in most cases their rate of survival is much greater. The seedlings were planted in December 1995 and March 1996.

Measurements of the seedlings were made for survival, height, and diameter. Physiological responses were recorded as well. Trees were graded for photosynthesis, stomatal conductance, transpiration, and water potential. These measurements would help determine which species would be more successful, the willow oak or the Nuttall. Of course, weather conditions were closely monitored.

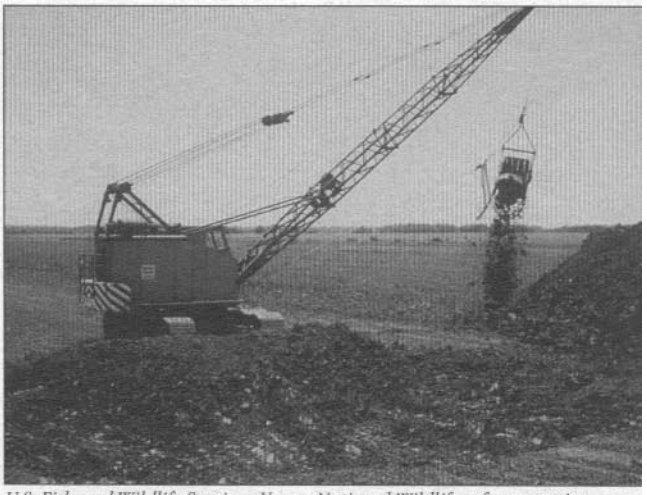
While the data are being compiled and interpreted, some results seem to already be clear. The Nuttall oak planted in December performed the best in all zones,but especially the no flooding zone, posting an 87.7 percent survival rate. It grew an average of 11.8 centimeters in height and 2.0 millimeters in diameter.

In the no flooding regime, Nuttall planted in March and willow oak planted in December also fared well, with survival rates of 74.8 percent and 82.0 percent respectively. March planting of willow oak in the no flood zone started out well, but finished poorly by the end of the season, with a disappointing 41.1 percent survival rate. Results for the March planting of willow oak in the winter and spring flood zones were even more dismal, with an average survival rate around 30 percent, and minimal growth figures recorded.

The least productive zone was the spring flooding regime. Both species were forced to endure a second round of leaf production, making it difficult for photosynthesis to occur. The energy it took to undergo photosynthesis was sapped by the hot, drying Mississippi summer sun. However, the Nuttall planted in December managed an 80.3 percent survival rate with minimal growth even in these conditions.

Floyd Wood, a State Biologist with the Natural Resources Conservation Service, is also using the site for his agency's independent study of direct seeding. When both studies are completed, comparisons will be made which will make the findings more reliable.

Results from these studies are timely since the Federal Wetlands Reserve Program is releasing $386 million in 1997 to farmers for reforestation projects in wetlands across the United States. Not only will the program put money into farmers' pockets, but given the right information about planting, farmers can have successful hardwood crops. While the crops are growing, the diversity of animal life will increase, and the property will be more esthetically pleasing. Hardwoods may take longer to mature, but with this research and federal money in hand, Delta farmers won't have to be singing the blues.



U.S. Fish and Wildlife Service - Yazoo National Wildlife refuge creating levees for flooding regimes during summer of 1995.

Aerial view of Sharkey Research Site on Yazoo National Wildlife Refuge before levee construction illustrating a farmed wetland that was formerly in soybean production.

Mississippi State University forestry students planting Nuttall oak seedlings and willow oak seedlings at the Sharkey Research Site in December 1995.

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FWRC-FO-34

Measurement Data for Seedling Performance at End of Growing Season

Table 1

Summary of Nuttall and willow oak seedlings planted in December 1995 and March 1996 in the No Flooding, Winter/Spring Crown, Winter/Spring No Crown, and Spring Flooding regimes.

Survival (%)	63.6
Height (cm)	36.1
Height Growth (cm)	-3.6
Height Change (%)	-0.5
Diameter (mm)	5.9
Diameter Growth (mm)	0.8
Diameter Change (%)	15.5
Leaf Area (cm^2)	2,351.6

Measurements for Nuttall oak planted in December 1995 per Flooding Regime

Table 2

Flooding Regime	Leaf Area(cm^2)	Survival (%)	Root/Shoot	Height Growth (cm)	Diameter Growth (mm)
No Flooding	4,385.0	87.7	2.2	11.8	2.0
Winter/Spring Crown	2,951.0	78.5	2.1	-1.4	-0.1
Winter/Spring No Crown	4,002.4	84.6	1.5	8.3	1.5
Spring Flooding	2,767.3	80.3	1.8	0.1	1.7

Measurements for willow oak planted in December 1995 per Flooding Regime

Table 3

Flooding Regime	Leaf Area(cm^2)	Survival (%)	Root/Shoot	Height Growth (cm)	Diameter Growth (mm)
No Flooding	2,367.9	82.0	1.8	-4.1	0.2
Winter/Spring Crown	2,024.2	72.5	1.2	-11.7	0.6
Winter/Spring No Crown	1,736.1	71.3	1.6	-2.2	0.2
Spring Flooding	1,289.8	49.6	1.3	-10.1	0.6

Measurements for Nuttall oak planted in March 1996 per Flooding Regime

Table 4

Flooding Regime	Leaf Area(cm^2)	Survival (%)	Root/Shoot	Height Growth (cm)	Diameter Growth (mm)
No Flooding	3,870.8	74.8	1.9	1.9	1.5
Winter/Spring Crown	2,437.7	84.4	1.8	-5.6	1.2
Winter/Spring No Crown	3,282.4	75.3	1.3	1.3	1.0
Spring Flooding	1,232.5	44.6	1.9	-11.1	0.8

Measurements for willow oak planted in March 1996 per Flooding Regime

Table 5

Flooding Regime	Leaf Area(cm^2)	Survival (%)	Root/Shoot	Height Growth (cm)	Diameter Growth (mm)
No Flooding	2,087.7	41.1	1.1	9.5	0.4
Winter/Spring Crown	1,209.7	29.1	1.2	12.5	-0.4
Winter/Spring No Crown	631.6	31.4	0.8	-2.9	0.5
Spring Flooding	1,349.9	30.8	2.0	-6.8	0.8