Geo-Spatial Resources

And Their Use in Forest Tree Seedling Production

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Questions

- How many of you have ever used a Global Positioning System (GPS)?
- How many of you have ever used a Geographic Information System (GIS)?
- How many of you have ever used Map Quest or maybe Google Earth?
- Think about what you have heard about GIS/GPS. What do you think it can do for you?

A history of natural resource decision making

- Geo-spatial technologies (GIS, GPS, etc.) have been part of natural resource management for over 20 years
  - Maps
  - Harvest scheduling
  - Silvicultural prescription decision support

- Aid in understanding the location and condition of land resources, which is critical for
  - Making long-term management decisions
  - Responding to short-term environmental and economic changes

- *If you don't know where it is on the ground, and how it is growing, it's difficult to make accurate management decisions!*

How it can help you

- Geo-spatial technologies can be used to better facilitate decision-making from the nursery to the forest stand.

- This talk will highlight the availability and application of geo-spatial technology and associated resources available for nursery managers.
  - What are geo-spatial technologies?
  - What associated resources are available?
  - How can this technology be used in tree seedling production?
  - Professional maps and beyond!

The new source of power is not money in the hands of few, but information in the hands of many

--John Naisbitt

What are geo-spatial technologies?

- GIS and GPS used to create a map.
- A map can be a truly valuable product of GIS and one of the most commonly thought of product.
- However, it is so much more……

What are geo-spatial technologies?

- Managing *information* of any kind based on where it is located.
- Goes beyond mapping, spreadsheets, and databases!
- Gives you the ability to reference natural resource inventory and condition information to a physical location.
  - Acres
  - Land cover
  - Stand age
  - Volume
  - Species
  - Condition

GIS

- According to ESRI a Geographical Information System (GIS) is defined as
  - "…an integrated system of computer hardware, software, data, and workflow procedures for collecting, storing, analyzing, and disseminating information about areas of the earth."
- GIS = Tabular Data + Spatial Data
- Can be used with and without GPS

GPS

- Satellite navigation system
- Maintained by the US Government
  - All weather
  - 24 hour
  - Worldwide
- Available free to the public

GPS

- Radio signals sent from orbiting satellites to earth
- Measures receiver-to-satellite distance
  - How long the signal took to get to your receiver
- GPS units receive and convert signals to position, speed, and time information

Beyond the Pretty Map!

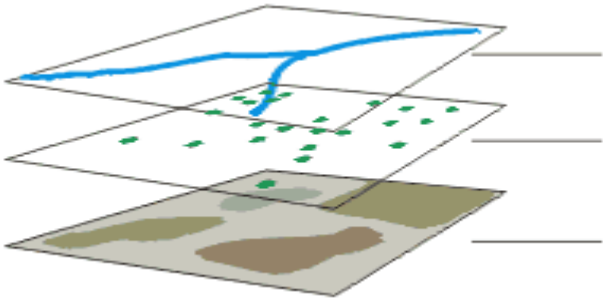
- Geo-spatial technology is used for the visualization, measurement, and analysis of the Earth's features.

- Ties information about a location to its physical spot on the ground.
  - It is NOT just a pretty map!
  - It is NOT just for research!

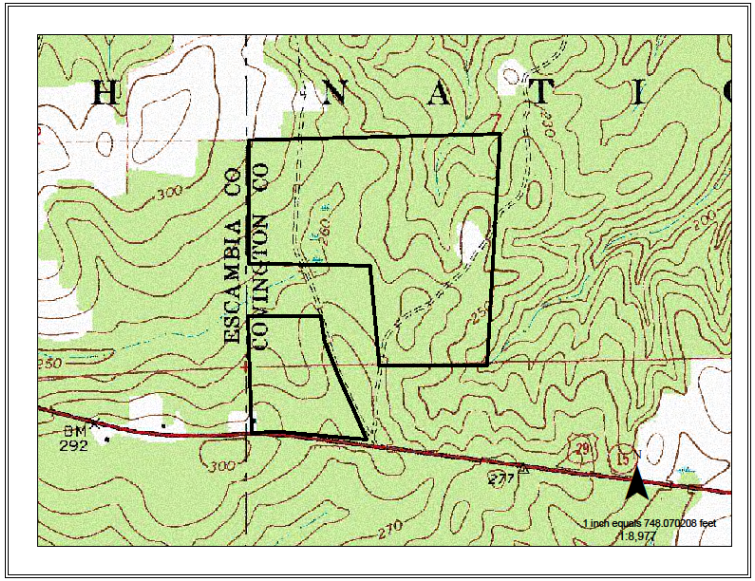
- To make it really work for you as a decision support tool, ***GOOD and ACCURATE DATA*** must go into it!

How it works

- Maps are graphical representations of the world.
- Real-world objects are represented with
  - Points – locations of fire stations, churches, and schools
  - Lines – roads, bridges, and creeks
  - Polygons – larger areas such as National Forests, city parks, and forest stands.
  - Rasters or Grids– layers of equal sized grid cells that represent values on the ground such as slope, aspect, and vegetation cover
- Paper maps provide limited information using
  - shapes
  - colors
  - patterns
  - labels

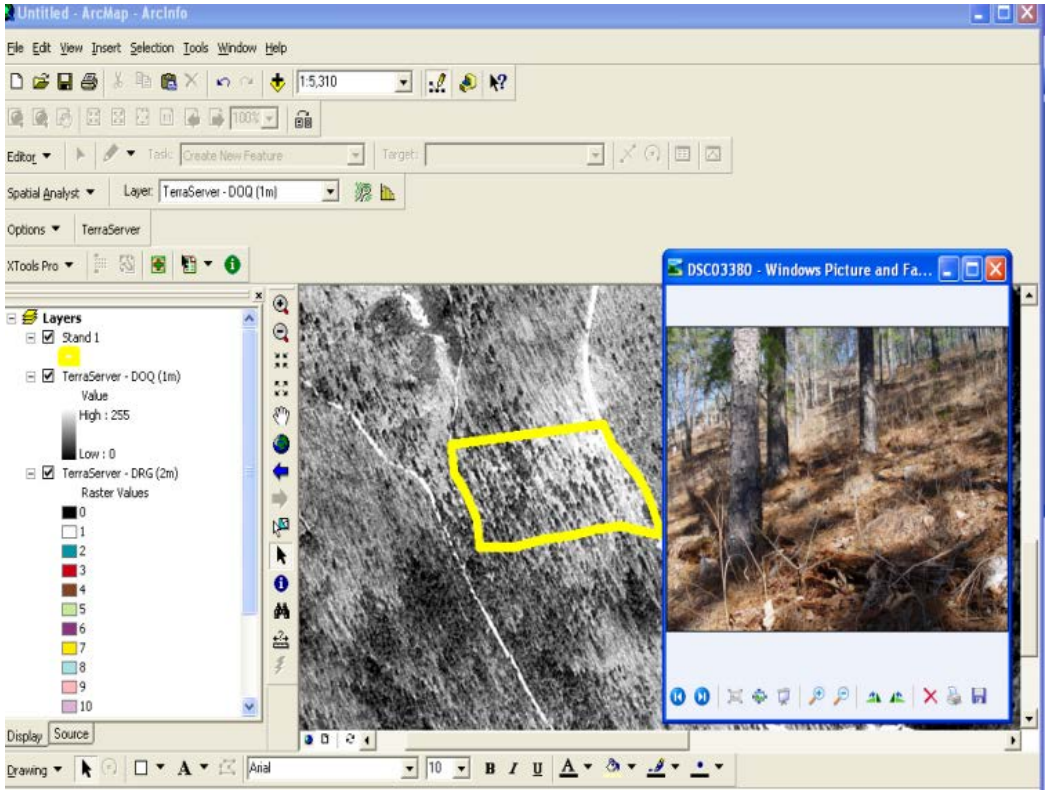


In other words....



or ?

How it works


Untitled - ArcMap - ArcInfo
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TerraServer - DOQ (1m)
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Low : 0
TerraServer - DRG (2m)
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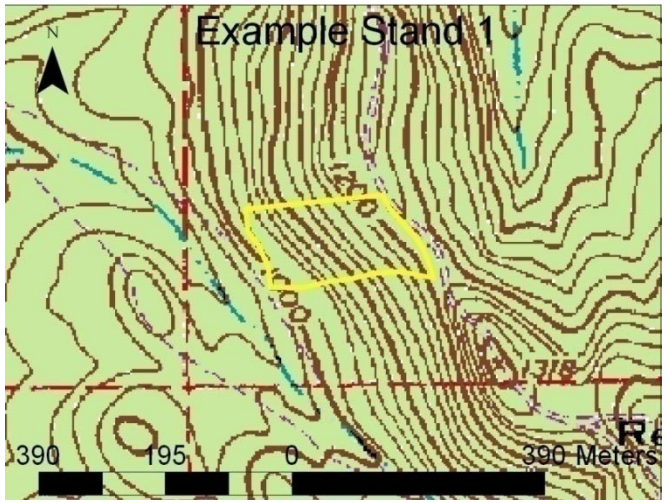
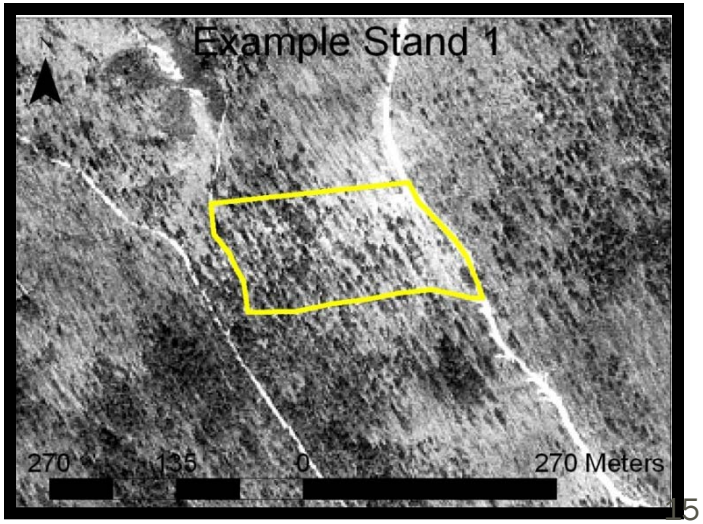
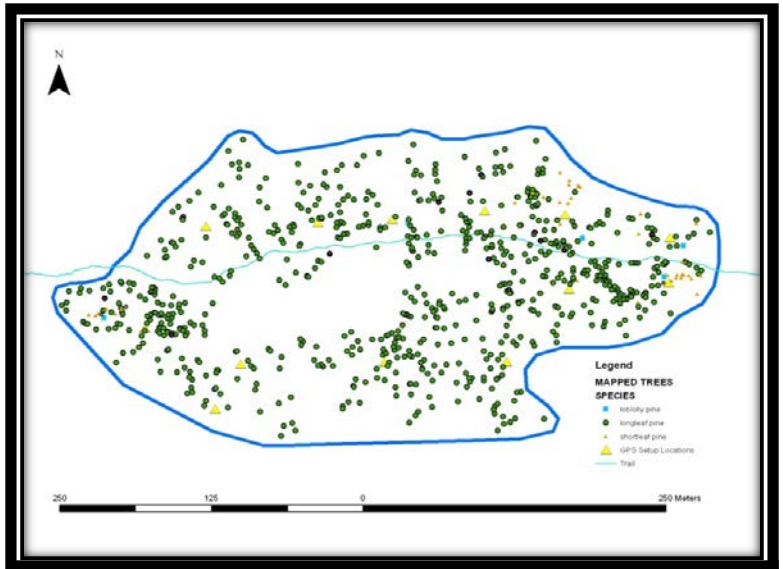

Example Stand 1
N
390
195
0
390 Meters


Example Stand 1
N
270
135
0
270 Meters

How it works

- Data behind the map is the true power of the system
- Can be as or more important than the map!
- Used for maps descriptions, analyses, reporting, etc.



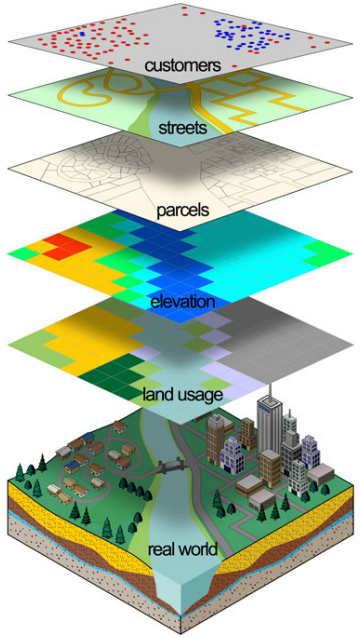
Attributes of STEMMAP

Shape *	x	y	pos_point	tree	distance	azimuth	DBH	HEIGHT	SPECIES
Point	587377.163	3686436.515	A	1	49.7	87.3	15		longleaf
Point	587366.8562	3686436.853	A	2	16.2	77.7	3		longleaf
Point	587381.3626	3686439.699	A	3	64.7	78.6	15		longleaf
Point	587372.8738	3686429.053	A	4	41.9	121.9	14.3		loblolly
Point	587394.9358	3686440.601	A	5	109.1	81.7	18.1		longleaf
Point	587367.5912	3686428.812	A	6	29.3	141.5	12.3		longleaf
Point	587383.8787	3686451.674	A	7	88.6	54	8.2		longleaf
Point	587372.3531	3686414.826	A	8	76.7	153.8	9.7		shortleaf
Point	587383.6602	3686448.745	A	9	82.7	59.1	9		shortleaf
Point	587373.9553	3686414.812	A	10	79.2	150.4	9.1		longleaf
Point	587375.2929	3686414.33	A	11	82.8	148.3	10.3		longleaf
Point	587377.9025	3686412.795	A	12	91.7	145.4	15.8		longleaf
Point	587383.7267	3686409.762	A	13	111.2	140.2	13.2		longleaf
Point	587357.0806	3686412.705	A	14	77.5	192.1	17.5		longleaf
Point	587356.0856	3686412.972	A	15	77.4	194.6	12.2		longleaf
Point	587385.5836	3686404.204	A	16	129.3	143.3	18.1		longleaf
Point	587351.4357	3686417.812	A	17	68.5	210.5	14		longleaf
Point	587361.638	3686428.283	A	18	24.7	183	18.4		longleaf
Point	587349.2046	3686409.266	A	19	96.7	205.8	15.4		longleaf
Point	587351.0719	3686434.533	A	20	36.2	263.4	14.4		longleaf
Point	587335.2366	3686413.634	A	21	114.1	230.4	16.7		longleaf
Point	587348.2872	3686435.969	A	22	45.1	270.7	15.4		longleaf
Point	587333.0068	3686413.849	A	23	119.4	232.9	16.6		longleaf

Record: 1 Show: All Selected Records (0 out of 781 Selected) Options

How it works

- With geo-spatial technologies the amount of information is almost limitless!



- Because the information is
  - Linked to a specific stand or location
  - Dynamic
  - Query-able
  - Flexible
- Your management objectives and the information you need will determine how it can best work for you.

A decision is as good as the information that goes into it

-John F. Bookout Jr.

Resources available to get started

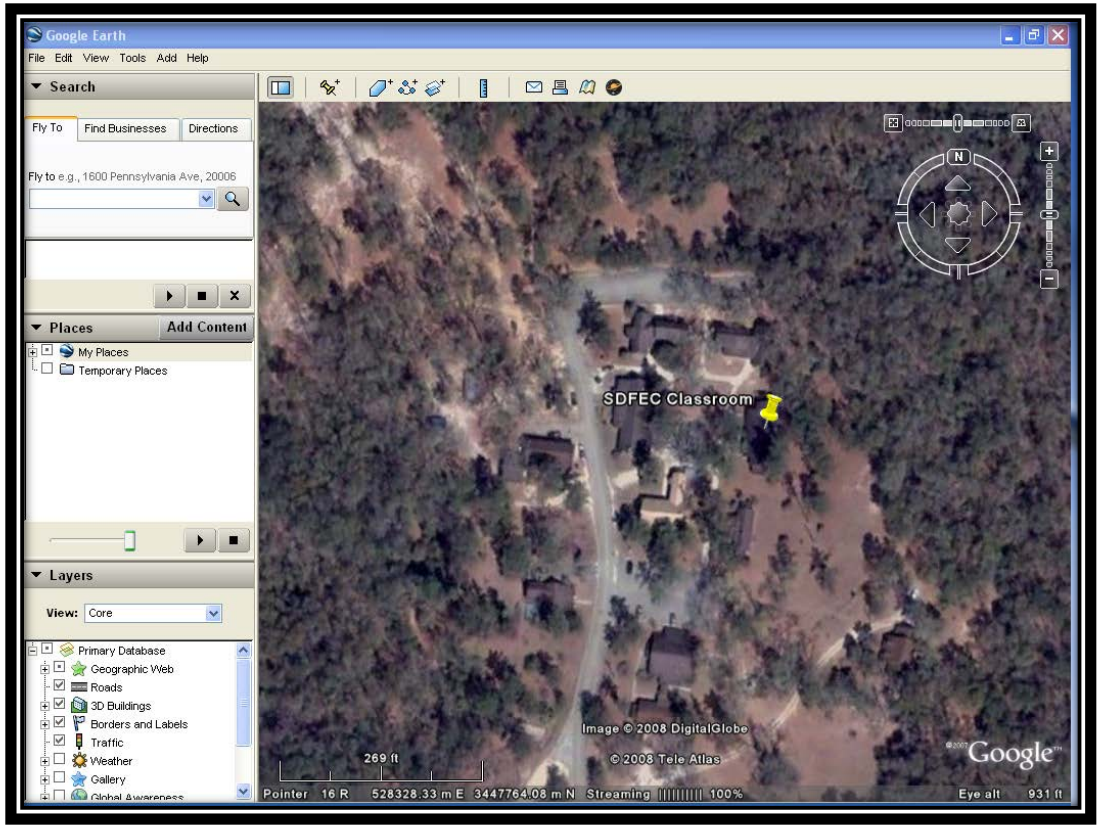
- GIS programs
- USDA Geospatial Data Gateway
  - Aerial imagery
- USDA Web Soil Survey
- Other sources
  - Planting zones
  - Drought monitor
  - Weather
  - Pests and disease

Example GIS Software Packages

- ArcGIS
  - http://www.esri.com/software/arcgis/arcview/index.html
- Tatuk
  - http://www.tatukgis.com/
- Quantum GIS (Free!)
  - http://www.qgis.org/

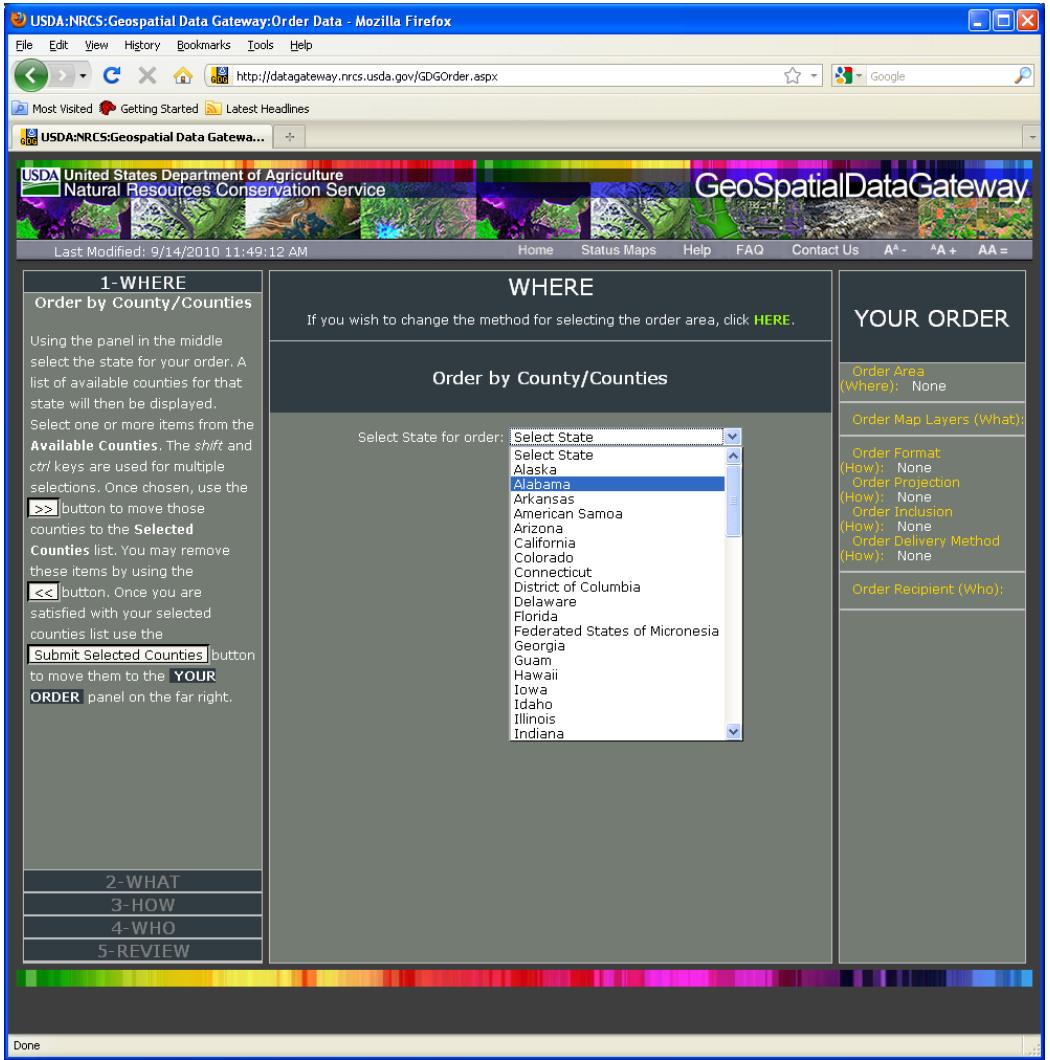
Google Earth

- View satellite imagery
- Create maps and directions
- Draw stand boundaries
- Measure distance and areas (with upgrade)



USDA Geospatial Data Gateway

Geospatial Data Gateway



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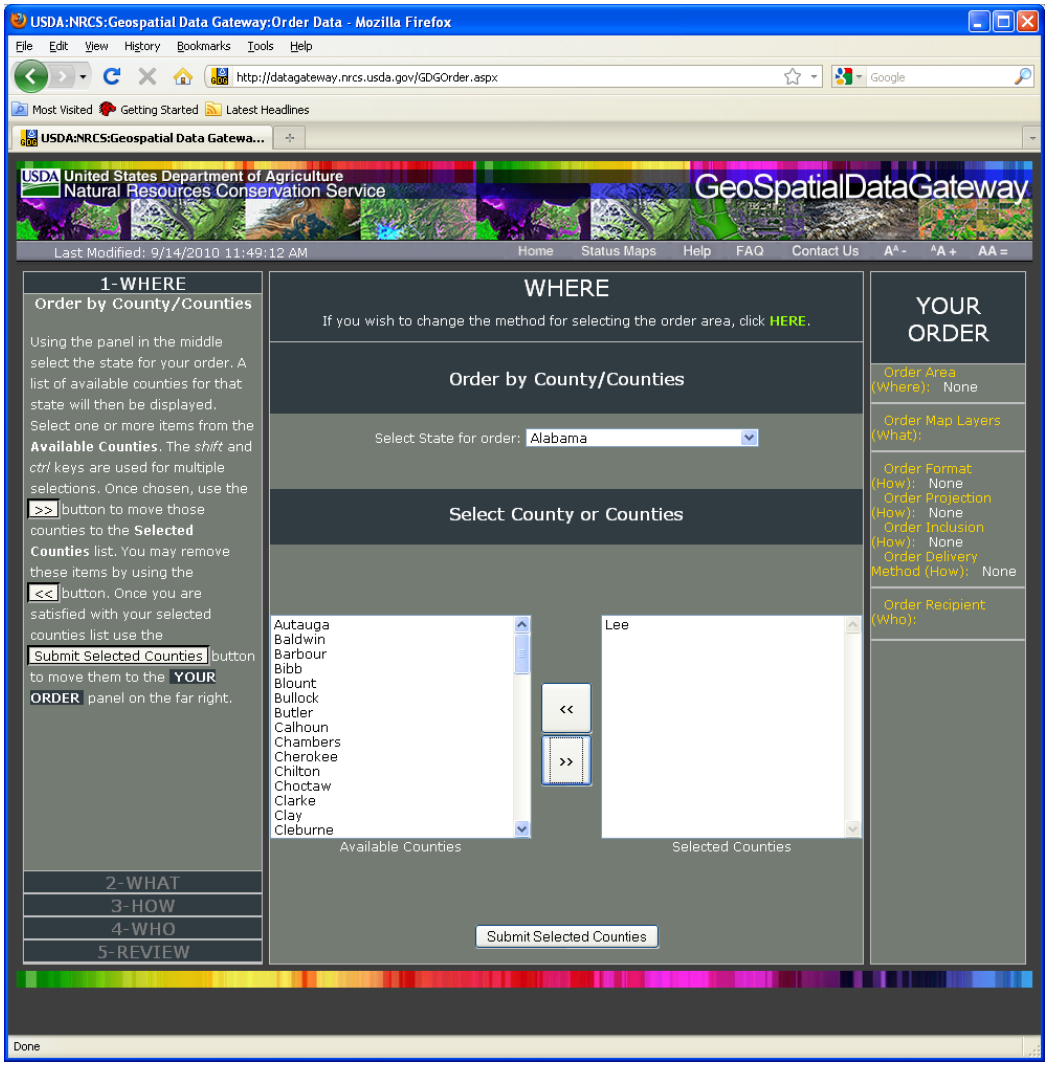

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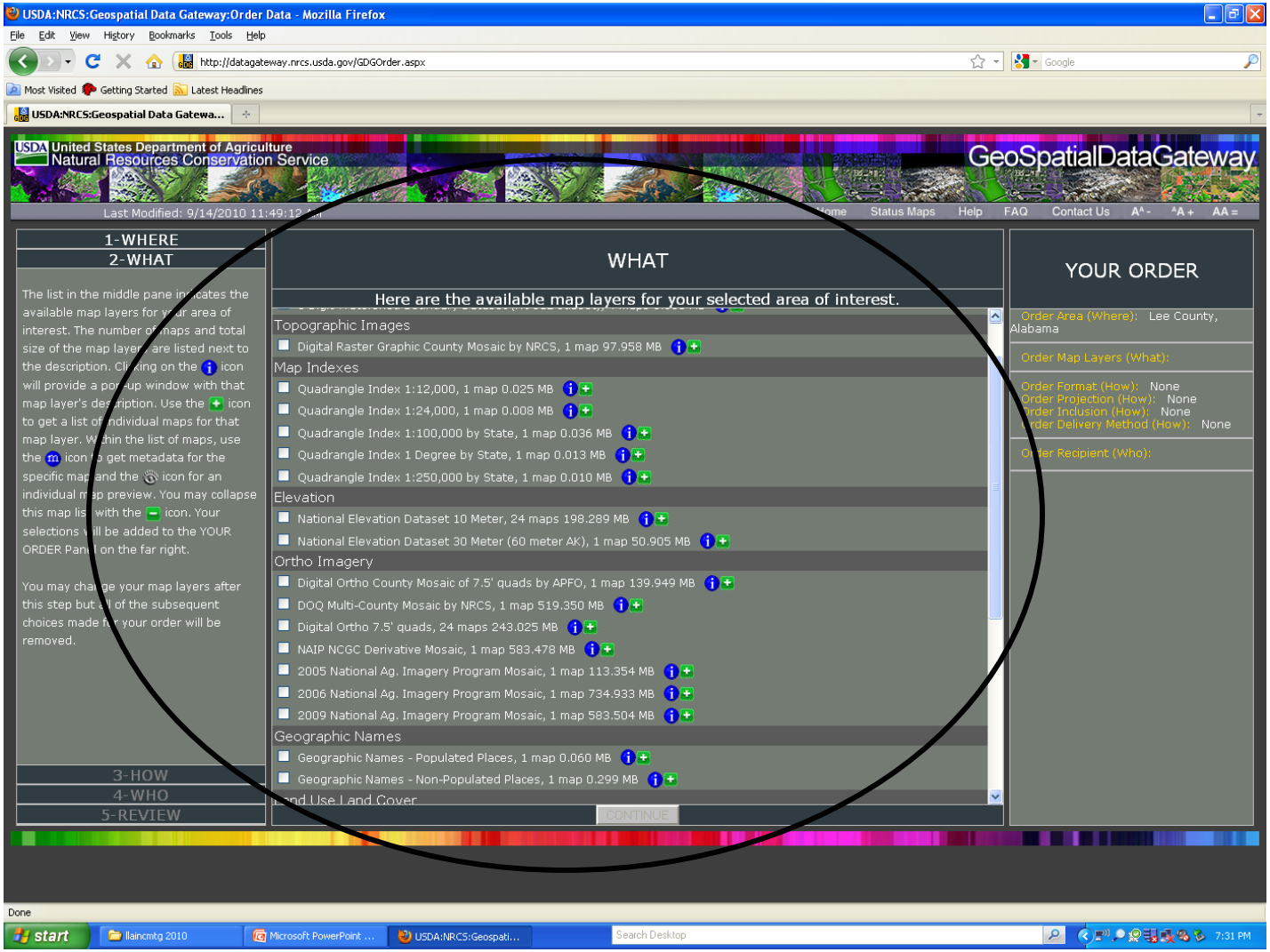
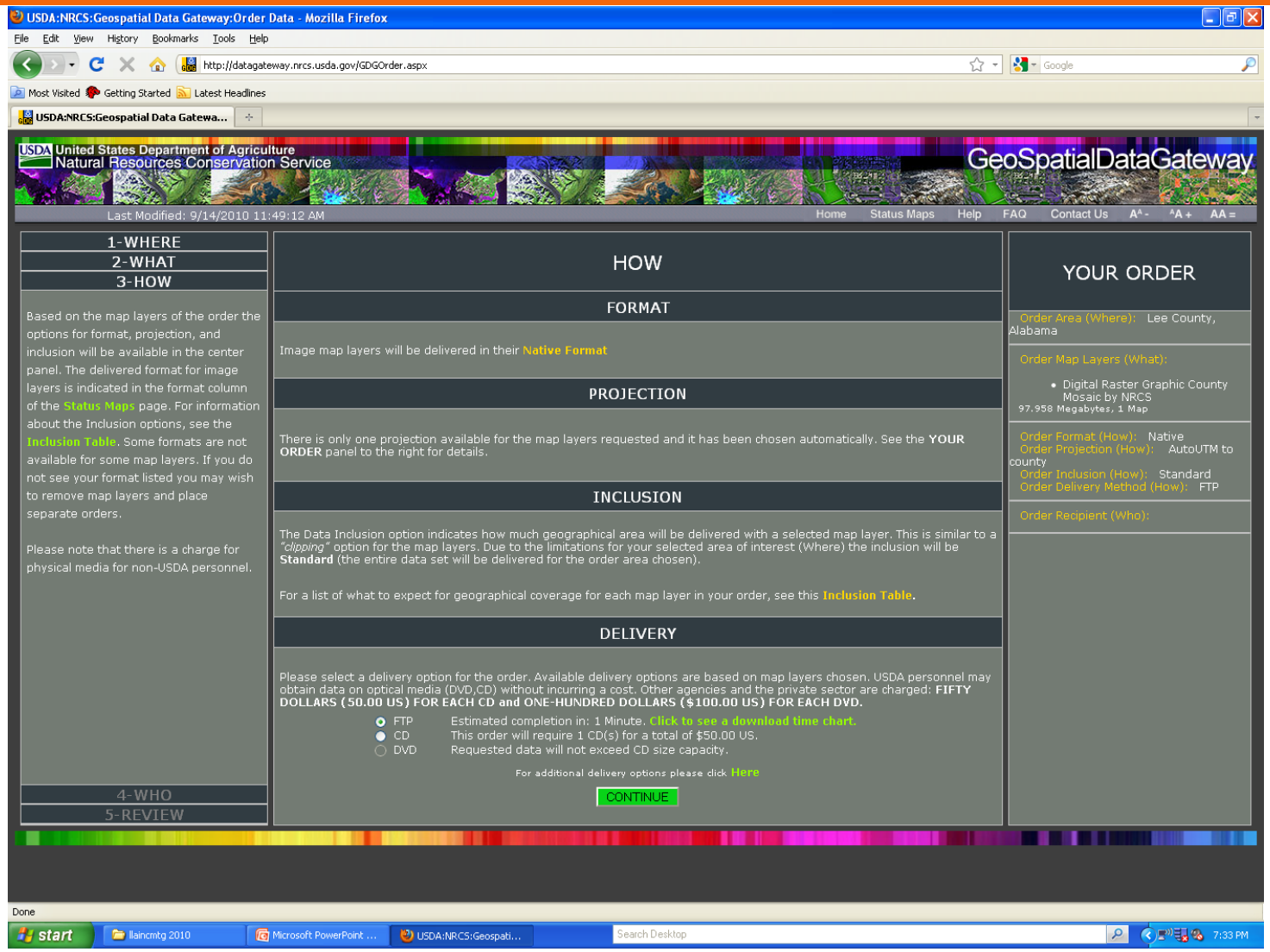


Geospatial Data Gateway



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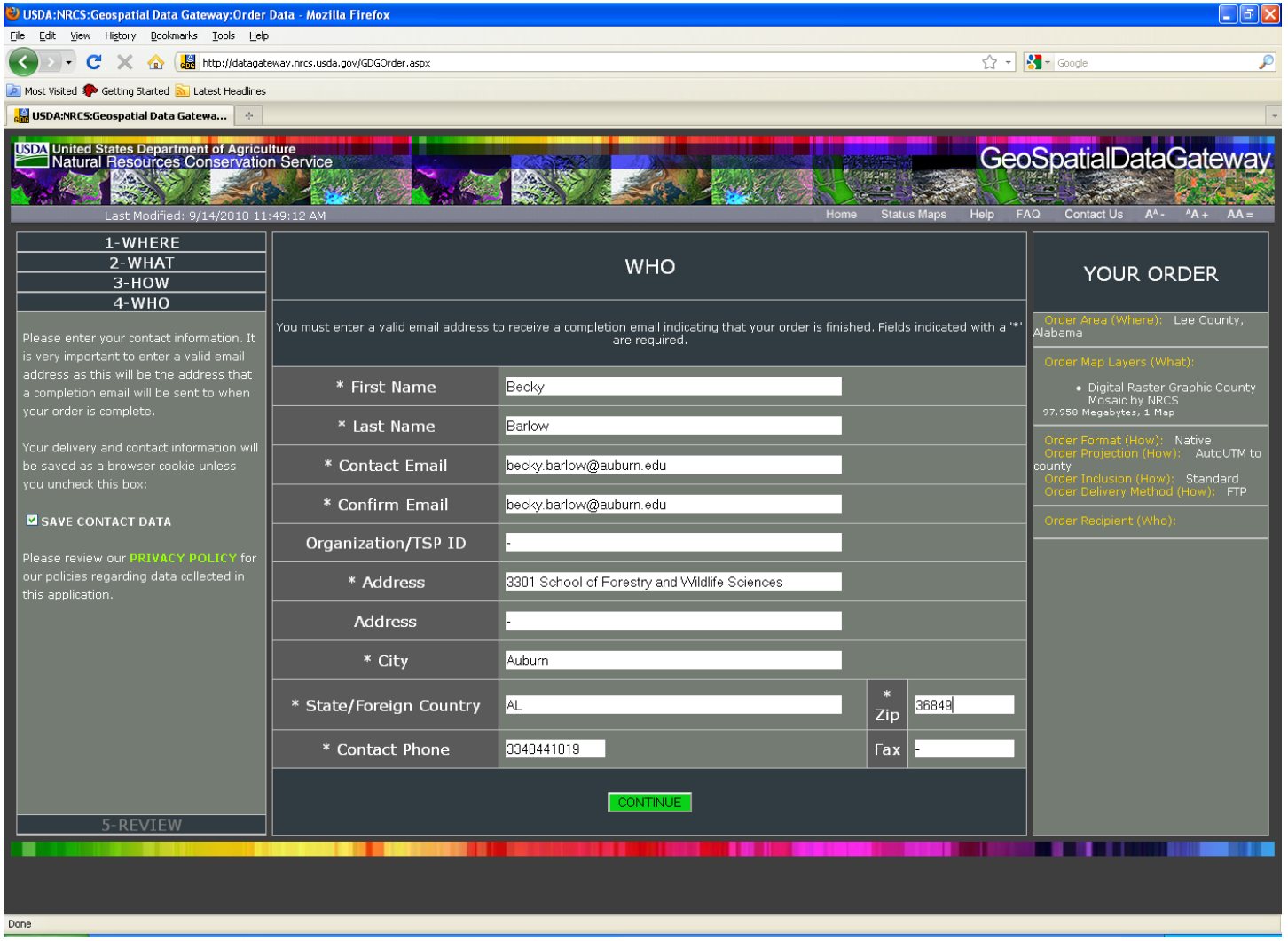

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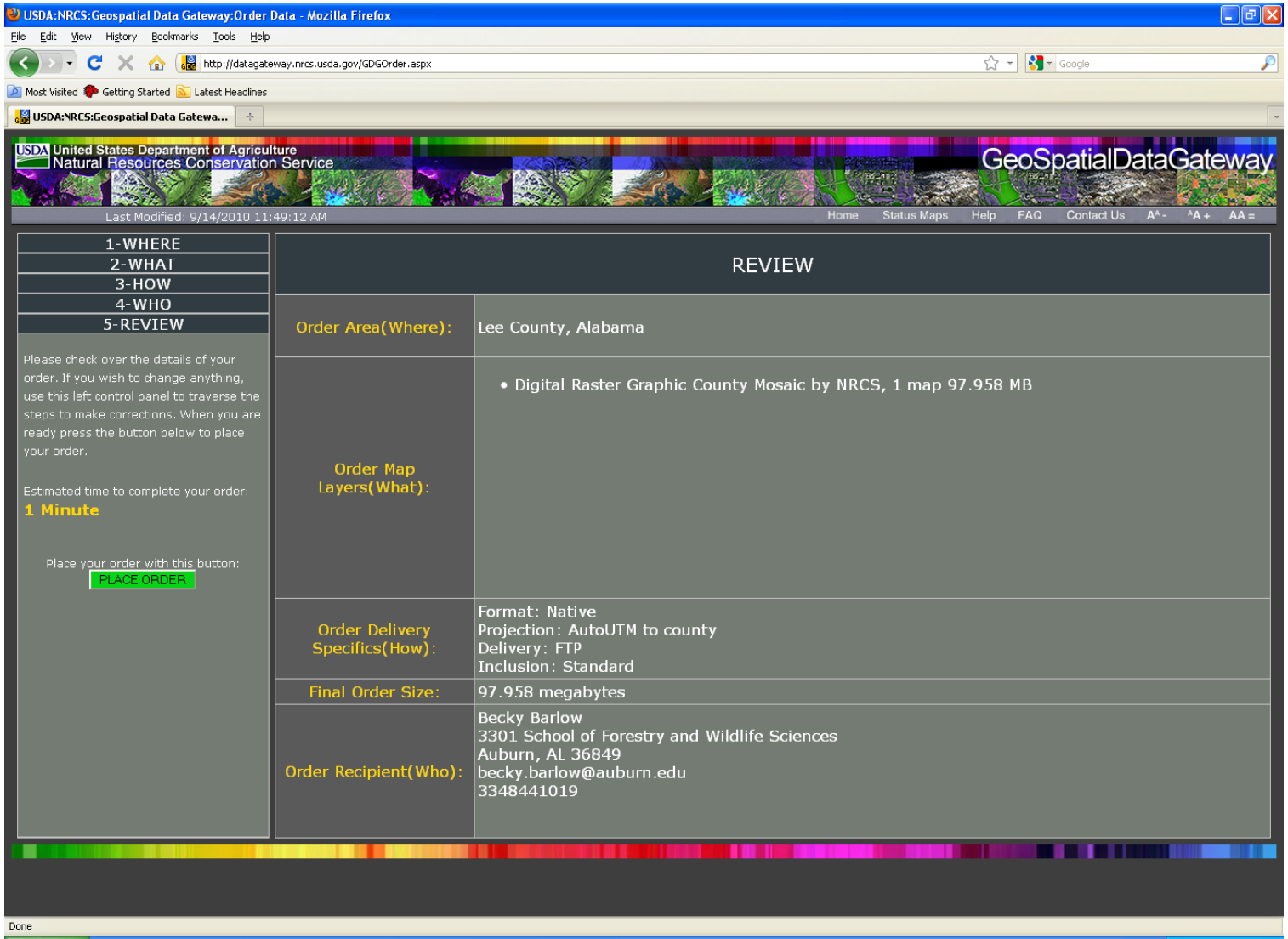
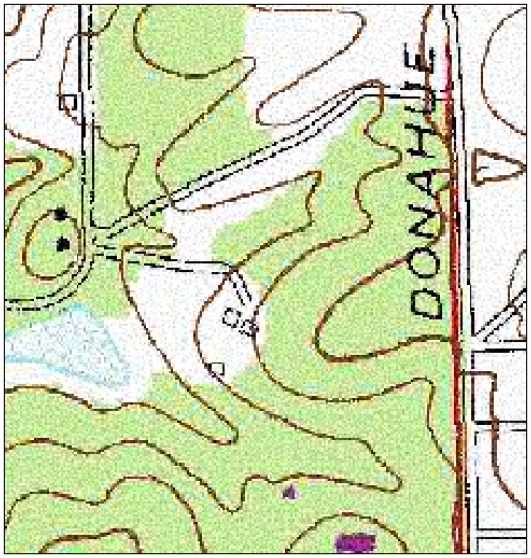


Geospatial Data Gateway



Donahue Drive Forestry Plots
Auburn University

Lee County, AL

Map Created: Feb 2010

N

0 175 350 700 Feet

Donahue Drive Forestry Plots
Auburn University

Lee County, AL

Map Created: Feb 2010

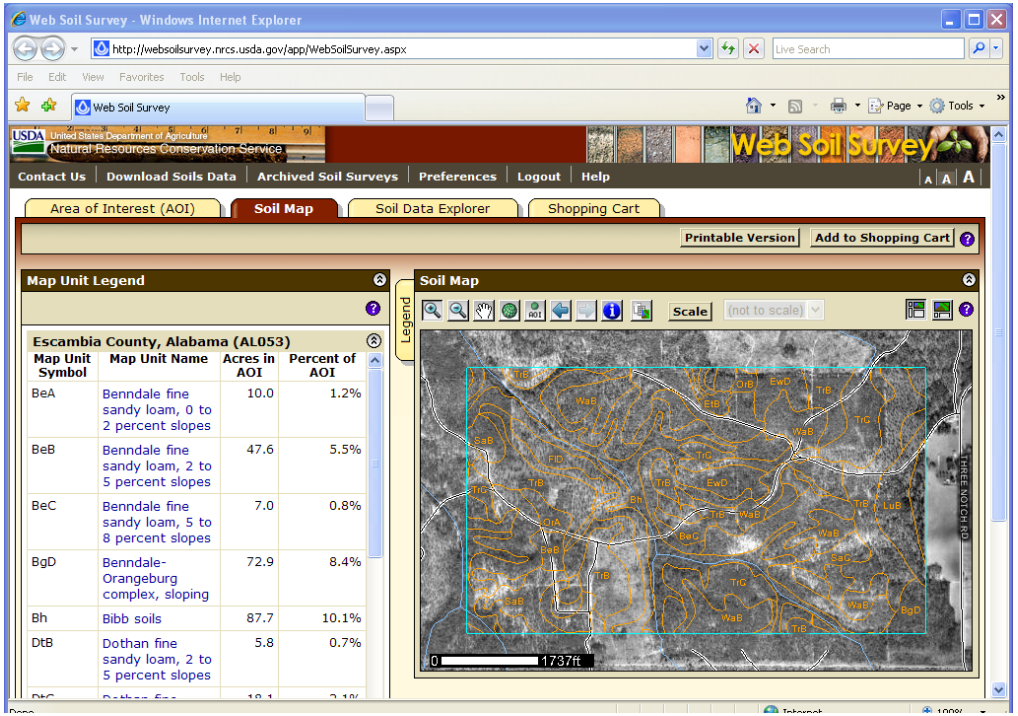
N

0 175 350 700 Feet

USDA Web Soil Survey

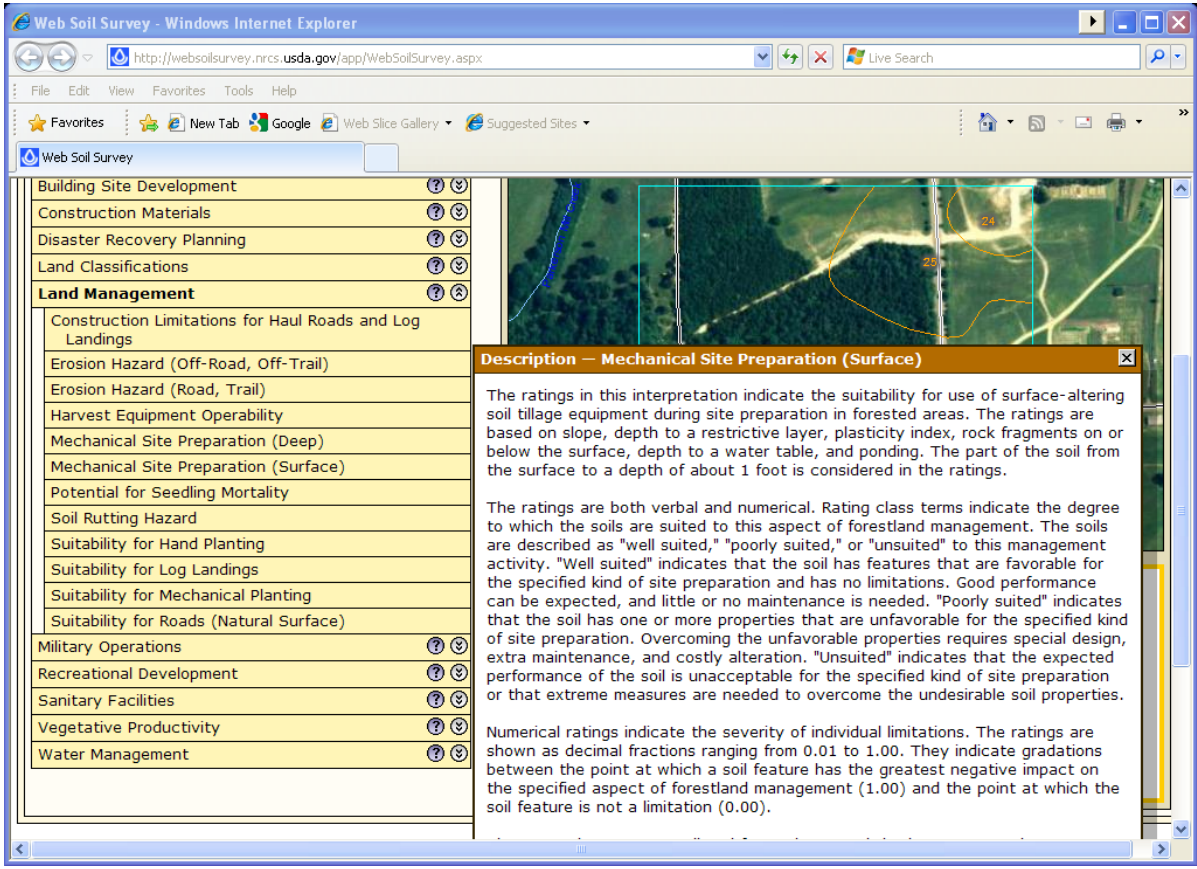
Soil Maps and Tabular Data

- Available from NRCS
- Obtain online soil surveys
- Create soil maps for a selected area



Soil Information

- Soil productivity
- Texture
- Site preparation information
- Suitability for hand planting
- Common species
- Site index
- Drainage class
- Slope



Forest Productivity

Description — Forest Productivity (Tree Site Index)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options — Forest Productivity (Tree Site Index): longleaf pine (USDA 1929 (580))

Units of Measure: feet

Tree: longleaf pine

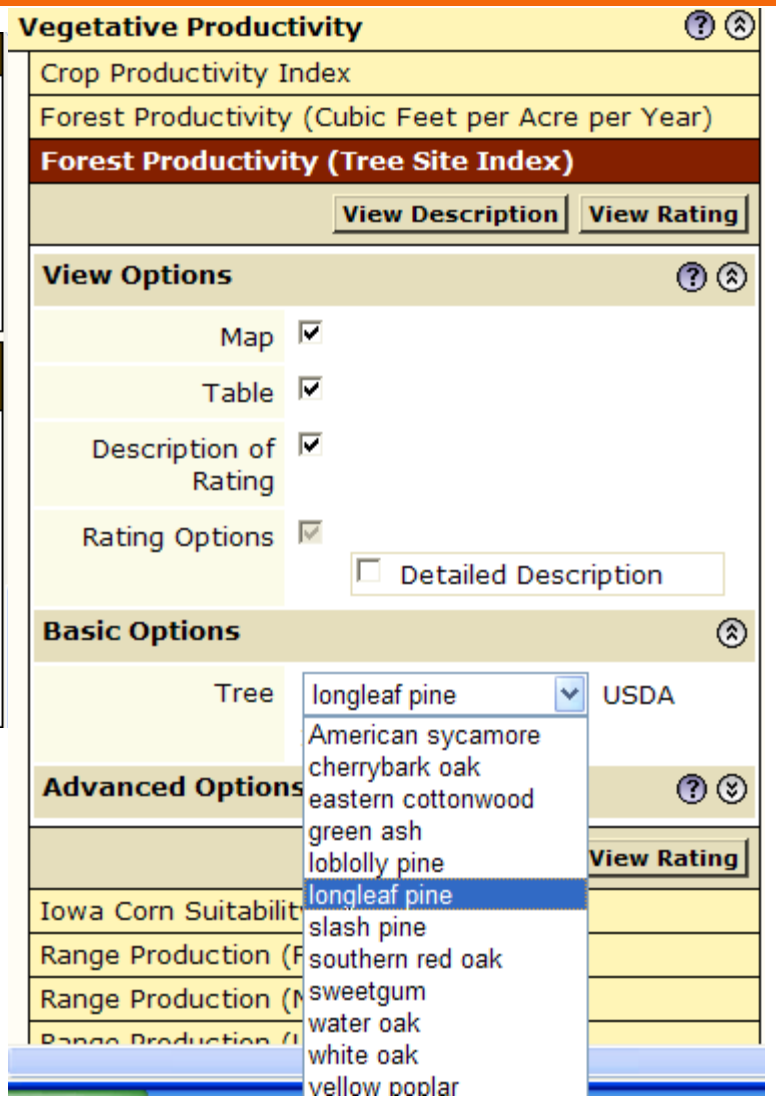
Site Index Base: USDA 1929 (580)

Aggregation Method: Dominant Component

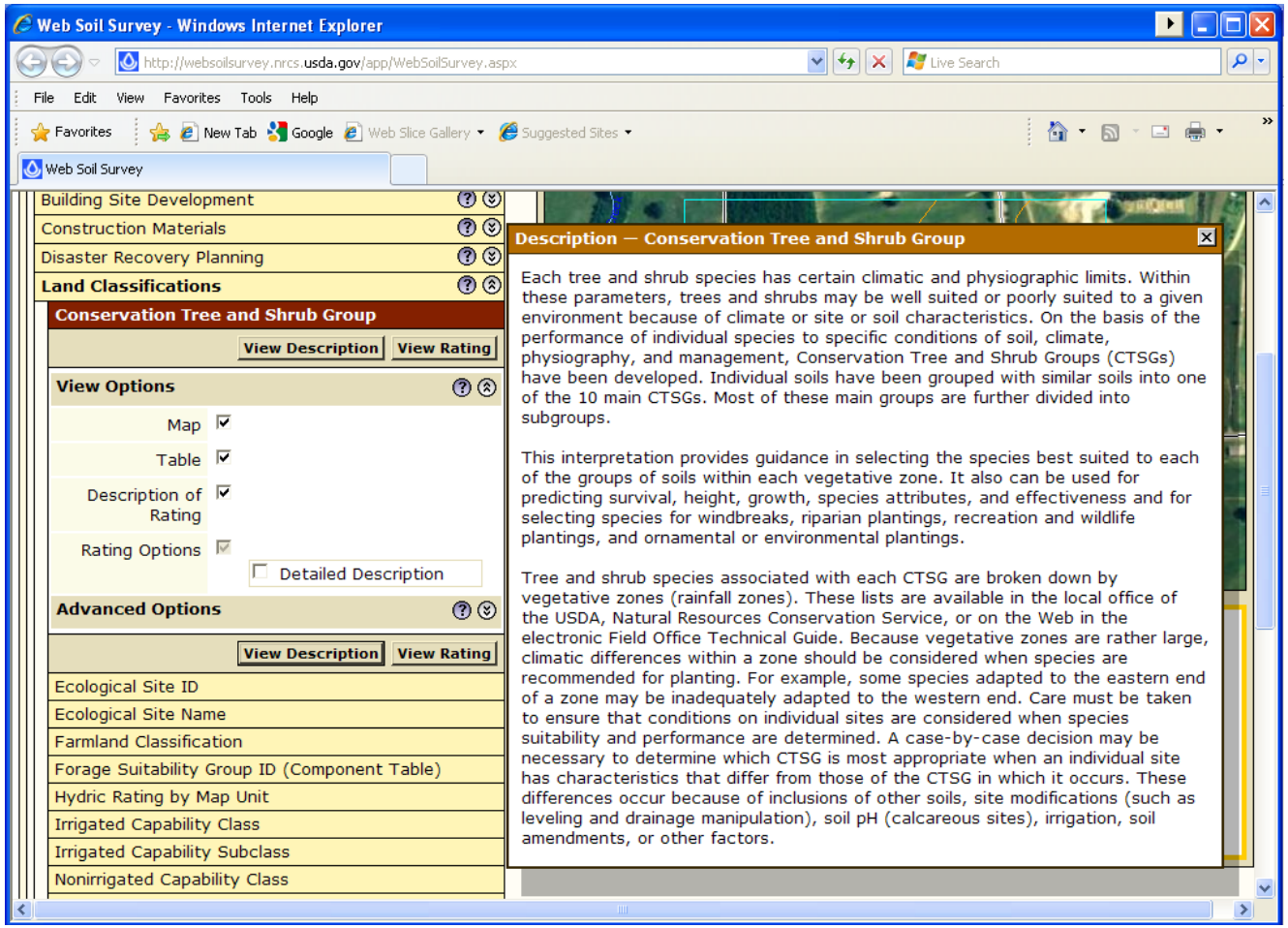
Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Interpret Nulls as Zero: No



Conservation Tree and Shrub Group



Potential for Seedling Mortality Rating

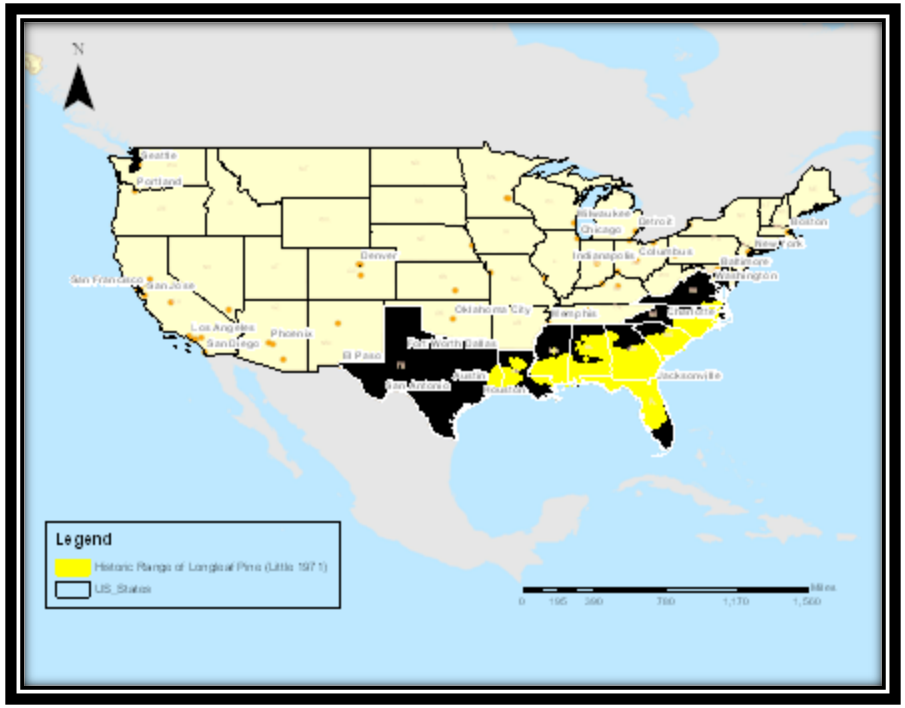
Tables — Potential for Seedling Mortality — Summary By Map Unit

Summary by Map Unit — Lee County, Alabama

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
21	Kinston silt loam, 0 to 1 percent slopes	High	Kinston (85%)	Wetness (1.00)	0.1	0.1%
			Mantachie (5%)	Wetness (1.00)		
24	Marvyn loamy sand, 1 to 6 percent slopes	Low	Marvyn (75%)		62.7	82.7%
			Uchee (5%)			
			Marlboro (5%)			
			Cowarts (4%)			
25	Marvyn loamy sand, 6 to 10 percent slopes	Low	Marvyn (80%)		11.6	15.3%
			Uchee (5%)			
			Cowarts (5%)			
W	Water	Not rated	Water (95%)		1.4	1.8%
Totals for Area of Interest					**75.8**	**100.0%**

Other types of spatial information

- Species natural ranges
- Seed collection zones
- Planting zones
- Drought ratings
- Adverse weather events
- Pest and pathogen outbreaks.



Longleaf Pine Seed Collection and Planting Zones

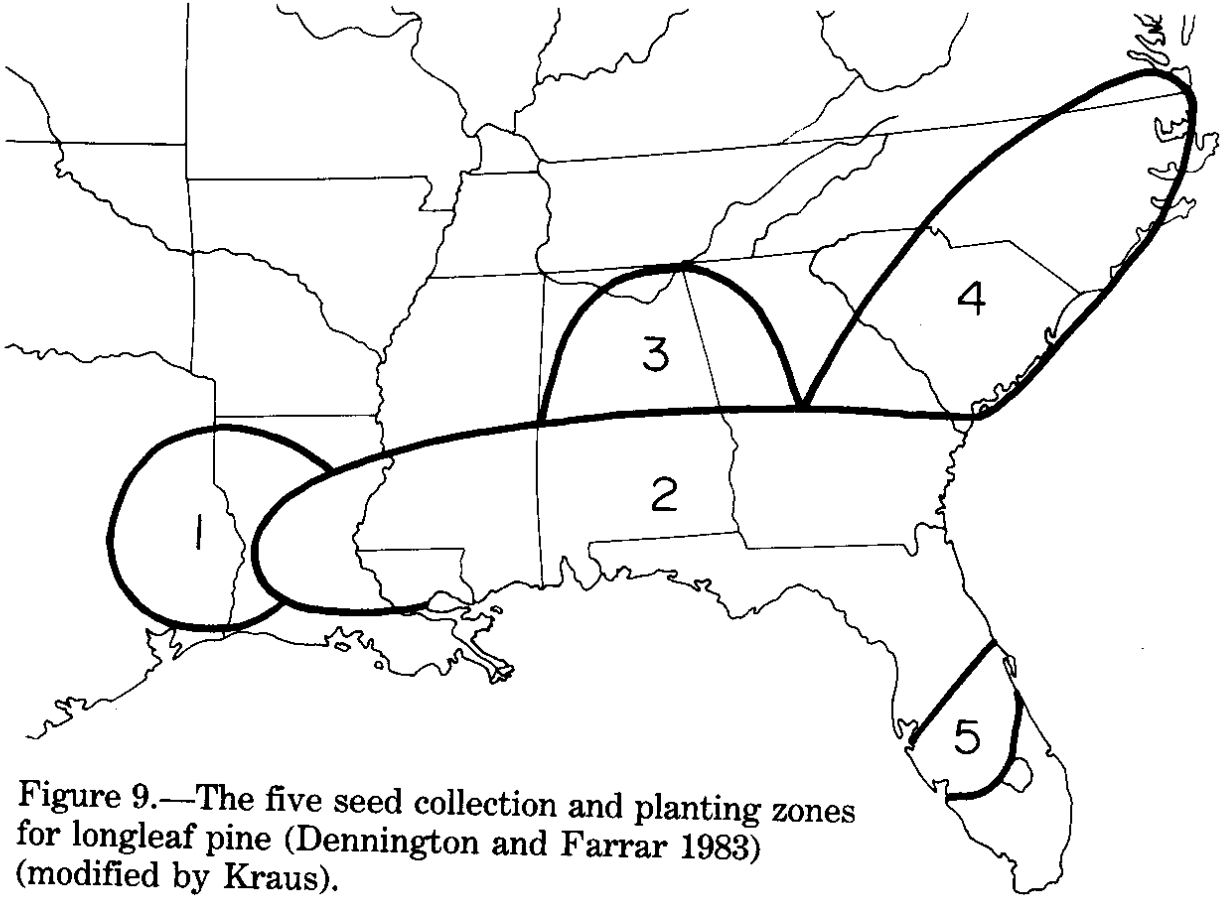


Figure 9.—The five seed collection and planting zones for longleaf pine (Dennington and Farrar 1983) (modified by Kraus).

Loblolly Pine Planting Zones

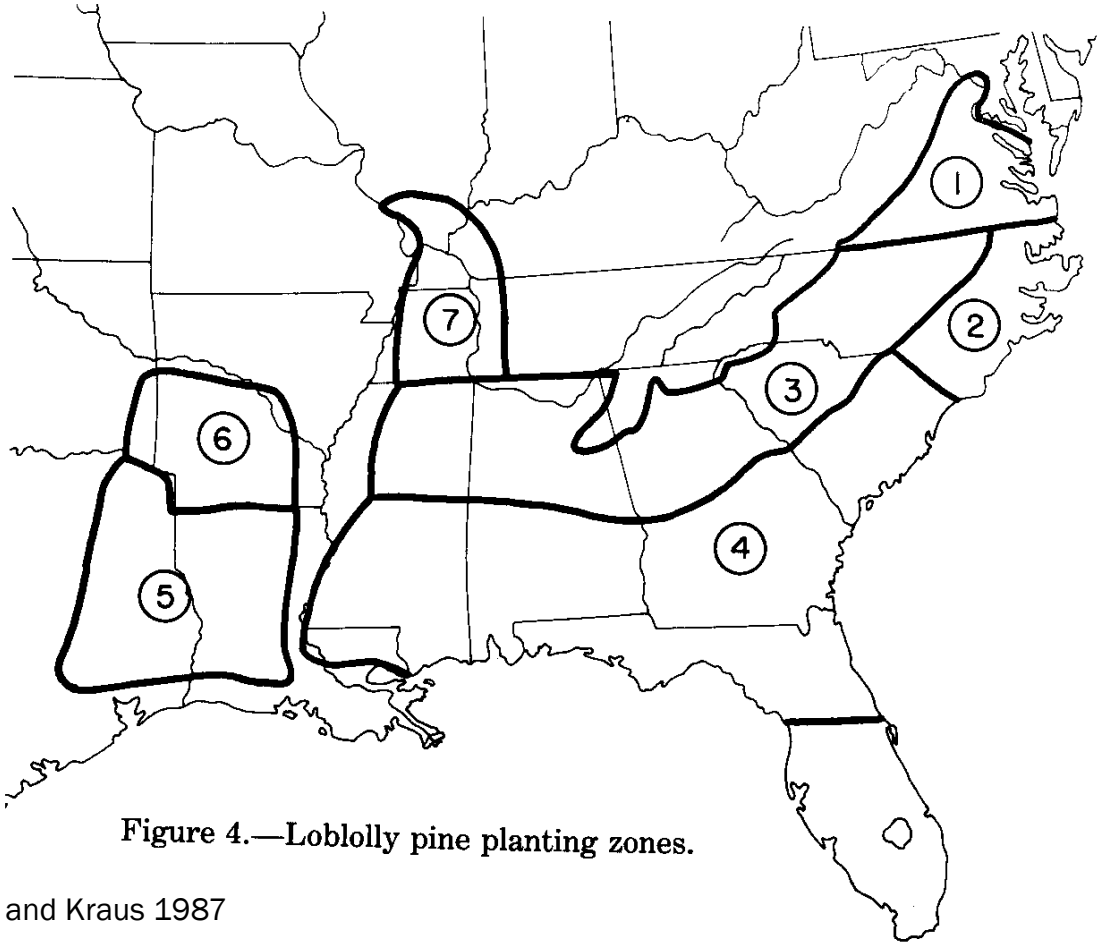
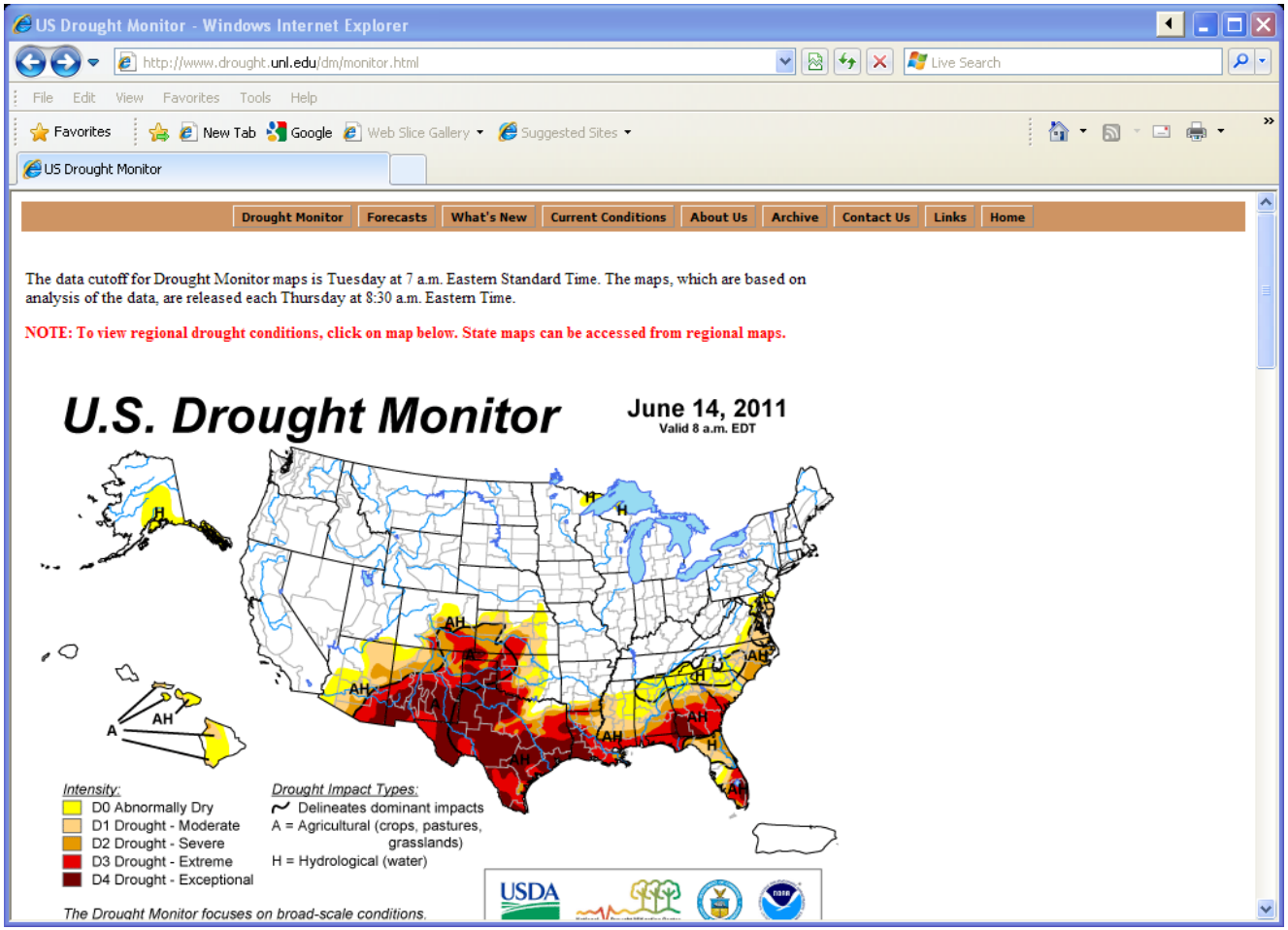


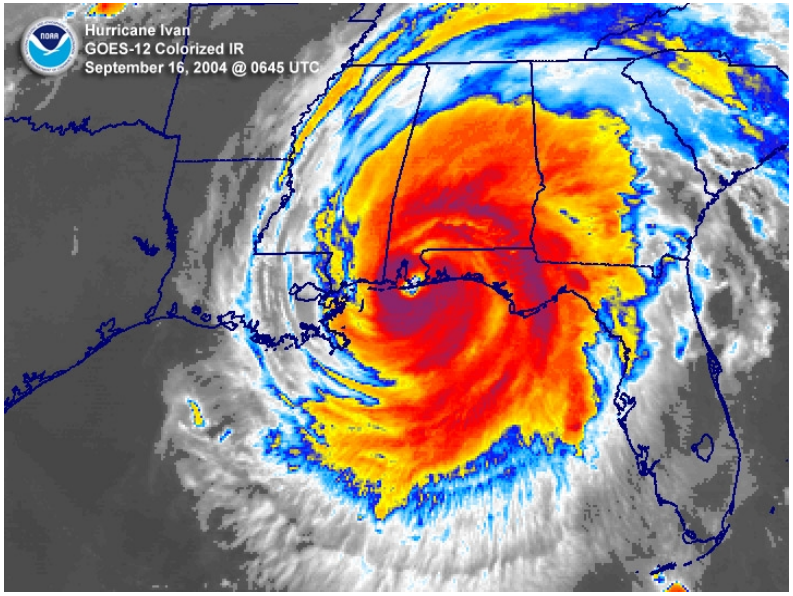
Figure 4.—Loblolly pine planting zones.

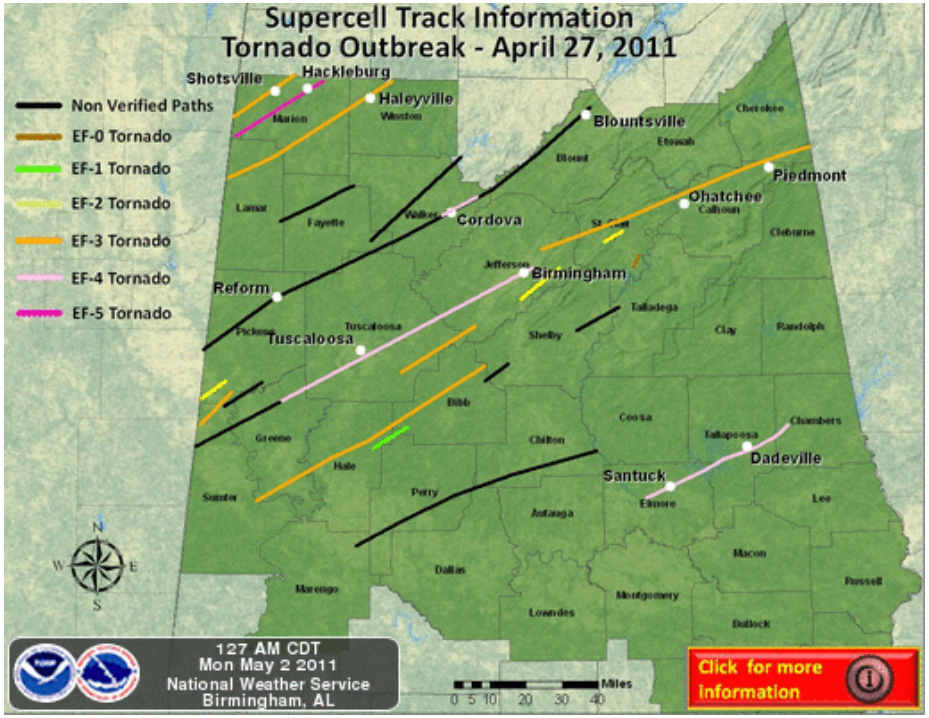
Lantz and Kraus 1987

US Drought Monitor



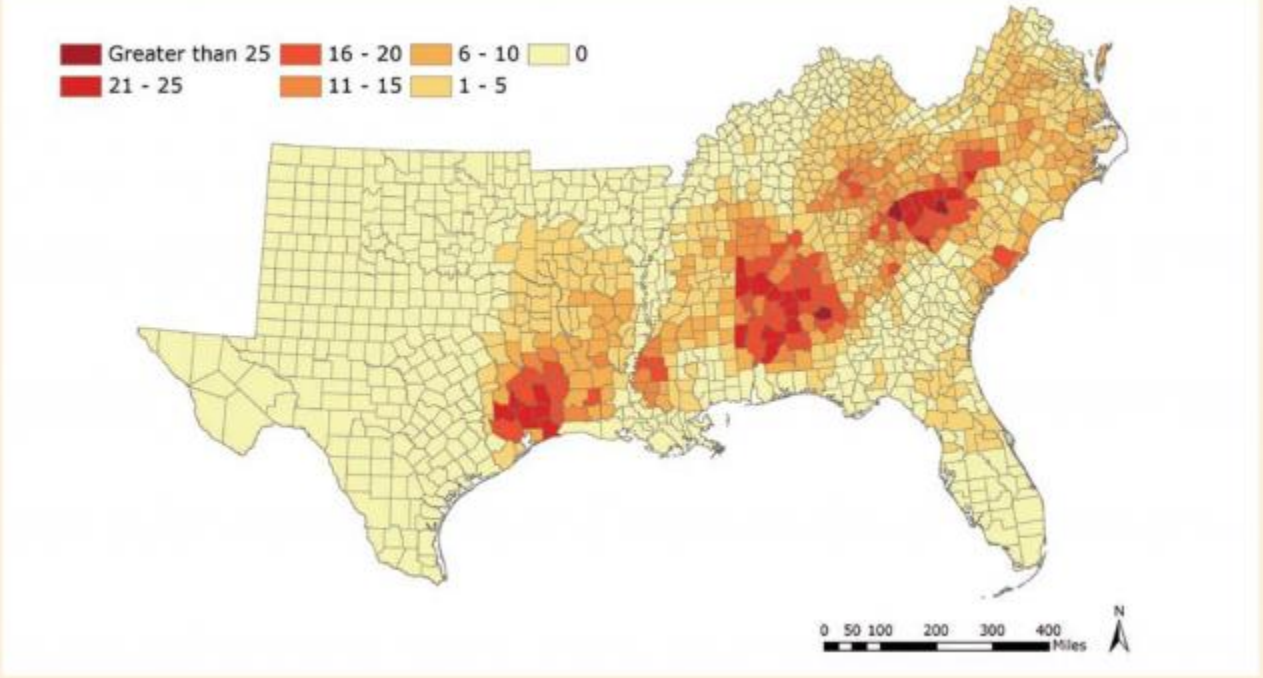
Adverse Weather Conditions





South Pine Beetle Outbreak by County and Year

Figure 4.7 Number of Years of Southern Pine Beetle Outbreaks by County (1960-2008)



Source: Southern pine beetle outbreaks by county (USDA Forest Service 2009), administrative boundaries (ESRI Data and Maps 9.3.1, ESRI 2008).
http://www.seesouthernforests.org/discover-southern-forests/drivers-change/drivers-change

Complex Analyses and Databases

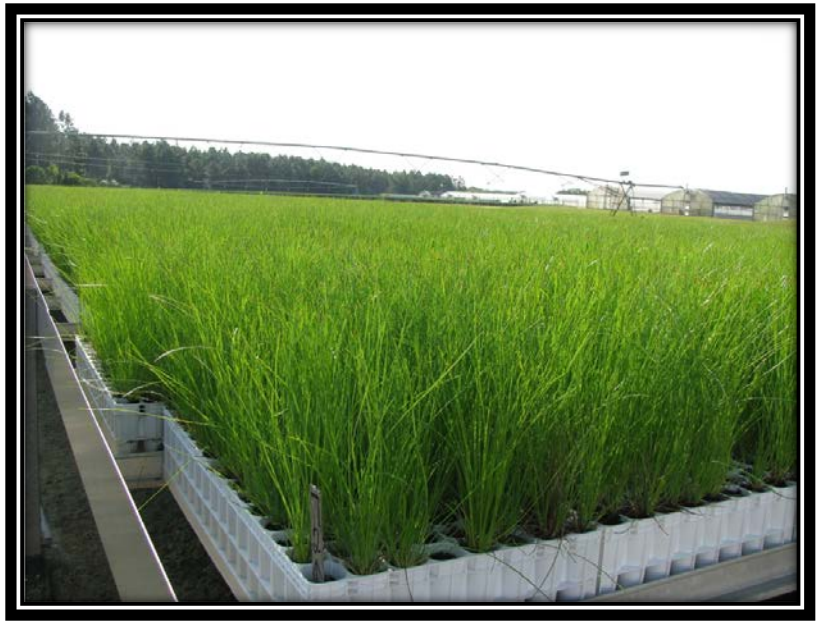
- Online resources and views can provide a great deal of information and useful products.
- Use a combination of online resources and data from your site to customize your GIS.

Few things are harder to put up with than the annoyance of a good example

-Mark Twain

Examples of what you can do

- Planning - Utilize available data to make informed management decisions
  - Soils data
  - Topographic maps
  - Aerial photos
  - Elevation information



- Tracking - On site
  - Field nursery locations
  - Seed orchards
  - Seed sources
  - Herbicide/pesticide treatments
  - Future stands

- Public Relations!

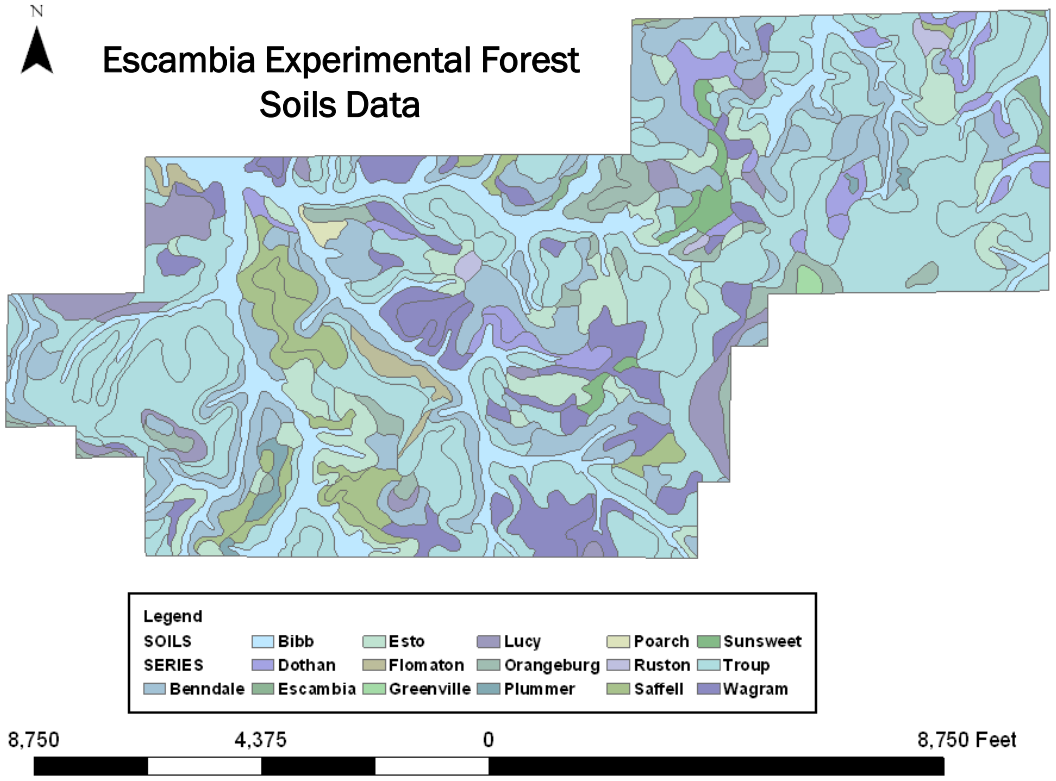
Planning

- Field nurseries
  - Past
  - Present
  - Future

Planning

- Assisting landowners
  - Planting locations
  - Site preparation tips
  - Planting methods

Planning



Attributes of Soils Layer

compname	plantscina	plantcomna	siteindex1
Fuquay	Pinus elliottii	slash pine	90
Troup	Pinus palustris	longleaf pine	70
Springhill	Liquidambar styraciflua	sweetgum	90
Troup	Pinus palustris	longleaf pine	70
Cowarts	Pinus palustris	longleaf pine	75
Cowarts	Pinus elliottii	slash pine	90
Troup	Pinus palustris	longleaf pine	70
Springhill	Liquidambar styraciflua	sweetgum	90
Troup	Pinus palustris	longleaf pine	70
Bonifay	Pinus palustris	longleaf pine	75
Troup	Pinus palustris	longleaf pine	70
Lucy	Pinus palustris	longleaf pine	70
Compass	Pinus elliottii	slash pine	90
Troup	Pinus palustris	longleaf pine	70
Springhill	Liquidambar styraciflua	sweetgum	90
Springhill	Liquidambar styraciflua	sweetgum	90
Nankin	Pinus palustris	longleaf pine	70
Troup	Pinus palustris	longleaf pine	70
Nankin	Pinus palustris	longleaf pine	70
Cowarts	Pinus palustris	longleaf pine	75
Cowarts	Pinus elliottii	slash pine	90
Orangeburg	Pinus elliottii	slash pine	90
Cowarts	Pinus elliottii	slash pine	90
Troup	Pinus palustris	longleaf pine	70

Record: 0 Show: All Selected Records (

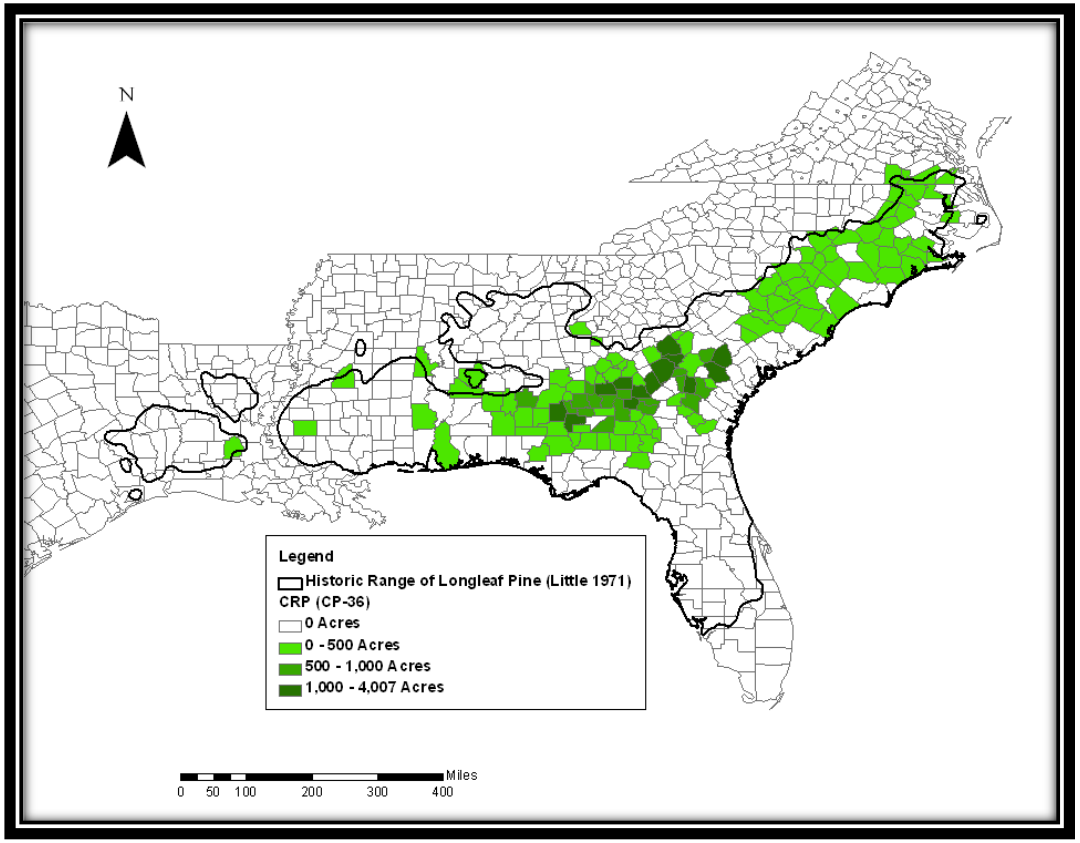
Tracking

- Seedling information
  - Seedling production by site and species
  - Seed sources
  - Chemical applications
  - Seedling sales and planting locations
  - Successes and failures

- Meetings and outreach activities as vendors
  - Professional meetings
  - Workshops
  - Landowner field days

Tracking - Cost-Share Programs

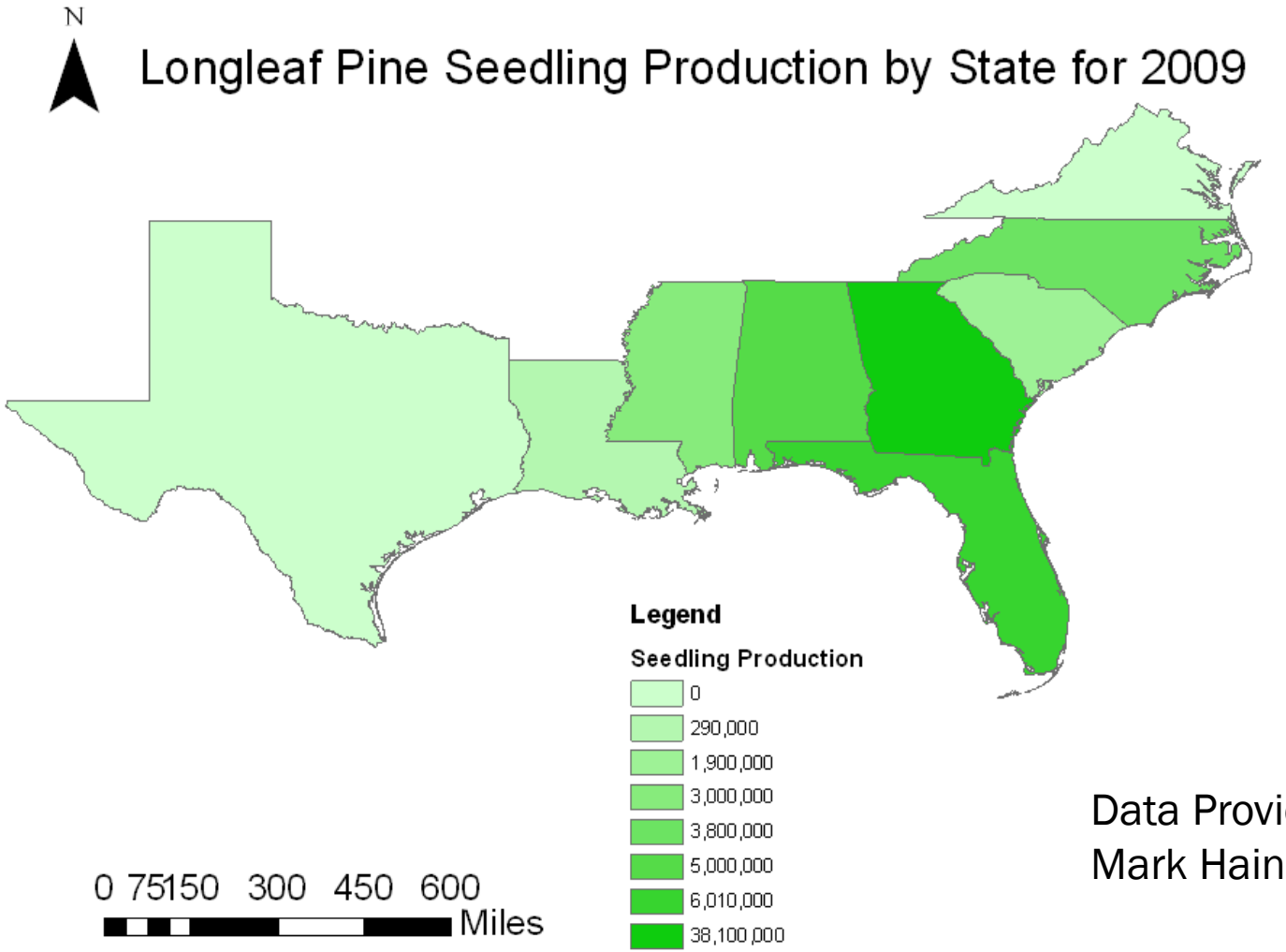
- Eligible counties by program
- Combine with tracking seedling information
- Used for public relations and distribution of outreach material



Tracking - Seedlings to the Stand

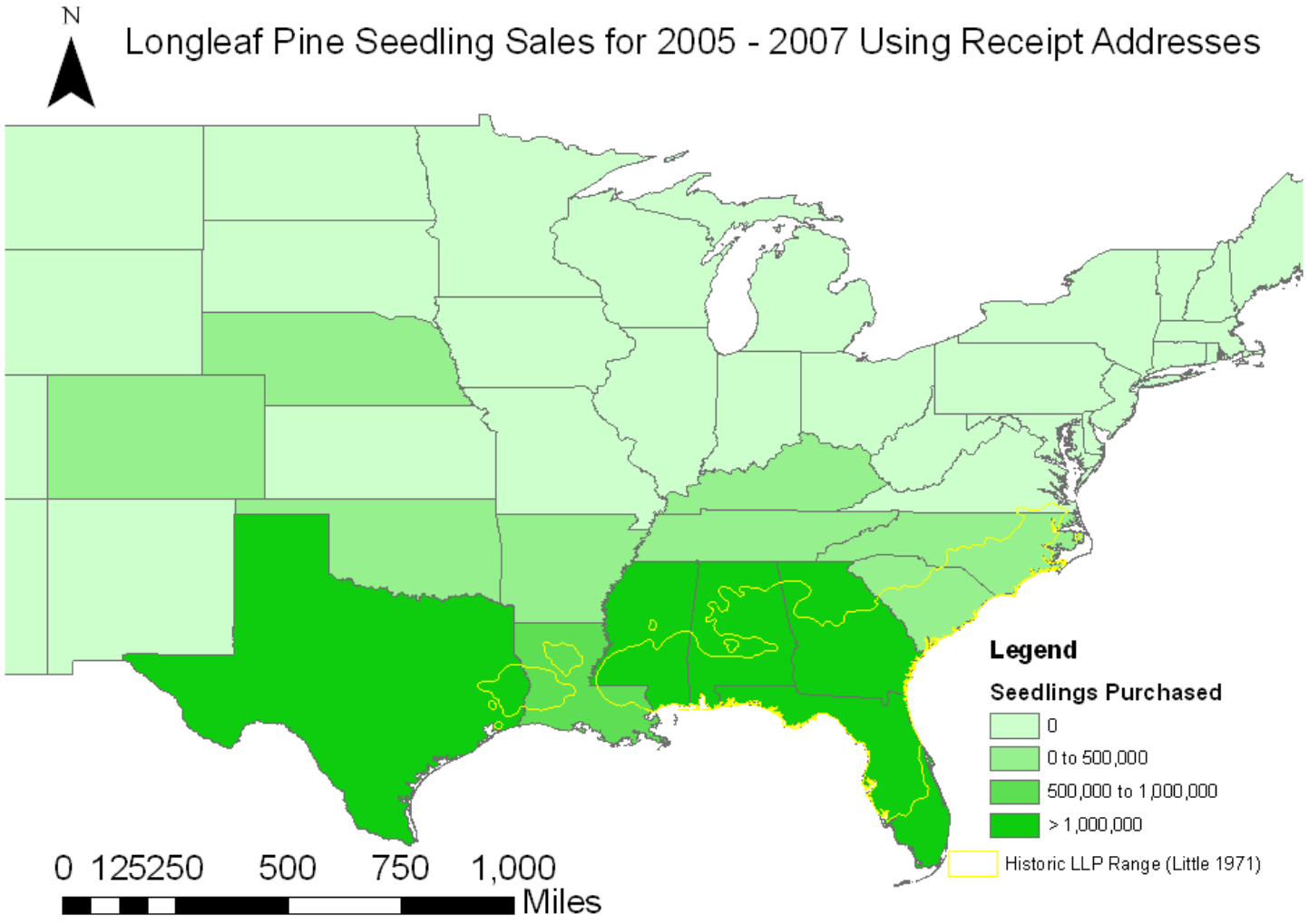
- Track from seedling production
- Track seedling sales
- Contact landowners through the nursery

Tracking - Seedling Production by State



Data Provided by Mark Hainds

Tracking - Seedlings Purchases



Tracking - Longleaf Pine GIS Database

- Previous information came from W.G.Boyette's Survey of Longleaf Pine Restoration Efforts 1996
- The current effort was initiated with the Longleaf Pine Stand Dynamics Laboratory and the Longleaf Alliance in 2007. Is gathering information about:
  - Location and size of planting
  - Seed source
  - Planting densities
  - Seedling type
  - Stand condition
  - Site preparation methods
  - Burn history
  - Additional comments
    - Success and failures – site prep, planting methods, time of year, etc.

Tracking - Longleaf Pine GIS Database

- Working with conservation professionals and landowners from all types of ownership

- As part of this effort
  - Contact those doing the planting, especially nonindustrial private landowners,
  - Attempting to track restoration from the seedlings to the stands

- Nursery managers have been and continue to be a integral part of this effort.

Planting and Existing Stand Forms
Over 3,500 acres of collected data in one planting season

The Longleaf Alliance
Mapping Longleaf Pine Project – Planting Information

Please fill out as much information as possible.

Location of planting:
State: _____
County: _____
Legal Description (example: Section Township Range) or GPS Location:
_____
_____
_____

Acres planted: _____

Number of seedlings: _____

Row Spacing: _____

Site Preparation: _____
_____
_____

Bare Root or Container (**circle**) - if planting both, please specify acreage and spacing for each

Cutover or old field (**circle**) - if planting both, please specify acreage and spacing for each

Cost Share Program: Please list if applicable - _____

Landowner Type: Private Landowner Industry NGO Agency Consultant Forester (**circle**)
If not a private landowner please specify organization: _____

Contact Information
Name: _____
Phone: _____
Email: _____
Address: _____

For more information or questions contact:

John Gilbert
School of Forestry and Wildlife Sciences
602 Duncan Drive
Auburn University, AL 36849-5418
gilbejo@auburn.edu
334-329-0236 Lab
334-844-1084 Fax

The Longleaf Alliance
Mapping Longleaf Pine Project –Existing Stand Information

Please fill out as much information as possible.

Location of Stand(s):
State: _____
County: _____
Legal Description (example: Section Township Range) or GPS Location:
_____
_____
_____

Acres: _____

Planted or Natural: _____
If Planted:
Bare Root or Container (**circle**) - if planting both, please specify acreage and spacing for each

Cutover or old field (**circle**) - if planting both, please specify acreage and spacing for each

Density (trees per acre or basal area per acre): _____

Comments (any additional information like site preparation techniques, burn history, etc.):
_____
_____
_____

Cost Share Program: Please list if applicable - _____

Landowner Type: Private Landowner Industry NGO Agency Consultant Forester (**circle**)
If not a private landowner please specify organization: _____

Contact Information
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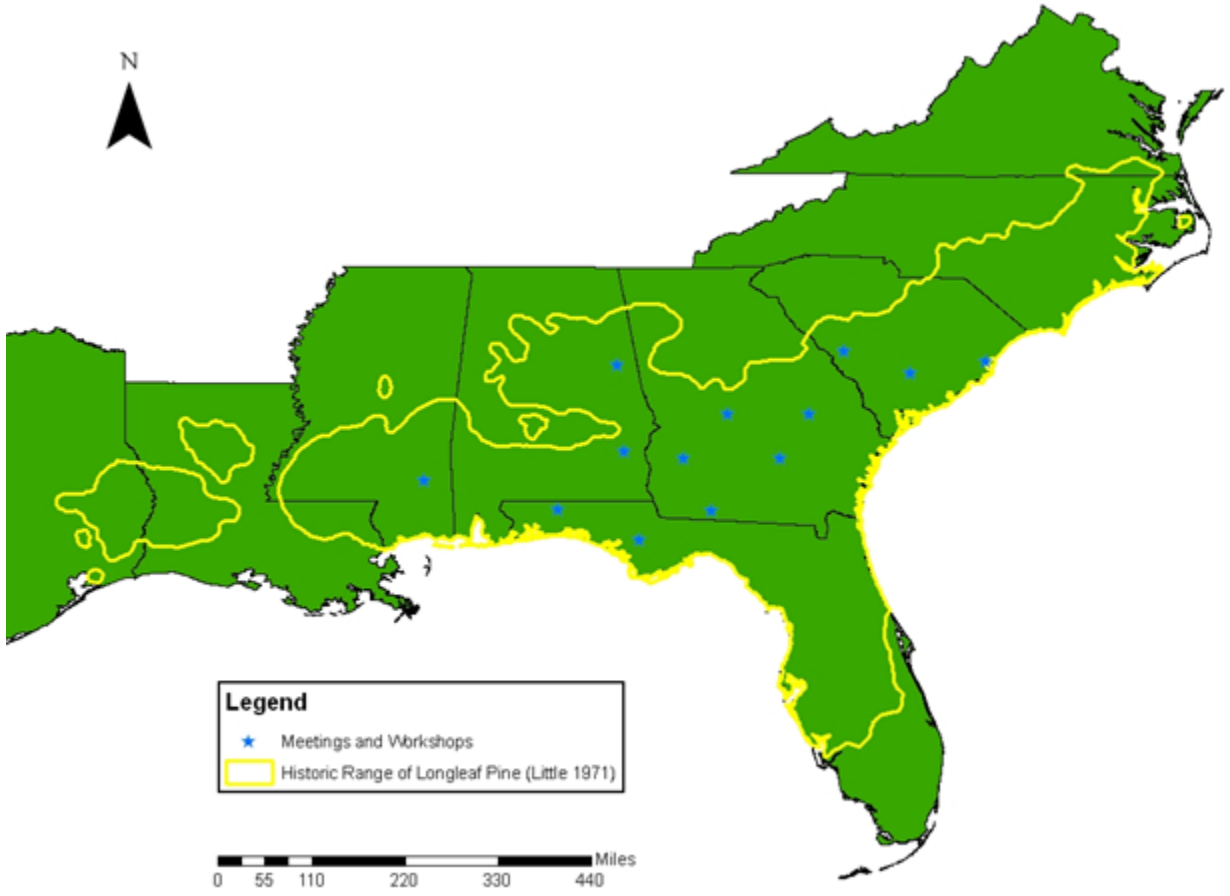
Tracking - Longleaf Pine GIS Database

- Ongoing effort
- Over 1.5 million acres of stand data
- Can be used by nursery managers
- Can be expanded to other species and topics of interest

Public Relations

- Reports
- Maps
- Online sharing
- Advertising
- Add to the current state of knowledge

Public Relations



Be the change you want to see in the world

- Mahatma Gandhi

Building Your Own GIS Database

- Take small steps from the data you currently collect
- Adding the spatial component or geocoding existing data
- Provides more information and the ability to make better decisions
- You can add to the current state of knowledge and help nursery production and success planting into the future

For More Information about GIS

- Numerous online options
  - Often free applications
  - Demos and free trials
- Take a continuing education course
  - Online tutorials
  - Online classes
  - Short courses

Sources of (FREE!) resources

- Google Earth
  - http://www.google.com/earth/index.html
- TatukGIS Viewer
  - http://www.tatukgis.com/getdoc/3e0de4ce-5b19-4a9a-ac30-e686bc5ee7f3/Viewer-%28Free%29.aspx
- FGIS
  - http://www.landmarkspatialsolutions.com/support/mappingsoftware.htm
- Geospatial Data Gateway
  - http://datagateway.nrcs.usda.gov/
- Web Soil Survey
  - http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Example GIS Software Packages

- ArcGIS
  - http://www.esri.com/software/arcgis/arcview/index.html
- Tatuk
  - http://www.tatukgis.com/
- Quantum GIS (Free!)
  - http://www.qgis.org/

Future Courses (TBA)

- Online Spatial Resources for Private Forest Landowners and Natural Resource Professionals (brochure and short course)

- Advanced Online Spatial Resources for Private Forest Landowners and Natural Resource Professionals

Future Courses (TBA) continued

- Advanced ArcGIS Applications with Vector Data for Forestry and Other Natural Resource Applications
- Introduction to GPS for Forestry and Other Natural Resources Applications
- Advanced GPS for Forestry and Other Natural Resource Applications

For More Information

- Contact:
  - Dr. Rebecca Barlow at becky.barlow@auburn.edu (334)844-1019
  - John Gilbert gilbejo@auburn.edu 334-329-0236
  - Dr. John Kush kushjoh@auburn.edu 334-844-1065

Good decisions for a better tomorrow