Historical Trends in Wetlands Loss and Efforts to Intervene

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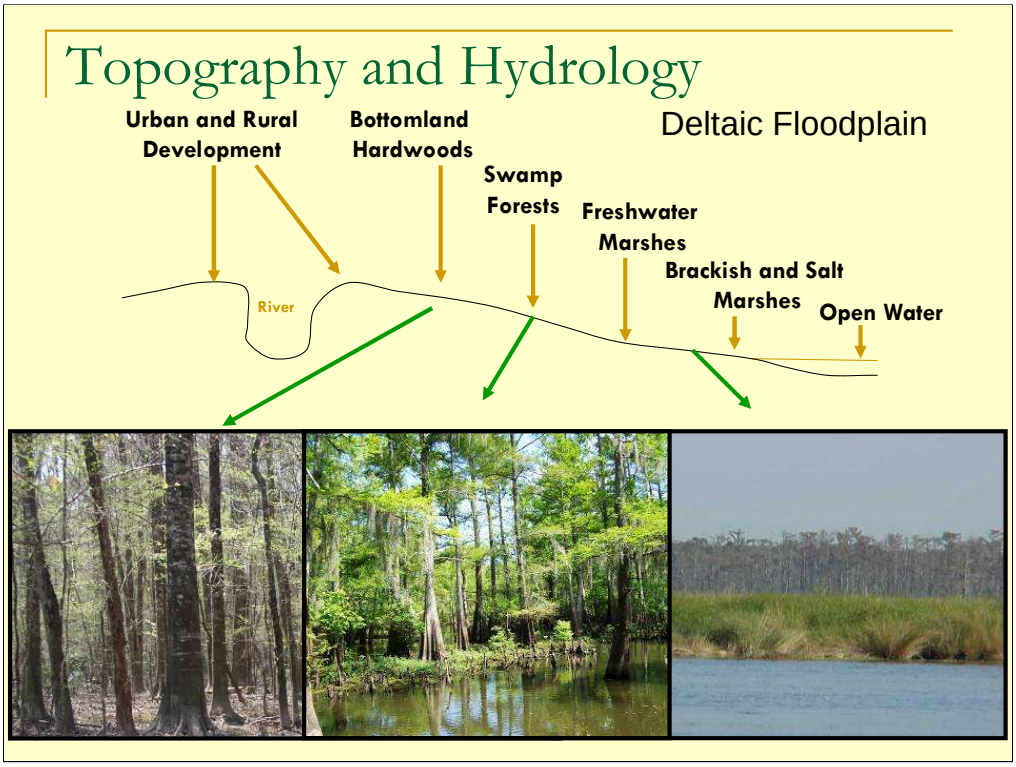
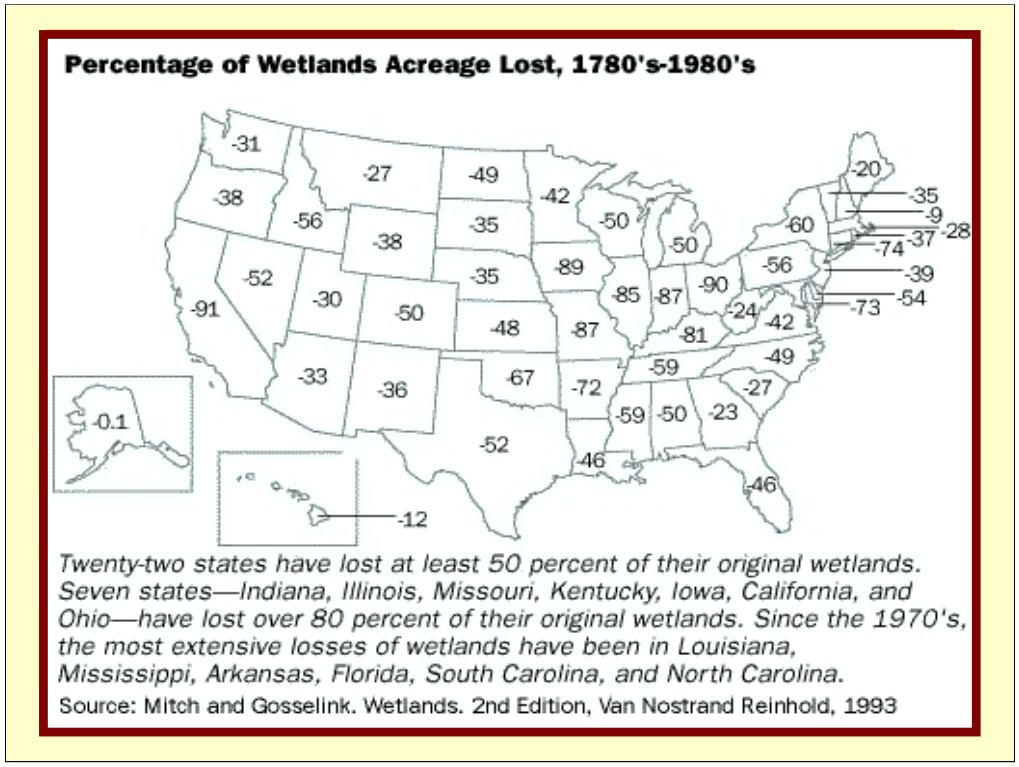
Objectives: 1) to give an overview of historical losses in wetland acreage in the United States and particularly the southeastern United States, and 2) to describe ongoing efforts to reverse those losses.



Floodplains of major and minor rivers share similar characteristics in ecosystem development overtime in that topography and hydrology control the ecology. The high ground is near the rivers where sediment has built natural levees or where we have replaced them with higher manmade levees. These former natural levees are typically where cities and towns and agriculture often developed as areas became populated.

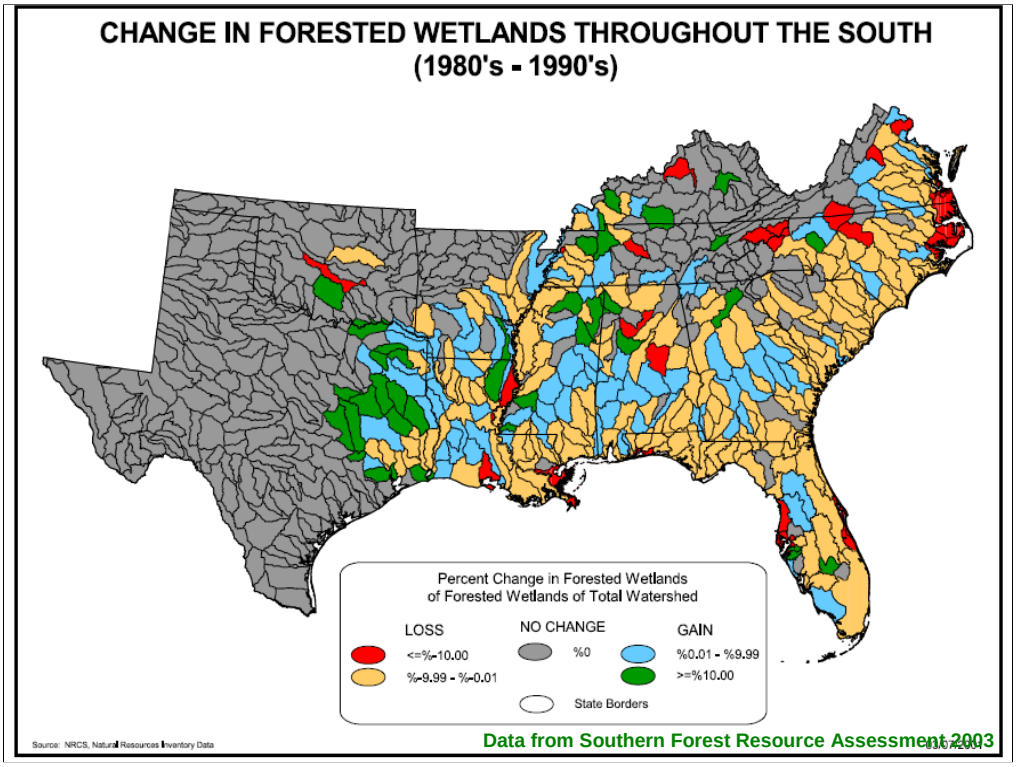
These ecosystems are broadly characterized as wetlands or wetland forests.

Swamp forests are dominated by flood tolerant baldcypress (*Taxodium distichum)* and water tupelo *(Nyssa aquatica).*



Approximately half of U.S. wetlands present in colonial times have been lost, primarily due to agriculture.

(This slide originated from the presentation “The Public’s Take on Wetlands” by Dr. Ken Cordell, US Forest Service, Southern Research Station, Athens GA)



Key Findings

The South had approximately 35 million acres of forested wetland remaining by 1996, 91 percent of which were riverine wetland.

Rates of loss—change from wetland to non-wetland—were greatest from the 1950s to the 1970s. Since then the rates have slowed, but losses are still occurring due to agriculture, urban and rural development, and silviculture.

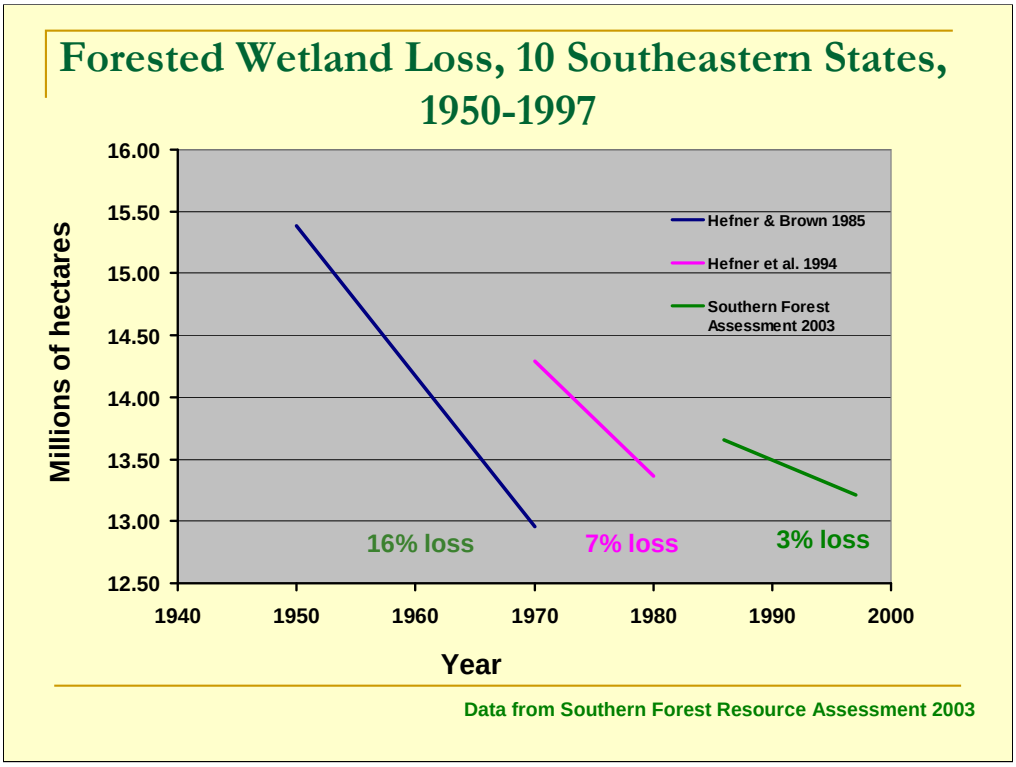
According to the National Wetland Inventory (NWI), 3.5 million acres of southern forested wetland underwent changes between 1986 and 1997. Ninety percent of the changes were conversions to another wetland or aquatic habitat type. Of these conversions 95 percent were to scrub-shrub or emergent wetlands. During this same time period approximately 119,000 acres of forested wetland went into urban and rural development, 112,000 acres were converted to agriculture, and 102,000 acres underwent intensive silviculture. While NWI attributes causes of losses, they do not attribute causes of conversion.

Effects of harvesting are short lived, and harvested riverine stands will return to pretreatment species composition; however, additional long-term research is needed to compare composition and ecological function of harvested and nonharvested stands.

As of 1997, Georgia, Florida, and Louisiana have the greatest amount of forested wetland in the South, followed, in descending order, by Mississippi, South Carolina, North Carolina, Arkansas, Texas, Alabama, Virginia, Tennessee, and Kentucky.

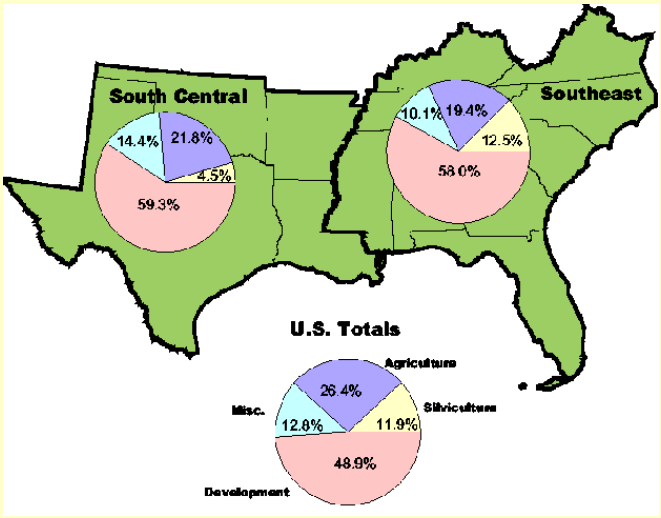
Restoration has been attempted primarily in riverine wetlands in the Lower Mississippi Valley, but success in restoring wetland acreage and function has been limited. Restoration of other forested wetlands, like mineral-soil pine flats, would have to include the reintroduction of fire.

Offsetting losses of wetland functions through the Clean Water Act, section 404 permitting process has not been well documented but appears to have had limited success.



In spite of differences between the compilation of the several data sets, it is clear that the rate of forested wetland loss across the southeast, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, and Tennessee, has **de**celerated since the 1950s. It is important also to note that each of these increments of loss represents draining of areas successively more flood-prone, such that potential habitat for Rusty Blackbird can be expected to be affected disproportionately in the later years. It is possible that even by the 1950s, much of the land clearing that had been done had taken place on habitats that were somewhat dryer than those preferred by Rusty Blackbirds.

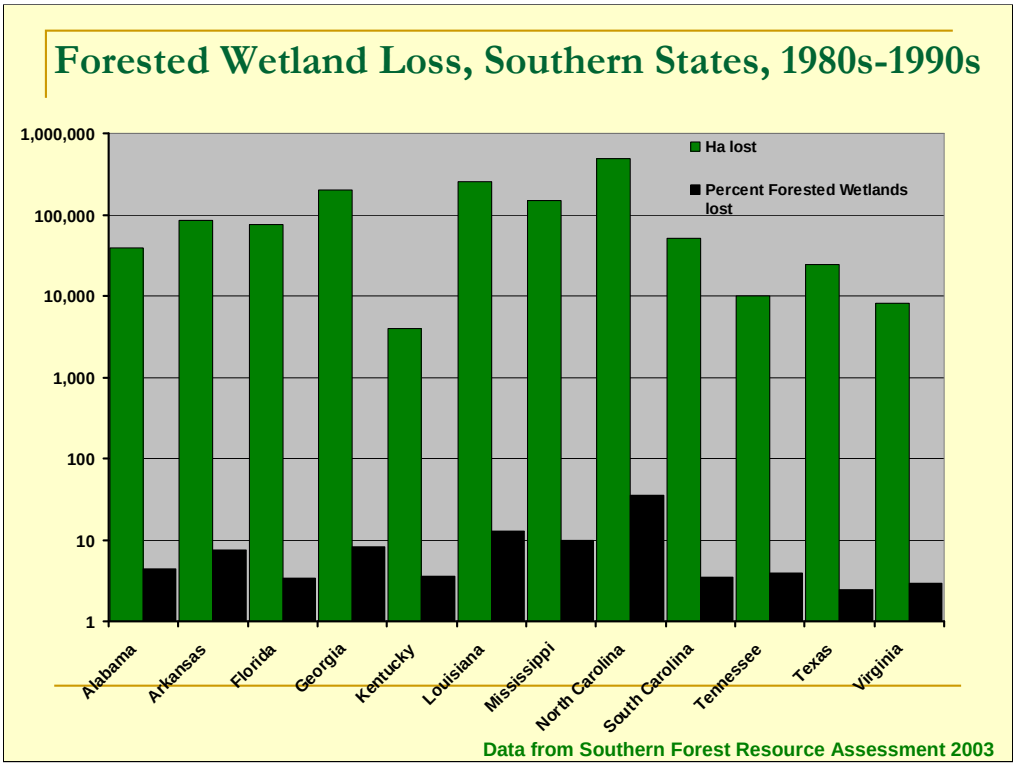
Causes of palustrine and estuarine wetland losses based on 1992-1997 National Resources Inventory Data



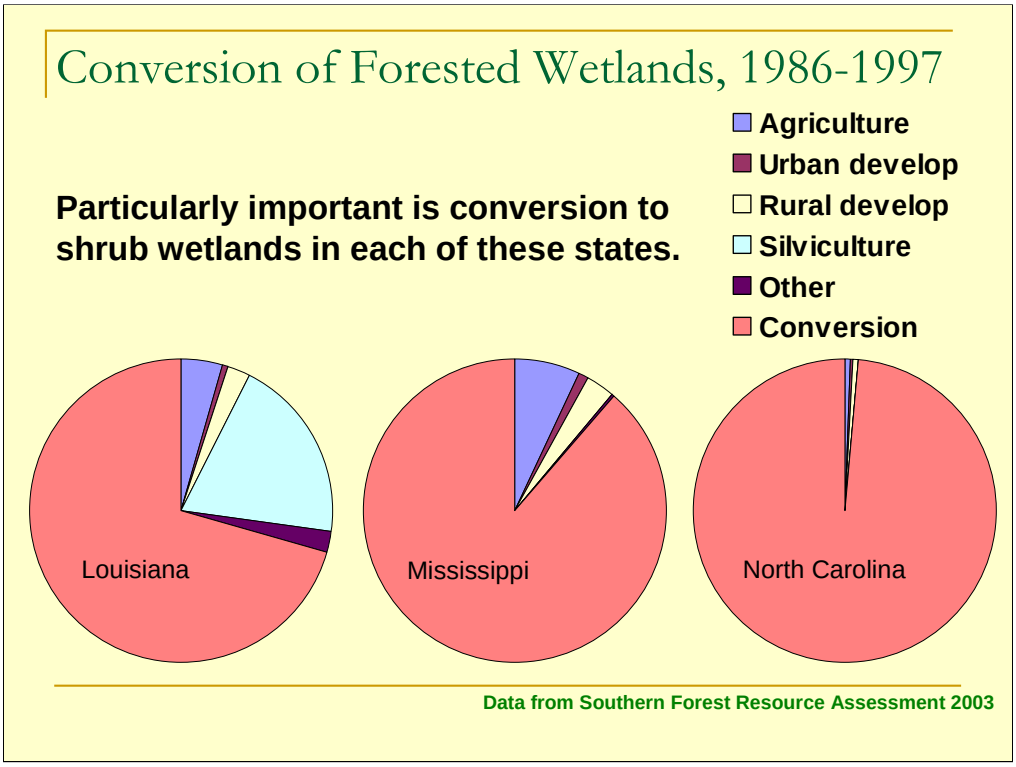
Approximately 442,000 ha of forested wetlands lost in this period

Data from Southern Forest Resource Assessment 2003

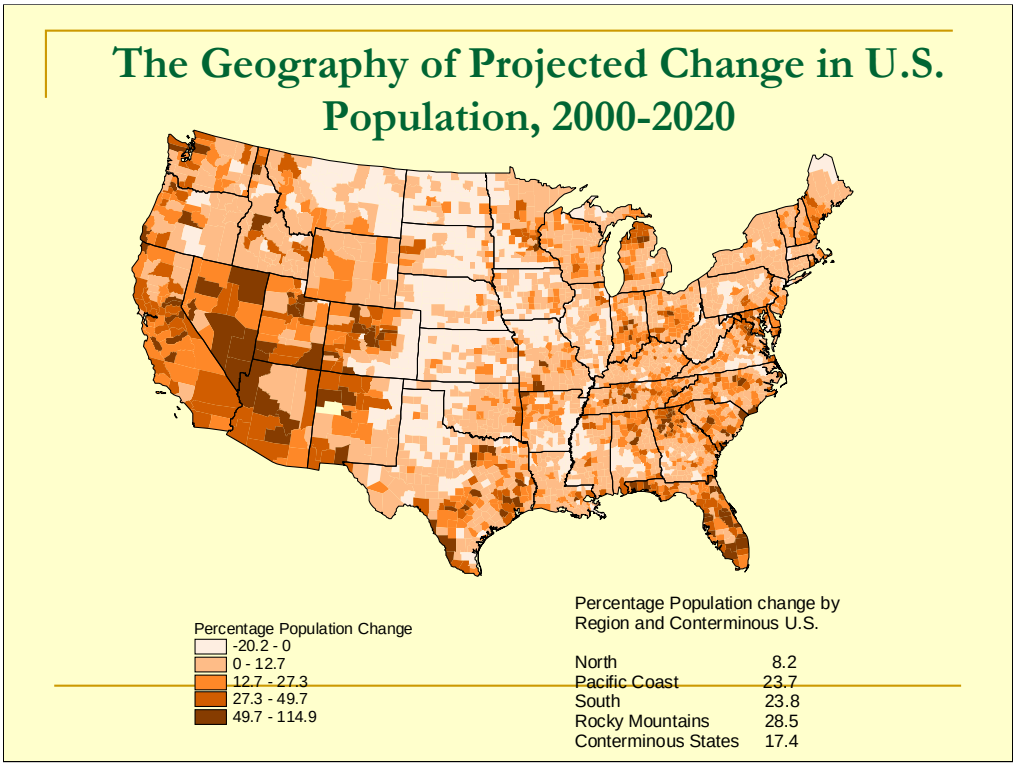
As we look at the results from several data sets, it is clear that the attribution to causes is not uniform among the sources and data sets, creating some difficulty in attempts to reconcile the total amounts of land use change among the separate data sets.



The largest losses in terms of area, as well as of percent, were in Louisiana and Mississippi, and in North Carolina, where large numbers of Rusty Blackbirds winter, suggesting that the effect on the birds may have been greater than the simple amount of habitat lost, because the habitat has been lost particularly in the areas where the birds are most concentrated.



This conversion to shrub wetlands may be the result of harvesting of the canopy trees of the original wetland forests. How this may have affected Rusty Blackbird is a question for us to answer as a part of this conference.



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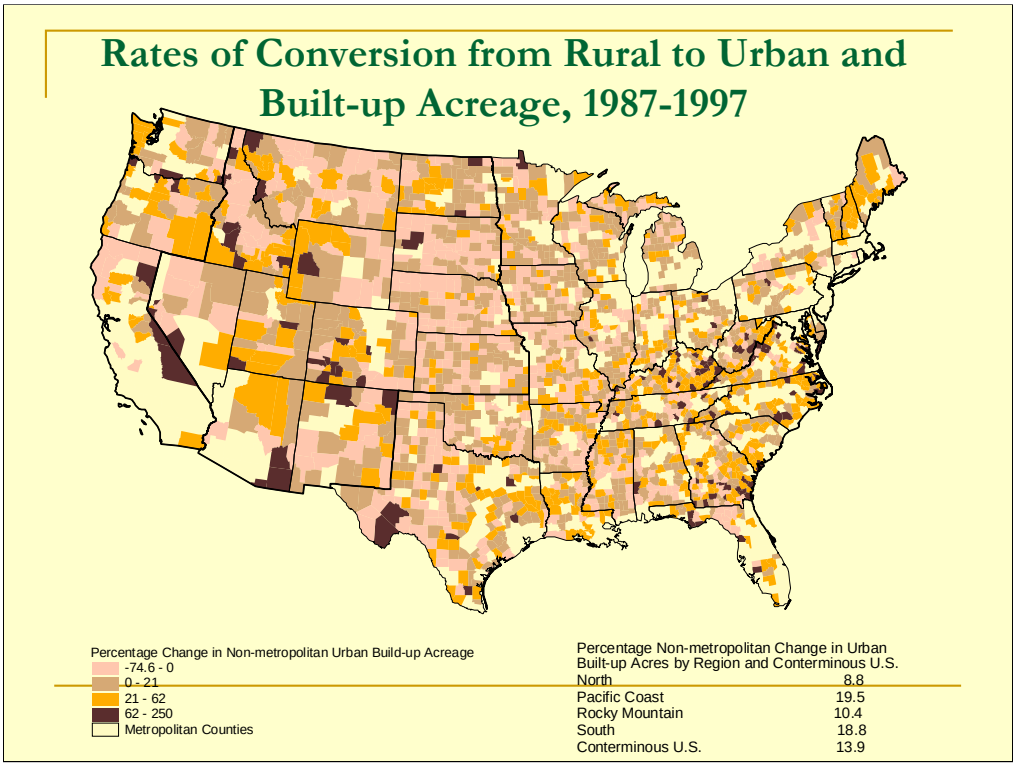

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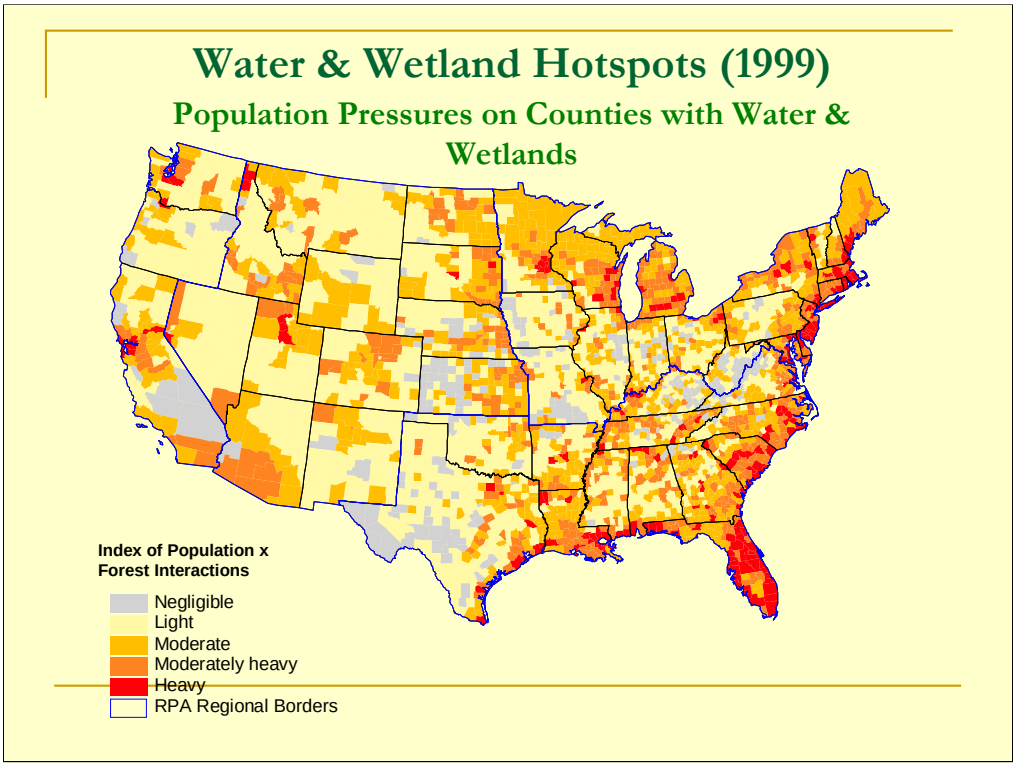

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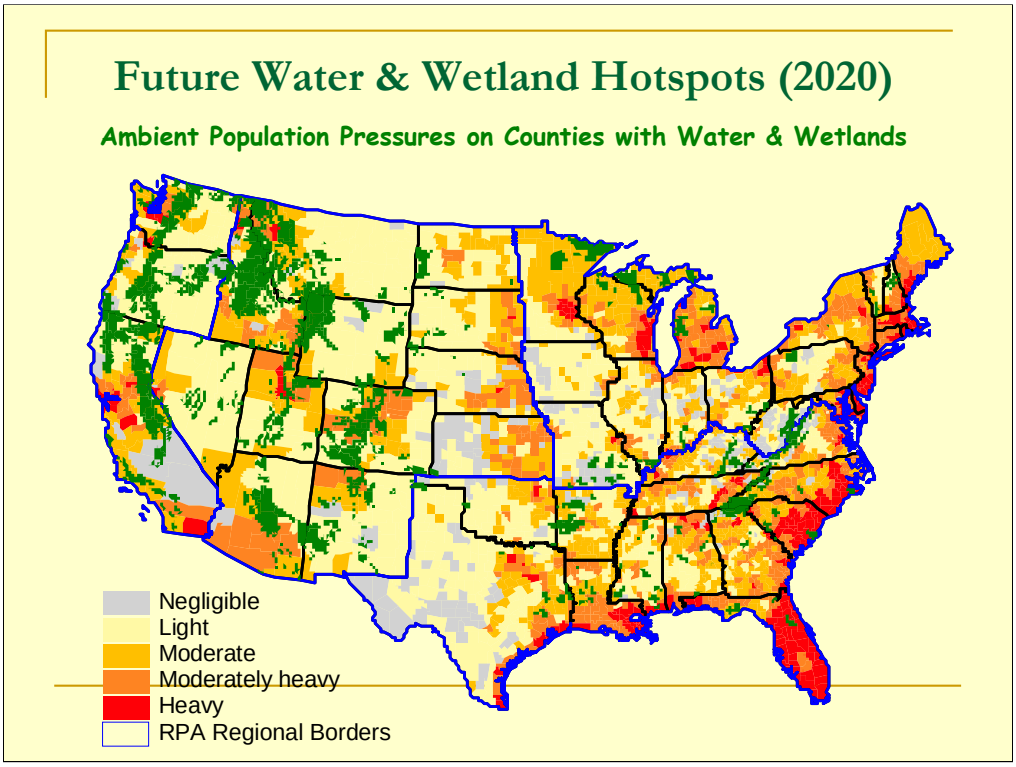

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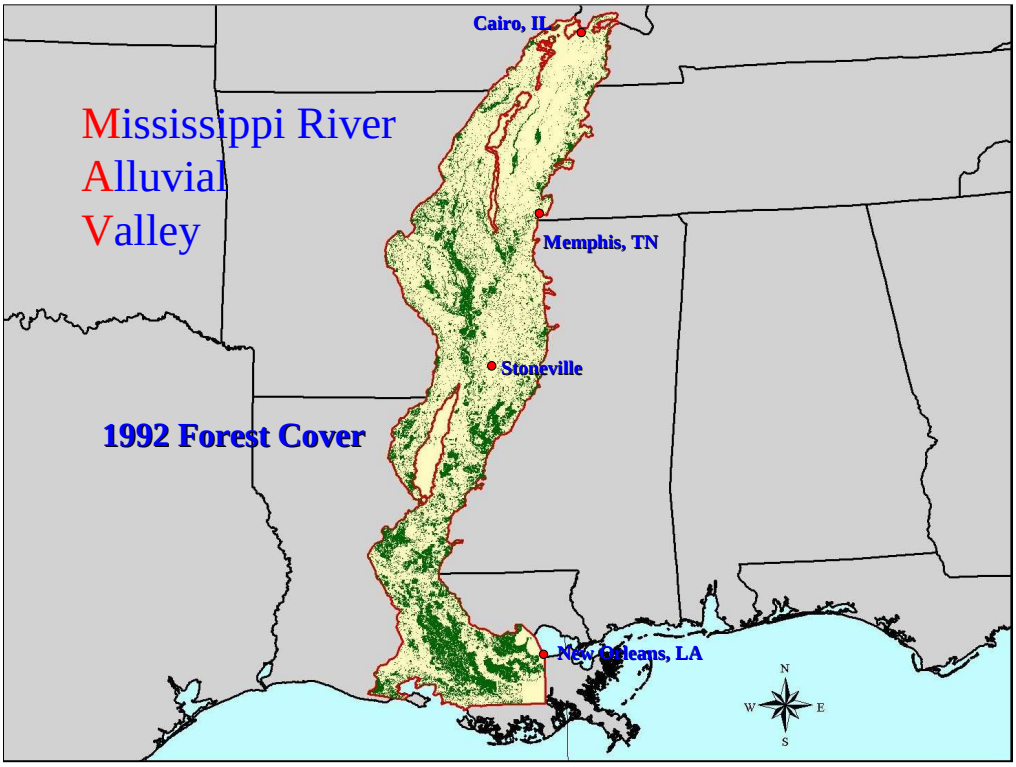
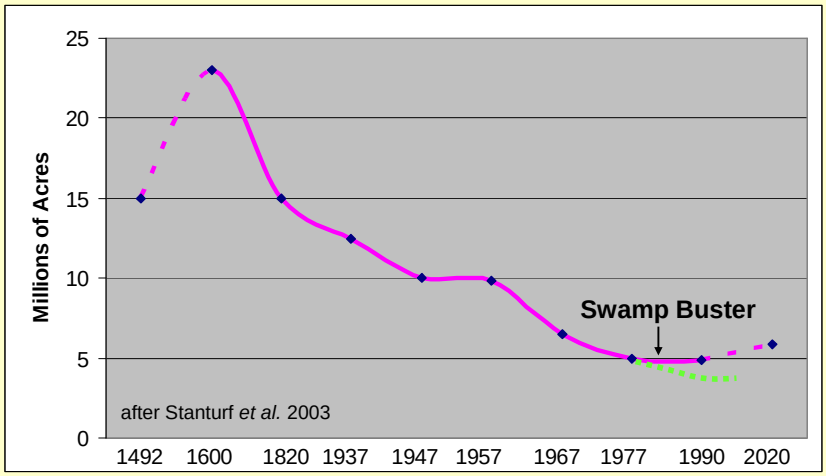


The Mississippi River Alluvial Valley, or MAV, occupies parts of seven states, stretching 600 miles from Cairo, Illinois at the confluence of the Mississippi and Ohio Rivers in the north to the Gulf of Mexico below New Orleans in the south. During colonial times, the bottomland hardwood forest occupied as much as 24 million acres (9,720,000 ha) within the valley. As recently as the late 1970s and early 1980s, the region was on a trajectory to have substantially fewer that 5 million acres (about 2 million ha) of bottomland hardwood forest in scattered patches. Shown here in green in this map is how forest cover appeared in 1992.

Large-scale land clearing began in the early 1800's and continued into the 1970's when it accelerated in response to increasing prices for agricultural crops, especially soybeans. Much of the land that was cleared is subject to flooding and may not produce a crop in most years. Efforts to restore the bottomland hardwood forest began in the mid-to-late-1980's and continue today. More and more of these cleared, agricultural lands (especially those that are fairly unproductive from an agricultural standpoint) are being planted to trees in an attempt to restore them to something approaching their former bottomland hardwood forest condition.

Extent of Bottomland Hardwood Forests in the MAV from pre-European Contact to Modern Times



This figure shows estimated forested acres in the MAV beginning with European arrival to the region to the present. It is believed that Native Americans cleared a substantial part of the alluvial valley for agriculture and settlements. Land was cleared by European settlers for agriculture beginning in the early 1800s and continued until the mid-1980s. In 1979, a report by MacDonald and others documented the chronology of deforestation to that point in time, and projected future loss rates through 1995, at which time they estimated bottomland hardwood forest land to be only 3.9 million acres. I have seen estimates of the total area of the MAV vary from 21 million to 24 million acres. It is important to point out that we are looking at a general trend in deforestation. This projected trend was staunched in no small part due to the "Swampbuster" provisions of the 1985 Farm Bill. A gradual reestablishment of trees on former agricultural land began about the same time, to the point where we now have trees growing on about one million acres of former agricultural land in the alluvial valley.

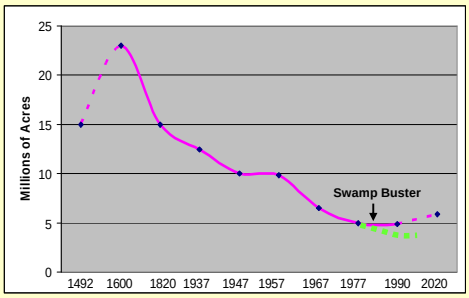
Figure from pg. 197: Ch. 9. Restoring Forested Wetland Ecosystems. 2003. Stanturf, Gardiner and Warren. In: Achieving sustainable freshwater systems: a web of connections. Ed. Marjorie M. Holland, Elizabeth R. Blood and Lawrence R. Shaffer. Island Press, Washington, DC.

Land Removed from Agriculture and Planted with Trees via CRP and WRP

357,989 CRP acres August 2006 (AR, LA, MS)

680,741 WRP acres Sept. 2005 (mostly AR, LA, MS)

1,038,730 Total acres

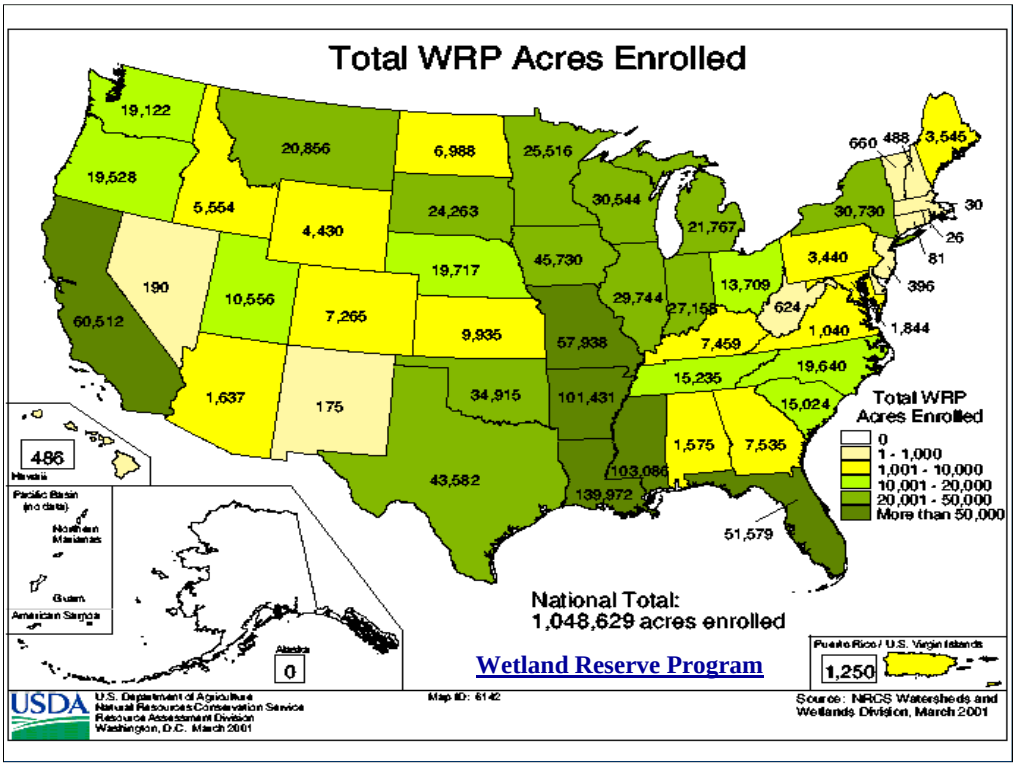


Land afforested under the Wetland Reserve Program makes up about 66% of the roughly one million acres, while that of the Conservation Reserve Program the remaining 34%.

I need to point out that these totals are for the entire states with portions of their area in the MAV, and not necessarily just MAV portions. But, these totals do not include other non-CRP or non-WRP afforestation efforts over the same period. So, on the whole, I hope we're safe in saying that there have been about 1 million acres planted to trees in the MAV. That is an important accomplishment over the past twenty years (50,000 acres per year).

CRP data are for CP-3A, CP-23, CP-31, CP-22, and CP-11 and 32 (pers. comm. Mike Oliver, NRCS, Greenwood, MS, February 22, 2007)

WRP data are from King, SL, Twedt, DJ, and Wilson, RR. 2006. The role of the Wetland Reserve Program in Conservation Efforts in the Mississippi River Alluvial Valley. Wildlife Soc. Bull. 34(4):914-920.


Total WRP Acres Enrolled
19,122
19,528
20,856
5,554
4,430
6,988
24,263
19,717
25,516
45,730
30,544
21,767
660
488
3,545
30,730
30
26
81
3,440
396
190
10,556
7,265
9,935
29,744
27,158
13,709
624
1,040
1,844
60,512
57,938
7,459
15,235
19,640
1,637
175
34,915
101,431
15,024
1,575
7,535
43,582
103,086
139,972
51,579
Total WRP Acres Enrolled
0
1 - 1,000
1,001 - 10,000
10,001 - 20,000
20,001 - 50,000
More than 50,000
486
Hawaii
Pacific Basin (no data)
Northern Marianas
Guam
American Samoa
Alaska
0
National Total:
1,048,629 acres enrolled
Wetland Reserve Program
Puerto Rico / U.S. Virgin Islands
1,250
USDA
U.S. Department of Agriculture
Natural Resources Conservation Service
Resource Assessment Division
Washington, D.C. March 2001
Map ID: 6142
Source: NRCS Watersheds and Wetlands Division, March 2001

Wetlands Reserve Program

- Help eligible landowners, protect, restore, and enhance the original hydrology, native vegetation, and natural topography of eligible lands
- Restore and protect the functions and values of wetlands (along with optimum wildlife habitat) in the agricultural landscape
- Help achieve the national goal of no net loss of wetlands, and
- Improve the general environment of the country.

It is important to understand the purpose of these two federally funded programs and what they are designed to do. The Wetlands Reserve Program is designed to "help eligible landowners, protect, restore, and enhance the original hydrology, native vegetation, and natural topography of eligible lands; Restore and protect the functions and values of wetlands (along with optimum wildlife habitat) in the agricultural landscape; Help achieve the national goal of no net loss of wetlands; and Improve the general environment of the country."

Landowners have three program participation options:

• Short-term 10-year restoration cost-share agreements,
• Mid-term 30-year conservation easements, and
• Permanent easements.

Conservation Reserve Program

- Reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources.
- Convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers.

The Conservation Reserve Program is designed to: “Reduce soil erosion, protect the Nation's ability to produce food and fiber, reduce sedimentation in streams and lakes, improve water quality, establish wildlife habitat, and enhance forest and wetland resources.” It is also used to “convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers.”

Continuous sign-up contracts are 10 to 15 years in duration.

Initial Afforestation in the MAV

Single-Cohort, Single-Species Stands

- Primarily oak and sweet pecan
- Important for wildlife
- Restricted seed dispersal
- Assumption regarding light-seeded species
- Planted in monocultures, or oak mixtures, 12 ft x 12 ft
- More recently mixtures of a variety of species occurs

In the early days of afforestation in the MAV and continuing until more recent times, the majority of afforestation was focused on planting hard mast species, typically 1-0 bareroot oak and sweet pecan seedlings, on a 12 ft by 12 ft spacing, in single-species stands. These species were selected because of their value in providing wildlife habitat and the perception that they are hard to establish through natural regeneration. In addition, it was believed that light seeded species (green ash, elms, American sycamore, sweetgum, and maples) would naturally populate the oak and pecan plantings via wind dispersal.

Problems (Stanturf 2000) with this early approach include: 1) establishment of light-seeded species by wind dispersal beyond 100 m of a forest edge is unlikely; 2) relatively pure oak plantations do not provide the complex vegetative structure required by many kinds of wildlife; 3) stocking levels under federal cost-share programs usually do no result in sufficient mature quality trees to support commercial timber management; and 4) oak monocultures sequester less carbon than mixed-species stands.

Currently in Mississippi, WRP afforestation involves a mix of as many as ten mast-producing and light-seeded hardwoods including: Nutall oak, willow oak, water oak, overcup oak, sweet pecan, bitter pecan, persimmon, baldcypress, green ash, and sweetgum. These are planted on 12 ft x 12 ft spacing and matched to soil type and existing hydrological conditions. An effort is made to plant approximately 60% of the site with oaks and 40% with light seeded or soft mast species. A limited number of acres may be sub-soiled prior to planting, but traditionally Mississippi uses mowing as a preferred site prep method.

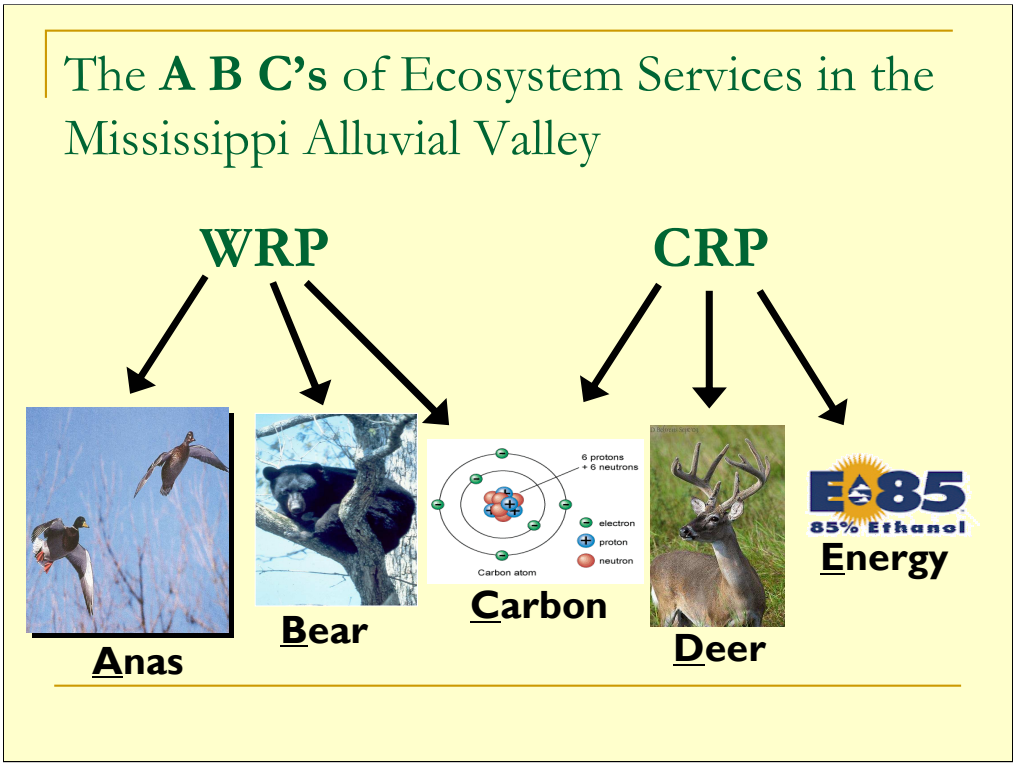
Often, the outcome of past afforestation efforts have resulted in landscapes that look like this. The land has been reclaimed to a grassy field with widely spaced oak trees that are branchy and are a long way off from crown closure and from approaching anything that resembles a bottomland hardwood forest.

Stand Development Based Afforestation Mixed Species Model

- Involves taking knowledge of development patterns in natural stands and applying them to artificial mixtures

Mixed-species plantations, by their nature, have more species and structural diversity than single species plantations. Artificial species mixtures are likely to produce higher quality trees from a commercial standpoint due to the influence on inter-specific competition early in the stand's development. Depending on the mixture, mixed-species plantations can also provide greater yield than single species plantations. Mixed-species plantations may reduce the risk of plantation failure compared to single-species plantations by providing greater resistance to damaging agents such as insects, disease, and wind ( ). The greater diversity of habitat conditions also provides for improved wildlife habitat compared to single species plantations ( ).

We are currently working on a Mixed Species Model to promote stand-development-based afforestation on former agricultural fields, which should have the favorable components of artificial stands while reducing the negative components. Inherent assumptions for constructing mixed-species forest plantations (after Ashton et al. 2001) include the mixing of shade-intolerant species with shade tolerant species or early-successional (pioneer) species with later-successional species. Planting early-successional species will enhance site conditions for planting and subsequent development of later-successional species. These mixtures will facilitate the development of stratified canopies that increase the number of niches for wildlife habitat while simultaneously providing inter-specific competition that enhances the development of quality stems on desired later successional species.



A simple model relating ecosystem services to the WRP and CRP programs, depicting a basic framework for the discussions about ongoing efforts to establish ecologically and economically sustainable bottomland hardwood forests wetlands, and wetland forests.

Habitat creation under WRP that favors ducks, may be suitable for Rusty Blackbirds. However, land use is constantly changing and, for example, land enrolled today under CRP to establish wetland forests may be used in the future to produce an agricultural crop to make biofuels.