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## A 'KEEP IT SIMPLE, STUPID' APPROACH TO SIMULATING BASAL AREA

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A national risk map starts with the best available data layers for standard measurements. The process is moving away from cover types to maps of stand measurements for individual species, basal area, quadratic mean diameter, stand density indexes, and other such structural variables. These will form the key layers for risk mapping because almost all of the 100 different risk models use them. The techniques for creating these layers were tested with data from 437 plots on the Barlett Experimental Forest, and Landsat data were used to map the BA condition classes. The process was then extended to the FIA data plots as a base to produce a national map. Key points included keeping the model relationships simple and using Arc/Info to build the maps. Efforts are being made to add TM Band5 and other layers to the mix, include measures of variations within pixels, test for agreement and mismatches, and generate regional scale maps at 250-meter resolution.

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## National Risk Map of Insects and Diseases

### A “Keep it Simple Stupid” Approach to Simulating BA Generating Layers For the National Risk Map

Presented by Frank Krist FHTET

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## Overview

- **Background**
- **Surfacing technique**
  - Built on work by Andy Lister and Randy Morin
  - Test area
  - Process
  - Sample National BA Maps
- **Where are we headed?**

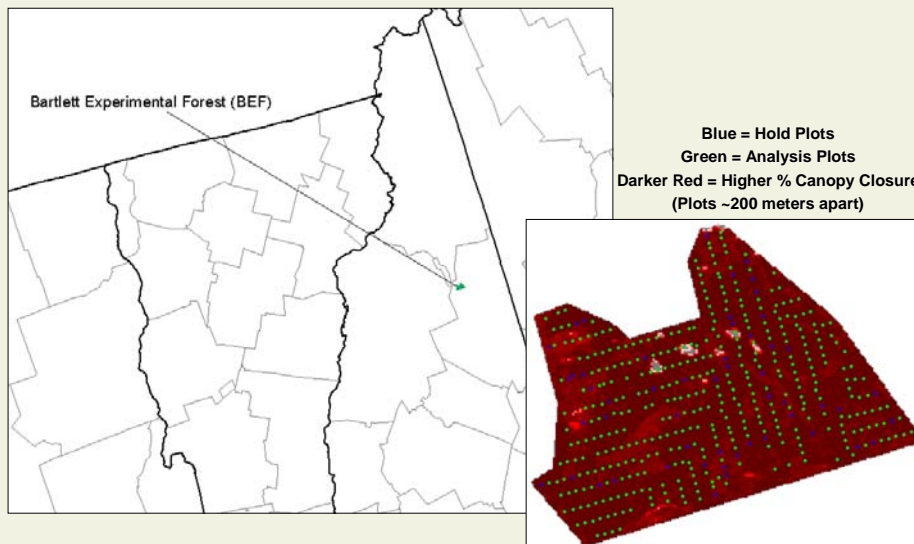
## Background

- **National Risk Map: Data Needs**
  - Looking for the best available national set of layers for stand measures...
  - Layers must maintain good agreement with "reality"
    - Cartographic (able to maintain natural variation)
    - Statistical tests
  - Coarse scale (short term) to fine scale (long term)
    - Two pronged approach
- **National Risk Map: New Direction**
  - Moving away from cover types...
  - To maps depicting stand measures for individual species
    - BA, QMD, SDI, etc.
      - Now testing and improving these 1km GRIDS
      - Key layers for the national risk map (nearly all models use them)
  - Looking for the best available national set of layers...open to ideas
  - We have nearly a 100 risk models and have identified an array of data needs at the national level

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## Surfacing Technique: Test Area

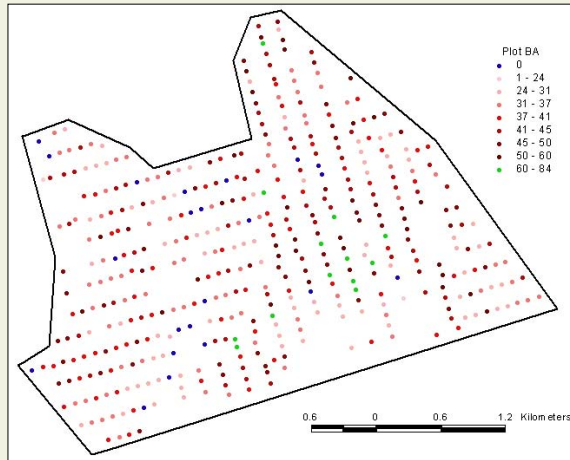
- **Test Area**
  - Bartlett Experimental Forest (BEF) Plots (Central NH)
  - Data on 437 plots were collected by BEF researchers in 2002



## Surfacing Technique: Test Area

### ➤ Test Area cont....

- Small test area with a dense plot network.
- Lacking other plot data and need to due further tests....wanted a quick assessment.
- BA (Meters/Hectare) measured nearly the same year as data collection for % canopy layer (NLCD).

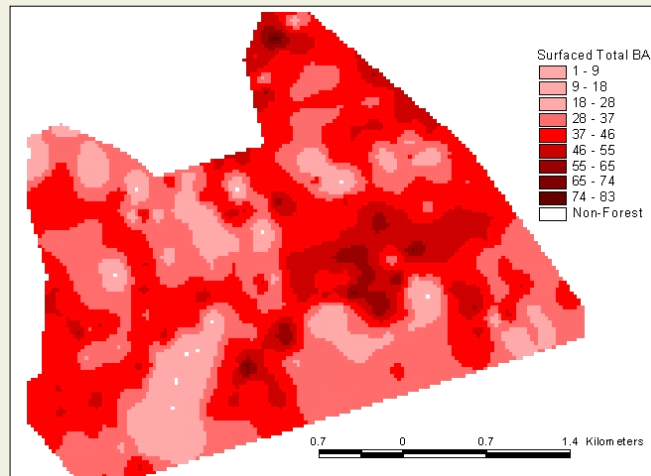


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## Surfacing Technique: Process

### ➤ Surface Points

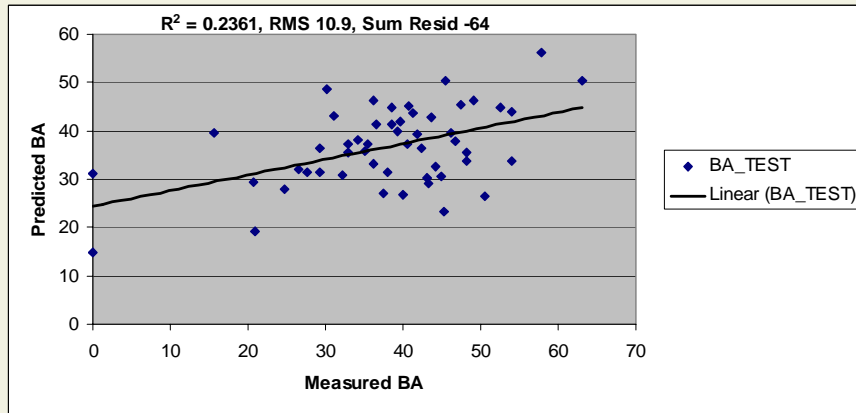
- Kriging
  - Did not try
- IDW, Spline, GIDS
- Discretised thin plate spline (TOPOGRID)



## Surfacing Technique: Process

### Surface Points

- ↳ Satisfied with fit but output looks like an interpolated surface...

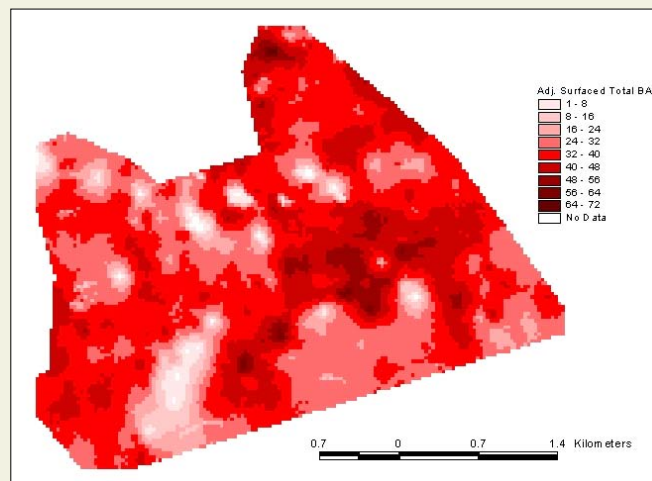


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## Surfacing Technique: Process

### Adjust BA by % Canopy Closure

- ↳ NLCD/VCF
  - Percent forest, deciduous, evergreen..

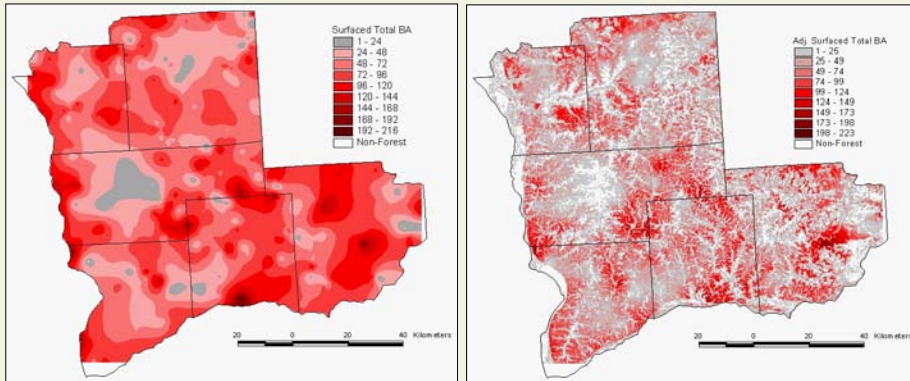


"Look" of the map has changed.

Example: 100 BA \* 80% Cover = 80 BA

## Surfacing Technique: Process

Effect of % Canopy Adjustment Can be Seen Easier on a Larger Area

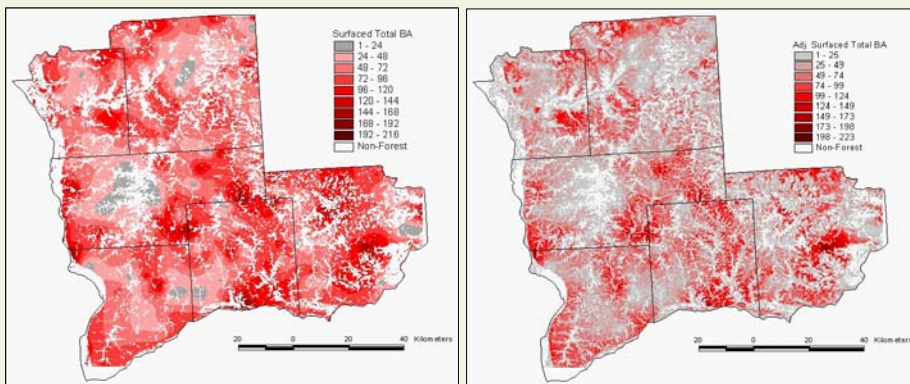


Southwestern Wisconsin Using "Fuzzed" FIA Plots

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## Surfacing Technique: Process

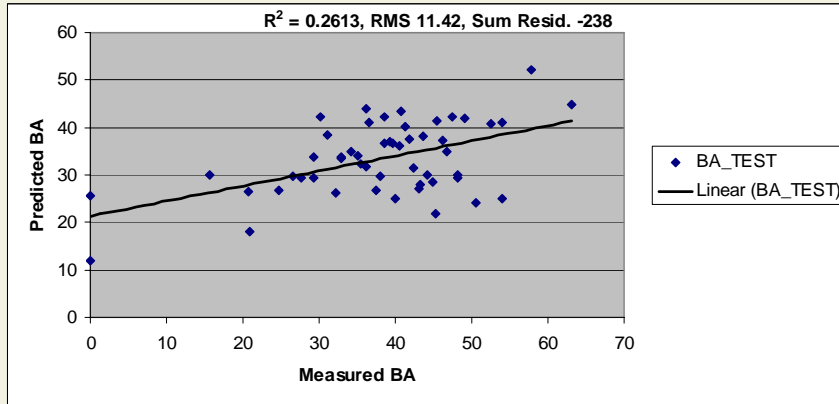
Effect of % Canopy Adjustment Can be Seen Easier on a Larger Area



Southwestern Wisconsin Using "Fuzzed" FIA Plots

## Surfacing Technique: Process

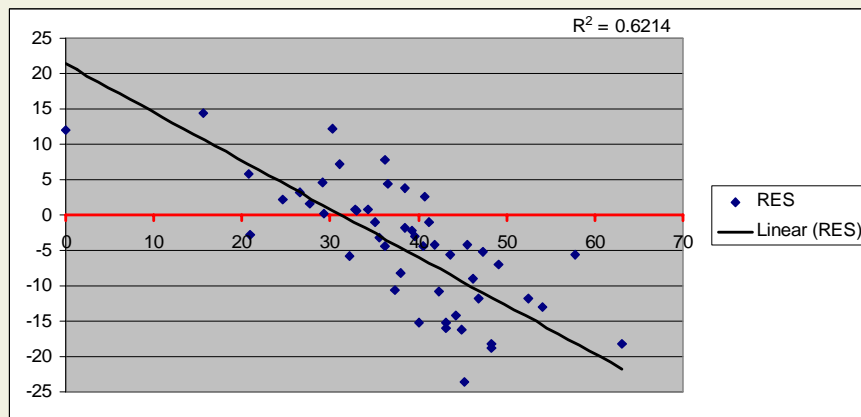
- Adjust BA by % Canopy Closure
  - Under represents BA (Sum Resid. -238)
  - Fit slightly better, RMS worse but the map is not such a smooth surface...



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## Surfacing Technique: Process

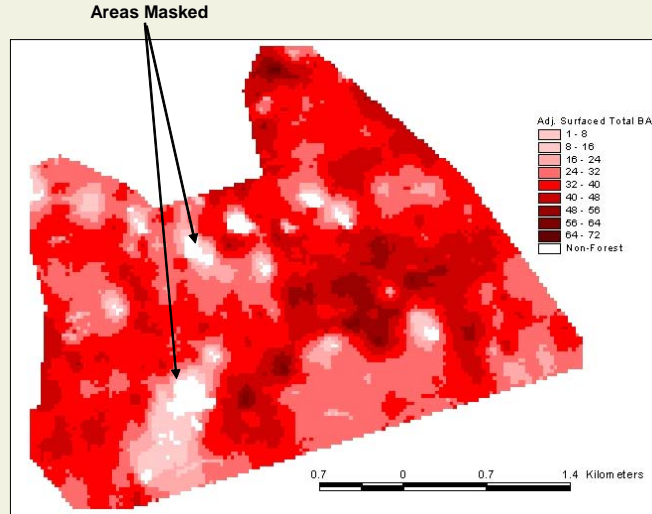
- Residuals
  - Adding these to the map does not improve it...Looking for other methods



Residuals vs. Measured BA

## Surfacing Technique: Process

### Mask out Non-Forest

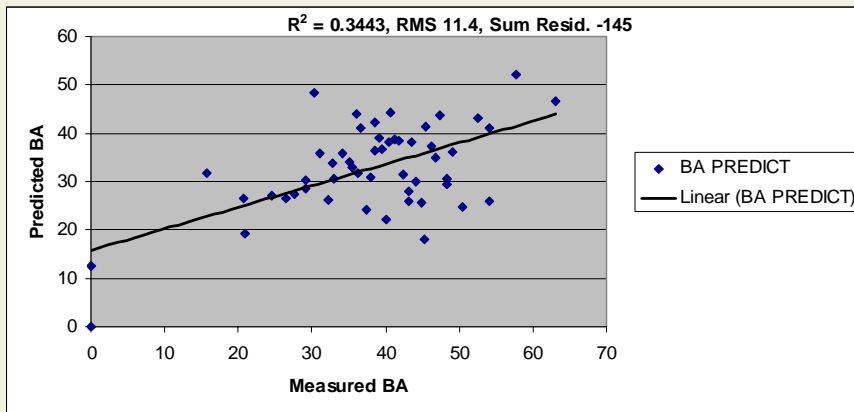


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## Surfacing Technique: Process

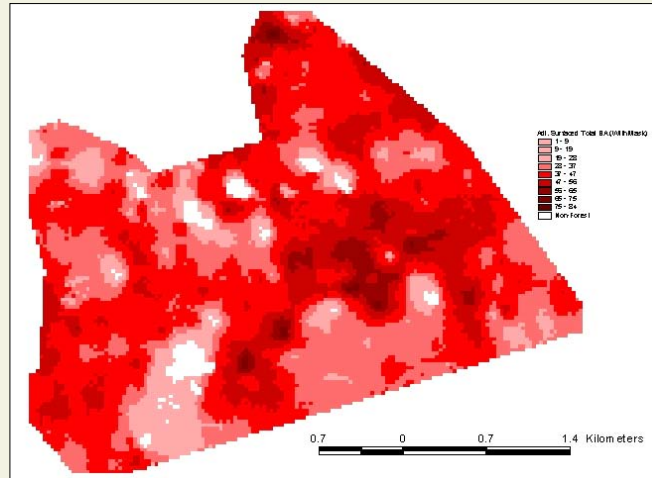
### Mask out Non-Forest

Fit improves



## Surfacing Technique: Process

### Adjust BA With A Constant

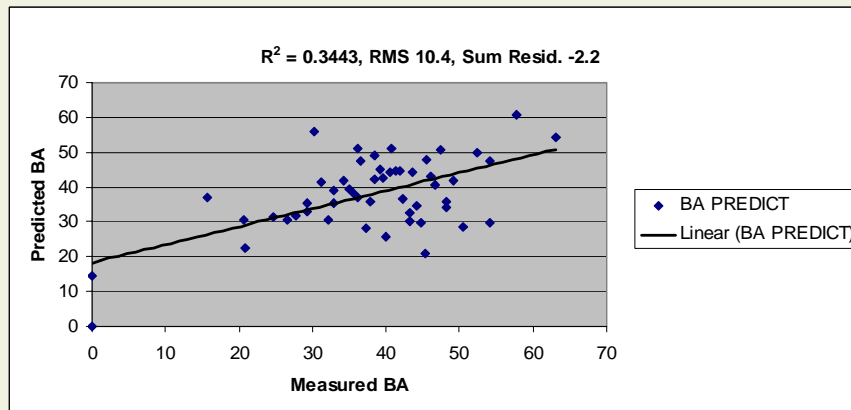


Example:  $100 \text{ BA} * 80\% \text{ Cover} * 1.16 = 92.8 \text{ BA}$

## Surfacing Technique: Process

### Adjust BA With A Constant

- Eliminates Negative Bias (Sum Resid. -2.2)
- RMS improves



## Surfacing Technique: Process

- Surfacing Process has been completely automated in Arc/Info
- FIA data prep. is the most work

```

Copy (2) of simple.aml - Notepad
File Edit Format Help

/*Generate BA Surface
topogrid ba_surf 30
datatype spot
enforce off
point c:\frank\US_GIS_Data\FIA_Surfaces\bartlett2\bart_plots_an %species%_type%
tolerances 1.0 0.5 0
end

/*Adj. BA Surface
grid
total_ba = ba_surf * pct_for * for_mask * 1.16

q
    
```

Arc

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ARC 8.3 (Wed Dec 18 08:17:08 PST 2002)

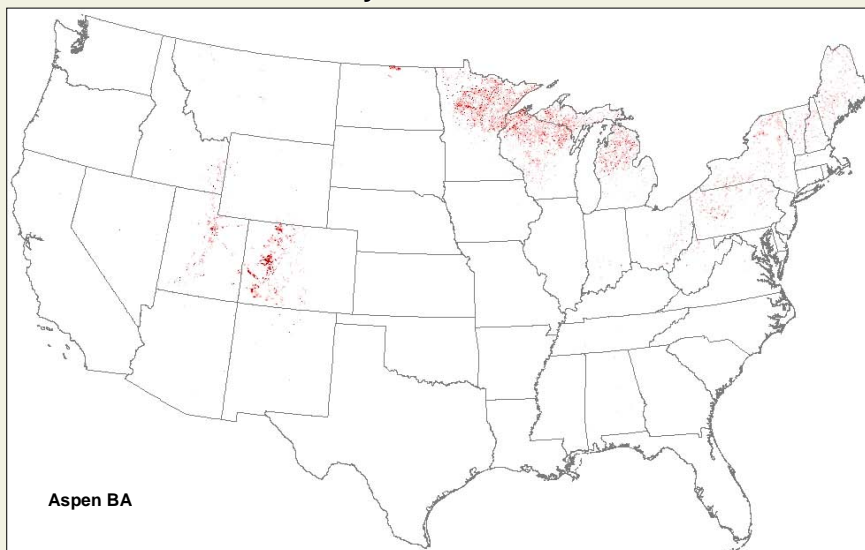
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Arc:

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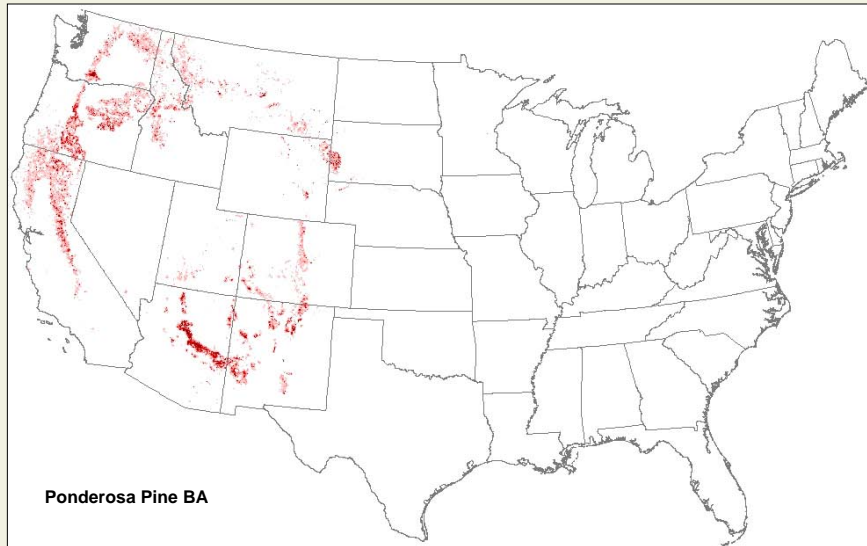
## Surfacing Technique: Sample Maps

- Using primarily “Fuzzed” FIA Plots Generated ~80 BA Maps for the National Risk Map
- Feedback Has Been Very Positive



Evaluation of Quantitative Techniques  
Denver, July 26 - 28, 2005

### Surfacing Technique: Sample Maps



Evaluation of Quantitative Techniques  
Denver, July 26 - 28, 2005

### Surfacing Technique: Sample Maps



## Where Are We Headed?

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- **Experimenting with TM Band5 and Other Layers**
  - Using a multi-criteria model to simulate BA potential
    - Rank values using a common scale (0-100)
    - Preliminary fit > .4
- **Looking at Other Ways to Incorporate Residuals**
- **Identify a Better Methodology for Assessing Agreement**
  - Data mismatch...
- **Improving QMD and Other Layers**
- **Generating Regional Scale Layers (~250 Meter Res.)**