BUILDING SCIENCE COMMUNICATION TOOLS WITH GIS IN FOREST INVENTORY

Christopher M Oswalt (USDA Forest Service)
Charles “The Hobie” Perry (USDA Forest Service)
A little help from my friends...

**USFS – FIA**
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James Garner
Brian Walters
Thomas Brandeis

Sonja Oswalt
Andy Hartsell
James Bentley
Jason Cooper

**Esri**
Tim Clark
John Steffenson
Peter Eredics
FIA Generates a Tremendous Amount of Data
Experience Mapping

- The USFS FIA program is shifting from a print-first model to a digital-first model
Experience Mapping

• Understanding user needs, desires, and experiences is imperative
  
  – Touchpoint opportunities are becoming more common
  
  – Channels of interaction are diverse – but some are vastly more popular (and more productive) than others
From This

To This
Experience Mapping

- What we have learned so far (ongoing) or What is making our users happy:
  - Interactive
  - Data
    - Temporally rich
    - Geographically rich (must contain my backyard)
  - Movement
  - Story-based
  - Shareability
  - Internal Relevancy

Credit – Julia Negrete
- Interactive
- Data
  - Temporally rich
  - Geographically rich
- Movement
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http://rokitscience.com/gis-for-small-business/
User-Product Interaction is KEY

• Our Users have said:
  – “Must provide for custom summaries”
  – “Needs access back to raw data”
  – “Leverage spatial data to fullest”
  – “aesthetics are important”
  – “avoid custom built apps where you can”
  – “would love print-on-demand factsheets”
I Live Here

- Must contain my location for it to be important

- Example – wood flow in the United States
Southern Interstate Wood Flow

This map tells the story of how much wood (in terms of procured raw material) is traveling across state lines in the southern United States.

Relative flow of wood material across state lines from southern US states.

MAP EXPLANATION - Each colored state centroid represents the total production within the state. Each similarly colored line (same as state centroid) represents material leaving the state and either headed to another state (line terminates at another state centroid) or that leaves the southern region (line terminates outside of the southern states) to be processed.

NOTE - Detailed information can be viewed by clicking either the state, the flow lines, or the state centroids.

Southern Exports
export_mcf

- > 55,032 to 76,877
- > 36,871 to 55,032
- > 19,843 to 36,871
Wood Movement in the United States

Timber is often processed and used far from where it was harvested. The depiction of timber flow in the United States illustrates harvest levels and the movement of logs to mills. Clearly, timber is moving all over the country, and some logs are even shipped to international markets. Understanding patterns in wood movement is important. This movement results from the complexity of wood product markets that connect landowners, loggers, mills, and consumers.
Make it Move…

Select the type of estimate:
- Totals

Reset All

Forestland Status
- Reserved Other Forest
- Reserved Productive Forest
- Unreserved Other Forest
- Unreserved Timberland

Number of plots selected: 5983

Units selected:
Area of forest land, thousand acres

Ownership
- All Private owners
- Bureau of Land Mgmt
- Dept of Defense/Energy
- Fish and Wildlife Service
- Local govt (City Muni)
- National Forest System
- National Park Service
- Other federal
- Other non-federal public
- State govt

Broad Species Group

Year

Forest Type Group
- Alder / maple group
- Aspen / birch group
- California mixed conifer group
- Douglas-fir group
- Elm / ash / cottonwood group
- Eucalyptus group
- Fir / spruce / mountain hemlock group
- Hemlock / Sitka spruce group
- Lodgepole pine group
- Nonstocked
- Other hardwoods group
- Other western softwoods group
- Pinyon / juniper group
Make it Move...

Forest Atlas of the United States
What's Your Story?
If Kudzu isn't the Devil, what is?

Most people rely on personal experience to define the environment around them. It comes as no surprise that the readily visible invasive plant Kudzu is often referred to by the general public as the "vine that ate the south," and is readily recognized by most. However, while kudzu certainly is invasive and damaging at the forest edge, research shows that it rarely invades the forest interior, and is less problematic to U.S. forests than many other common invasive plants. The myth of Kudzu was recently explored in the Smithsonian Magazine. Throughout this story, we explore and uncover the real vines, trees, grasses, and herbs that plague southern forests.

In the map, the proportion of forest plots occupied by any invasive plant is shown in gradients of blue (scroll for legend). The points are forested locations containing kudzu, sized by percent cover. While kudzu is found in many southern states, it is present in just one percent of forested subplots. Simply click on the on the state or on the individual kudzu point for an informative popup. Zoom all the way in to see individual subplots fanned out.

Kudzu (Pueraria montana var. lobata) can dominate large areas to the exclusion of all native plant species.

Photographer: Flickr user reephas. Original url
www.flickr.com/photos/41839209@N07/3857938694/

On each successive page, the maps show the distribution of each invasive vine plant on forested land in the...
Pueraria montana (Lour.) Merr. var. lobata (Willd.) Maesen & S.M. Almeida ex Sanjappa & Predeep kudzu

About our new maps

General Information

Symbol: PUMOL
Group: Dicot
Family: Fabaceae
Duration: Perennial
Growth Habit: Vine
Native Status:
- MI I
- LA I
- PB I

Data Source and Documentation
This is your table of individual subplots. To join this data with other P2 data please visit DataMart.

These data were collected using version 6.0 of the field guide manual. Please note a few critical changes:

1) In previous manuals the percent cover was a code, and not a literal value. In the 6.0 manual PERCENT_COVER is percent cover from 1-99 percent of the Condition area.
2) SPECIES CODE has been modified from a 4 digit code to the USDA PLANTS symbol.
3) COND_CN has been added to facilitate joining back to the P2 data.
4) If you arrived at this page from another webpage and would like to learn more about the SNIPET data, please visit HERE.

This is your table of subplots for Kudzu, species code 'PUMOL' for an individual Eval Group 282014, all counties

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Chinese privet was first introduced in 1852 as an ornamental cultivar. This prolifically seeding species has since become extremely invasive in southern forest, and impacts ecosystems by displacing native plants. The plant was fairly contained prior to the 1960s, but expanded rapidly in the decades from 1960 to 2000. Lawn and garden supply stores continue to sell privet, which is now considered naturalized in the southeastern United States. Additionally, seeds are dispersed by birds and other wildlife that consume them.

Chinese privet is the second most common invasive species in the southern United States.
Forest Inventory & Analysis
Invasive Plant Monitoring

Forest invasives data at your fingertips...

The Southern Research Station (SRS) Forest Inventory and Analysis (FIA) program began monitoring invasive plant (IP) species in 2001 in response to a growing desire to track potential forest health threats on United States (US) forestland. Invasive plants are threats to US forests through the displacement of native species, the alteration of soil physical and chemical properties, and the disruption of successional pathways among other potential impacts. Because of the environmental and ecological burdens posed by these species, IP inventory and monitoring is considered a priority in many parts of the US. The SRS-FIA IP program has produced significant results and contributed considerably to the understanding of the distribution and spread of IP.
Lonicera japonica (Japanese honeysuckle)

Approximate locations of USDA Forest Service Forest Inventory & Analysis plots with observed infestations of Lonicera japonica.
Spanning 13 Southern States from Texas to Virginia, southern forests include a diversity of dynamic landscapes and ecosystems, and play a vital role in the region’s culture and economy. The forests are highly productive, providing raw materials that fuel regional, national, and global economies.

Southern forests, known as the “wood basket” of the Nation, accounted for 63 percent of the total timber volume harvested in the United States in 2011 (Oswalt and others 2014). Primary wood-processing plants in the South produced 45 percent of the saw-log products, 63 percent of veneer products, 74 percent of the pulpwood, and 64 percent of all composite products in the Nation in 2011 (Oswalt and others 2014). The South’s forests are so productive that, while they makeup only 2 percent of the global forest cover, they produce 12 percent of the world’s industrial roundwood and 19 percent of its pulp and paper products—greater production than that of any other nation.

Southern Forests Products
An Economic Engine

Southern forests provide a significant portion of the forest product output of the United States while only having 32% of the forests of the US.
Timber Product Output in the South

These maps contain data from canvasses of primary wood using plants. The canvasses determined the amount and source of wood receipts and annual timber product drain by county as well as interstate and cross-regional movement of industrial roundwood. Only primary wood using mills were canvassed. More detailed information on statewide and county-level TPO output is available on the online TPO database and in the individual State TPO reports.

Primary mills are those that process roundwood in log or bolt form or as chipped roundwood. Examples of industrial roundwood products are saw logs, pulpwood, veneer logs, poles, posts, and logs used for composite board products. Mills producing products from residues generated at primary or secondary processors were not canvassed. Trees chipped in the woods were included only if they were delivered to a primary domestic manufacturer.

Additional product maps:

Click the map above for additional product mapping options.

NOTE - Texas data is not represented and in cases where ownership information would be jeopardized by the release of county-level data, data were not included.
Primary Wood Processing in the South

There are currently over 1,400 primary wood processing mills distributed across the southern United States with nearly 100,000 employees.

The map here depicts approximate locations of each mill along with the type of mill in operation.

NOTE - Click each mill for information on the type of wood mix (softwood or hardwood) utilized OR click on each state to get detailed state level information regarding the number of mills in the state, the number of employees working within the mills in the state, and links to FIA harvest and utilization reports, timber product output reports, state mill directories (if available) and the mill directory maintained by the Southern Group of State Foresters.

Southern mills (2011)
- Sawmill
- Pulpmill
- Other
- Pole
- Veneer
- Plywood
- Post
- Composite Panel

2011 Forest Industry employees (no.)
Forest industry employees (no.)
- > 9,766 to 13,517
- > 7,592 to 9,766
- > 4,973 to 7,592
- > 951 to 4,973
- > 951 to 951
A Declining Mill Base

Jobs and their associated labor income are lost when mills close or curtail operations. From 2004 to 2009, the South lost 26 percent of full- and part-time jobs (direct employment), resulting in an estimated 20 percent loss in total jobs associated with the wood products industry (direct, indirect, and induced employment). All Southern States showed direct job losses, varying from a low of 15 percent in South Carolina to a high of 35 percent in North Carolina. These job losses had a corresponding negative impact on labor income for the Southern States. Direct job losses were particularly acute in wood product industries that produced primary solid wood products (34 to 36 percent between 2004 and 2009) and solid secondary wood products (34 percent loss).

In each southern state there has been significant declines in the number of mills operating within its borders during the periods in which FIA has been collecting data (click chart below to enlarge).

NOTE - click each state on the map to the right to get detailed state-specific information.

For further information - see “Economic Dynamics of Forests and Forest Industries in the Southern United States.”
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Average annual mill decline -3.01 (percent)

Mills are Declining

Change in number of mills over the time SRS-FIA-TPO has been tracking this data.

For further information - see “Economic Dynamics of Forests and Forest Industries in the Southern United States.”

Content may not reflect National Geographic’s current map policy. Sources: National Geograp...
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Relative flow of wood material across state lines from southern US states.

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Relative flow of wood material across state lines from southern US states.
Shareability

Get engaged with the Forest Service!
usfs.maps.arcgis.com/apps/PublicGeospatialService/
#FSNatureWatch #ForestService #Ecosystems

FIA Engagement Portfolio
A new and visually engaging portfolio of tools are designed to provide rich, interactive experiences while simultaneously making the content available on usfs.maps.arcgis.com

What is GIS? @GISdotcom - 16 Jun 21
Seeing the Forests for the Trees. Explore Service & ESRI arcgis.is/1Xql09K

Forest Inventory and Analysis
Annual Reporting
FIA state annual reports in story map form reveal new dimensions of state forest areas. ow.ly/RqVnc09hZFR

Southern Research @usfs_srs - Mar 27
Southern Pine Beetle Prevention Program ow.ly/x8IK309W8t

Northern Research @usfs_nrs - Jun 9
More than #maps, Forest Atlas of US turns #data into stories about our nation's #forests & challenges they face. go.usa.gov/xkSE4
Shareability

Southern Forest Products: An Economic Engine
by Zoe Hoyle, SRS Science Communications • January 17, 2017

A story map developed by U.S. Forest Service researchers allows users to interactively chart the ebb and flow of forest products across the southern states. Using Forest Service Inventory and Analysis (FIA) data loaded onto Esri’s ArcGIS Online (AGOL) platform, Southern Forest Products – An Economic Engine, provides a constantly updated guide to southern timber... MORE »
Shareability

Invasive plants taking a toll on nation’s forests, including those in Utah

SATURDAY, JANUARY 18, 2015, 6:00 AM

In this 2013 photo provided by the U.S. Bureau of Land Management cheatgrass in southern Idaho grows in between native sagebrush and juniper trees. A century-long losing battle has been waged in the West against an invasive weed that is responsible for massive wildfires and threatens native species and rangeland. Now, some 65 years after famed naturalist Aldo Leopold summed up the general consensus in the battle against cheatgrass as hopeless, there might be some hope. (AP Photo/U.S. Bureau of Land Management)

Leila Larsen

United States, not just lands managed by the U.S. Forest Service. Scientists with the Forest Inventory and Analysis (FIA) program studied ¼-acre subplots within every 6,000 acres of forested land for evidence of non-native plants.

"From invasive grasses that exist on the forest floor up to the largest trees that are invasive, everything is documented that we can find," said Chris Oswalt, a research forester based in Knoxville, Tennessee, and the lead author of the study.

Researchers mapped the invasion-intensity for FIA sample sites and then estimated invasion-intensity for U.S. regions. Image: U.S. Forest Service Forest Inventory and Analysis program

Hawaii has by far been hit the hardest by non-native species, with 70 percent of its forested land impacted, but the East Coast, the South and the Great Lakes Region have a significant invasion rate, too.
Engagement Portfolio

Providing rich, interactive experiences for the public while simultaneously making forestry data available to resource professionals and other users...

We encourage you to explore all of our demos, and we look forward to any feedback you might want to share.

Observing and Analyzing America's Forests
Document Link by USFS_NRS_FIA. Last Modified Sep 12, 2016. A video introduction to our Engagement Portfolio.

My City's Trees
Document Link by USFS_NRS_FIA. Last Modified Sep 12, 2016. The My City's Trees application produces custom reports summarizing urban forest conditions and services using the latest Urban Forest Inventory and Analysis (Urban FIA) data.

A Link Between Land and Water
Web Mapping Application by USFS_NRS_FIA. Last Modified Oct 7, 2016. This map journal explores the relationship between land and water in the Great Lakes region.

Why are we building this?

The USDA Forest Service Forest Inventory and Analysis (FIA) Program is in the information business, and our focus is on the extent, condition and trends of forest land across the entire country. We invest $75 million a year to collect data across three themes: field inventories of forest land, a census of the forest products industry, and surveys of forest land owners.

This massive campaign collects data on over 355,000 plots, on public and private lands, across 9 time zones, from Guam to our Caribbean territories. The result is a database with more than 19 million trees. And we've been doing this for over 80 years.

Our spectrum of users is expanding. On the one end we have our long-standing relationship with power users. At the other end, we have the

http://www.fia.fs.fed.us/engagement-portfolio/
Additional Acknowledgements

• FIA field crews across the country
• Eric Aiello
• Esri

http://www.fia.fs.fed.us/engagement-portfolio/
THANK YOU

coswalt@fs.fed.us

http://www.fia.fs.fed.us/engagement-portfolio/