Offsetting Greenhouse Gas Emissions: Agriculture's Role in the Mississippi Alluvial Valley

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I appreciate the opportunity to be here and participate in these discussions on "Agriculture's Role in Offsetting Greenhouse Gas Emissions." The remarks I have prepared are focused regionally (Slide 1) on the Mississippi Alluvial Valley (MAV). Considering the impact this region has traditionally had on national agricultural policy, I think it appropriate to consider for a moment how agriculture's emerging role in carbon sequestration could affect the MAV and vice versa.

I intend to structure my remarks around three topics (slide 2): 1) how the wildlife community views agriculture's role; 2) how the wildlife community is positioning itself to support that role; and 3) a "context for coordination" between the energy, agriculture, and environmental communities.

How the Wildlife Community Views the Role of Agriculture in the MAV

On a national scale, agriculture's role in offsetting greenhouse gas emissions is focused primarily on carbon sequestration in agricultural soils. I've taken the liberty here of borrowing two slides from Dr. Paustian's presentation last year to make the following point. (Slide 3) The agricultural practices employed throughout much of the 1900's resulted in as much as a 50% decrease in soil carbon over a 50-70 year period. However, as noted by Dr. Paustian in last year's presentation (Slide 4), agricultural production practices of the past 10-20 years have begun to reverse the process of carbon depletion, and by some estimates US agricultural soils are beginning to function as a carbon sink. The potential for further sequestration is high; and not surprisingly, the focus of the agricultural community is on continuing the trend, recognizing that substantial soil and water quality benefits can also accrue. It is appropriate at this point to say that we in the wildlife community agree heartily – carbon friendly agriculture will invariably be water quality friendly. Over the past 10 years (Slide 5), the wildlife community, operating through the North American Waterfowl Management Plan's Lower Mississippi Valley (LMV) Joint Venture has devoted considerable resources promoting waterfowl (and water quality) friendly management practices on production agricultural lands within the MAV. We have provided technical and financial assistance to over 2,000 landowners to seasonally restore and manage wetland hydrology on more than 210,000 acres of harvested croplands. The water quality and soil retention benefits have been well documented, and we expect this management practice to be very carbon friendly.

But, it is appropriate here to digress. Much of agriculture's contribution to greenhouse gas (GHG) emissions has been a function of not simply how we've farmed, but what we've farmed (Slide 6). This is particularly so in the MAV, and herein lies a broader role for agriculture in offsetting GHG emissions. Let me explain.

The history of natural resource development in the MAV is a history of agricultural expansion into "the Nation's floodplain."(Slide 7). In its pre-settlement state, the MAV contained a 22-million acre expanse of sub-tropical/temperate zone forested wetlands. Early expansion was focused on the higher landforms

– braided stream terraces and the natural levees associated with the Mississippi River's numerous meander belts. At the time of the original National Wetland Inventory in the early 1950's, agriculture was well established on the higher sites and protected from Mississippi River headwater flooding. The MAV still contained an internationally significant expanse of forested wetlands. More than 9 million acres remained, generally on the more poorly drained portions of the MAV and in areas regularly affected by the headwater flooding of alluvial valley tributaries and/or backwater flooding from the Mississippi River. Over the next 30-35 years, more than 4 million acres of the remaining forested wetlands were converted to agriculture.

In the Mississippi Alluvial Valley, the Nation's post-war agriculture expansion was less an expansion than an encroachment – a movement of agriculture from the higher, better drained sites into the poorly drained, frequently flooded portions of the MAV. This phenomenon merits a closer look (slide 8), and in doing so let me go back to forest cover of the 1950's and focus on the middle two-thirds of the MAV where we have new information on the extent of natural flooding. For orientation, let's compare again the extent of forested wetlands in the 1950's with that of the early 1990's (slide 9). That most of this 2 million-acre expansion occurred in increasingly wetter areas is illustrated with this slide (slide 10); where, as you can see, the majority of the clearing occurred on soil associations that were increasingly more hydric in nature.

Let's now look (slide 11) at natural flood storage basins as discerned from an analysis of satellite imagery of flood events over the past 20 years. By overlaying flood storage basins on 1950's land cover (slide 12), you can see that prior to the last major agricultural expansion, over 70% of these flood prone areas was still forested. By the early 1990's less than 40% was forested (slide 13), and most of this was either on the unprotected side of the mainline Mississippi River levees or within the system of state and federal wildlife refuges. Said in other words, the extent of agricultural expansion into the Delta's remaining flood storage basins has been nearly complete.

From this illustration, you can perhaps see that we in the wildlife community view agriculture's role in offsetting GHG emissions as being two-fold (slide 14). It includes not only carbon sequestration in agricultural soils; but also carbon sequestration within all terrestrial carbon pools achieved through the reestablishment of forested wetlands on a portion of "the Nation's floodplain." The conservation partners of the Lower Mississippi Valley (LMV) Joint Venture have characterized the scope of the opportunity as being the reestablishment of forested wetlands (slide 15) on as much as two to four million acres of the MAV's most environmentally sensitive land by 2050 as part of a national response to offsetting GHG emissions. Within this role lies an opportunity to address conditions that many observers have long characterized as being neither economically nor environmentally sustainable.

How the Wildlife Community Is Positioning Itself to Support Agriculture's Role in the MAV (slide 16)

To support this ambitious goal, the partners of the LMV Joint Venture came together only last week to form a "Lower Mississippi Valley Carbon Sequestration Initiative"(slide 17). The Joint Venture itself is a 14-year old partnership of private, state, federal wildlife conservation organizations focused on implementing regional, national, and international bird conservation plans. Through the "LMV Carbon Sequestration Initiative," Joint Venture partners will be developing an "ecological roadmap" (slide 18) to complement and support the Department of Energy's "Carbon Sequestration Technology Roadmap." Our intent is to promote and support within the Mississippi Alluvial Valley and West Gulf Coastal Plain carbon sequestration partnerships that are both ecologically and economically sustainable.

A key element of the roadmap (slide 19) will be science-based decision support models to provide an objective and credible means of targeting forest wetland restoration to the most environmentally sensitive lands. Decision support models are being developed for the three primary categories of wetland restoration benefits: habitat; hydrology; and water quality. A habitat-based decision support model has already been developed for the suite of wildlife species most affected by forest fragmentation, neotropical forest breeding birds (slide 20). This model, originally developed from 1992 land cover data, is currently being updated to account for nearly 400,000 acres of reforestation that has occurred since 1992. It will be augmented with a decision support model built on the biological needs of another area-sensitive species, the Louisiana black bear. The natural flood storage data you saw previously (slide 21) is being refined to provide spatially explicit stage/area data as indicated in this example from central Louisiana (slide 22). A soil moisture index developed by Ducks Unlimited and the Forest Service will be incorporated as a key data layer in a water quality model. Additionally, Joint Venture partners are cooperating in the development of a web-enabled reforestation tracking system to support landscape-level monitoring programs (slide 23).

In this manner, the wildlife community is committed to science-based support of an extensive, long term approach to forest wetland restoration in the Mississippi Alluvial Valley.

A "Context for Coordination" (slide 24)

Clearly, the scope and scale of the issues associated with managing the Nation's GHG emissions pose an unprecedented conservation challenge to both the agricultural community and the wildlife community. I say "conservation challenge" because the sequestration of carbon in terrestrial ecosystems is at heart a restoration issue – an attempt to restore a degraded ecosystem function. The passage of the 1986 Farm Bill ushered in an era of unprecedented coordination between the agricultural community and the wildlife community. Recognizing that debate continues on how farm policy will ultimately balance commodity supports with conservation incentives, throwing carbon into the mix will add to the complexity, increase the stakes, and underscore the need for even closer cooperation. In the simplest terms, I believe our "context for coordination" should be this (slide 25) – creating programmatic and policy linkages between energy, agriculture, and environment that move us collectively toward more sustainable use of the Nation's agricultural and forestry land base. Lest I sound too idealistic, let me conclude with a real world example (slide 26).

An environmentally sensitive portion of the MAV strongly affected by agricultural encroachment is a region in central Louisiana known as the Bushley Bayou Area. As you can see (slide 27), the conversion of forested wetlands to high risk agricultural land was extensive. When, in the 1990's, the Wetland Reserve Program brought economically viable alternatives to continued cropping of high risk lands, response was high(slide 28). However, the demand was even higher, and last year a major agricultural landowner sold nearly 19,000 acres (slide 29). The area was purchased in partnership by the Fish and Wildlife Service and American Electric Power (AEP) with assistance from The Conservation Fund. The Service acquired approximately 8,000 acres (to include the residual rights in the WRP tracts). AEP acquired, and has reforested (slide 30), the remaining 11,000 acres for its potential carbon credits. The Service will manage the AEP property under a 25-year management agreement as part of Catahoula NWR, a RAMSAR "Wetland of International Importance." It also worth noting that this carbon-financed restoration effort will largely obviate the need for a multi-million dollar system of levees and pumps proposed by the Corps of Engineers in the late 1950's in support of the land conversion that was only just beginning. At Bushley Bayou, a linkage has been created between energy, agriculture, and the environment in support of sustainable restoration; and therein lies

the “context for coordination” that I alluded to earlier. (slide 31)

By now I think most everyone is aware of the new directions charted by President Bush last week. The President’s “Clear Skies Initiative” and “Global Climate Change Initiative” will provide new incentives for partnerships between the energy, wildlife, and agricultural communities in support of ecologically sound and economically sustainable approaches to carbon sequestration. Nowhere is the promise greater or the potential higher than in the Lower Mississippi Valley. To that end, we should be guided by a goal commensurate with the challenge. And yet, as we ponder the potential of seeing two to four million acres of forest wetland restoration in the Lower Mississippi Valley, we should be mindful that the goal is not one of returning to another era. It is rather a goal for moving forward in search of an agricultural and forestry land base that will support communities and economies sustainable in the broadest sense.

Offsetting GHG Emissions: Agriculture's Role in the Mississippi Alluvial Valley

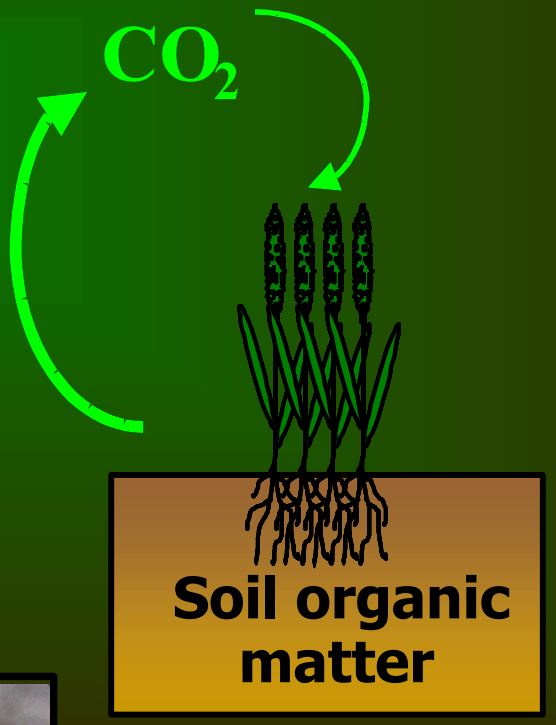
Three Topics...

- A View from the Wildlife Community on Agriculture's Role in Offsetting GHG Emissions
- How the Wildlife Community is Positioning Itself to Support Agriculture's Role
- A "Context for Coordination"

Past Agricultural Practices

Erosion

Intensive tillage



Residue removal

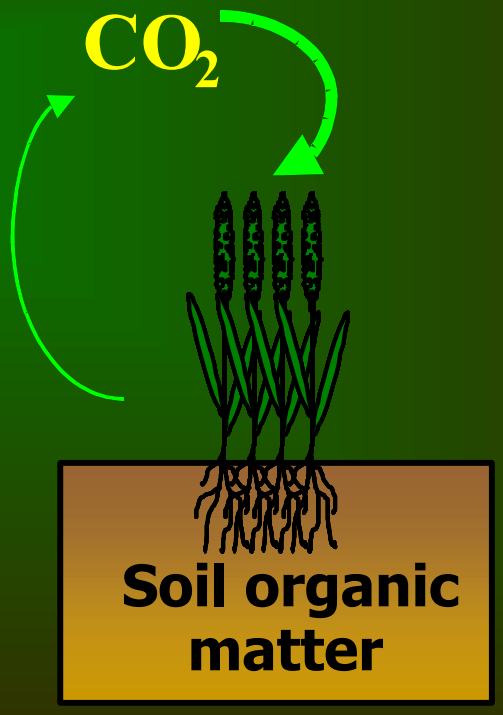
Low Productivity

Paustian 2001

Improved Agricultural Practices

Conservation buffers

Conservation tillage



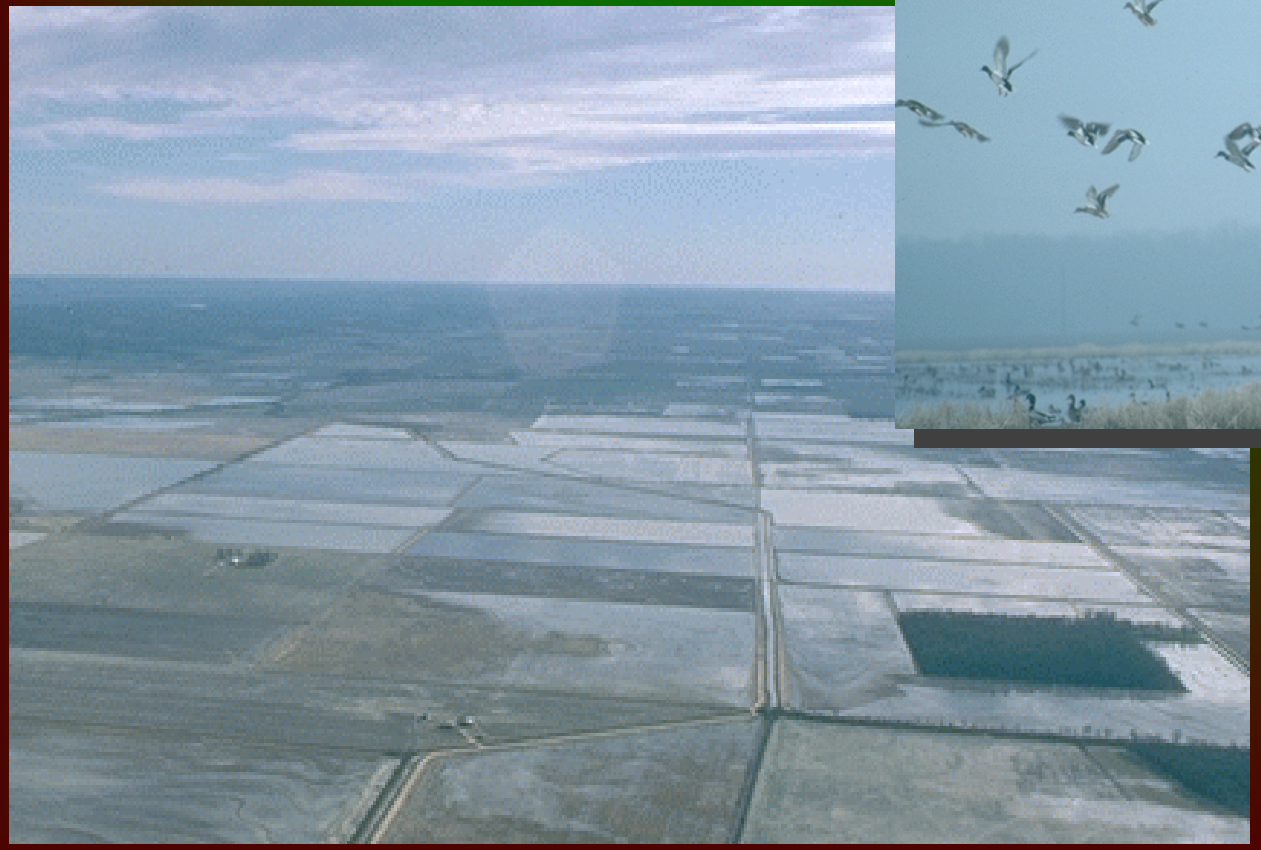
Cover crops

Improved rotations

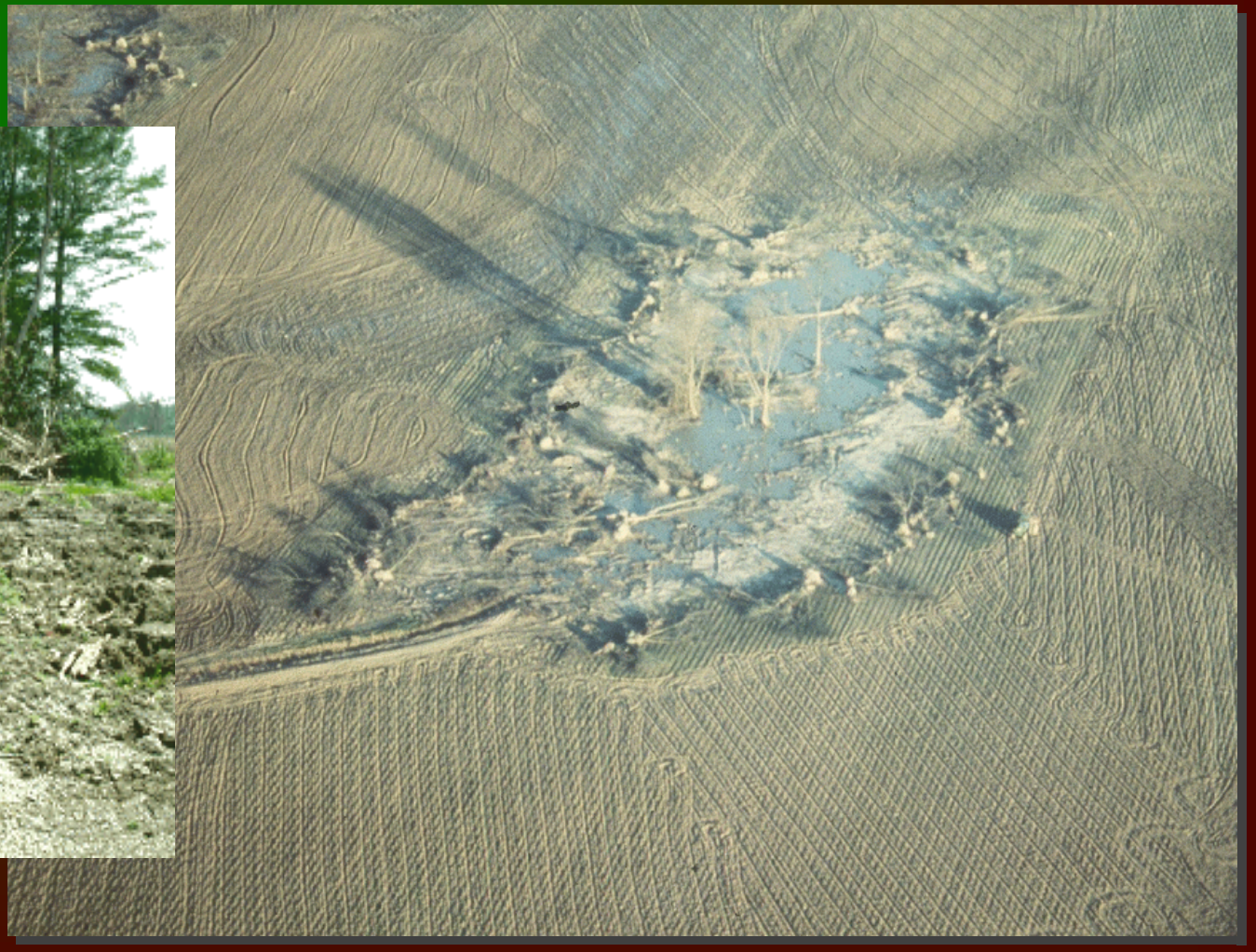
Paustian 2001

Winter Flooded Agricultural Fields

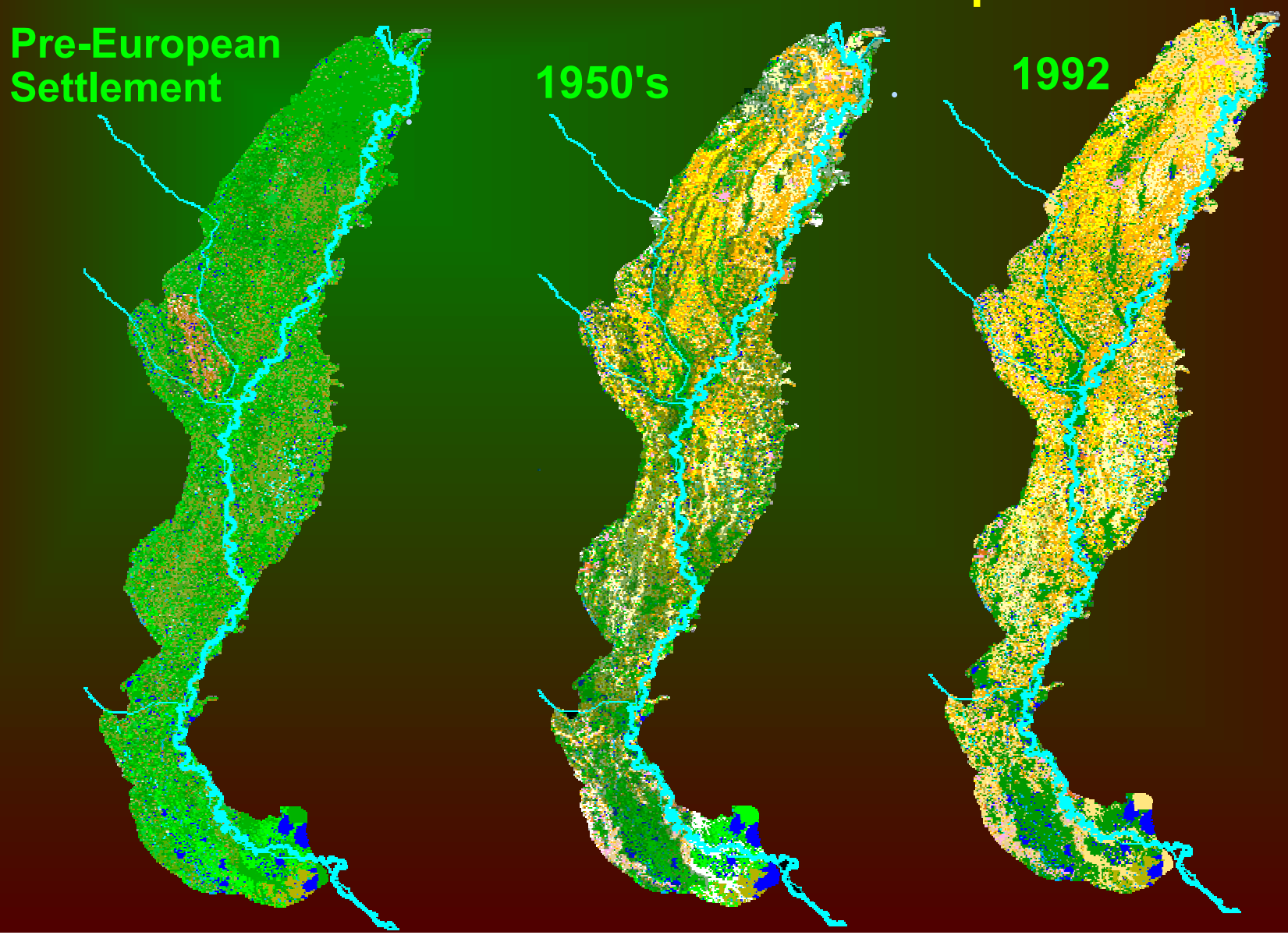
3,806 Water Management Units

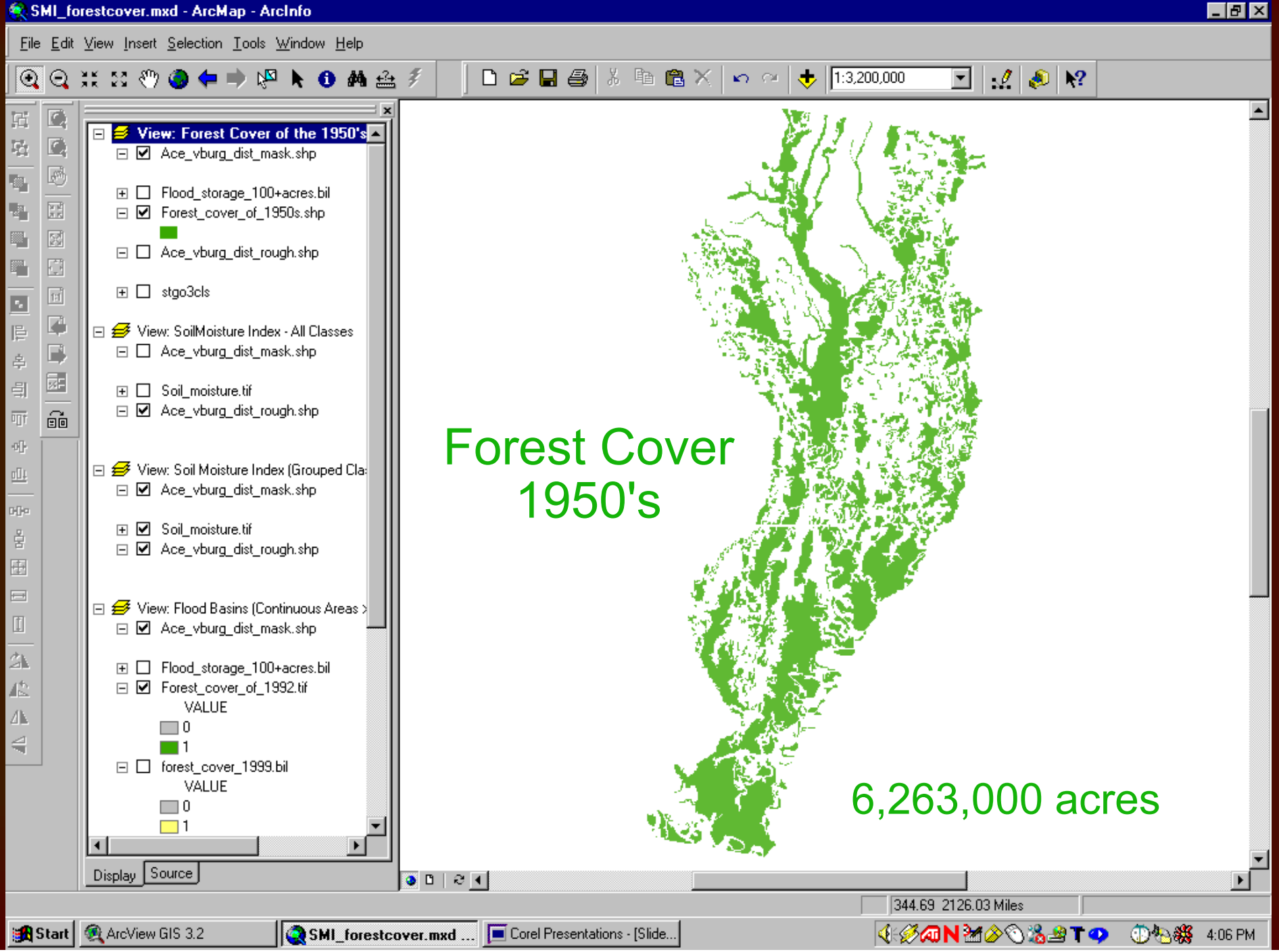


210,329 acres



Agricultural Expansion in “The Nation’s Floodplain”

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Forest Cover
1950's
6,263,000 acres
344.69 2126.03 Miles
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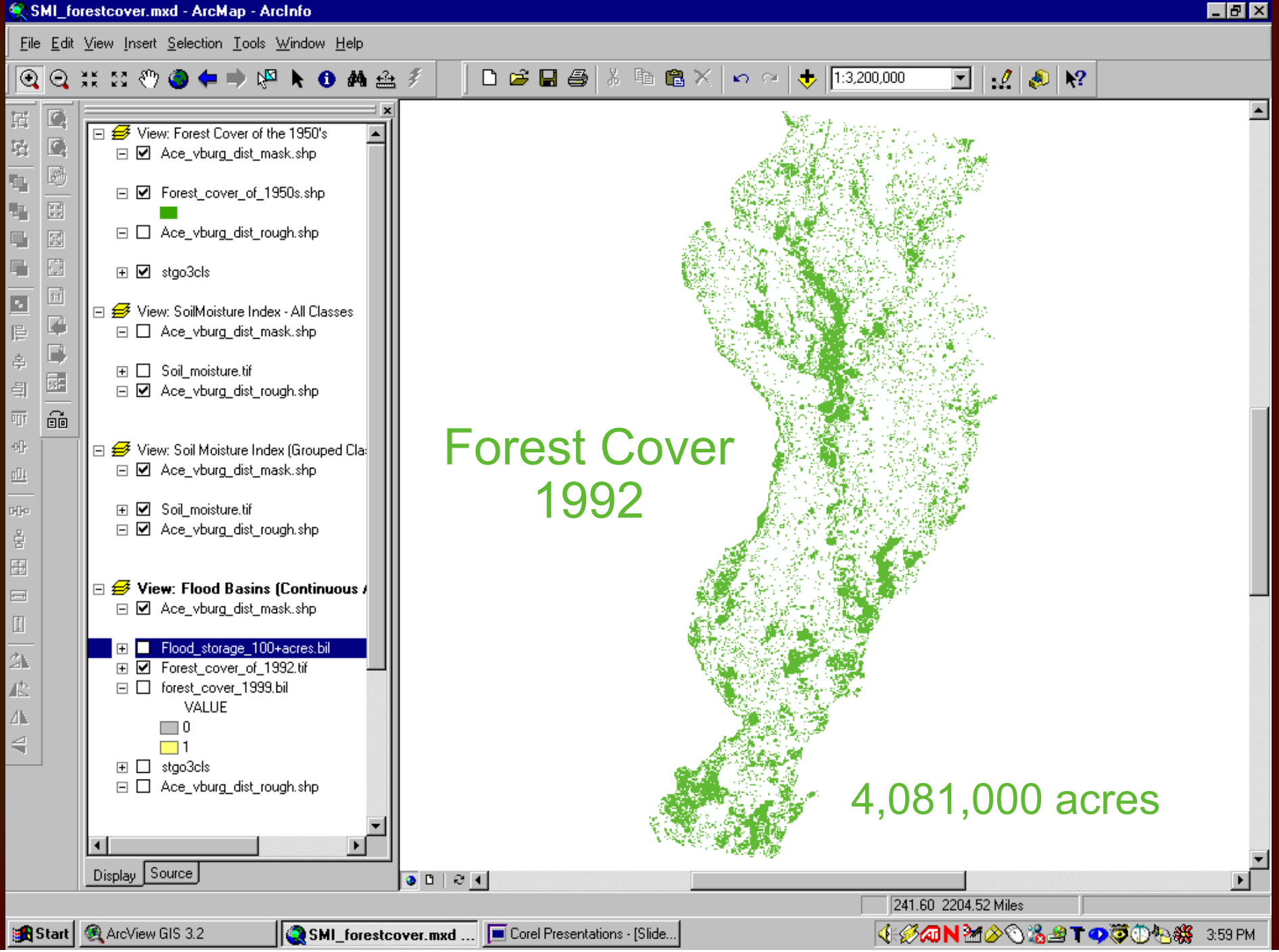
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1992
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241.60 2204.52 Miles
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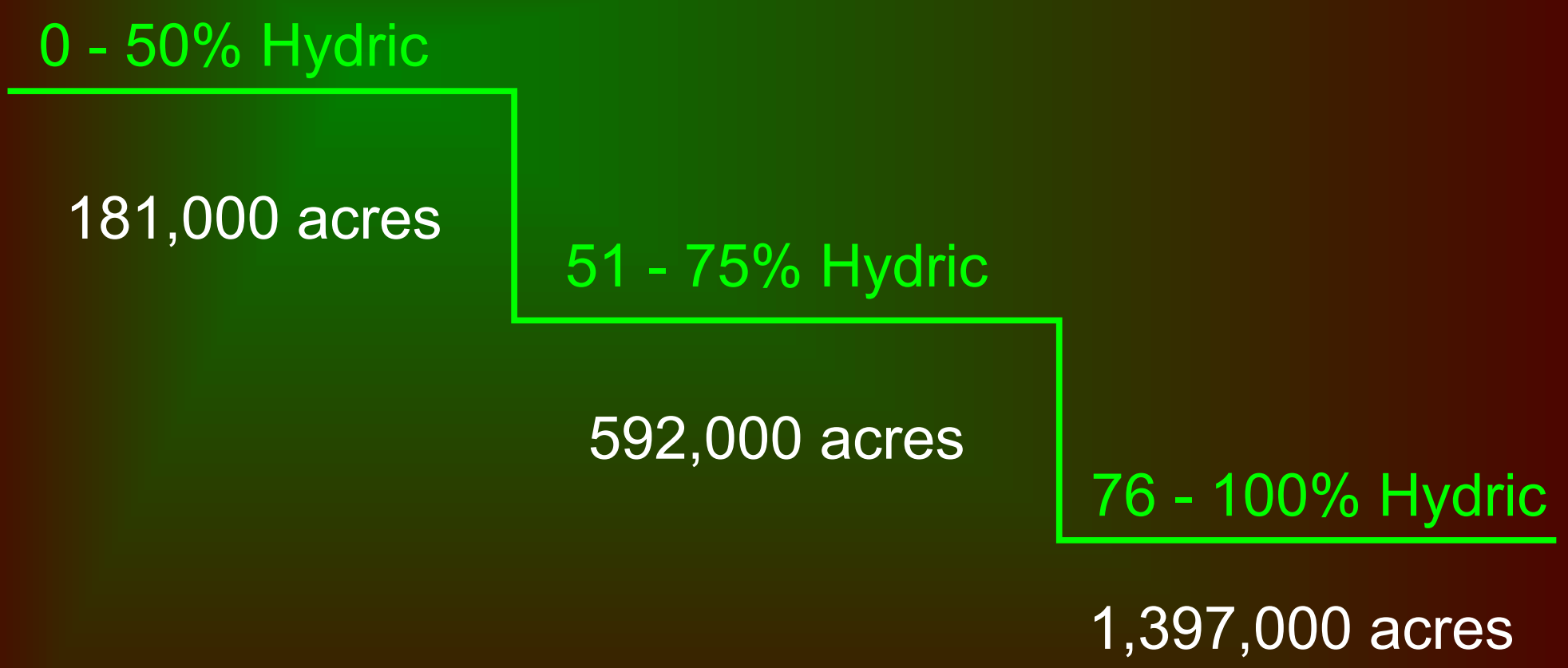
Forest Wetland Conversion 1950's – 1992
Distribution by Hydric Soil Associations*



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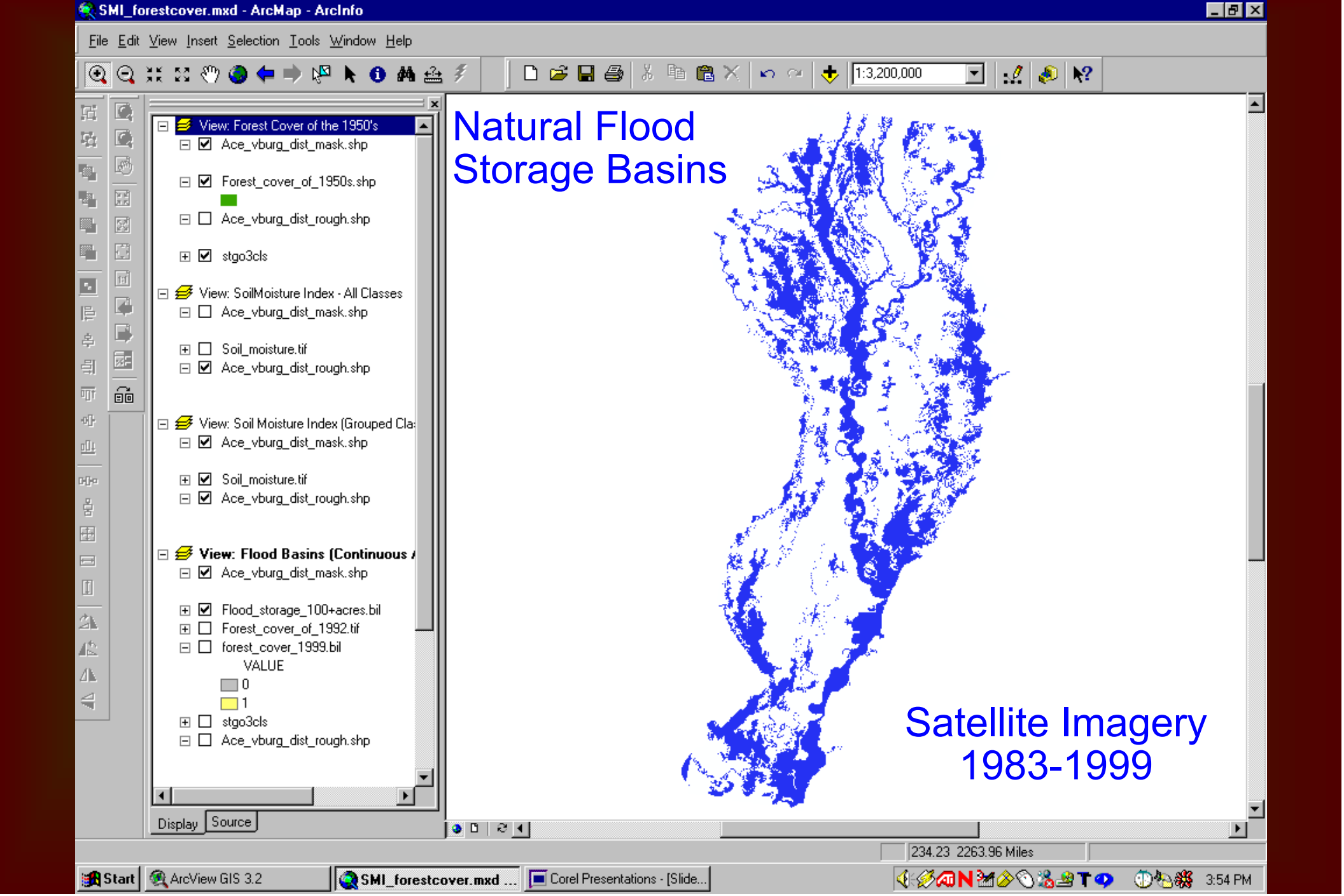
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Natural Flood
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1983-1999
234.23 2263.96 Miles
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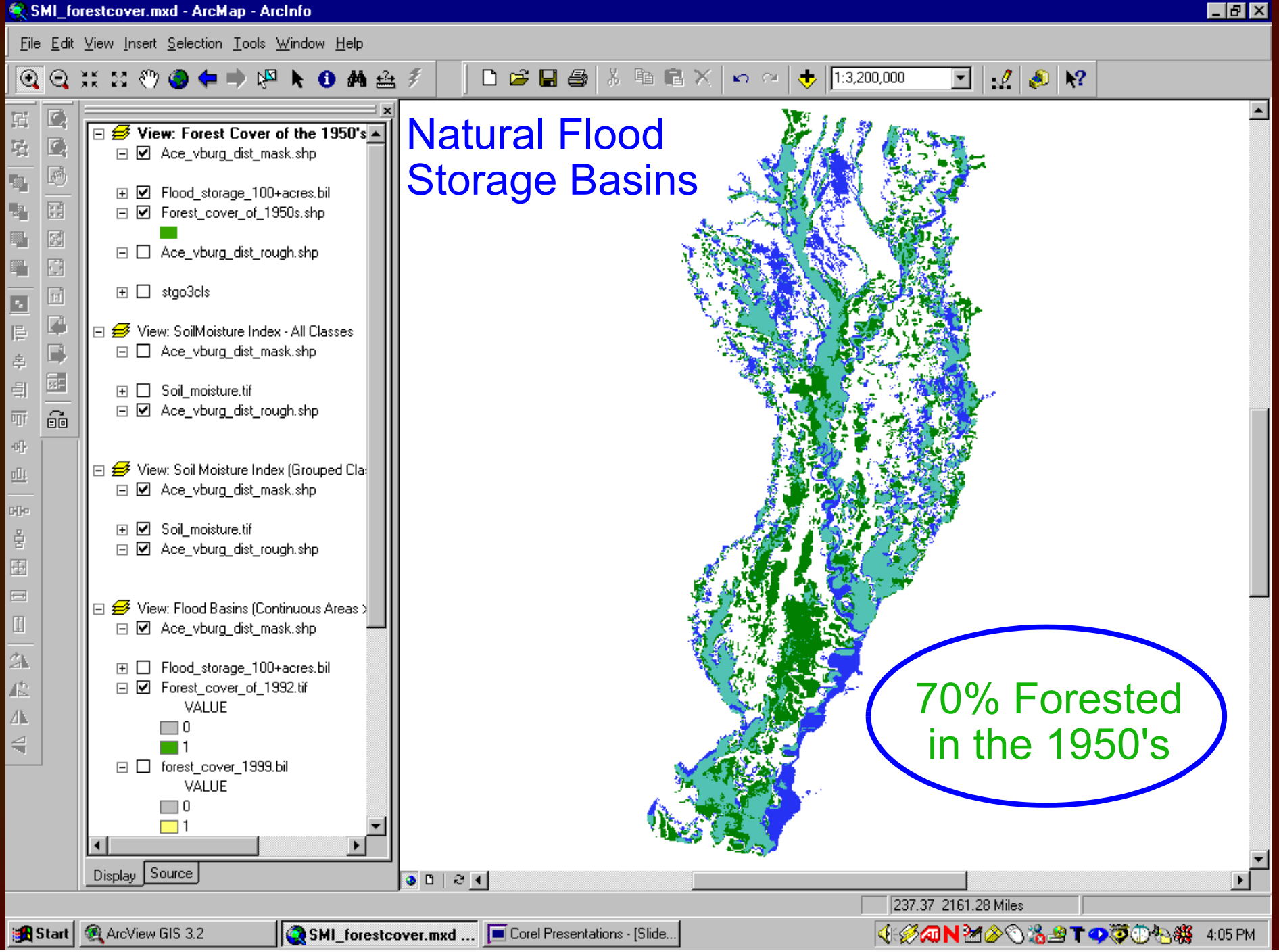
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Natural Flood Storage Basins
70% Forested in the 1950's
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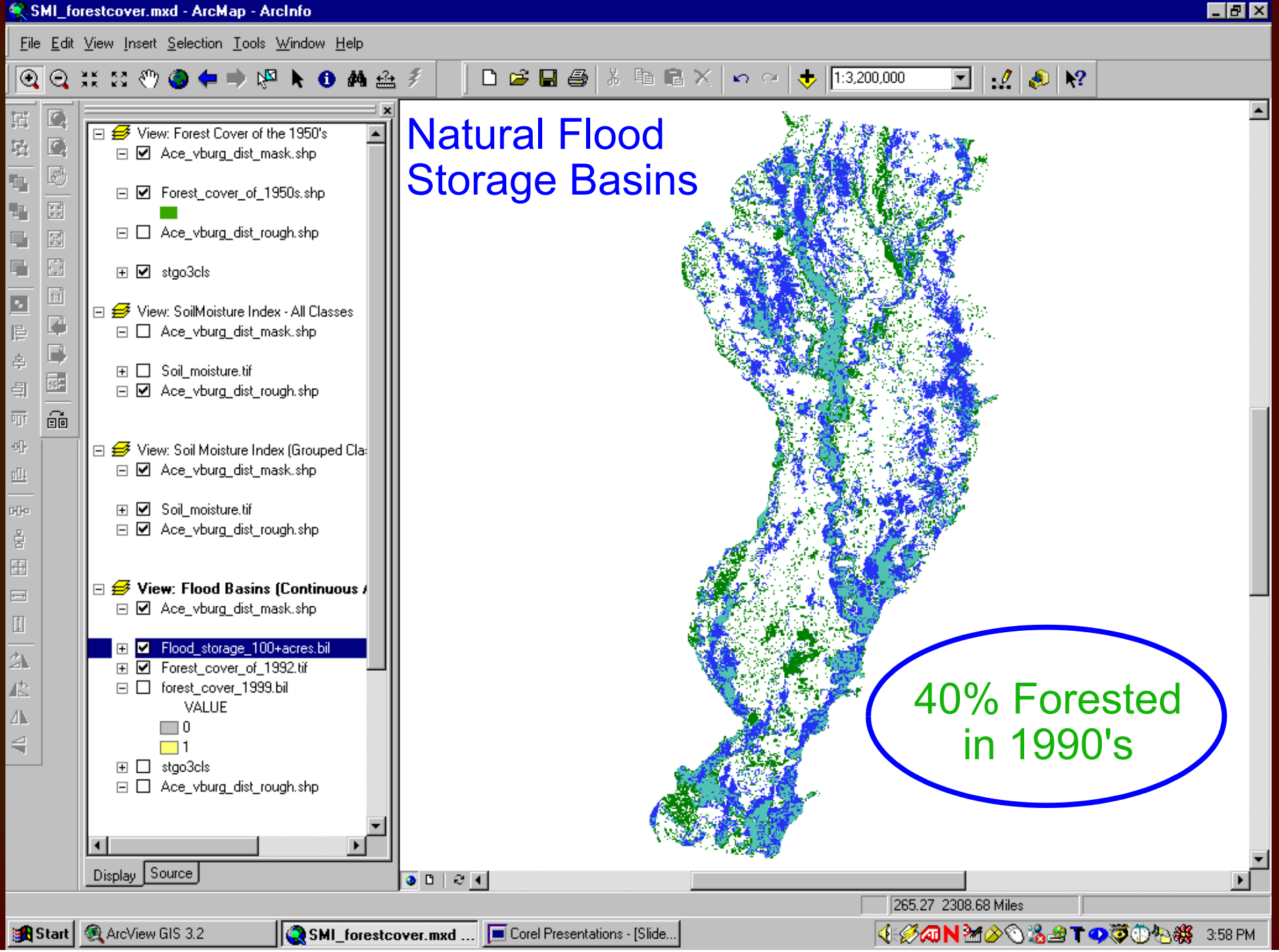
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Natural Flood Storage Basins
40% Forested in 1990's
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Agriculture's Role in Offsetting GHG Emissions in the Mississippi Alluvial Valley

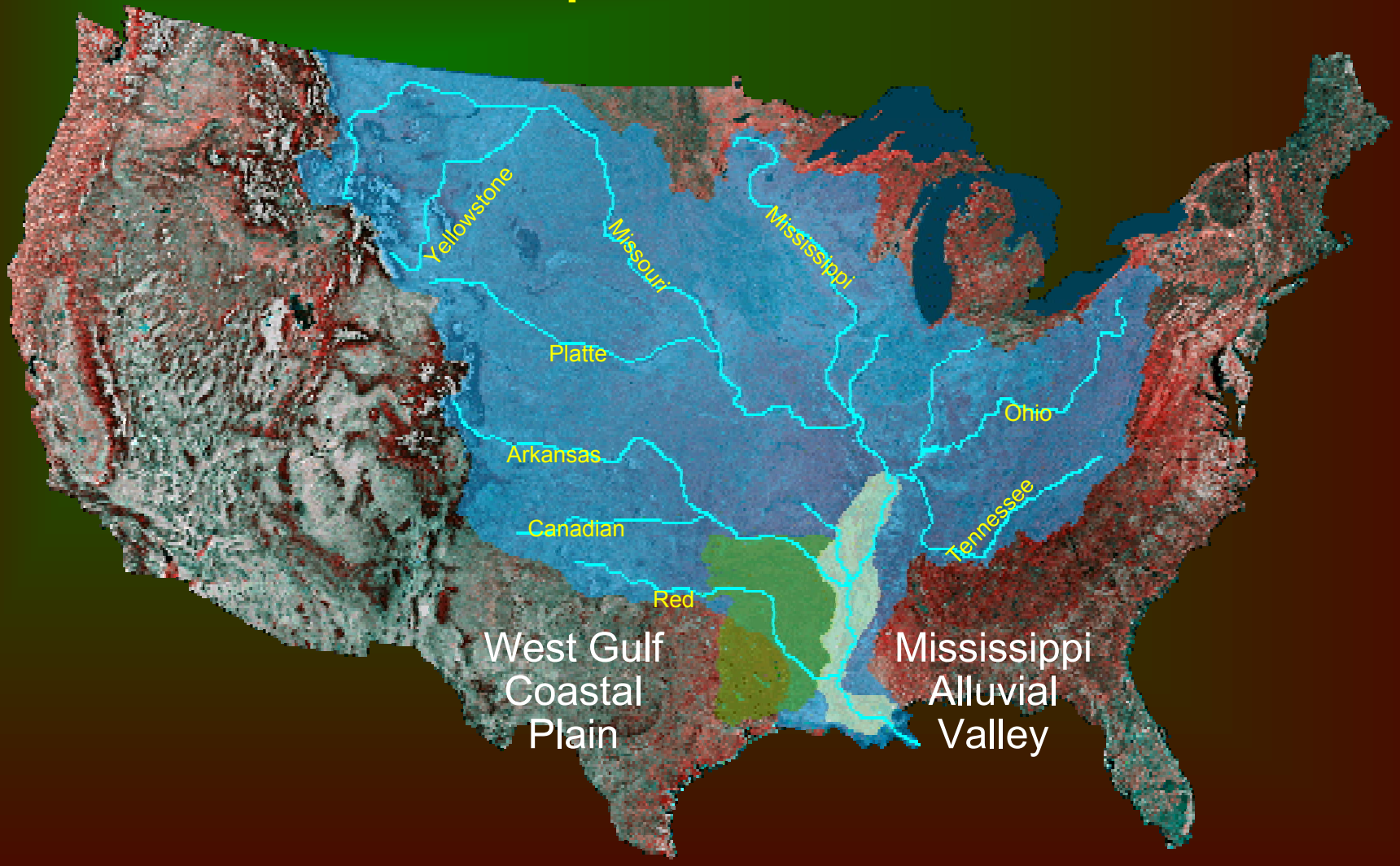
- Soil Carbon Sequestration through Agricultural Best Management Practices
- Terrestrial Sequestration via Forest Wetland Restoration on Environmentally Sensitive Lands

Forest Wetland Restoration in the Mississippi Alluvial Valley

Three Topics...

- A View from the Wildlife Community on Agriculture's Role in Offsetting GHG Emissions
- How the Wildlife Community is Positioning Itself to Support Agriculture's Role
- A "Context for Coordination"

Lower Mississippi Valley Carbon Sequestration Initiative



Carbon Sequestration in Terrestrial Ecosystems

Pathways to Ecologically Sound Economically Sustainable Carbon Sequestration

in the
Mississippi Alluvial Valley
and West Gulf Coastal Plain

Lower Mississippi Valley
Joint Venture
June 2002

Lower Mississippi Valley Joint Venture

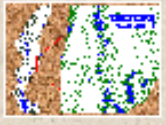
Decision Support Models For the Mississippi Alluvial Valley

Habitat

Background

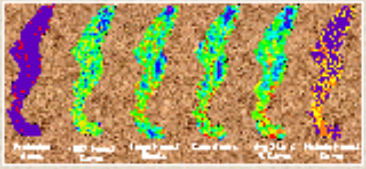
- Focused on Area-sensitive Species (e.g., black bears and forest-interior songbirds).

- Deforestation since the turn of the century has resulted in:



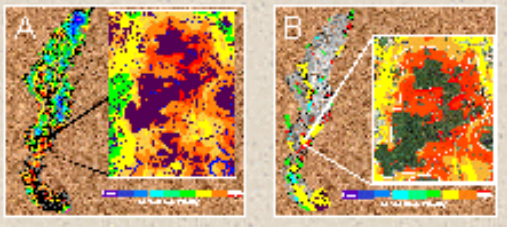
- 75% reduction in forested area
- Fragmentation of remaining 25% into 35,000+ blocks
- 99% of these blocks are incapable of supporting source populations of forest breeding birds

Model Development



- Model landscape characteristics known to limit reproductive success of area-sensitive songbird species using spatial analyses.

Product



- (A) A decision support model that identifies priority areas for reforestation that maximize benefits to forest breeding birds. (B) High priorities can be aggregated into Forest Bird Conservation Areas to establish habitat objectives and further focus reforestation (e.g., building larger forest blocks and increasing "core" habitat).

Water Quality

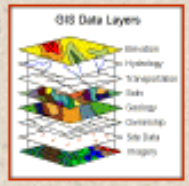
Background

- Each summer nitrogen and phosphate washing from farmlands in the Mississippi River Basin enter the Gulf of Mexico, creating an extensive "dead zone" covering up to 20,000 km²—threatening economic and environmental resources.

- In the MAV, agricultural runoff is the largest non-point source pollutant.

- "Ditched" topographic depressions, stream banks, internal lake systems and exposed agricultural lands are priority areas for hydrology restoration or reforestation to improve the water quality of our aquatic resources in the MAV.

Model Development



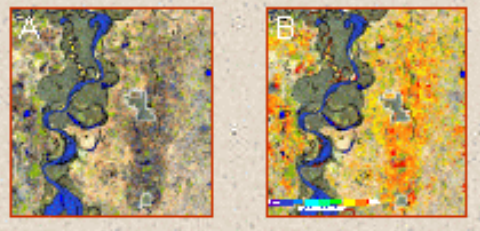
- Obtain and develop spatial data necessary to model hydrology and vegetation restoration priorities that will benefit water quality.

Streams

Soil Moisture

Digital Elevation Models

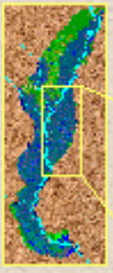
Product



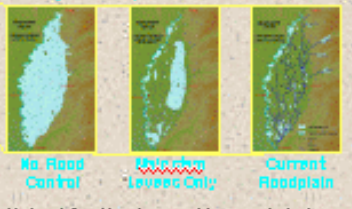
- A decision support model that identifies priorities for hydrology restoration and reforestation. Here, A satellite image depicts (A) cleared depressional areas and (B) an example of how the water quality/decision support model will help define high priority restoration sites within depressional areas.

Hydrology

Background



- Historic flood pulse of the Mississippi River and its tributaries inundated millions of acres with nutrient rich alluvium. Flood control and drainage projects have significantly altered aquatic resources.

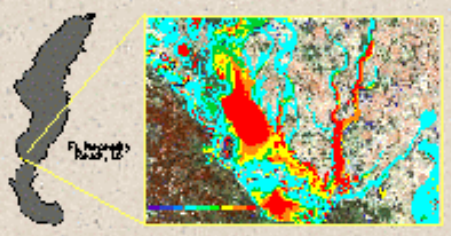


- Natural flood basins provide a myriad of ecological and socio-economic benefits, such as improved flood storage and habitat for wintering waterfowl.

Model Development

- Classify extent of natural flooding from Landsat TM satellite imagery that corresponds to a range of river gauge readings.

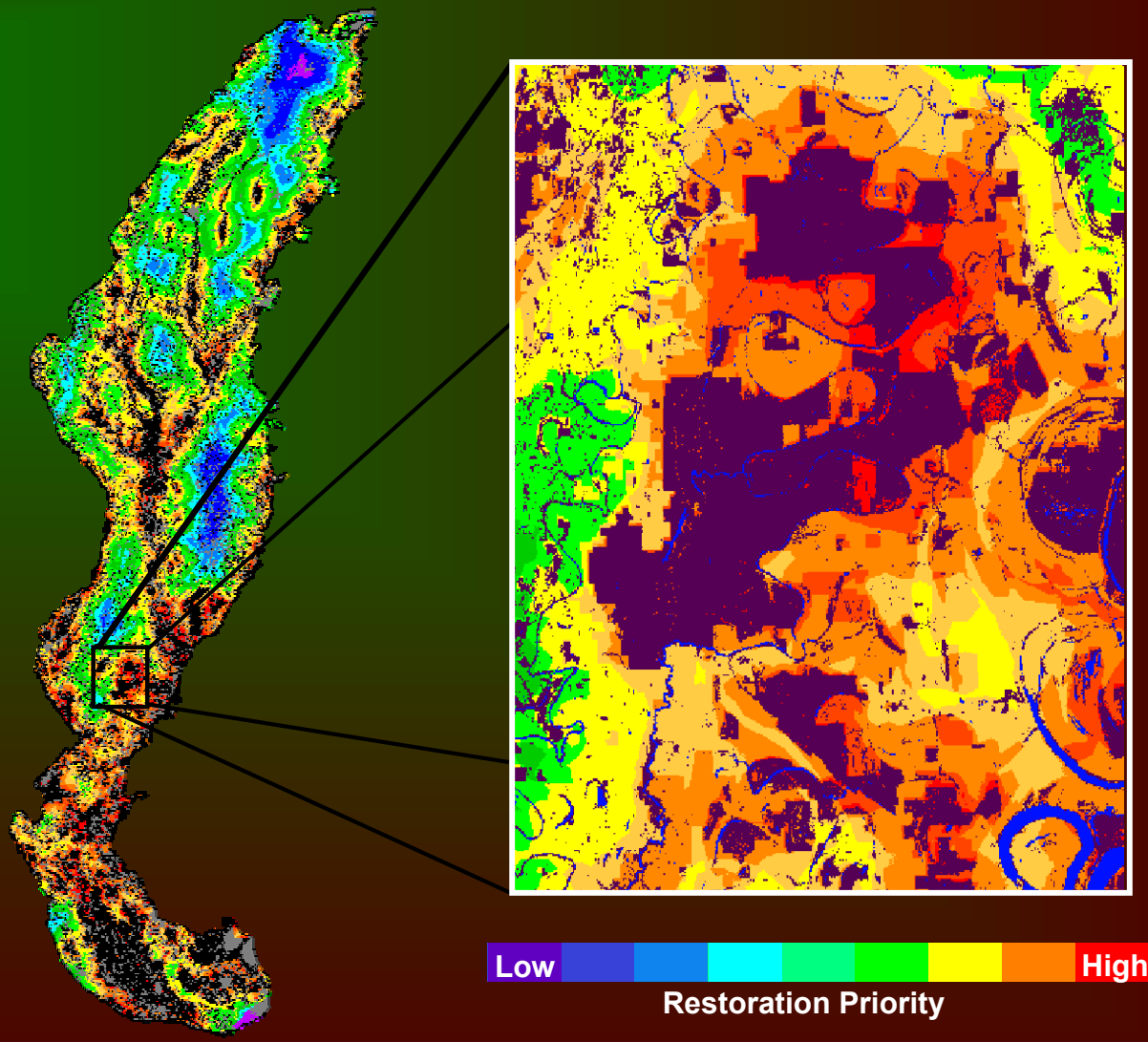
Product

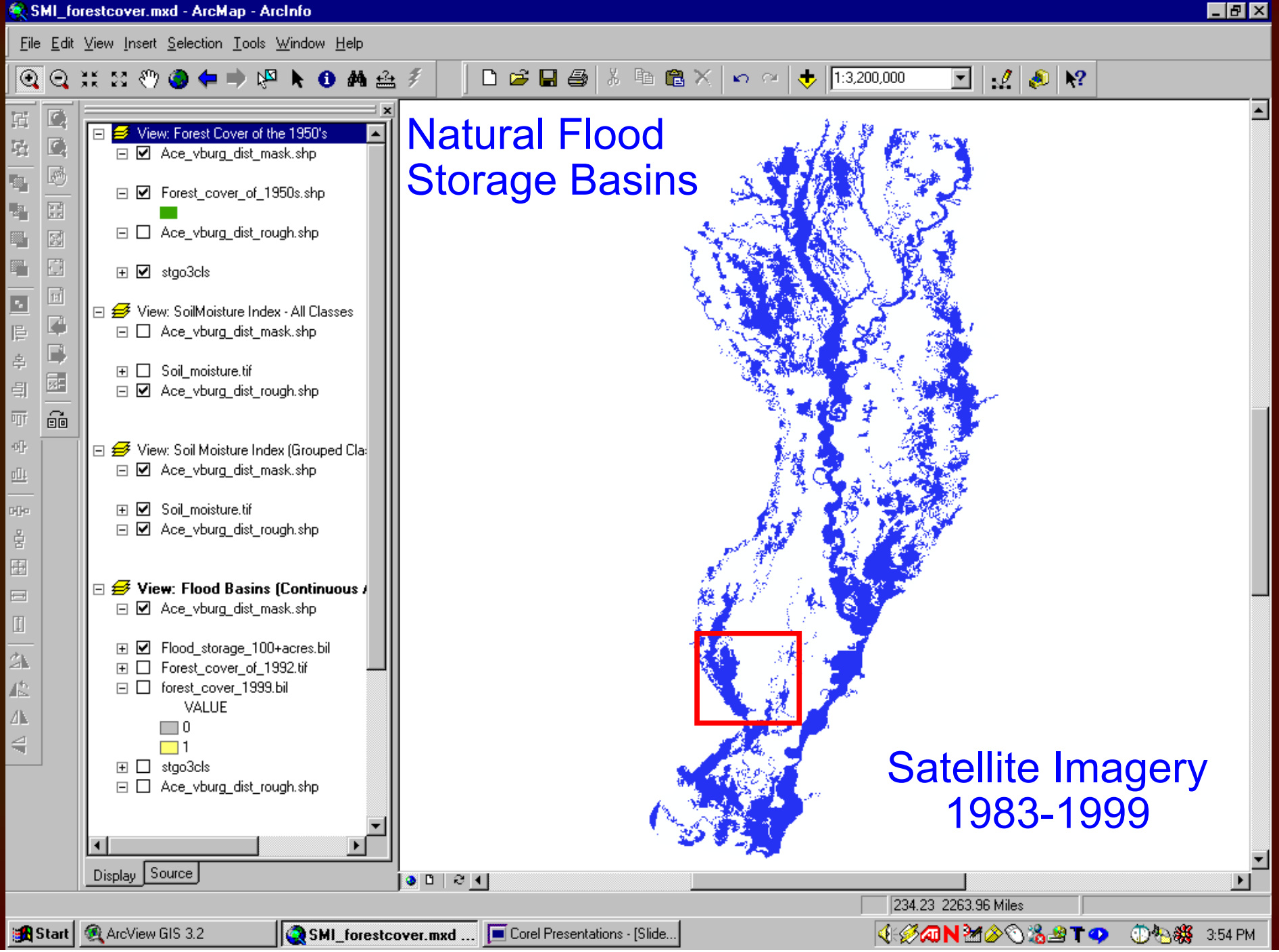


- A decision support model that identifies reforestation priorities focused on natural flood storage for high frequency/event sites. Here, observed flood events derived from satellite imagery are interpolated to predict the continuum of flood events with higher frequency/events receiving higher restoration priorities.

Reforestation Priorities for Forest Breeding Birds

Science-based Priorities
and
Decision Support Models




SMI_forestcover.mxd - ArcMap - ArcInfo
File Edit View Insert Selection Tools Window Help
1:3,200,000
View: Forest Cover of the 1950's
Ace_vburg_dist_mask.shp
Forest_cover_of_1950s.shp
Ace_vburg_dist_rough.shp
stgo3cls
View: SoilMoisture Index - All Classes
Ace_vburg_dist_mask.shp
Soil_moisture.tif
Ace_vburg_dist_rough.shp
View: Soil Moisture Index (Grouped Cla
Ace_vburg_dist_mask.shp
Soil_moisture.tif
Ace_vburg_dist_rough.shp
View: Flood Basins (Continuous
Ace_vburg_dist_mask.shp
Flood_storage_100+acres.bil
Forest_cover_of_1992.tif
forest_cover_1999.bil
VALUE
0
1
stgo3cls
Ace_vburg_dist_rough.shp
Display
Source
Natural Flood Storage Basins
Satellite Imagery 1983-1999
234.23 2263.96 Miles
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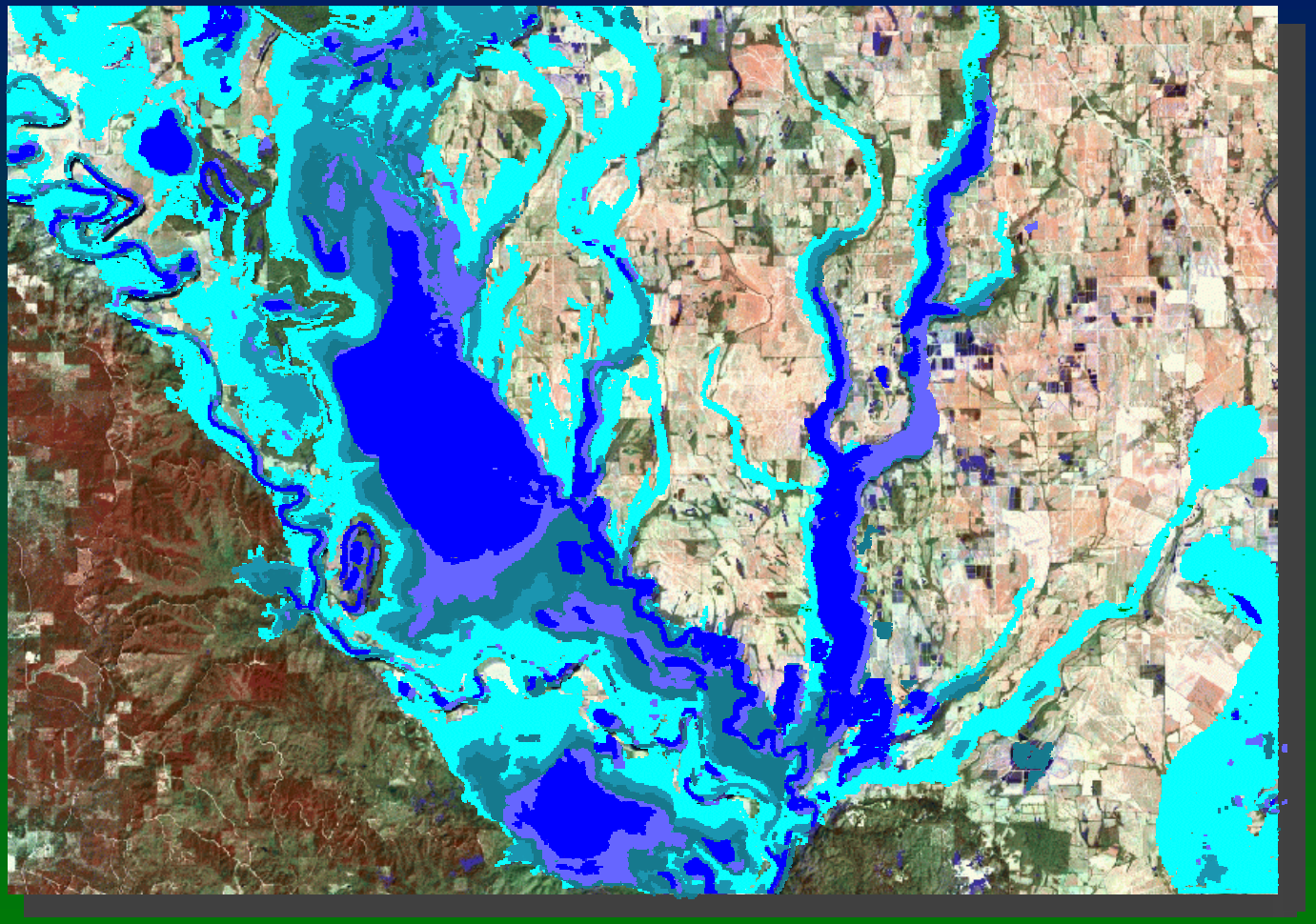
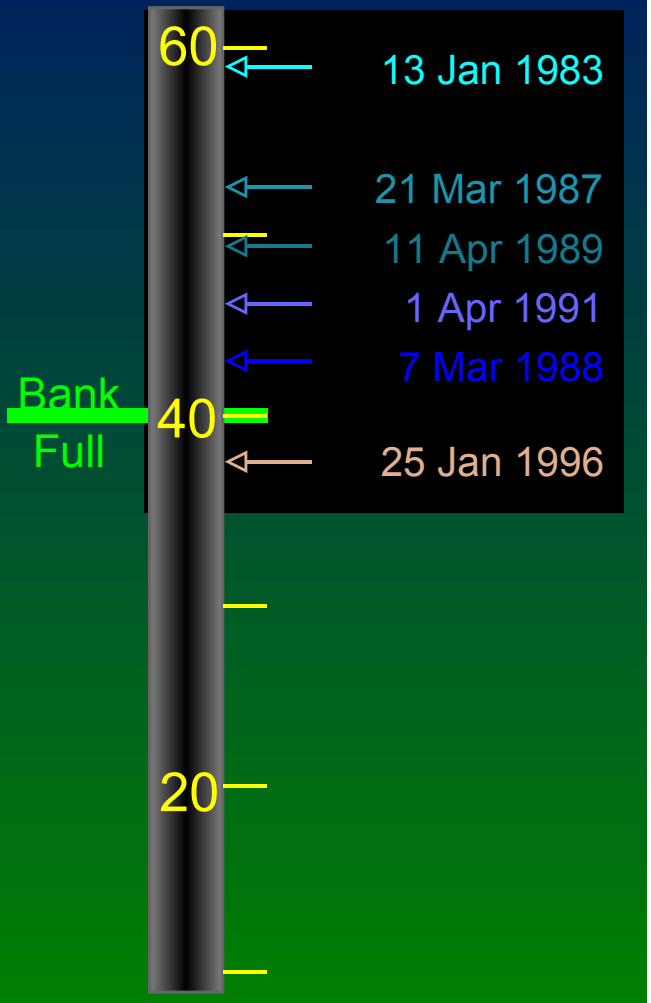
Corel Presentations - [Slide...
3:54 PM

Flood Modeling Pilot Project
Lower Boeuf River, Louisiana

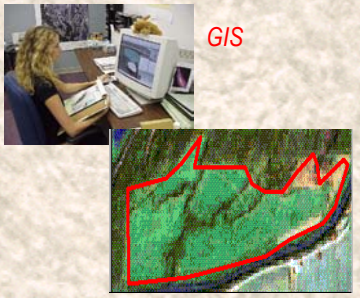




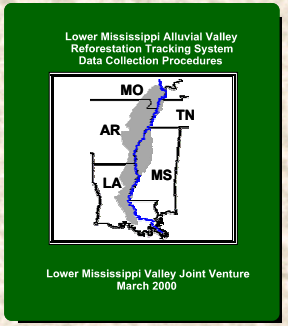
Reforestation Tracking and Monitoring Capabilities

The LMVJV Reforestation Tracking System

Cleared lands restored through reforestation



GIS and GPS used to delineate geographic location of reforested area.



Critical planting event information documented using RTS Procedures for tracking and evaluation purposes

*The Lower Mississippi Valley Joint Venture **Reforestation Tracking System (RTS)** is designed to provide a means of reporting and tracking reforestation, to establish baseline conditions for monitoring and evaluation purposes, and to deliver a spatial depiction of forest changes over time in order to assist with planning at multiple spatial scales.*

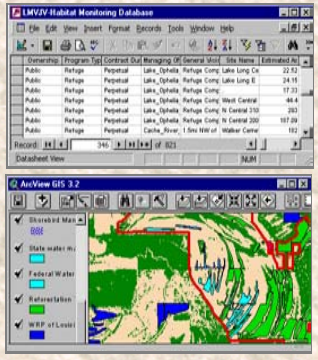
Monitoring programs designed to evaluate the success of planting strategies readily established within the framework provided by the RTS

Automated Reporting System

Internet-accessible data entry tables provide the reporting forester with user-friendly forms and links for easy data entry updates to the RTS database

	Reforested Acres
ARKANSAS	18,512
ILLINOIS	661
LOUISIANA	47,491
MISSISSIPPI	28,817
OKLAHOMA	172
TENNESSEE	1,632
TEXAS	1,192

Hard copy maps, data queries, and statistical summaries can be easily derived from the RTS



Tabular Databases
MS Access

linked

Spatial Databases
ESRI ArcView

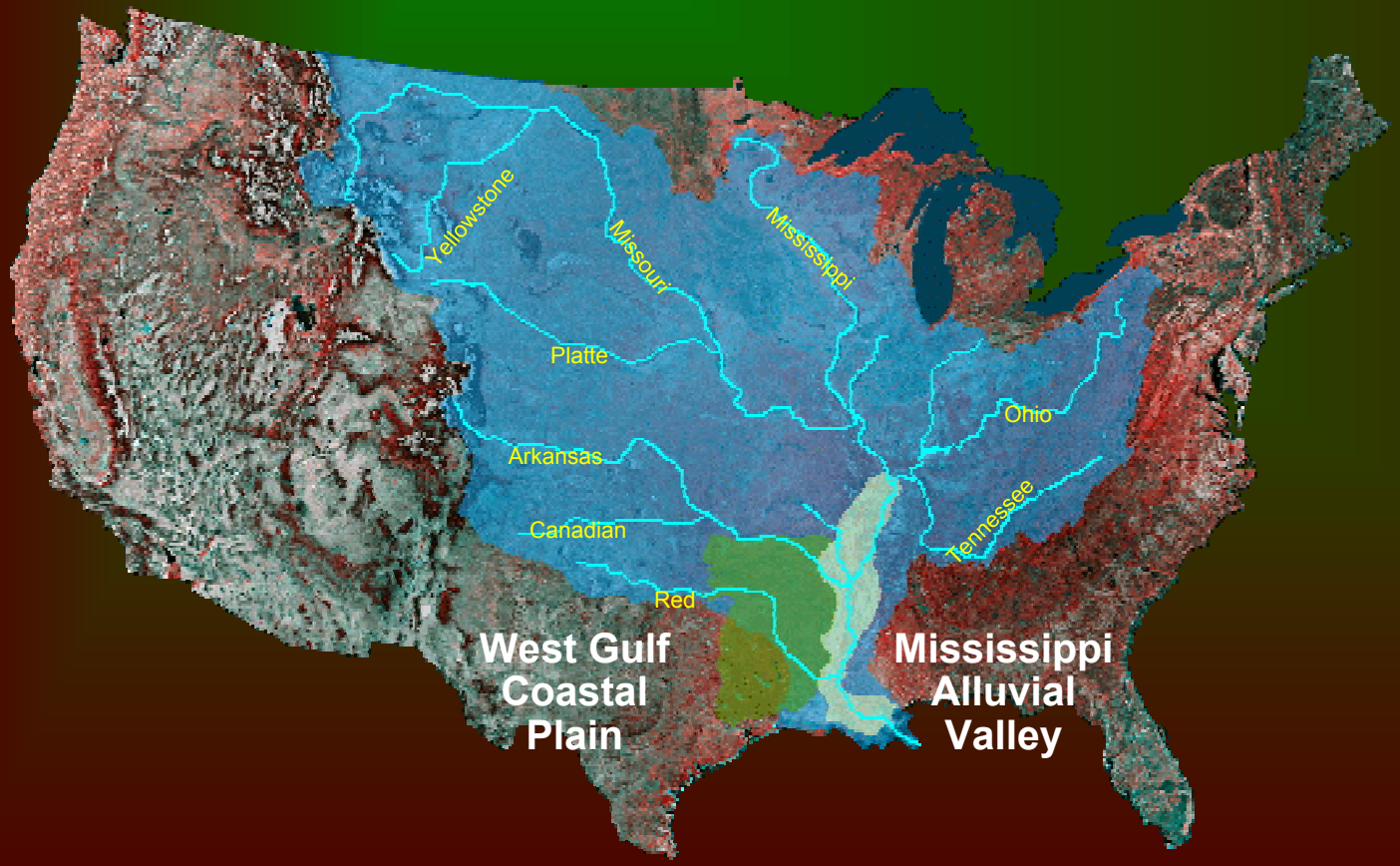
Resulting product is geospatial information linked with attribute data in a relational database system

Three Topics...

- A View from the Wildlife Community on Agriculture's Role in Offsetting GHG Emissions
- How the Wildlife Community is Positioning Itself to Support Agriculture's Role
- A "Context for Coordination"

A “Context for Coordination”

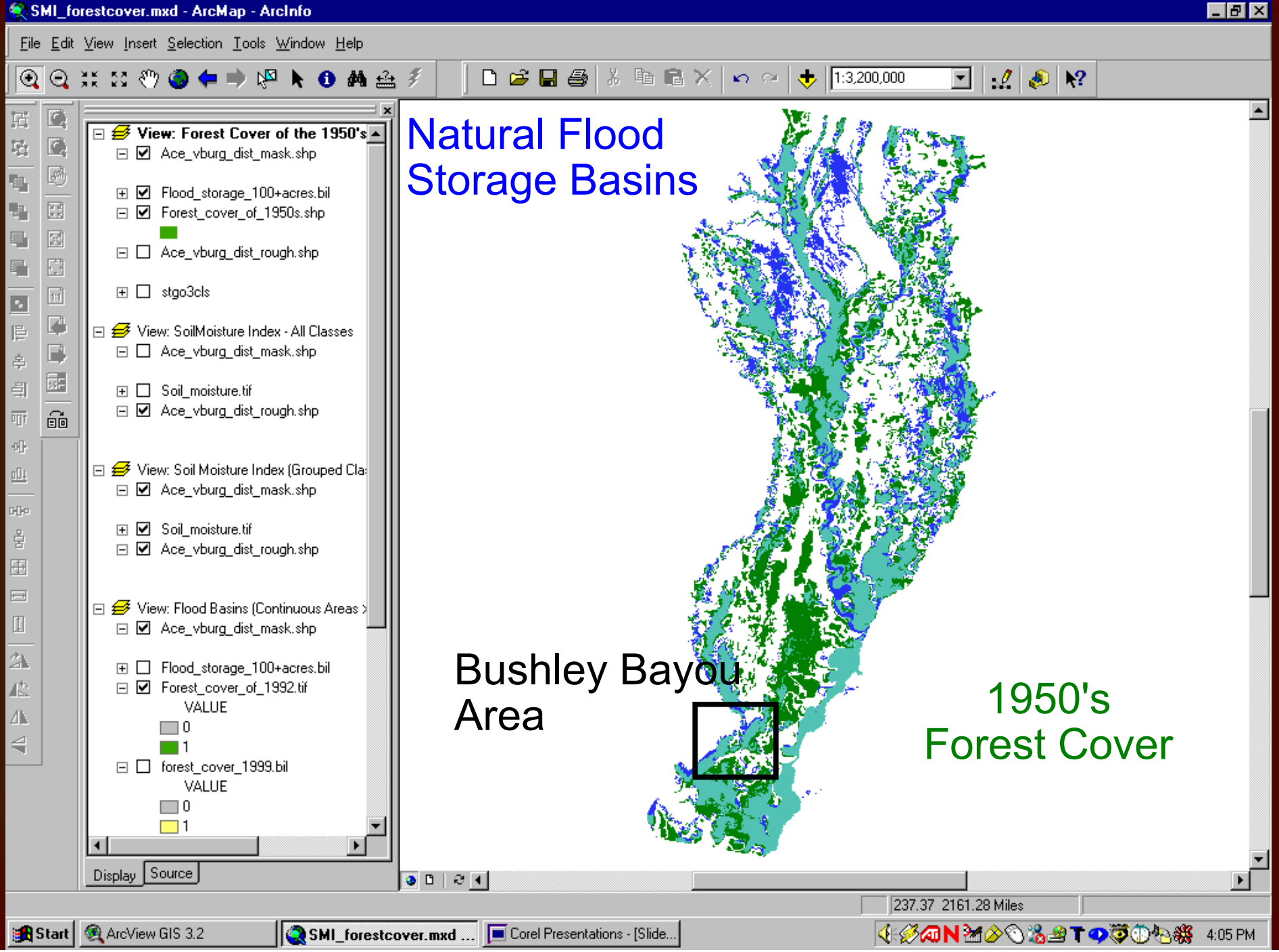
Linking energy, agricultural, and environmental policies and programs in support of ecologically and economically sustainable restoration



Energy

Environment

Agriculture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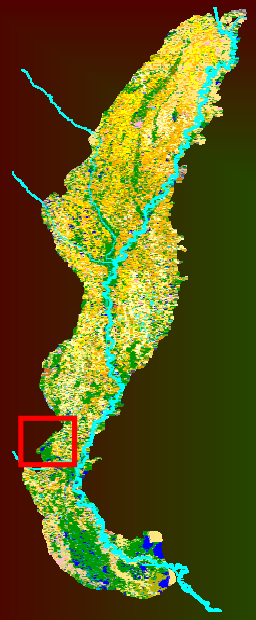
View: Flood Basins (Continuous Areas
Ace_vburg_dist_mask.shp
Flood_storage_100+acres.bil
Forest_cover_of_1992.tif
VALUE
0
1
forest_cover_1999.bil
VALUE
0
1
Display
Source
Natural Flood Storage Basins
Bushley Bayou Area
1950's Forest Cover
237.37 2161.28 Miles
Start
ArcView GIS 3.2
SMI_forestcover.mxd ...
Corel Presentations - [Slide...
4:05 PM

Bushley Bayou Area

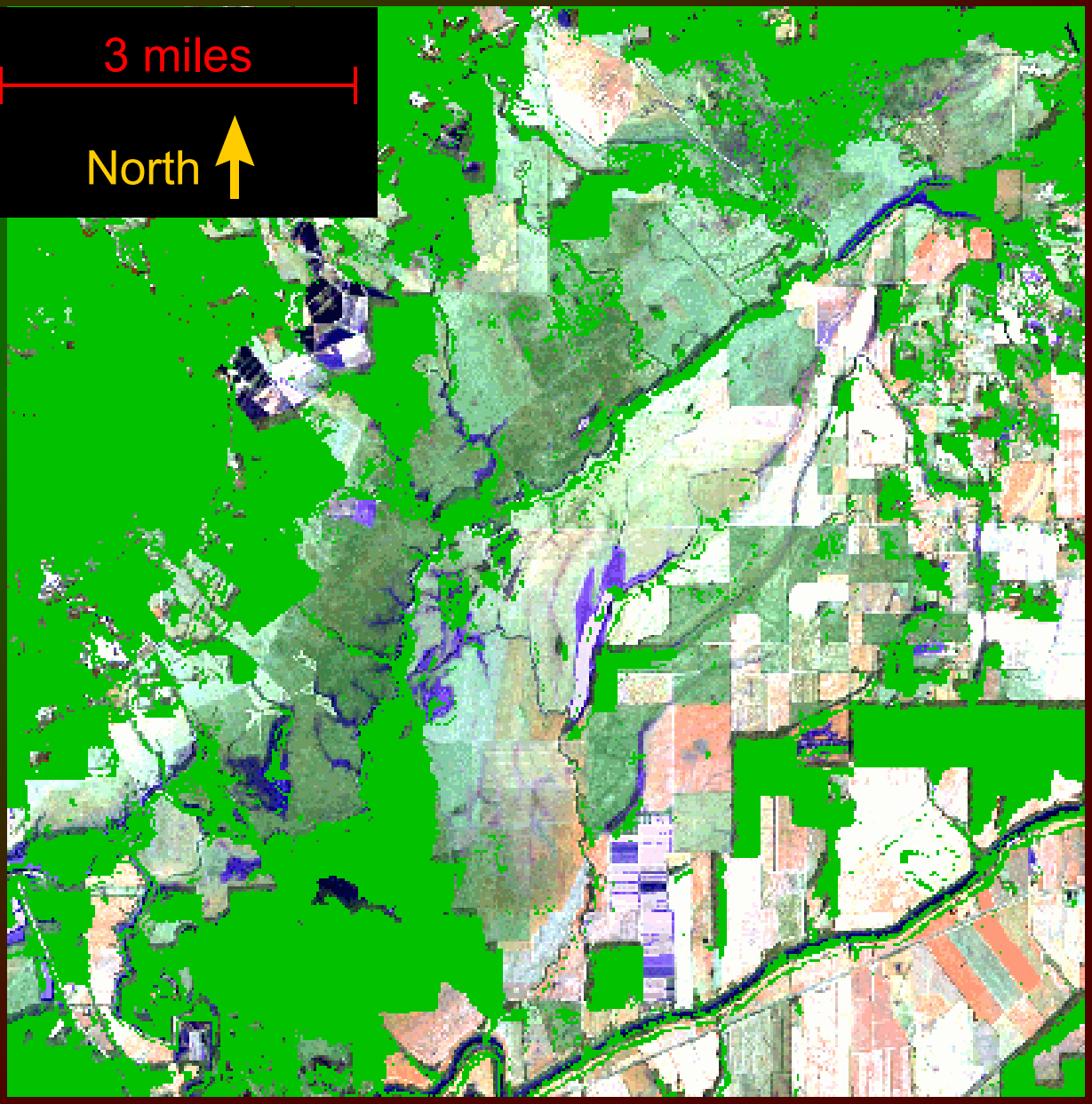


Bushley Bayou
Louisiana

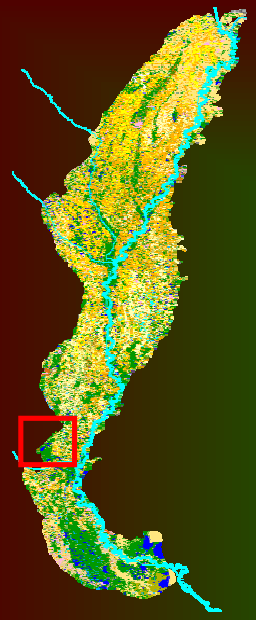
3 miles

North

1992 Forest Cover



Bushley Bayou Area



Bushley Bayou
Louisiana

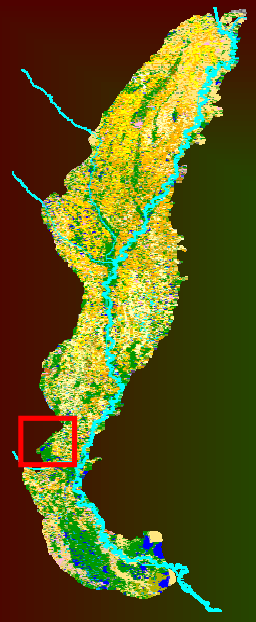
3 miles

North

1992 Forest Cover

Wetland Reserve Program

Bushley Bayou Area



Bushley Bayou
Louisiana

3 miles

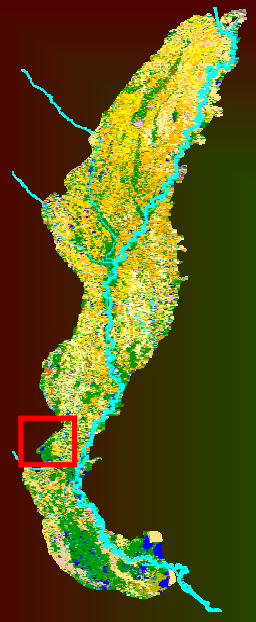
North

1992 Forest Cover

Wetland Reserve Program

AEP/FWS Acquisition

Bushley Bayou Area



Bushley Bayou
Louisiana

3 miles

North

1992 Forest Cover

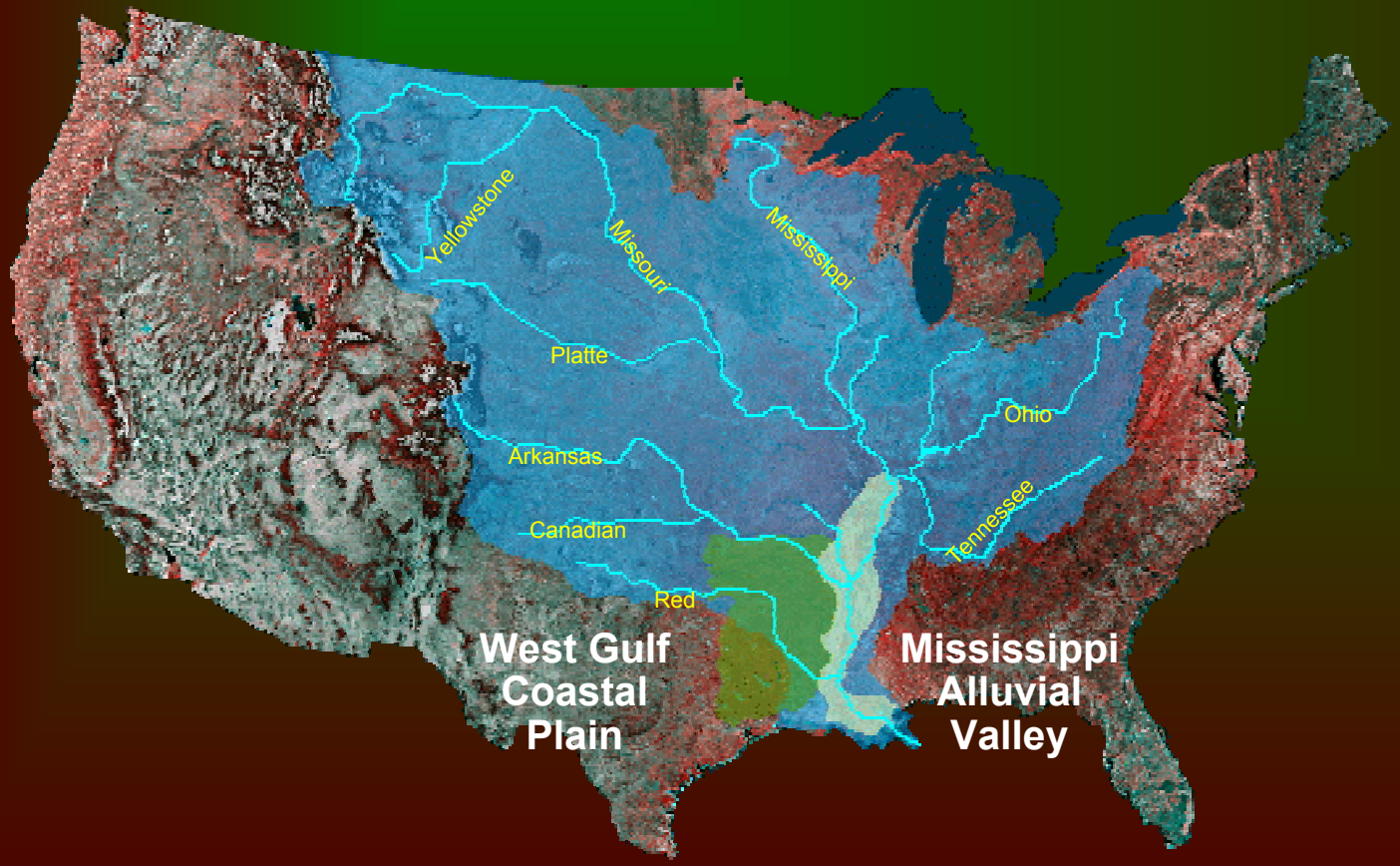
Wetland Reserve Program

AEP/FWS Acquisition

AEP Reforestation

A “Context for Coordination”

Linking energy, agricultural, and environmental policies and programs in support of ecologically and economically sustainable restoration



Energy

Environment

Agriculture