

# Pasture Management for Soil Quality

Soil & Water Conservation Society

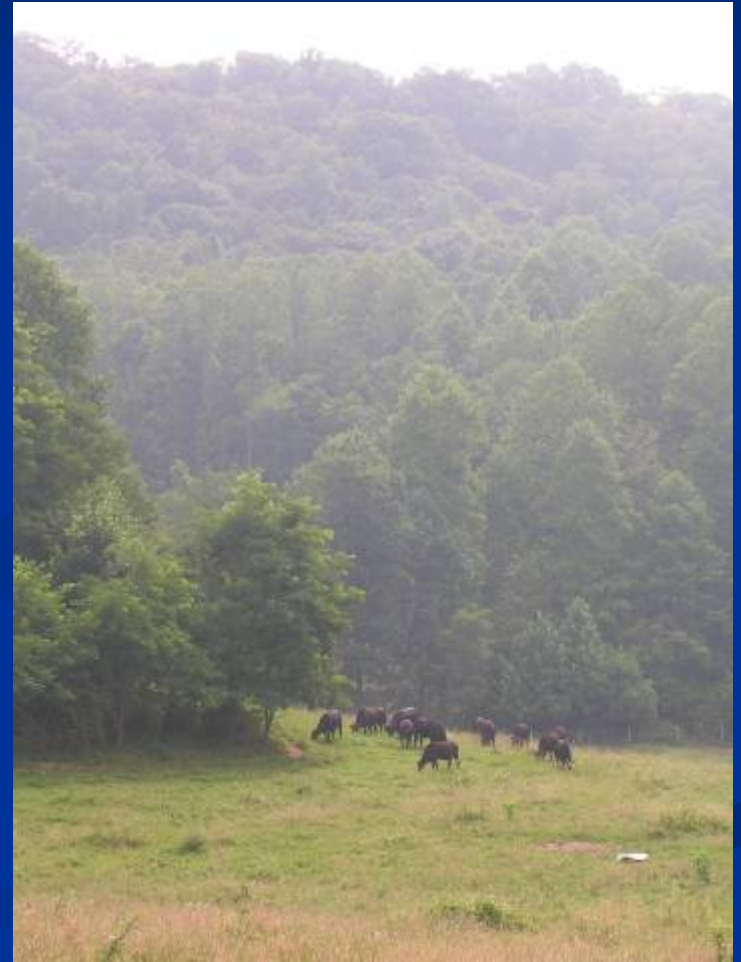
Tampa, FL July 25, 2007

Daniel F. Wallace

USDA-NRCS State Resource Inventory Coordinator, Athens, Georgia

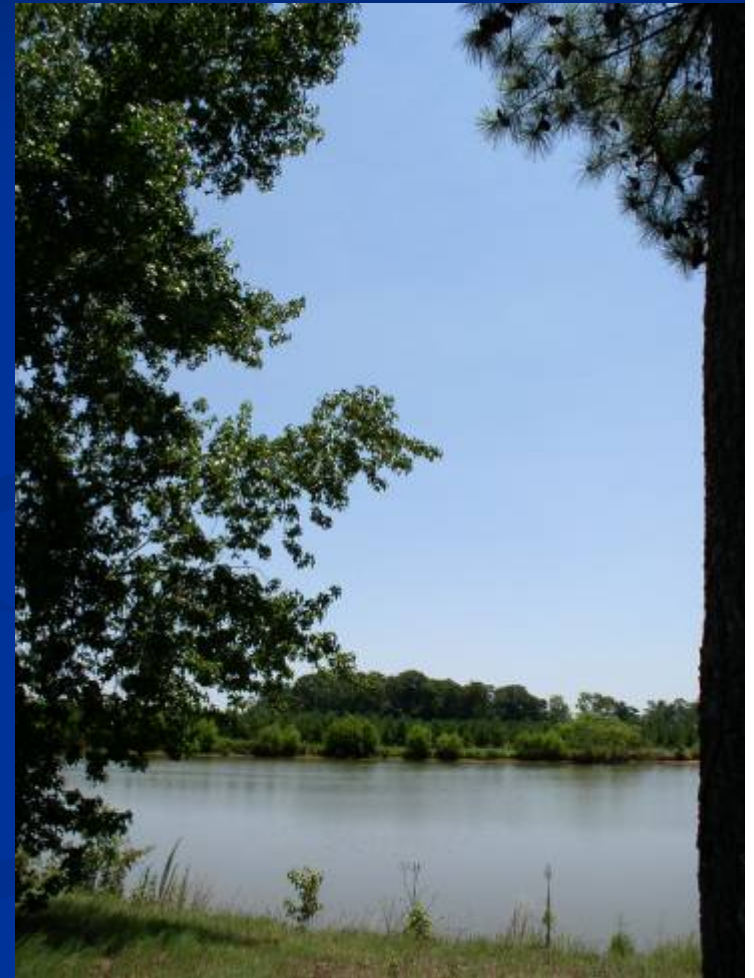
# Outline

- Define Pasture Systems –  
Locations, livestock,  
forages, farmers
- Pasture Soils
- Soil Problems – Pastures
- Pasture Management
- The Old Breedlove Farm
- Summation



# Define Pasture Systems

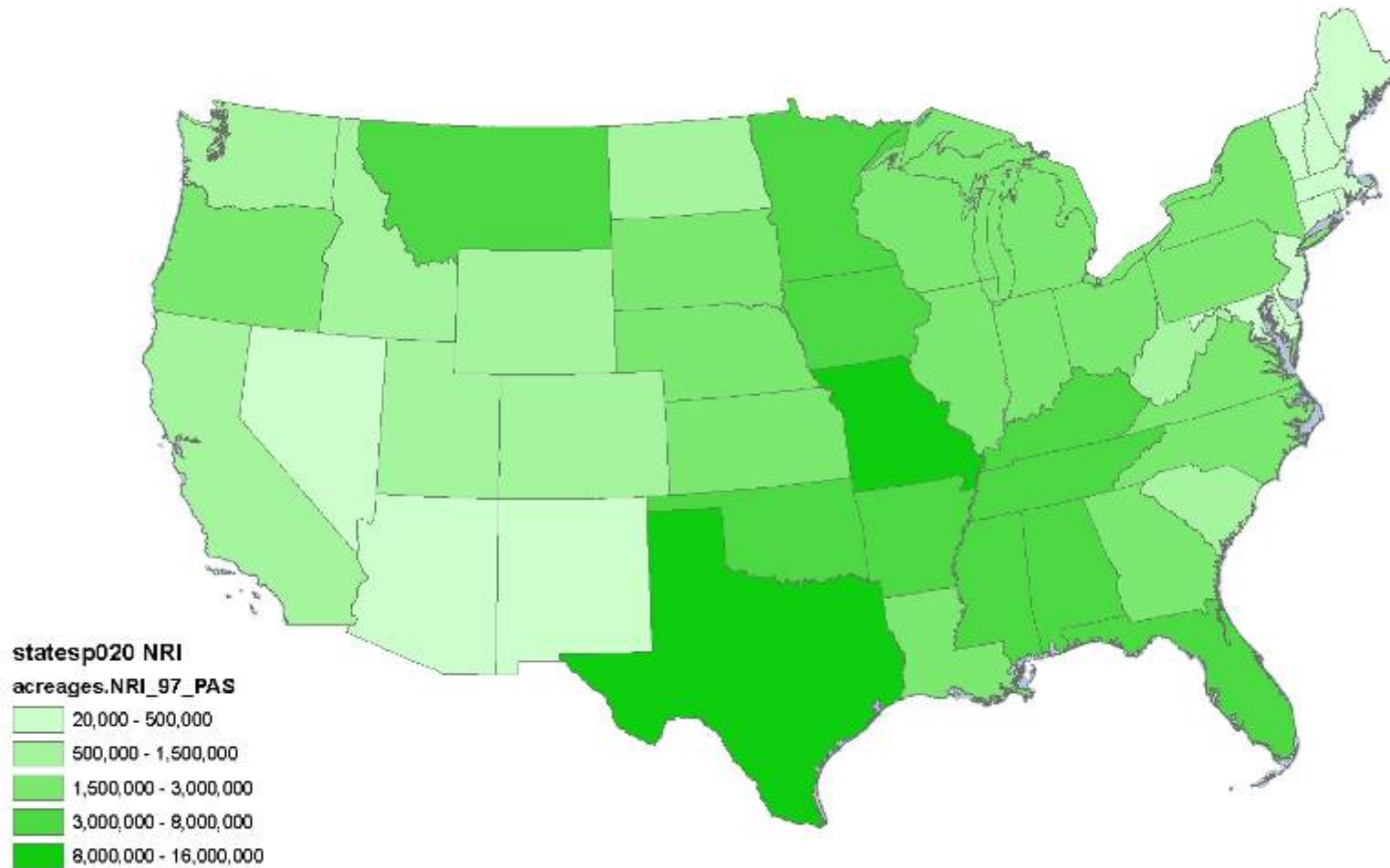
- A. Pasture – estimates of extent
- B. Pasture – estimates of distribution
- C. Livestock – estimate of types and distribution
- D. Forage – types and distribution



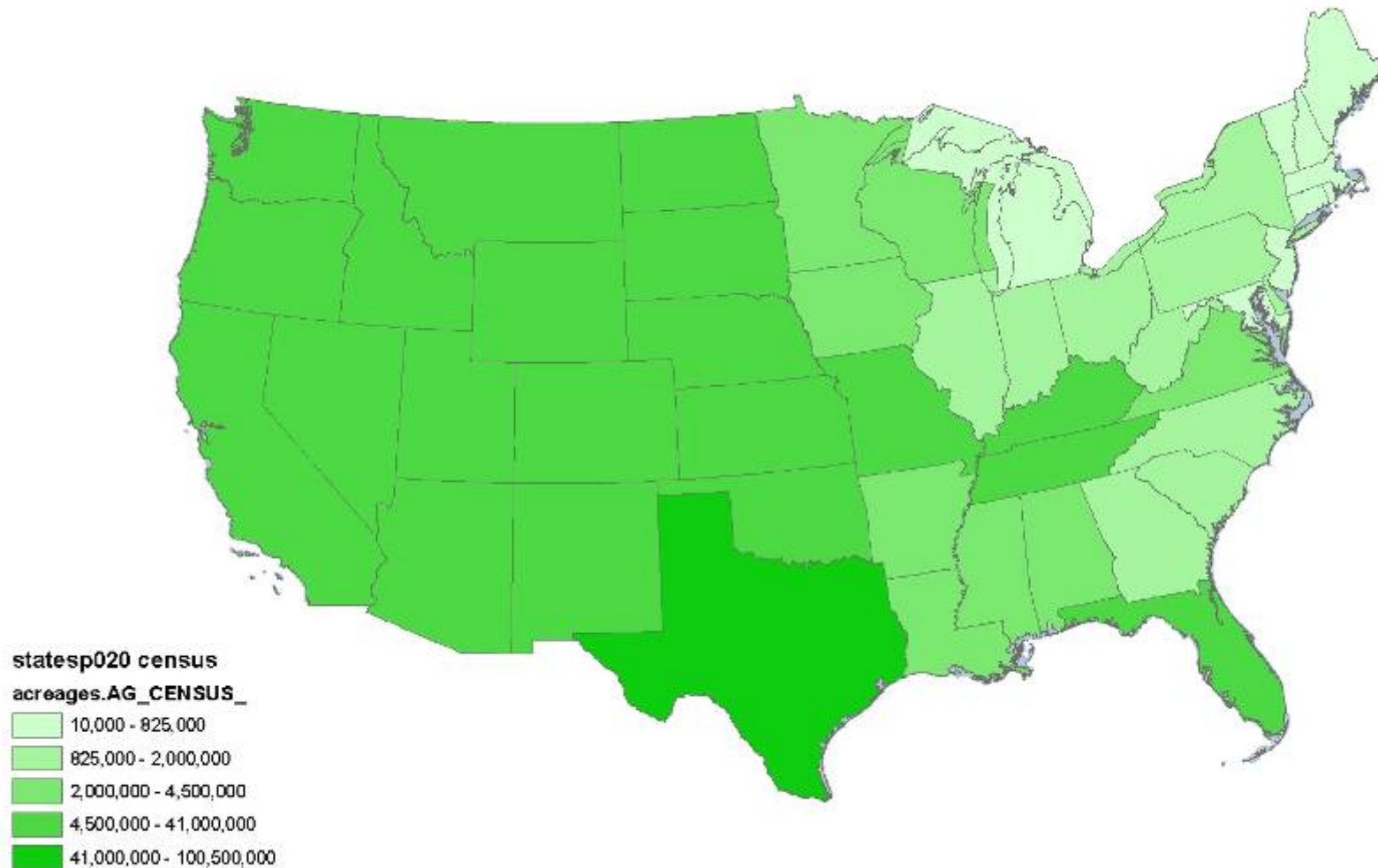
## A. Estimates of Acreage within Conterminous United States

- i. National Resources Inventory, USDA-NRCS 1997 - 119,566,600 acres
- ii. Census of Agriculture, USDA-NASS 2002 - 485,310,500 acres
- iii. National Land Cover Dataset, MRLC 2001 - 178,897,000 acres

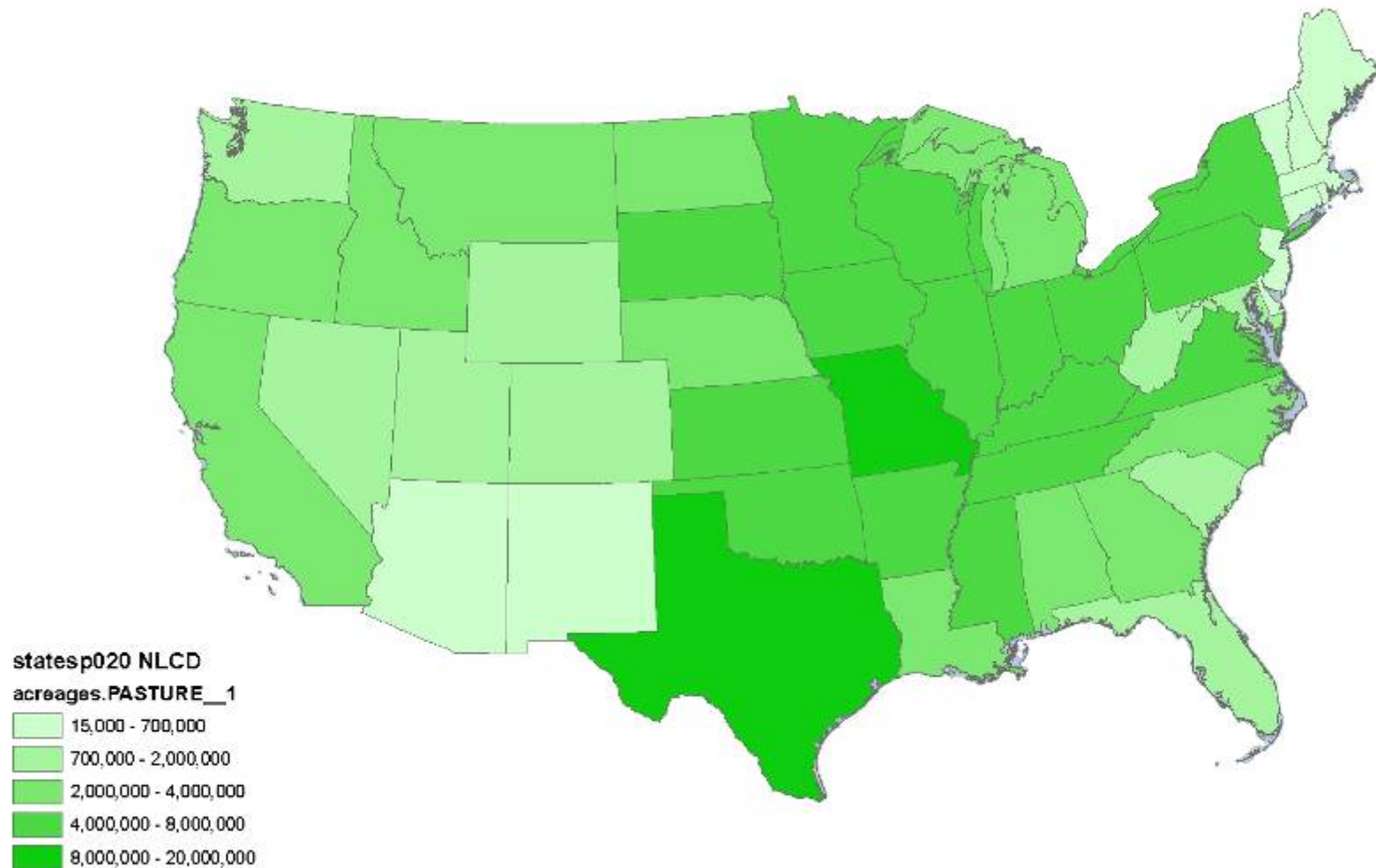
# B. Choropleth of National Resources Inventory Pasture Estimate



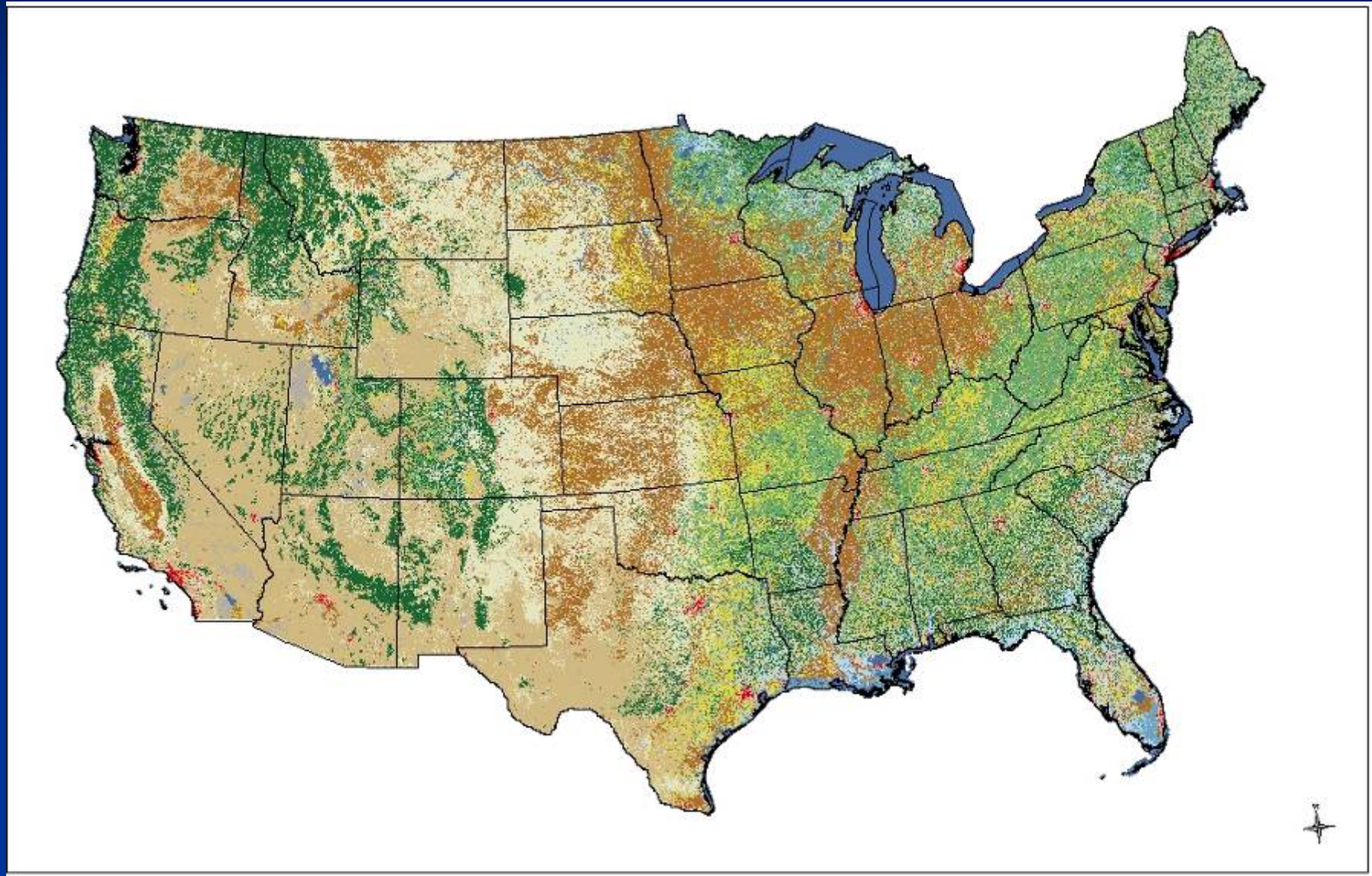
# B. Choropleth of Census of Agriculture Pasture & Range Estimate



# B. Chloropleth of National Land Cover Dataset Estimate

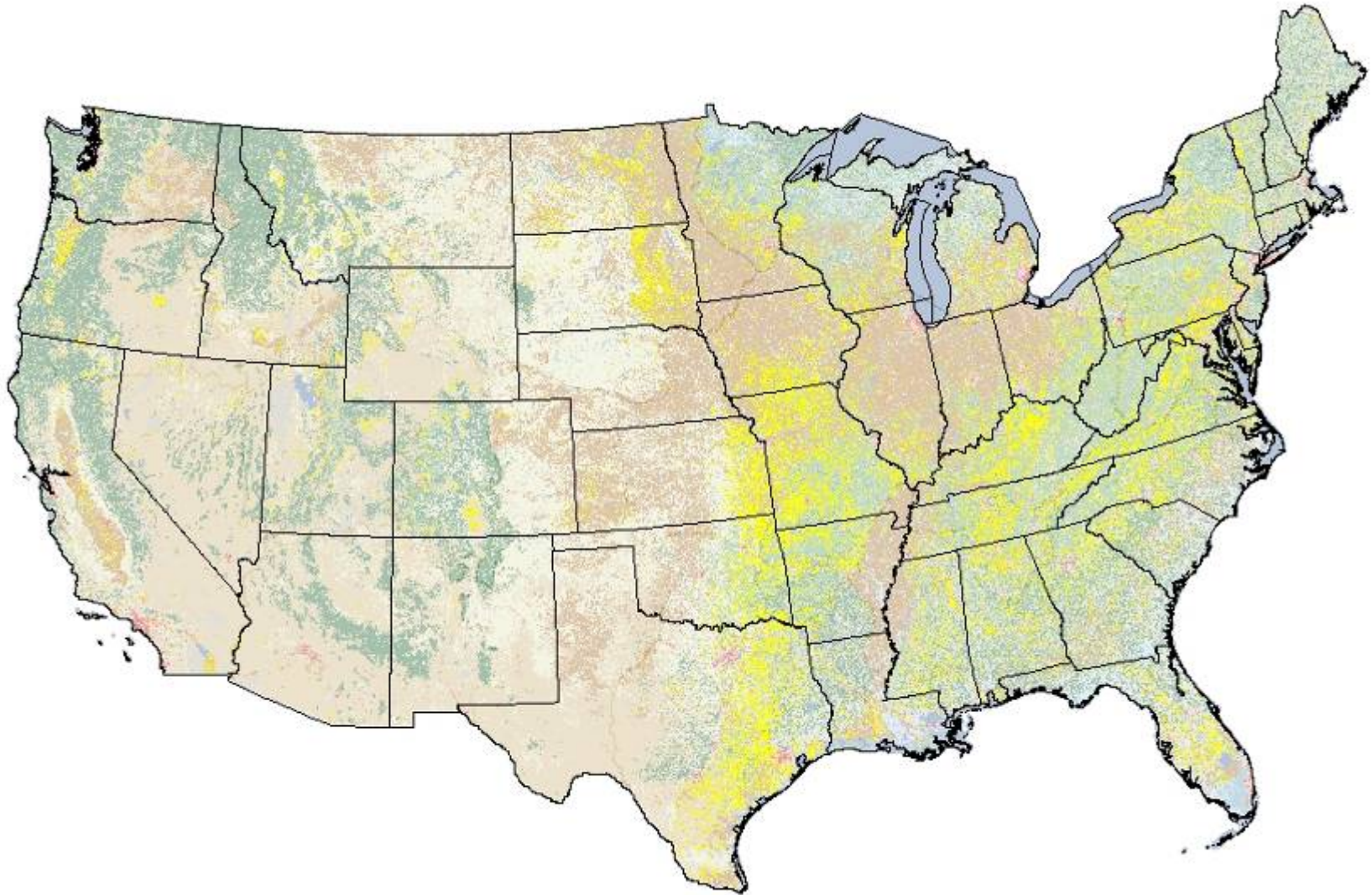


# B. National Land Cover Dataset 2001 Full Resolution

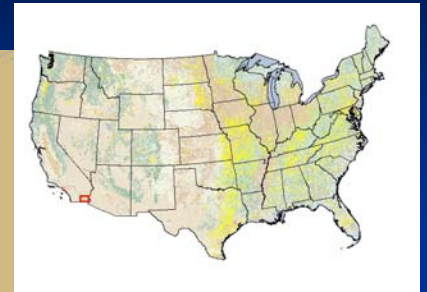
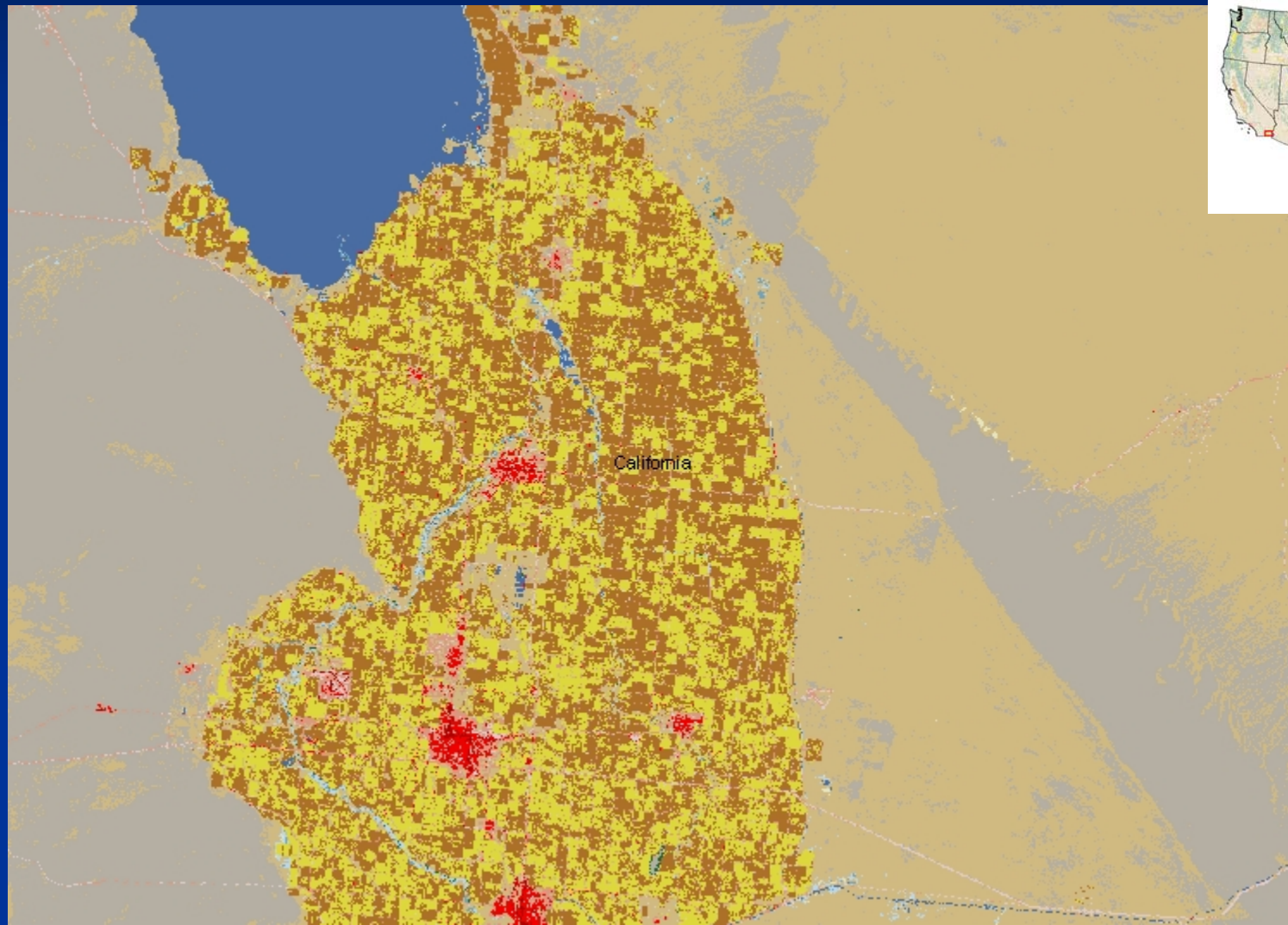




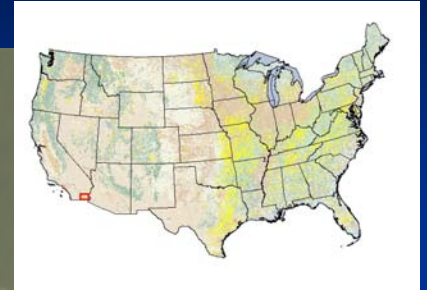
# B. National Land Cover Dataset 2001 Pasture Highlighted



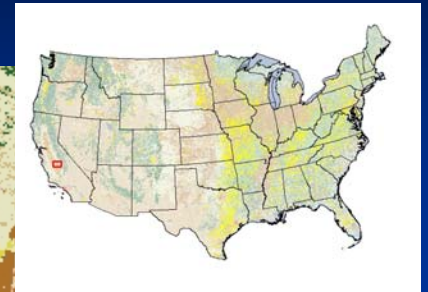
# B. National Land Cover Dataset 2001 California Imperial Valley 1 to 500,000



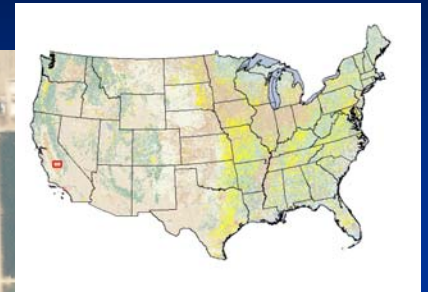
# B. NAIP 2006 California Imperial Valley 1 to 20,000



# B. National Land Cover Dataset 2001 California Central Valley 1 to 500,000

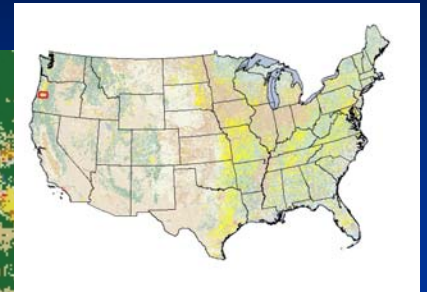
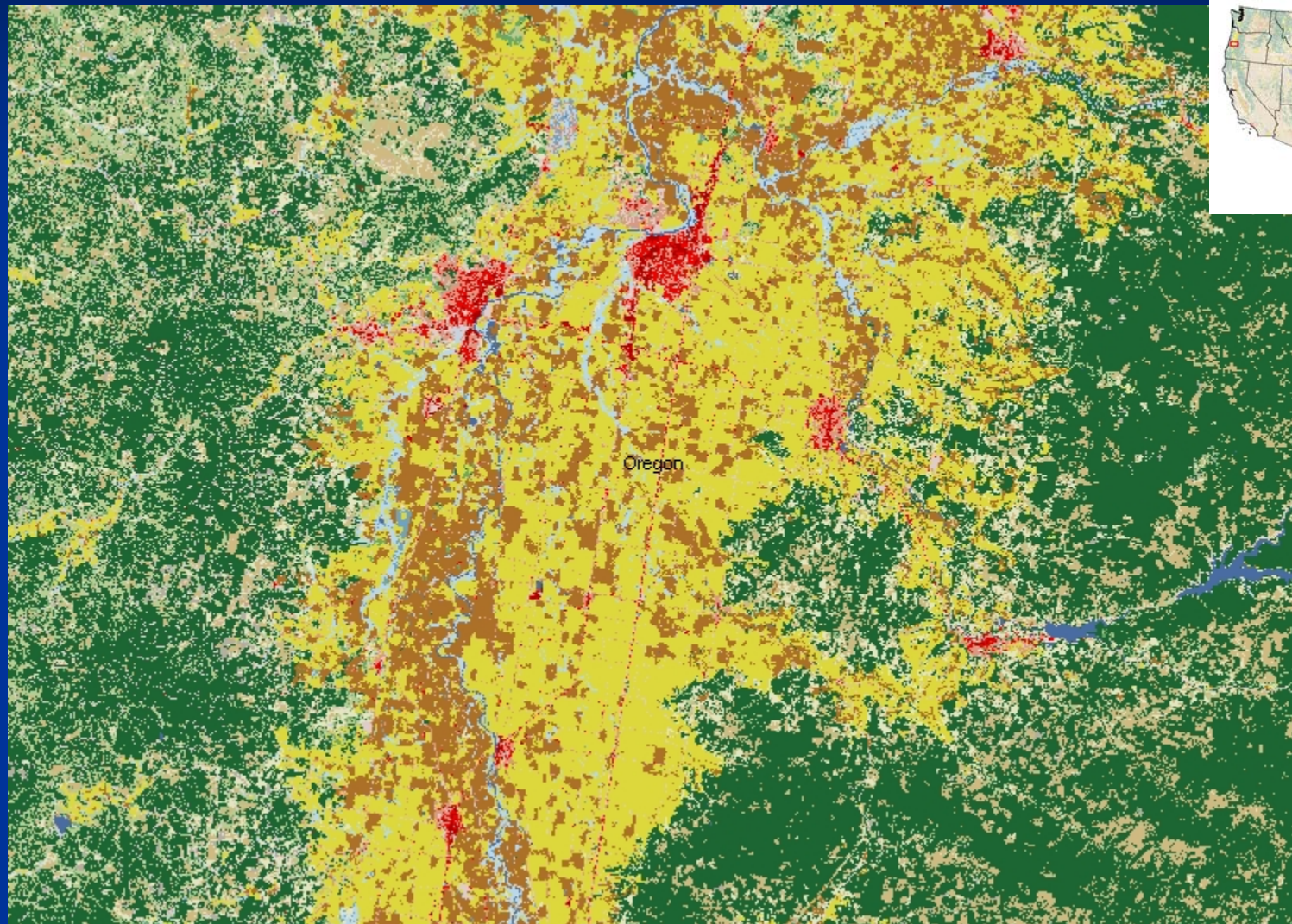


# B. NAIP 2006 California Central Valley 1 to 20,000

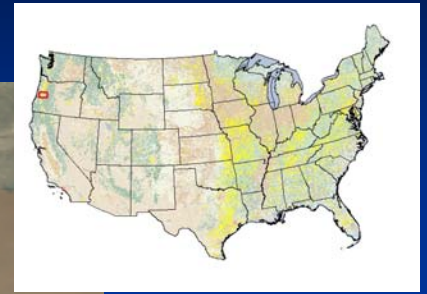


# B. National Land Cover Dataset 2001

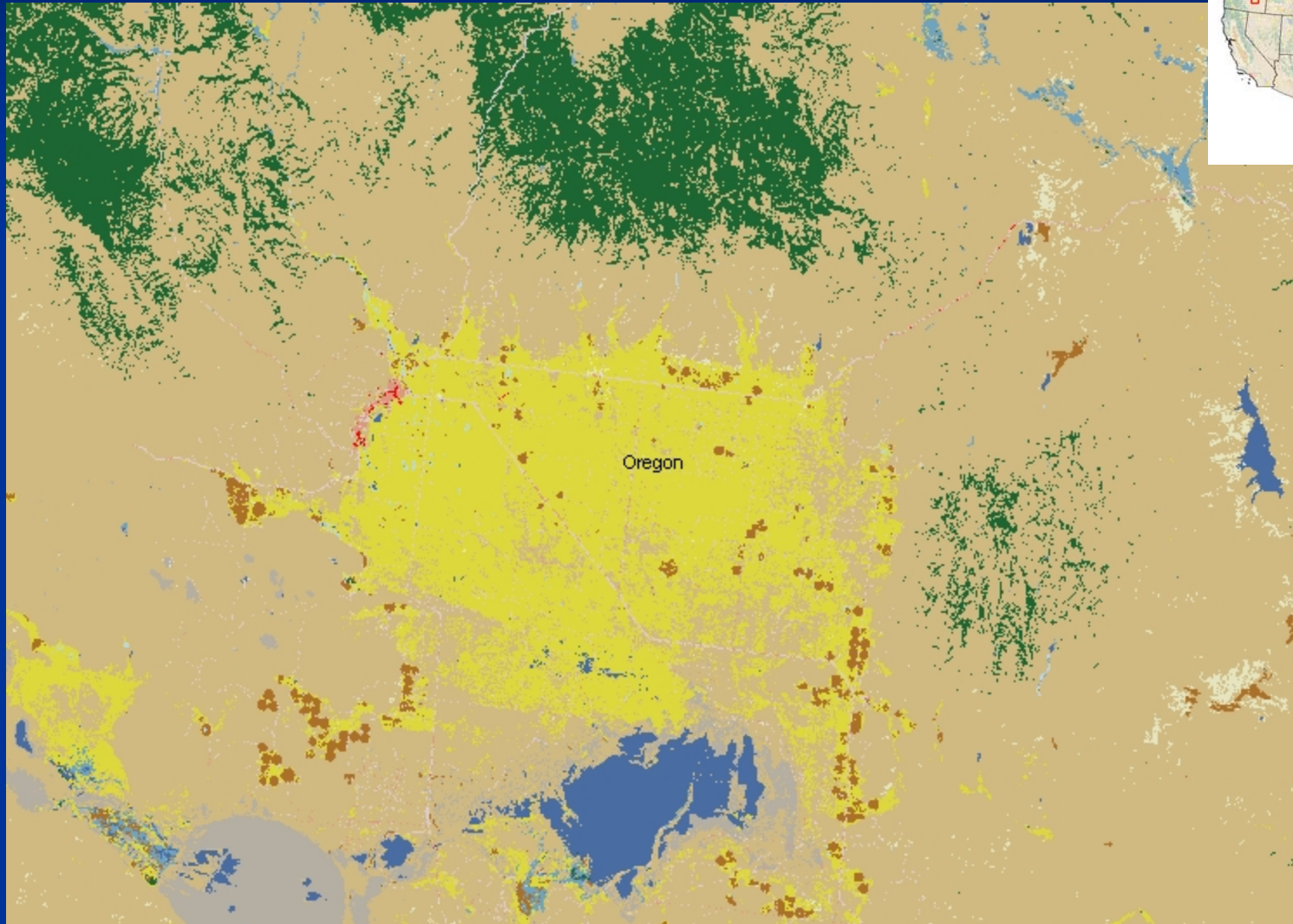
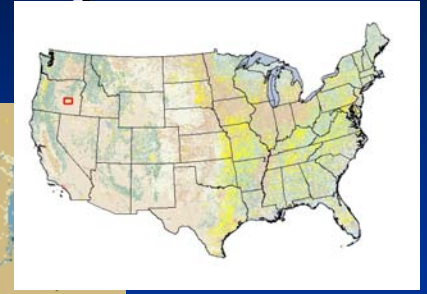
## Oregon Klamath Valley 1 to 500,000



# B. NAIP 2006 Oregon Klamath Valley 1 to 20,000



# B. National Land Cover Dataset 2001 Eastern Oregon 1 to 500,000

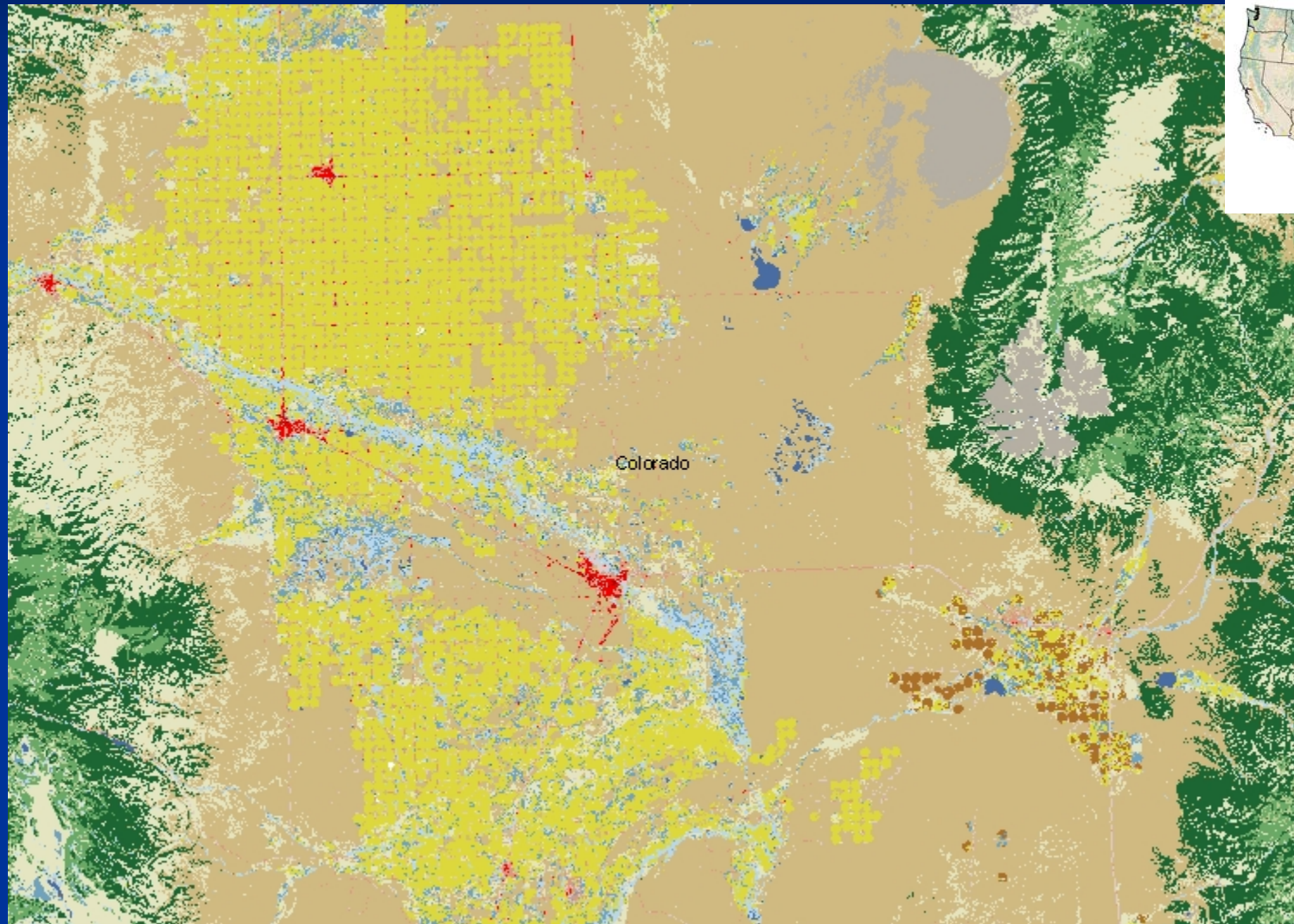




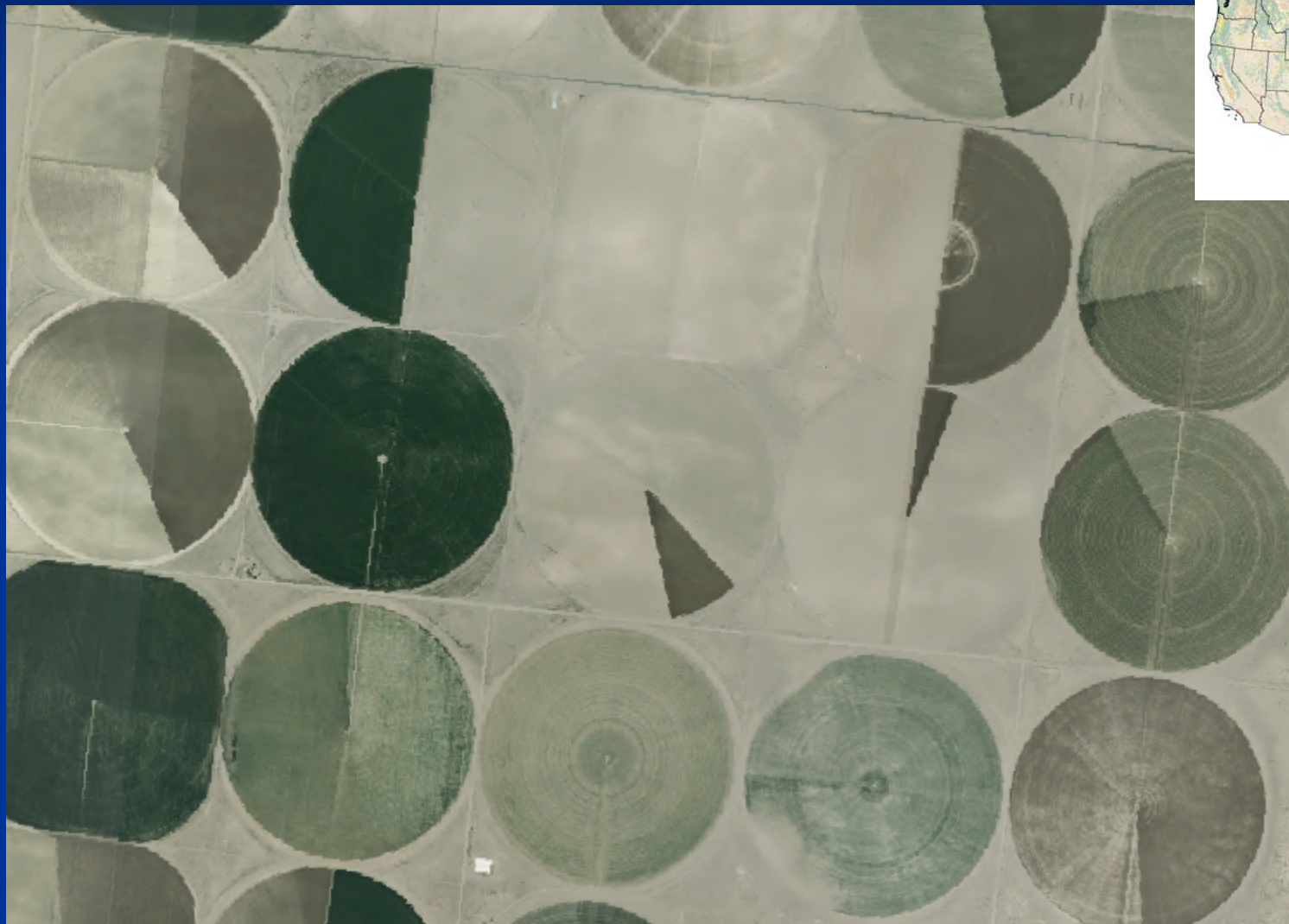
# B. NAIP 2006 Eastern Oregon 1 to 20,000



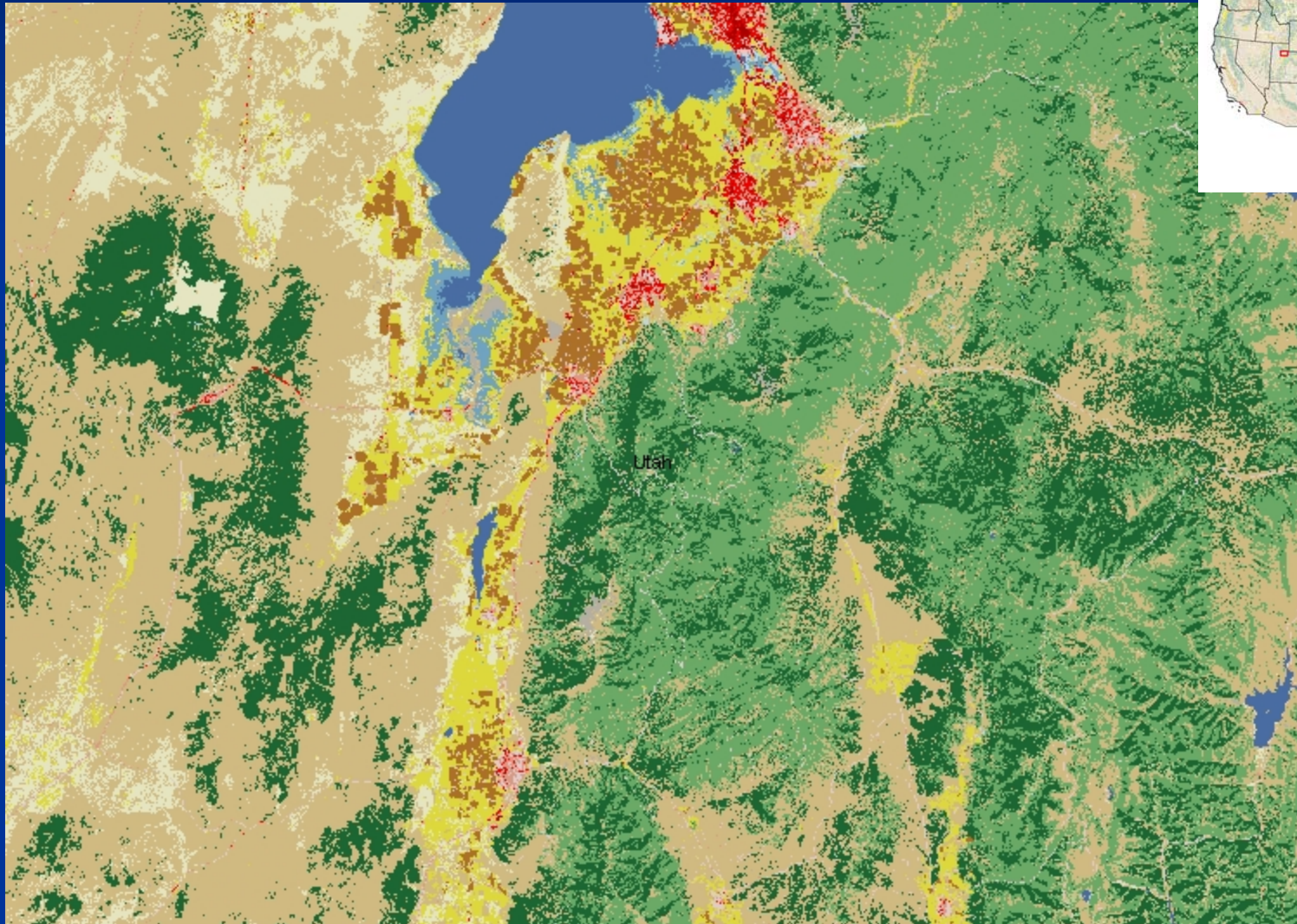
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# B. NAIP 2006 Colorado 1 to 20,000



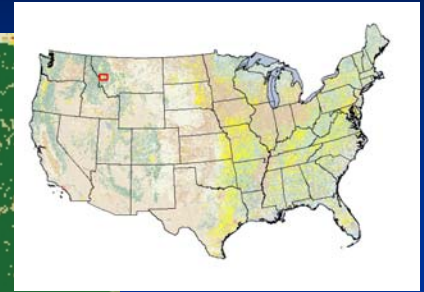
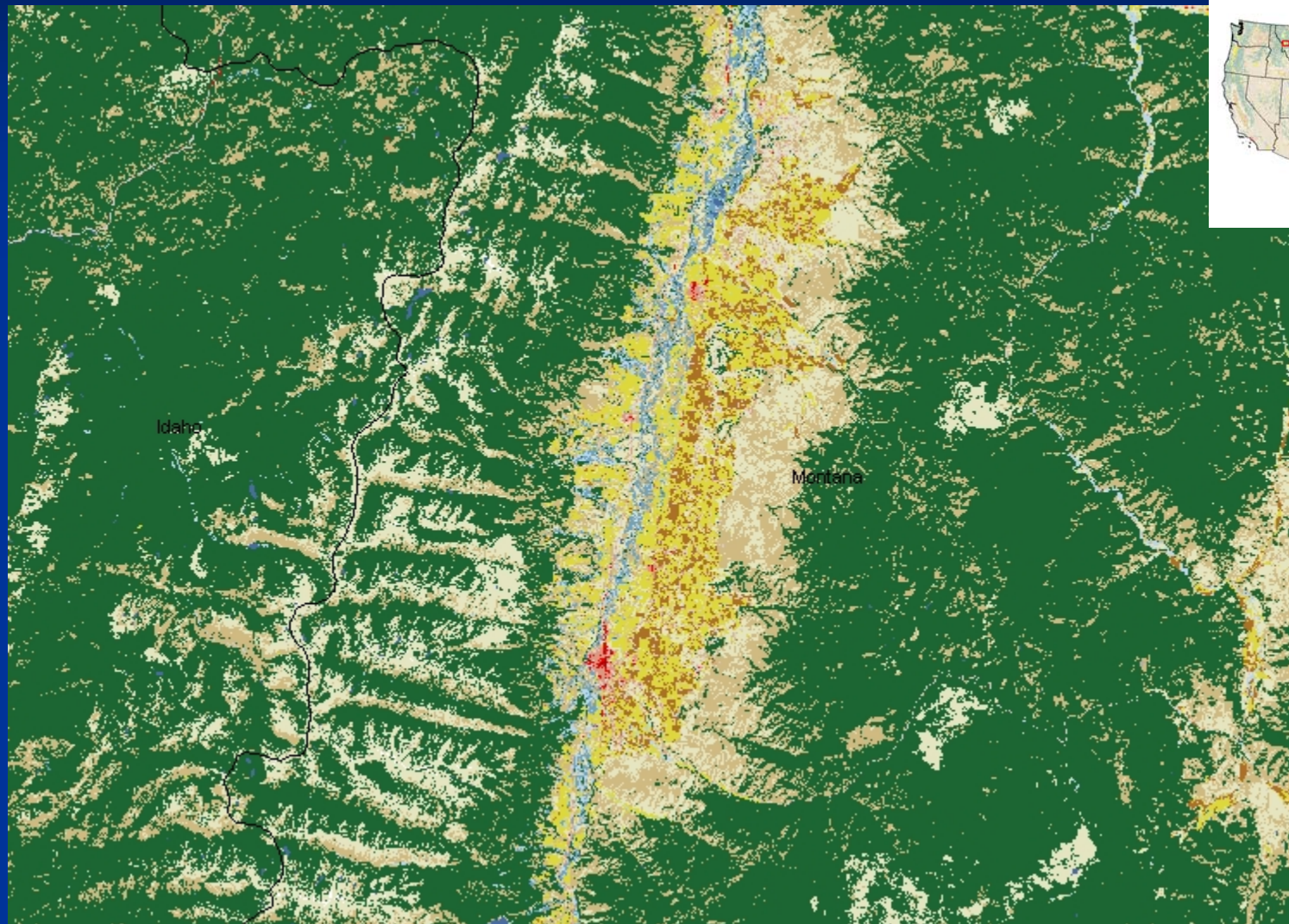
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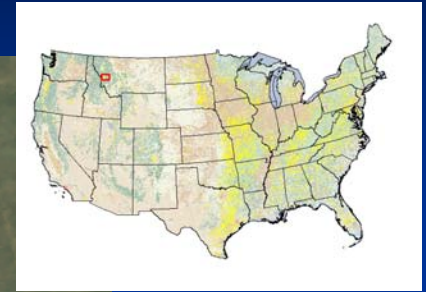
# B. NAIP 2006 Utah 1 to 20,000



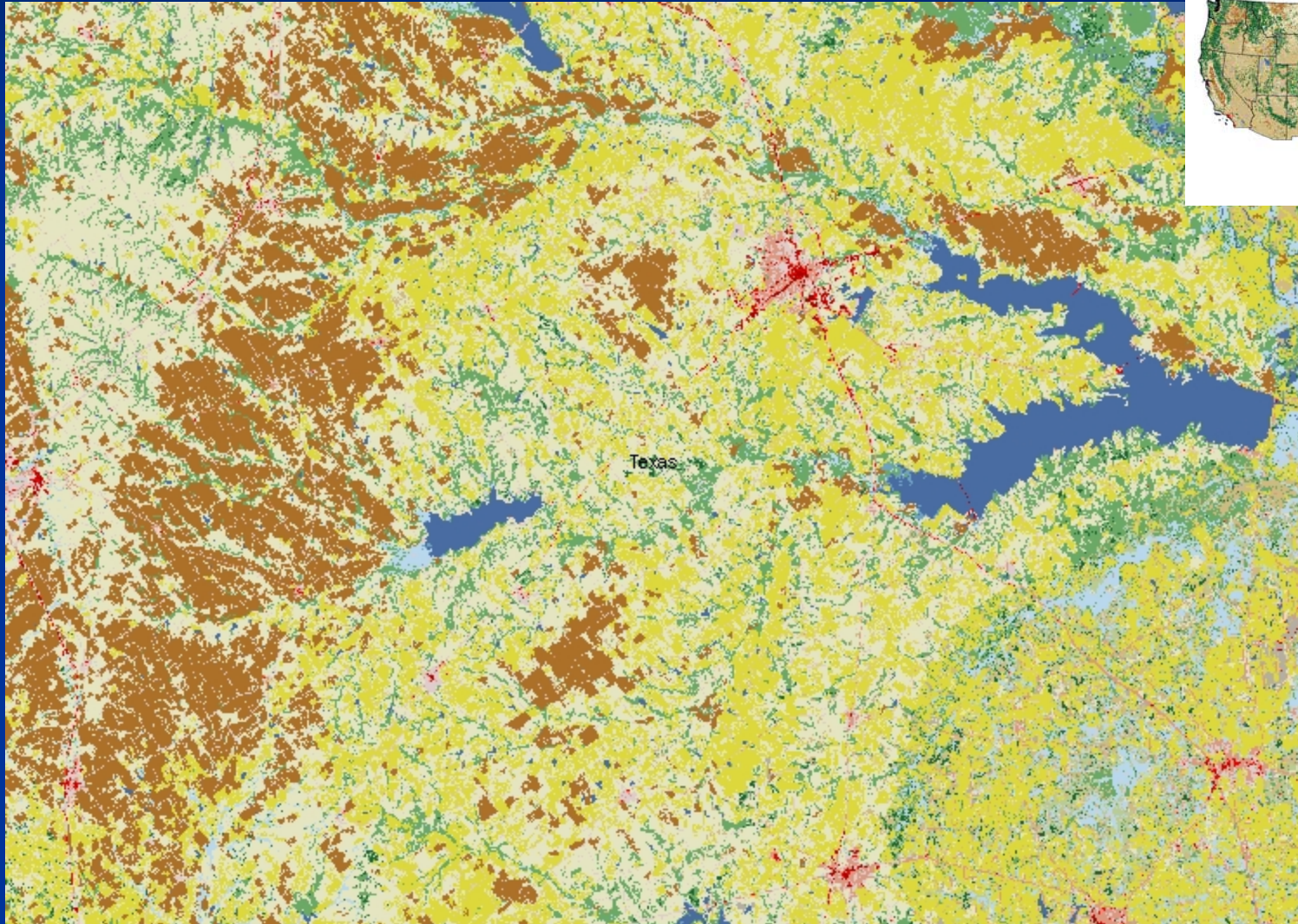
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# B. NAIP 2006 Montana 1 to 20,000

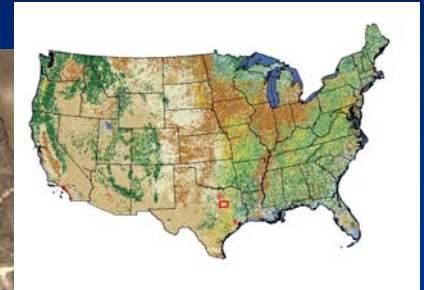


# B. National Land Cover Dataset 2001 Texas Interior 1 to 500,000

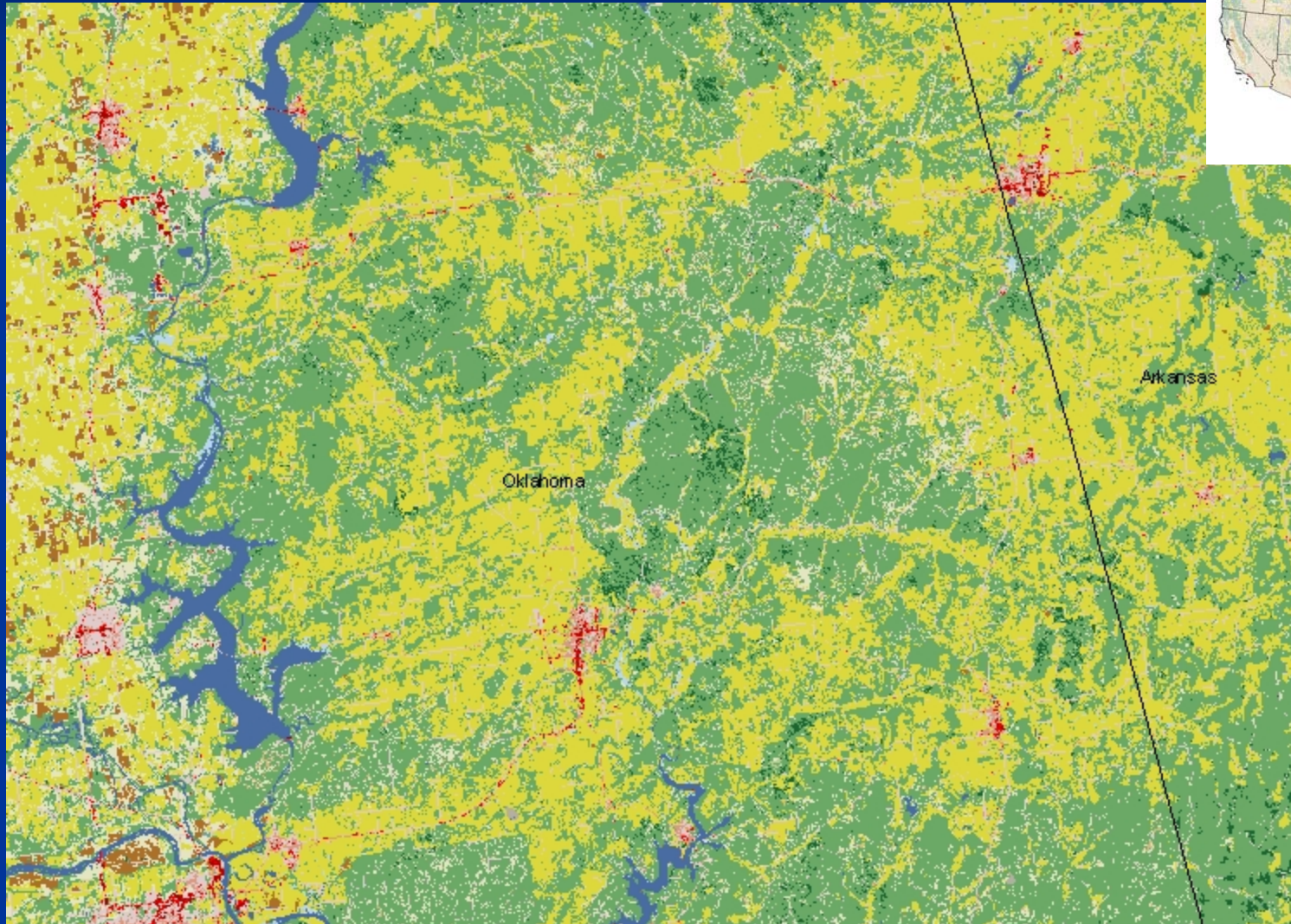
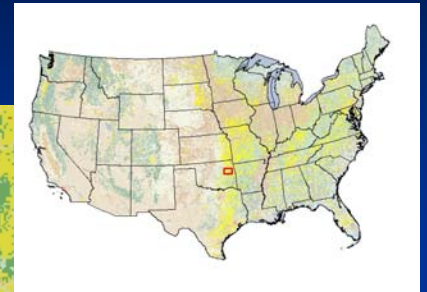




# B. NAIP 2006 Texas Interior 1 to 20,000



# B. National Land Cover Dataset 2001 Oklahoma 1 to 500,000

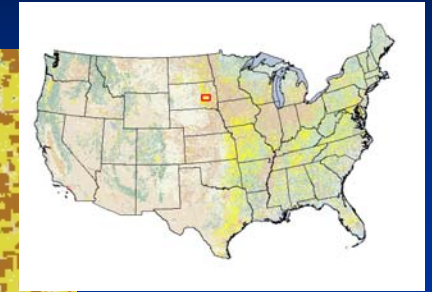
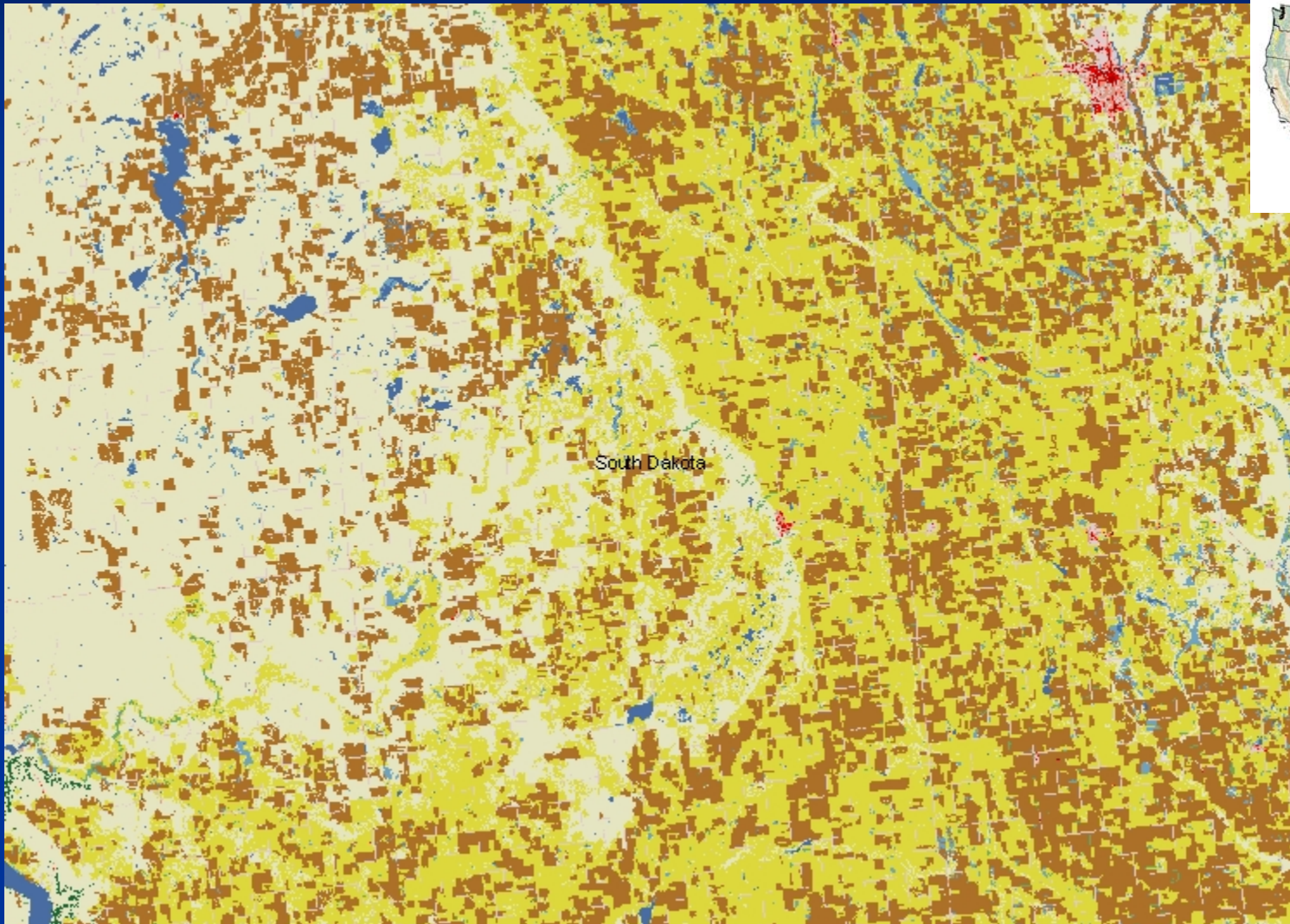


# B. NAIP 2006 Oklahoma 1 to 20,000



# B. National Land Cover Dataset 2001

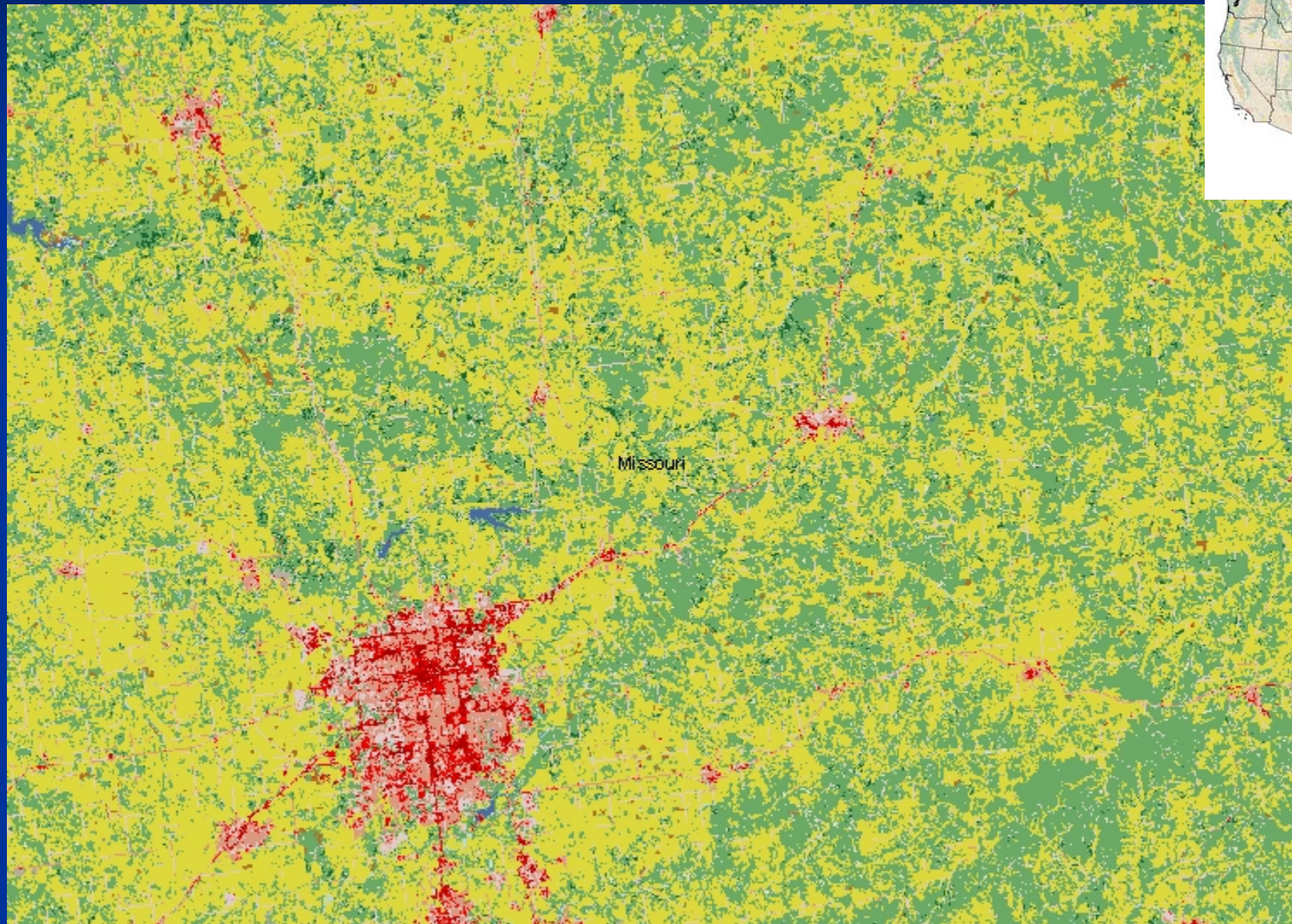
## South Dakota 1 to 500,000



# B. NAIP 2006 South Dakota 1 to 20,000



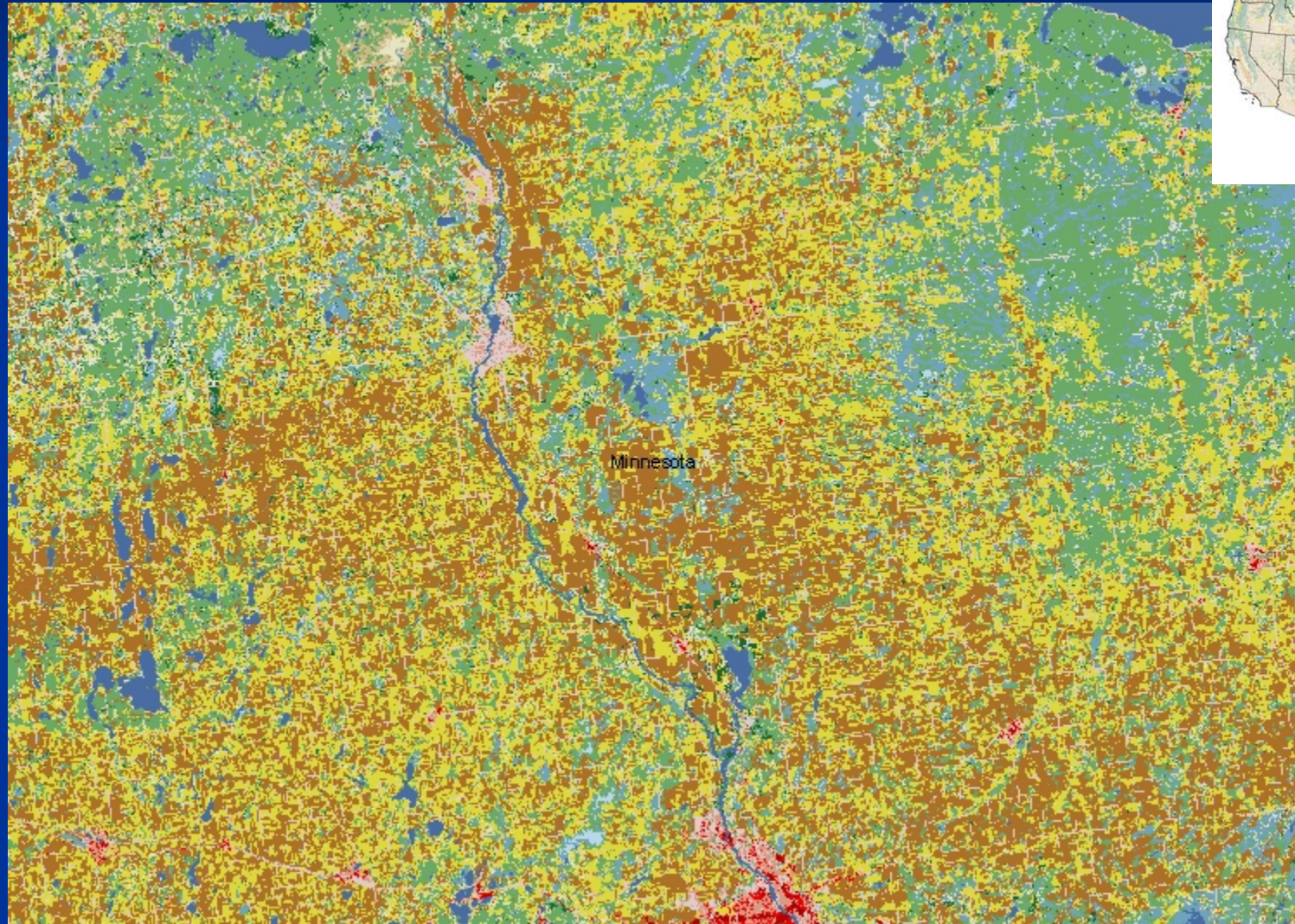
# B. National Land Cover Dataset 2001 Missouri 1 to 500,000



# B. MDOQ 1999 Missouri 1 to 20,000

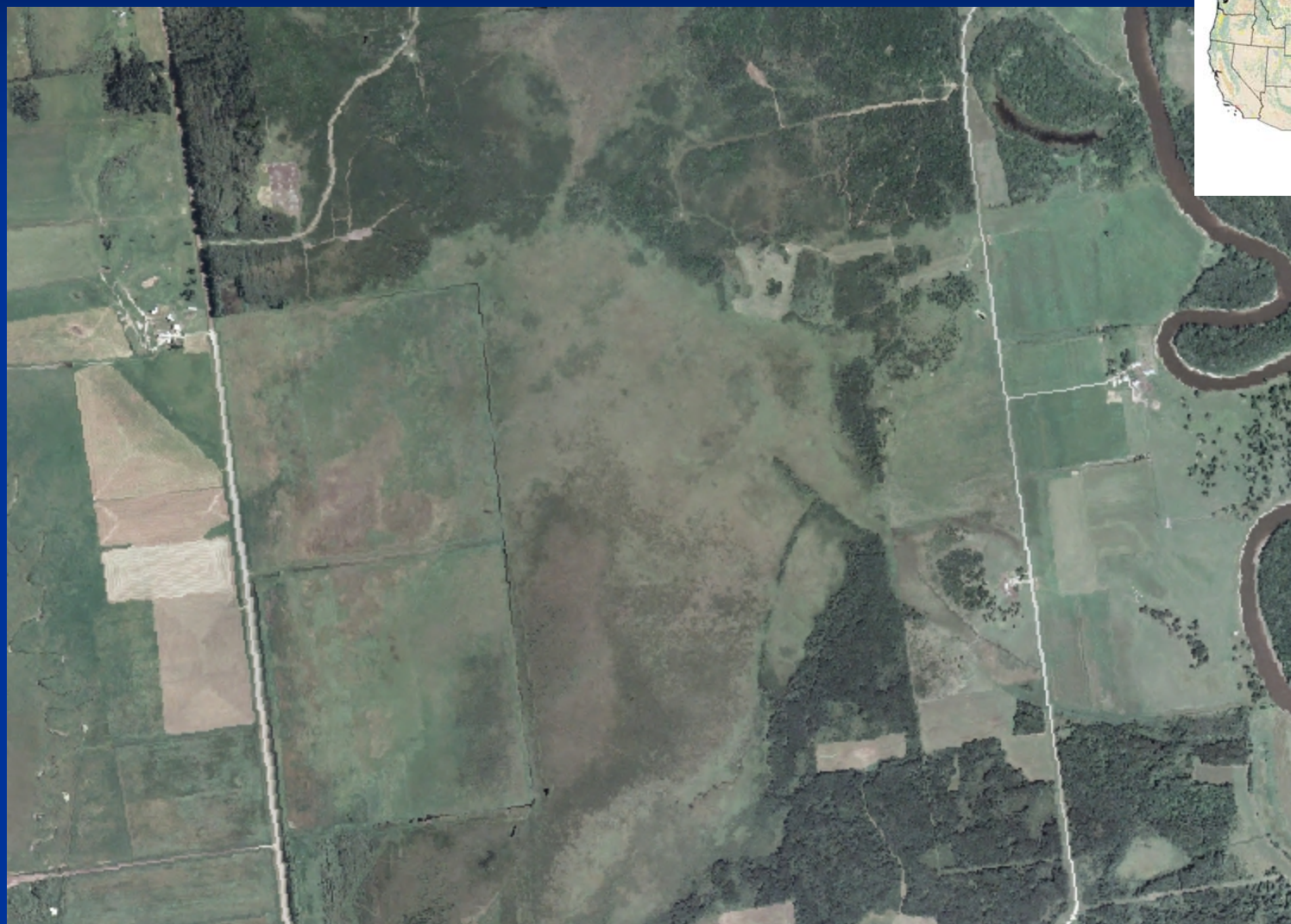


# B. National Land Cover Dataset 2001 Minnesota 1 to 500,000

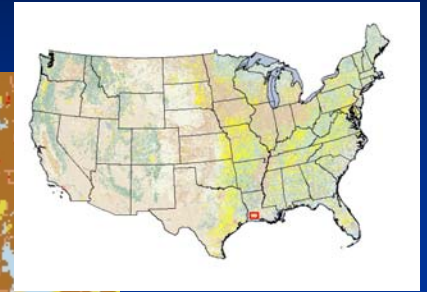
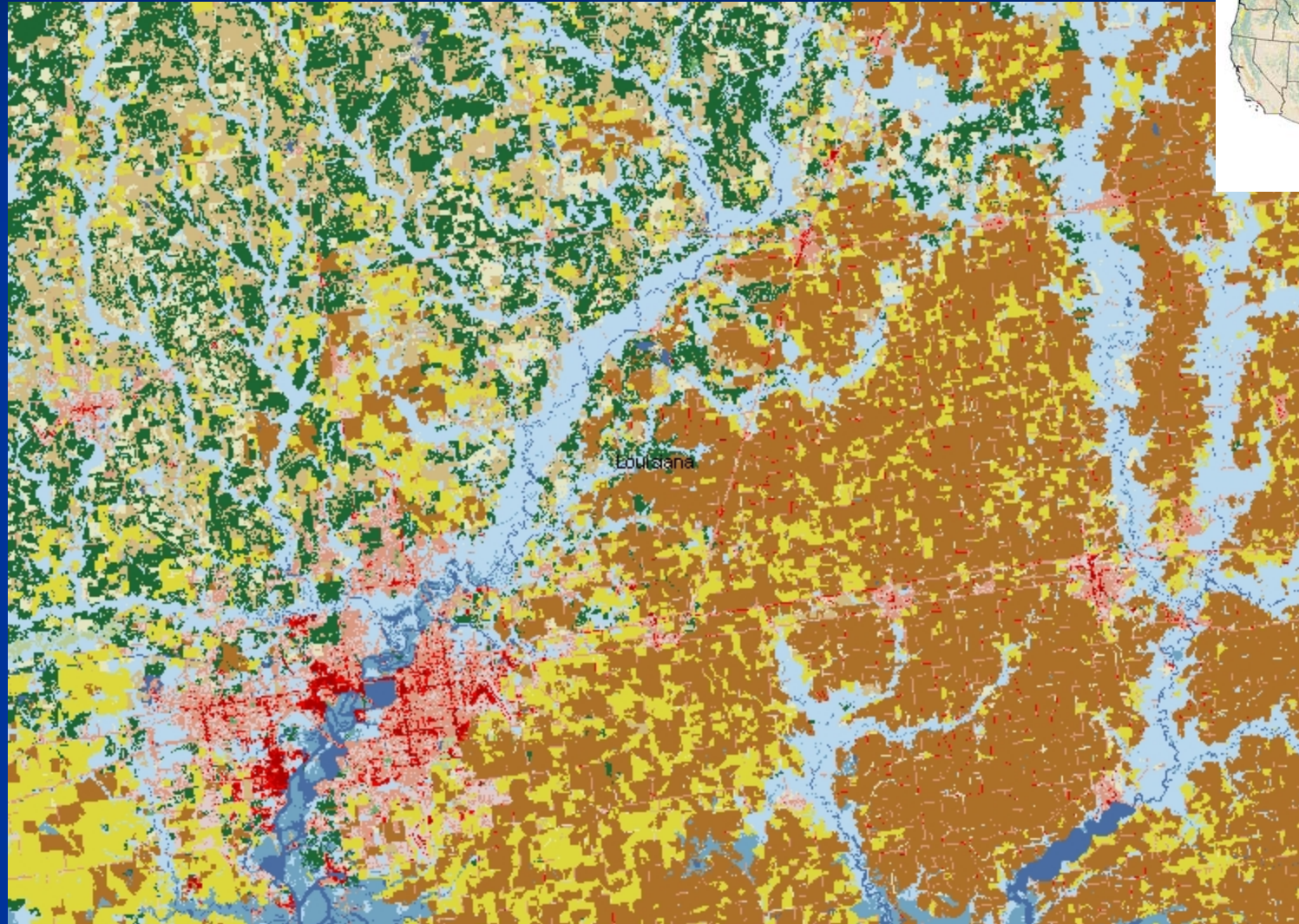




# B. NAIP 2006 Minnesota 1 to 20,000



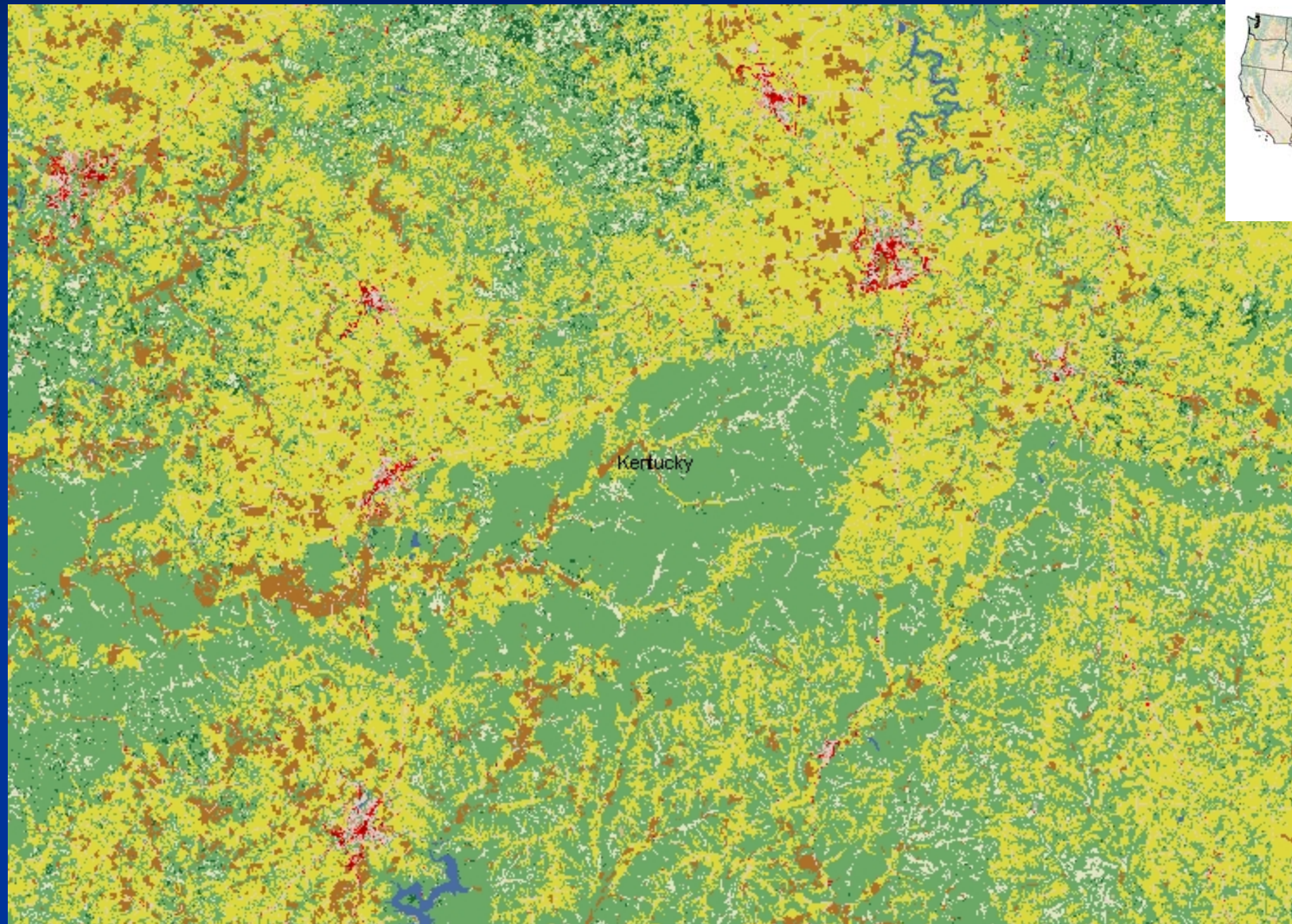
# B. National Land Cover Dataset 2001 Louisiana 1 to 500,000



# B. NAIP 2006 Louisiana 1 to 20,000



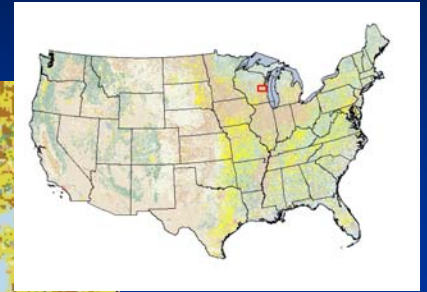
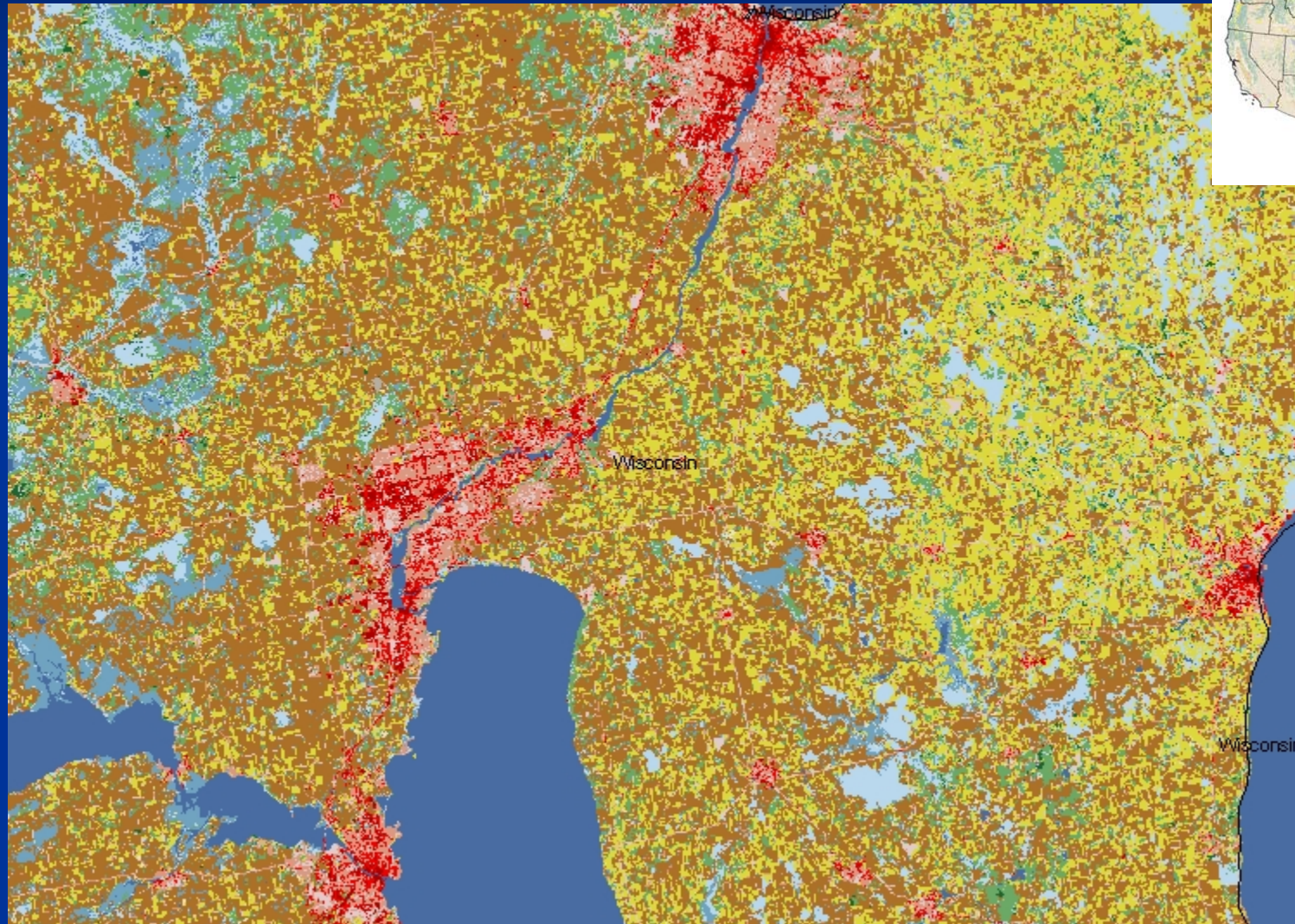
# B. National Land Cover Dataset 2001 Kentucky 1 to 500,000



# B. NAIP 2006 Kentucky 1 to 20,000



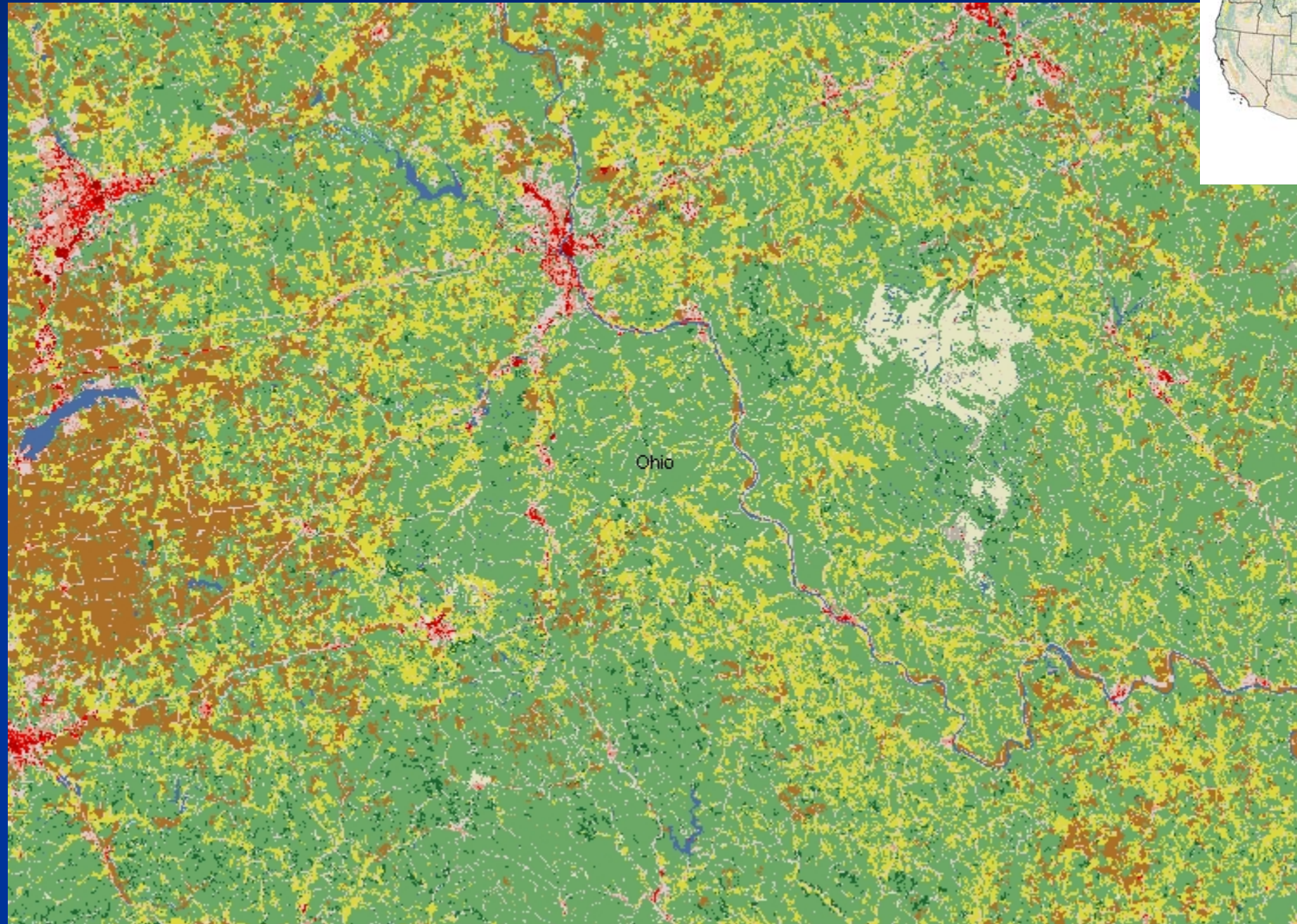
# B. National Land Cover Dataset 2001 Wisconsin 1 to 500,000



# B. NAIP 2006 Wisconsin 1 to 20,000



# B. National Land Cover Dataset 2001 Ohio 1 to 500,000

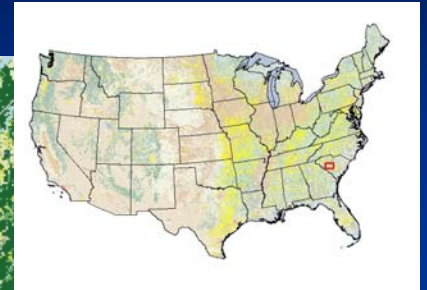




# B. NAIP 2006 Ohio 1 to 20,000



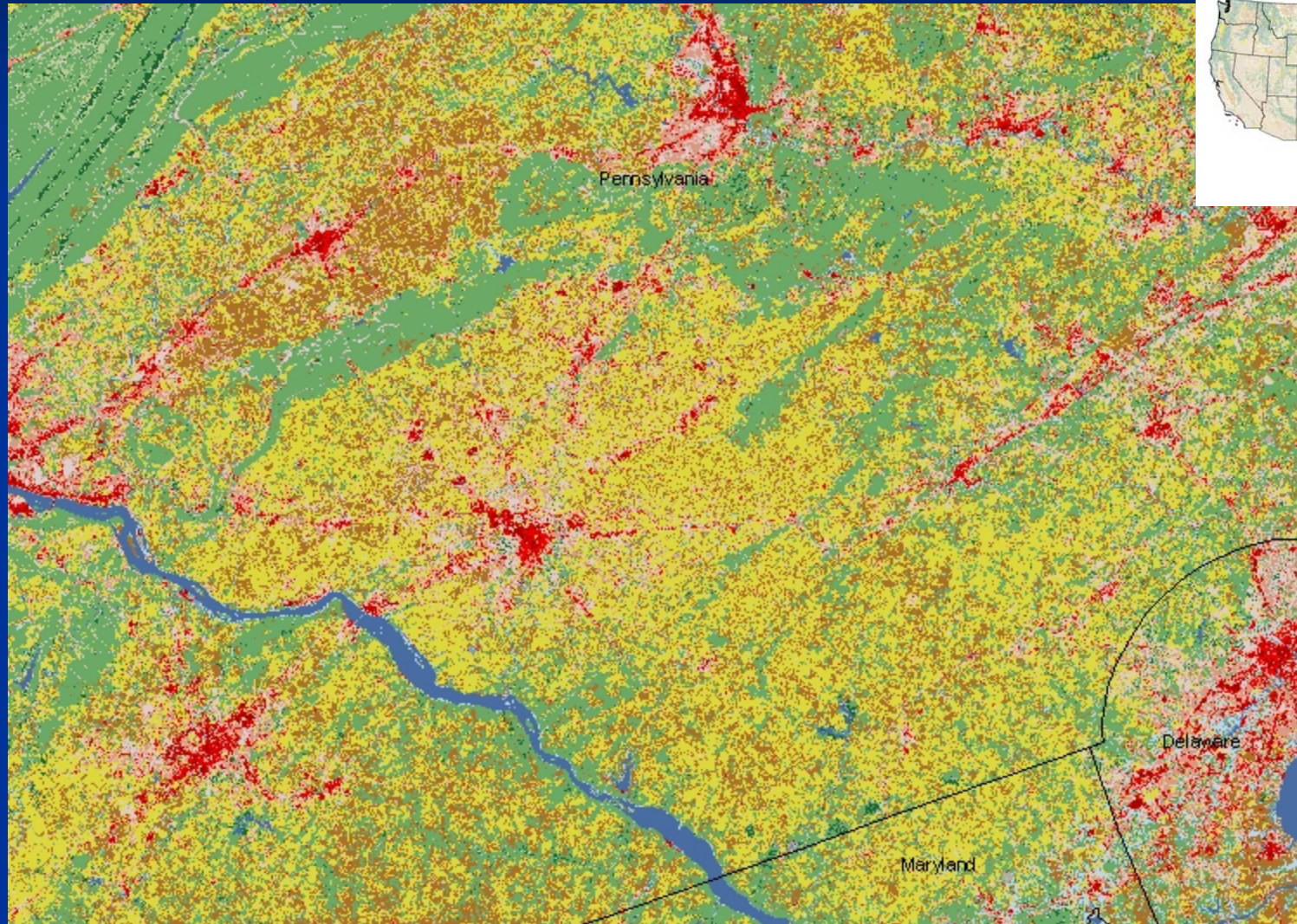
# B. National Land Cover Dataset 2001 South Carolina 1 to 500,000



# B. NAIP 2006 South Carolina 1 to 20,000



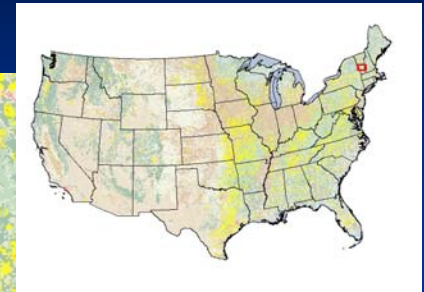
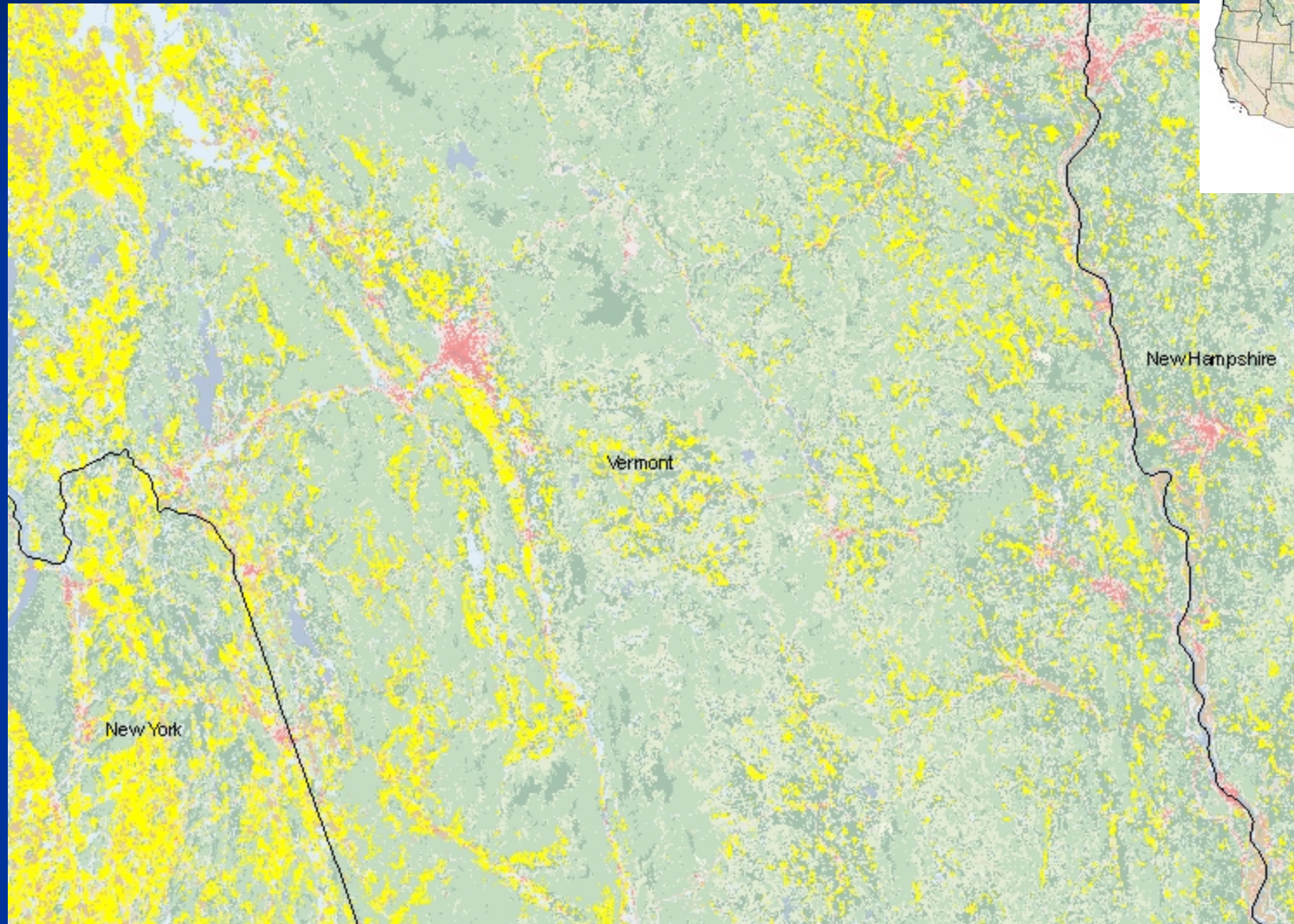
# B. National Land Cover Dataset 2001 Pennsylvania 1 to 500,000



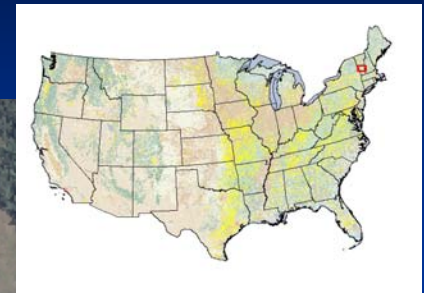
# B. MDOQ 1999 Pennsylvania 1 to 20,000



# B. National Land Cover Dataset 2001 Vermont 1 to 500,000



# B. NAIP 2006 Vermont 1 to 20,000



<http://gdw.apfo.usda.gov>

## C. Livestock Types Counted in Census of Agriculture 2002

- Beef & Dairy Cattle
- Hogs
- Sheep
- Layer & Broiler Chickens
- Turkeys
- Ducks & Geese
- Emus & Ostriches
- Pheasants, Pigeons & Quail
- Horses, Mules, Burros & Donkeys
- Goats – Milk, Angora & Meat
- Bees
- Mink
- Bison, Deer & Elk
- Rabbits



## C. Beef Cattle Top Ten States – Census 2002

- Texas - 5,545,824
- Missouri – 2,108,452
- Oklahoma – 2,050,866
- Nebraska – 1,915,107
- South Dakota- 1,694,091
- Kansas – 1,539,636
- Montana – 1,497,915
- Kentucky – 1,125,183
- Tennessee – 1,093,059
- Iowa – 987,670

## C. Dairy Cattle Top Ten States – Census 2002

- California – 1,644,692
- Wisconsin – 1,243,315
- New York – 670,003
- Pennsylvania – 591,531
- Minnesota – 478,248
- Idaho – 390,600
- New Mexico – 315,130
- Texas – 309,058
- Michigan – 298,429
- Ohio – 261,759

# C. Hogs Top Ten States – Census 2002

- Iowa – 15,486,531
- North Carolina – 9,887,421
- Minnesota – 6,440,067
- Illinois – 4,094,706
- Indiana – 3,478,570
- Nebraska – 2,993,620
- Missouri – 2,909,609
- Oklahoma – 2,246,926
- Kansas – 1,520,996
- Ohio – 1,422,966

## C. Poultry, Broilers, Top Ten States – Census 2002

- Georgia – 1.3 Billion
- Arkansas – 1.2 Billion
- Alabama – 1.1 Billion
- Mississippi – 750 Million
- North Carolina – 740 Million
- Texas – 540 Million
- Maryland – 290 Million
- Missouri – 270 Million
- Kentucky – 270 Million
- Virginia – 266 Million

# D. Forage Types from Soil Survey Yield Tables

- Alfalfa
- Kentucky Blue Grass
- Reed Canary Grass
- Brome grass
- Orchard Grass
- Improved Bermuda Grass
- Tall Fescue
- Timothy
- Bahiagrass
- Red Clover

# Forage Availability Growth Curves

- Months along the X-axis and a bell-shaped curve for the time when a given plant is growing and producing excess forage.
- State & Transition Models = artificial holding of succession at early stage

# Soil utilized for Pasture

- A. Land Capability Classification
- B. Carrying Capacity
- C. Examples



# A. Land Capability Classification

- From 19 random soil survey yield tables with significant amounts of pasture:
  - 18 had as high as Class 7 land
  - 1 had only up to Class 5 land (Wharton County, Texas)
  - 1 had Class 8 land (Harney County, Oregon)
  - The highest class that forage yields were given for was Class 6 land
  - However, this is much higher than crop yields
  - Pasture is traditionally recommended as more conserving



## B. Carrying Capacity/Stocking Rate

- From the same 19 soil surveys:
  - Yields given in Animal Unit Months ranged from 2 to 16
  - However, every survey had significant variation:
    - Every area had large numbers of not-rated mapunits
    - Irrigated areas had the highest variation
    - Harney County Oregon – 4 – 16
  - Translating AUM to stocking rate: 4 = 3 acres/cowcalf 16=.75 acres/cowcalf (AUM/month?)

# C. Examples: Central Valley, CA



# C. Examples: Minnesota



# C. Examples: Ohio



# C. Examples: Louisiana



# Soil Problems – Pastures

- A. Erosion
- B. Nutrient Management/Waste Disposal
- C. Pest Management
- D. Compaction
- E. Soil pH
- F. Development Pressure
- G. Nature of Livestock Enterprises

# A. Erosion - general



# A. Erosion – Heavy Use Areas





# A. Erosion – Watering Areas



# A. Erosion – Watering Areas



# A. Erosion – Watering Areas



## B. Nutrient Management & Waste Disposal



# B. Nutrient Management & Waste Disposal



# C. Pest Management



## C. Pest Management



# D. Compaction





# E. Soil pH



# Management Practices for Pasture Soil Problems

- References:
  1. National Range & Pasture Handbook
  2. Guidelines for Soil Quality Assessment in Conservation Planning

# Management Practices for Pasture Soil Problems

- Nine Steps of Conservation Planning:
  1. Identify Problems & Opportunities
  2. Determine Objectives
  3. Inventory Resources
  4. Analyze Resource Data
  5. Formulate Alternatives
  6. Evaluate Alternatives
  7. Make Decisions
  8. Implement the Plan
  9. Evaluate the Plan

# Management Practices for Pasture Soil Problems

- Minimum Data Sets:

? ?

# Management Practices for Pasture Soil Problems

- Nutrient Management
- Pest Management
- Prescribed Grazing
- Use Exclusion

# Management Practices for Pasture Soil Problems

- No, but seriously folks:
  - Water Facilities
  - Heavy Use Areas
  - Fence

# Management Practices for Pasture Soil Problems

- Prescribed Grazing

# The Old Breedlove Farm

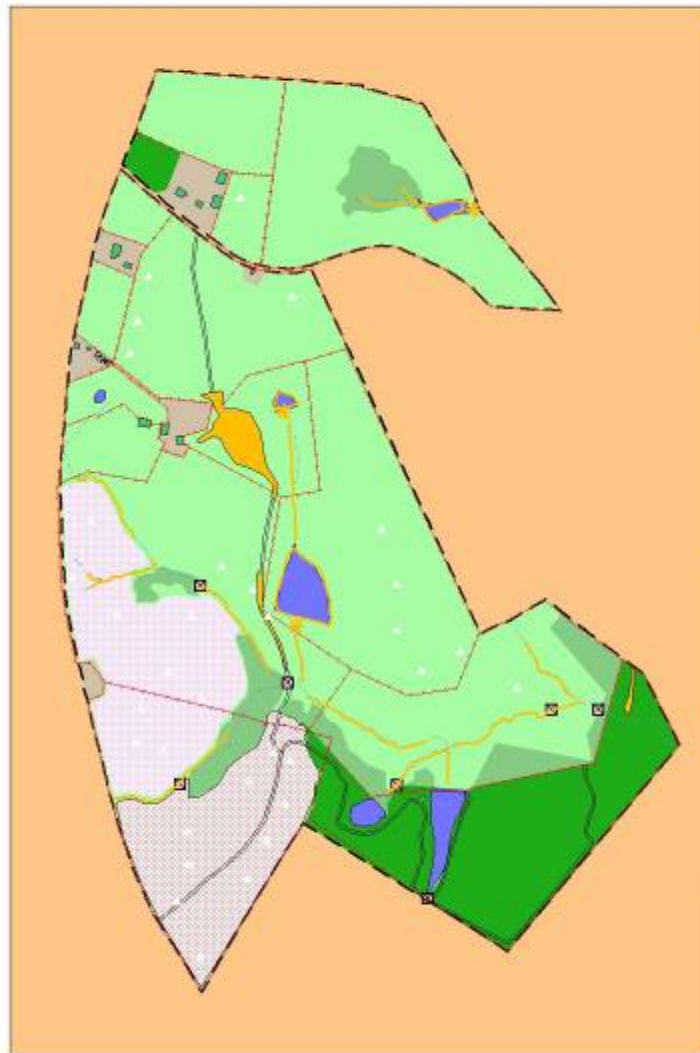




# Before Problems

## Benchmark Conditions of Powers Property

Conditions as Existing Fall 2001



Land Use, 2001	
Forest	44.0 ac.
Grazed Forest	20.5 ac.
Headquarters	15.0 ac.
Pasture	268.0 ac.
Water	6.3 ac.

Benchmark Land Use	
<span style="color: green;">■</span>	Forest
<span style="color: lightgreen;">■</span>	Grazed Forest
<span style="color: grey;">■</span>	Headquarters
<span style="color: yellow;">■</span>	Pasture
<span style="color: blue;">■</span>	Water

Erosion	
<span style="color: yellow;">—</span>	Bare Eroding Streambanks
<span style="color: orange;">■</span>	Severely Eroding Areas
<span style="color: yellow;">●</span>	Damaged Dams

Plants	
<span style="background-color: #e0e0e0;">■</span>	Low Forage Vigor
<span style="background: repeating-linear-gradient(45deg, transparent, transparent 2px, #ccc 2px, #ccc 4px); border: 1px solid black;">■</span>	Forage Species Lacking
<span style="color: black;">■</span>	Observed Pest Species

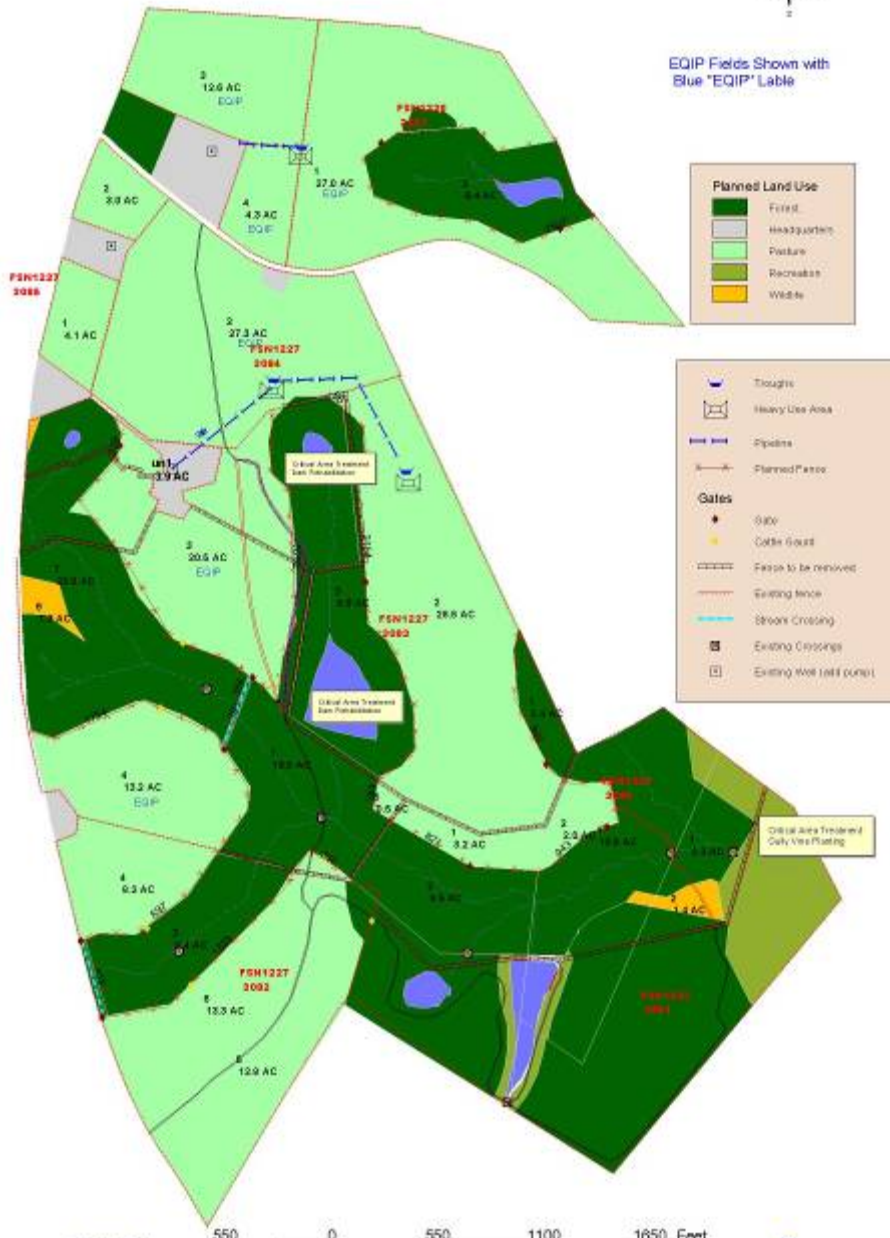
\* Observations not taken on all areas. Especially around main barn, and between big and little ponds.

<b>SOIL</b>	
Erosion	380 tons/yr. of streambank & pond soil lost 3 dams near failure from erosion 3.6 acres severe erosion
Condition	Compaction, especially around handling areas
Deposition	Pond siltation underway
<b>WATER</b>	
Quality	Contaminants with direct path to water bodies: Nutrients (Nitrogen & Phosphorus) Pathogens (Fecal coliform bacteria) Pesticides (principally herbicides)
Quantity	Recreational potential severely reduced by cattle
<b>AIR</b>	
Quality	No effects noted.
Condition	No effects noted.
<b>PLANTS</b>	
Suitability	Fairly good forage, Back fields need work Grazed forest understory severely reduced. Wildlife habitat severely reduced Forage species suffering on steep and wet soils.
Condition	Overgrazing has occurred Nutrients seem deficient on back fields, especially on unsuitable soils.
Management	Pest species are expanding.
<b>ANIMALS</b>	
Habitat	Good for cattle Little for wildlife
Management	Insufficient opportunity to observe
<b>ECONOMIC &amp; SOCIAL</b>	
Profitability	Minimal return from grazing lease.
Development Pressure	Developers knocking at the door.
Recreational	A proud history of enjoying the land is being diminished by deteriorating conditions.

## Powers Conservation Plan Map



EQIP Fields Shown with Blue "EQIP" Label



**Planned Land Use**

- Field
- Headquarters
- Pasture
- Recreation
- Wetlands

**Other Features**

- Ponds
- Heavy Use Area
- Pipelines
- Planned Fence

**Gates**

- Gate
- Gate Guard
- Fence to be removed
- Existing fence
- Brooks Crossing
- Existing Crossings
- Existing Well (with pump)



Prepared with assistance from USDA Natural Resources Conservation Service.  
 Daniel F. Wallace, Soil Conservationist, Watkinsville Field Office  
 Oconee County, September 2, 2002



# Conservation Plan

# Conservation Programs used in implementing Breedlove Plan

- Environmental Quality Incentives Program (EQIP)
- Farm & Ranchland Protection Program (FRPP)
- Continuous Conservation Reserve Program (CRP)
- Forestry Incentives Program (FIP)
- Wildlife Incentives for Non-Game & Game Species (WINGS)

# Before & After – Little Pond



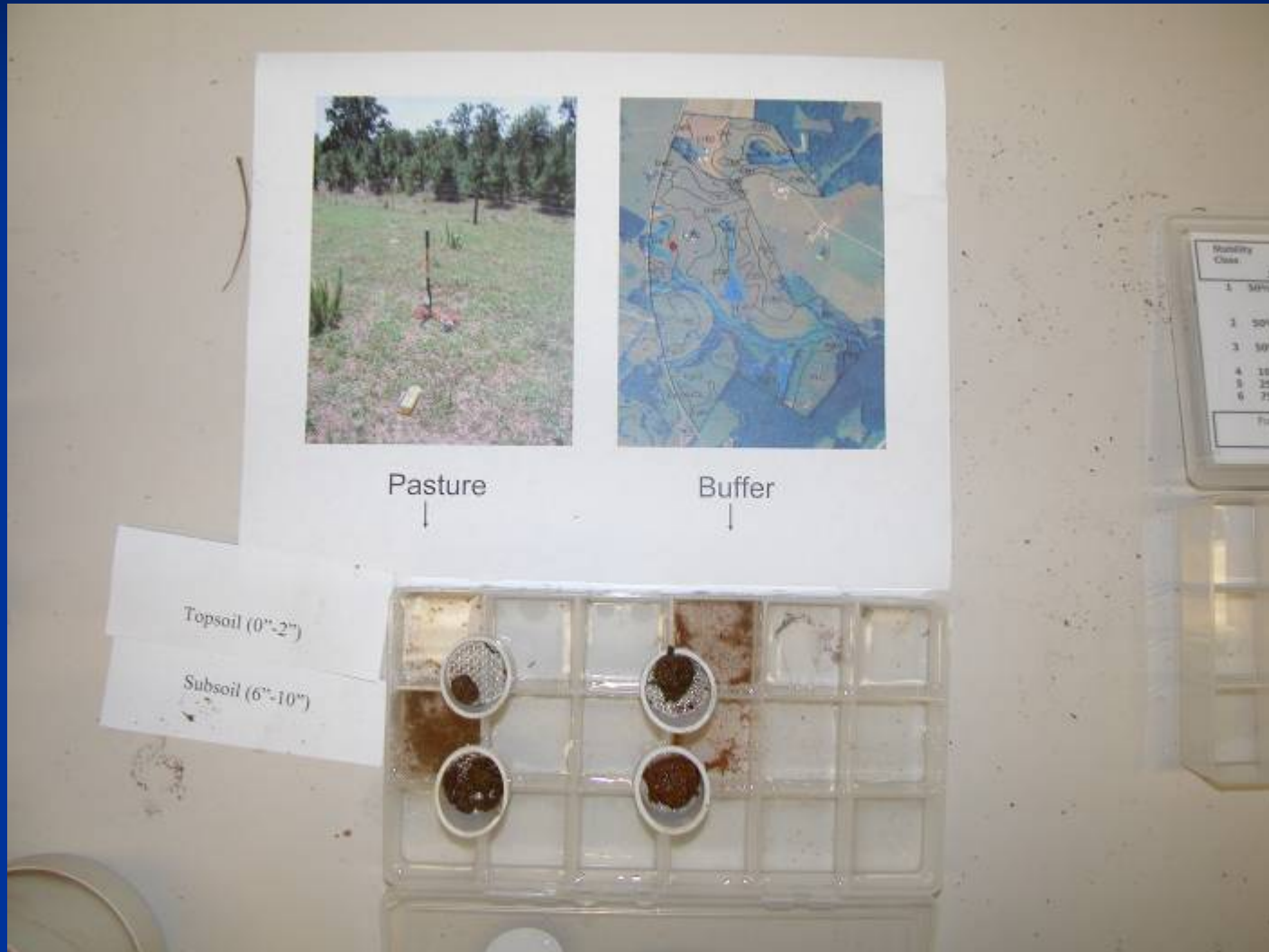
# Before & After – Big Pond



# Before & After – Long View



# Soil Quality Observations



# Summation

- Pasture is a red-headed stepchild
- Soil Quality could stress inherent properties more & Soils could stress dynamic properties more
- Minimum Data Sets & Protocols for observations and demonstrations helpful
- Prescribed Grazing is a ripe area for pasture soil quality research
- Soil & Water are truly two sides of the same coin



