Visualizing Spruce in a GIS

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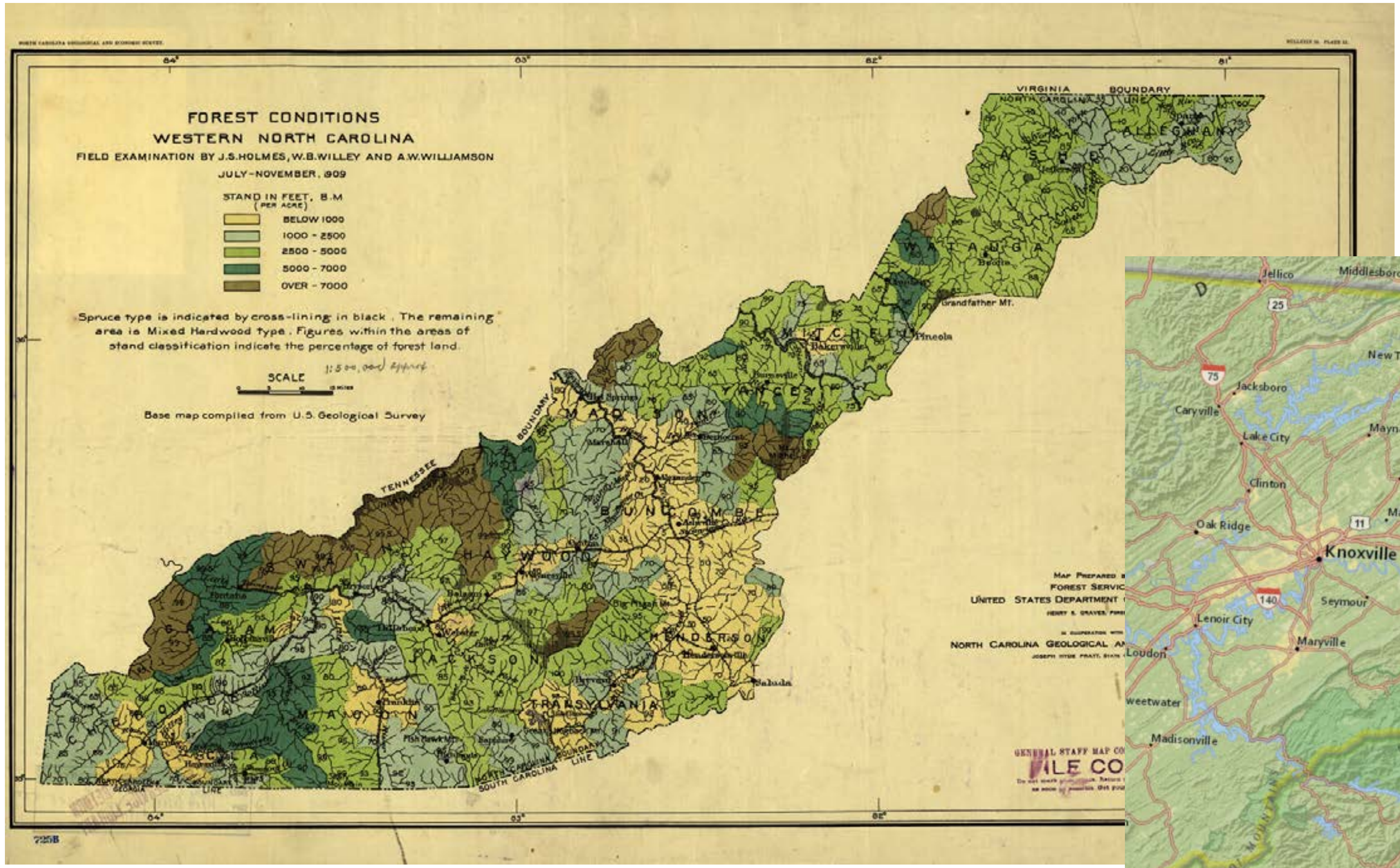
Existing Spruce Datasets

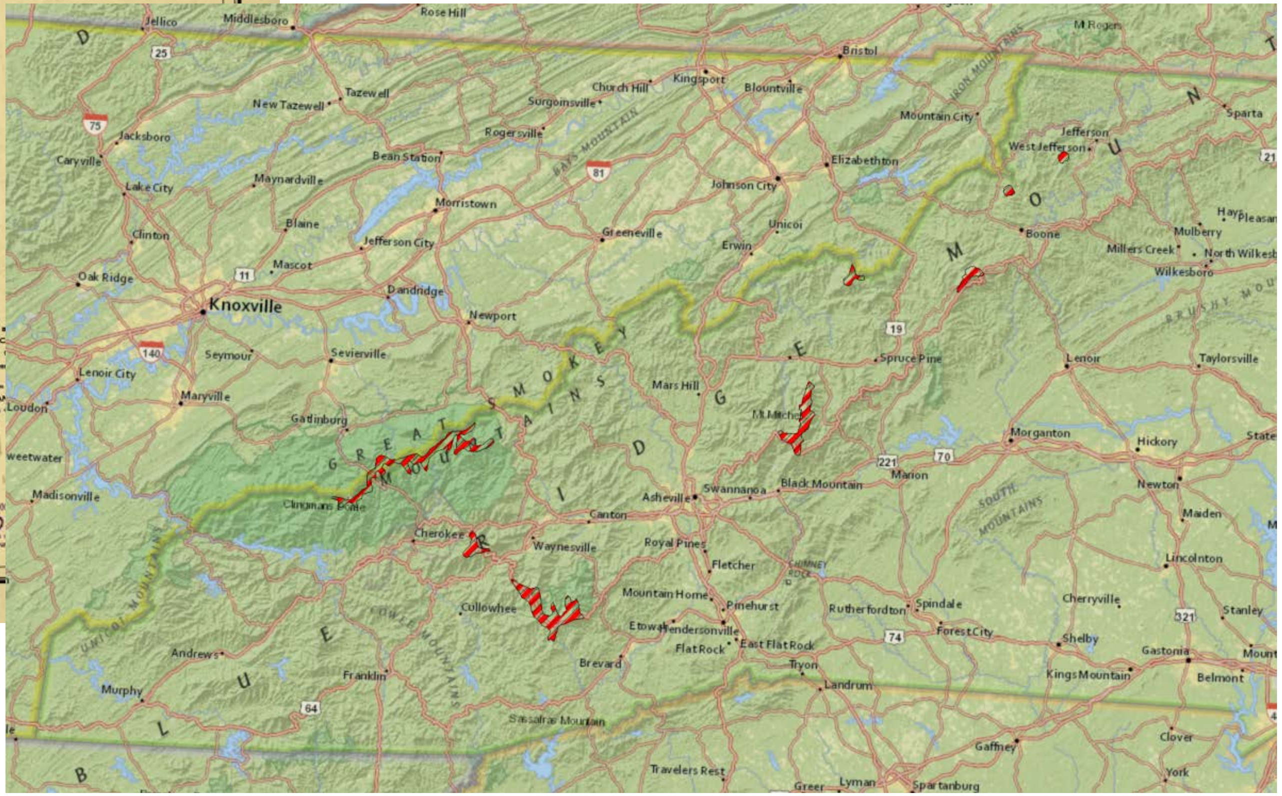
- Pre-Digital Data
  - Holmes et al. 1909
  - Pyle and Schafale 1985
  - Dull et al. 1988
- Digital Datasets
  - SAMAB Southern Appalachian Assessment 1996
  - USFS Ecological Zones
  - GAP Landcover datasets
    - SEGAP – 2001 and 2011
    - NCGAP
  - SASRI Spruce Units 2016
  - SASRI Spruce Restoration Prioritization

Holmes et al. 1909

- Map showing forest conditions in Western North Carolina circa 1909
  - Map accompanied a forest service report
    - Logging including forest response to it
    - Fire
    - Railroads
- Extent exclusive to Western North Carolina
- Spruce-Fir
  - Single class

Holmes et al. 1909 – Forest Conditions, WNC





Pyle and Schafale 1985

- Map showing forest disturbance history in a portion of the Black Mountains and Mount Rogers
  - A report to Southern Appalachian spruce-fir ecosystem assessment program
- Calculated the percent of historic disturbance each spruce restoration unit contained

Pyle and Schafale 1985

FIGURE 1

DISTURBANCE HISTORY OF THE SPRUCE-FIR ZONE OF MT. ROGERS NATIONAL RECREATION AREA

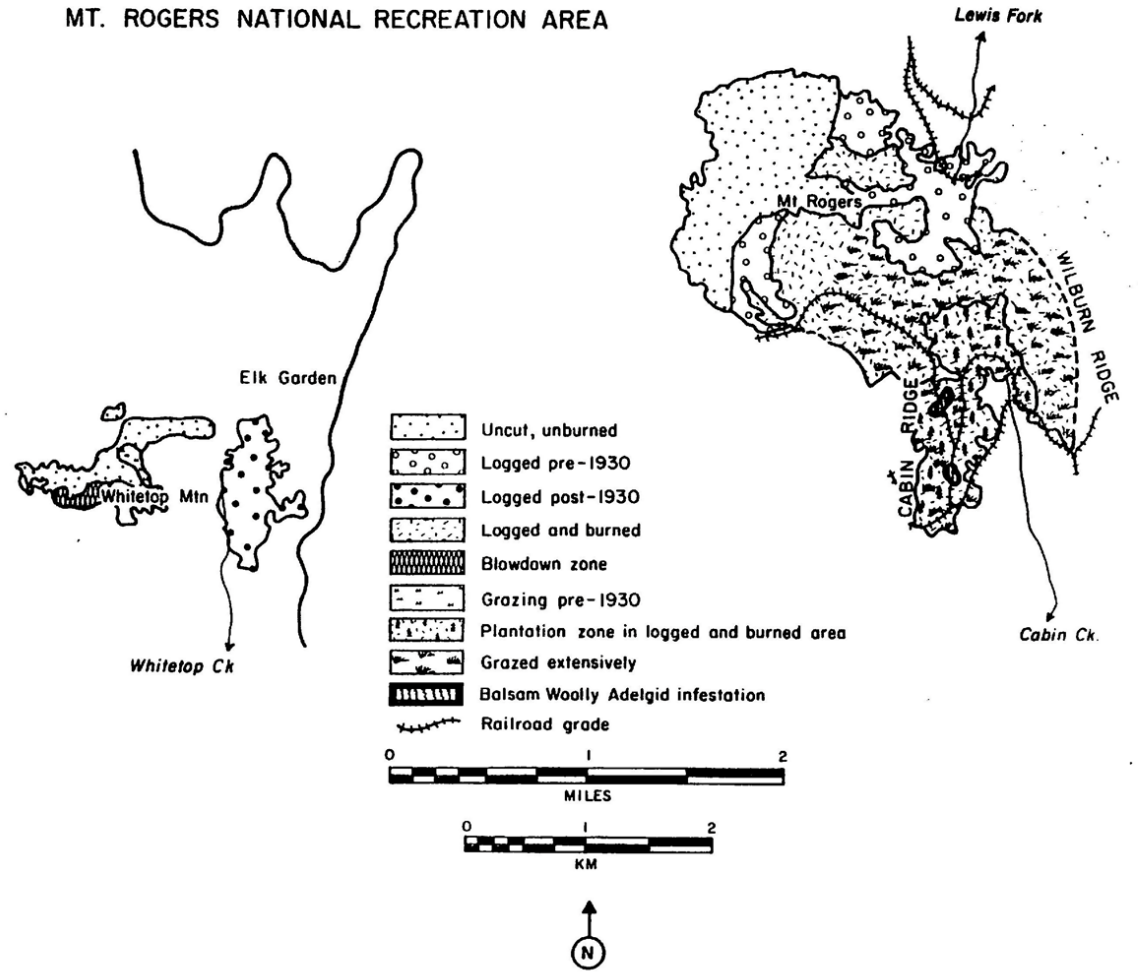


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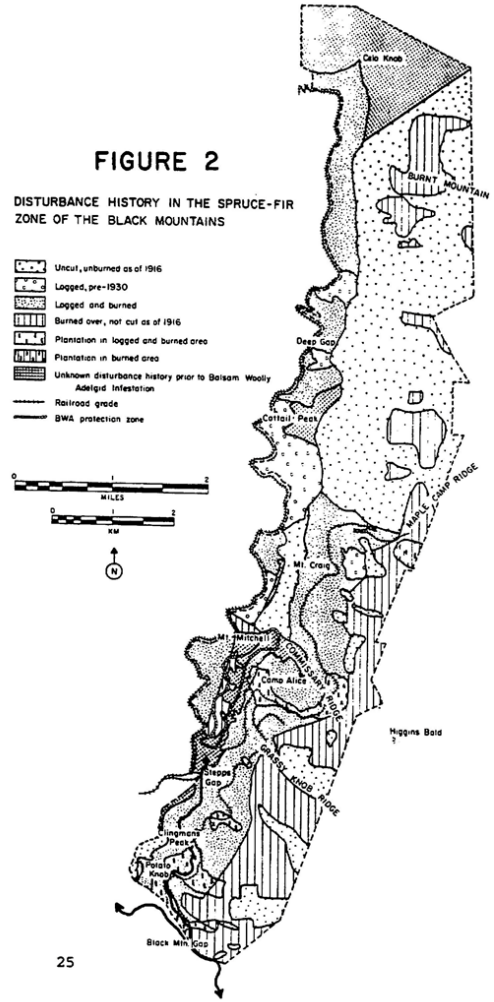
FIGURE 2

DISTURBANCE HISTORY IN THE SPRUCE-FIR ZONE OF THE BLACK MOUNTAINS



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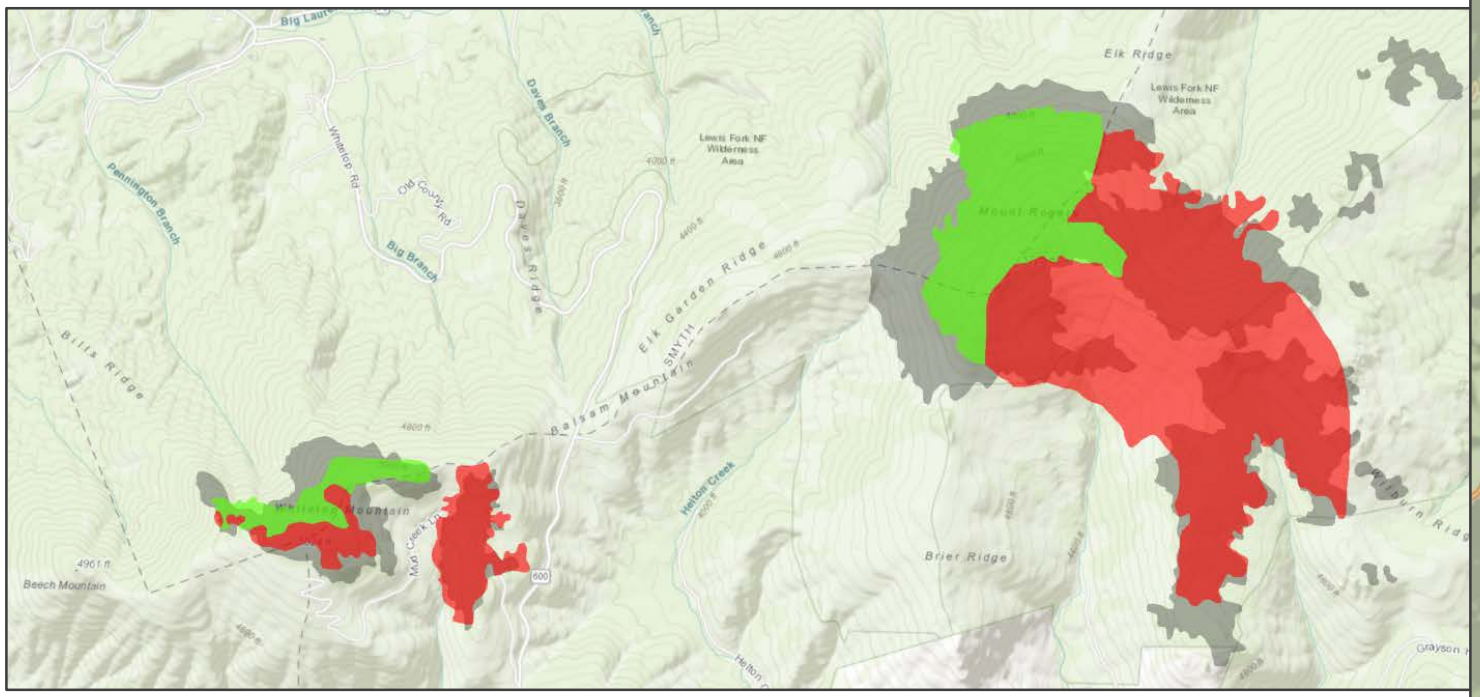
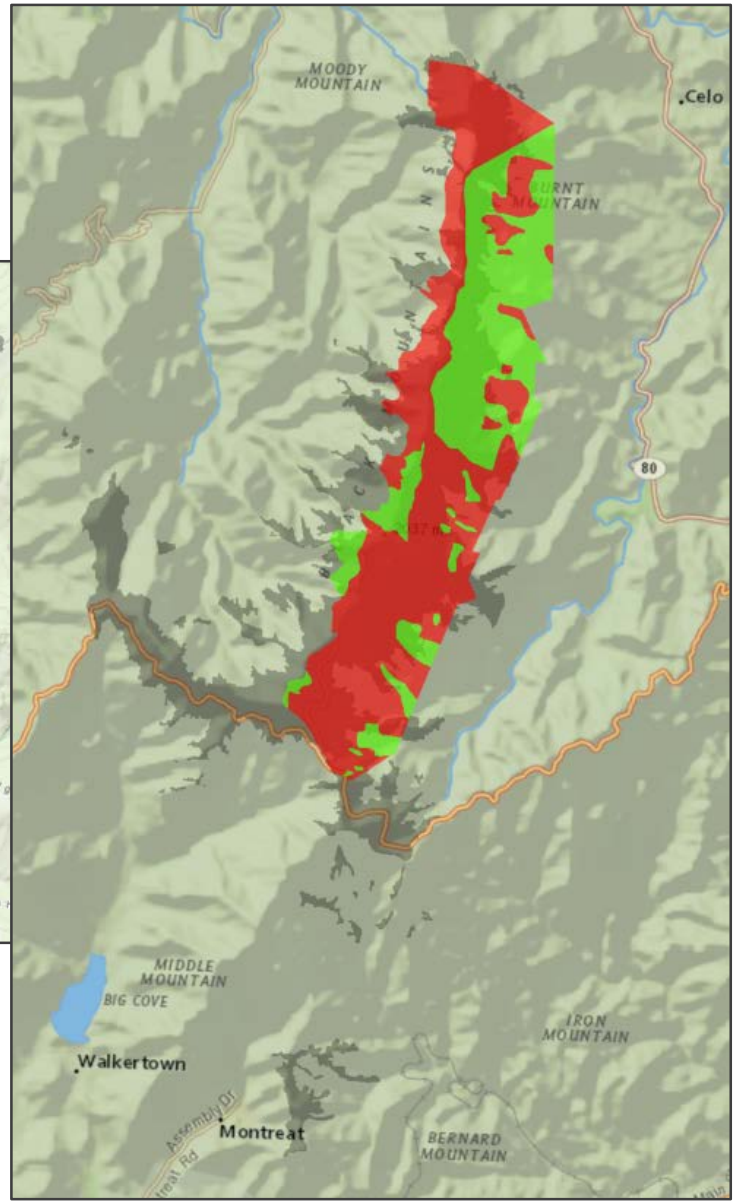
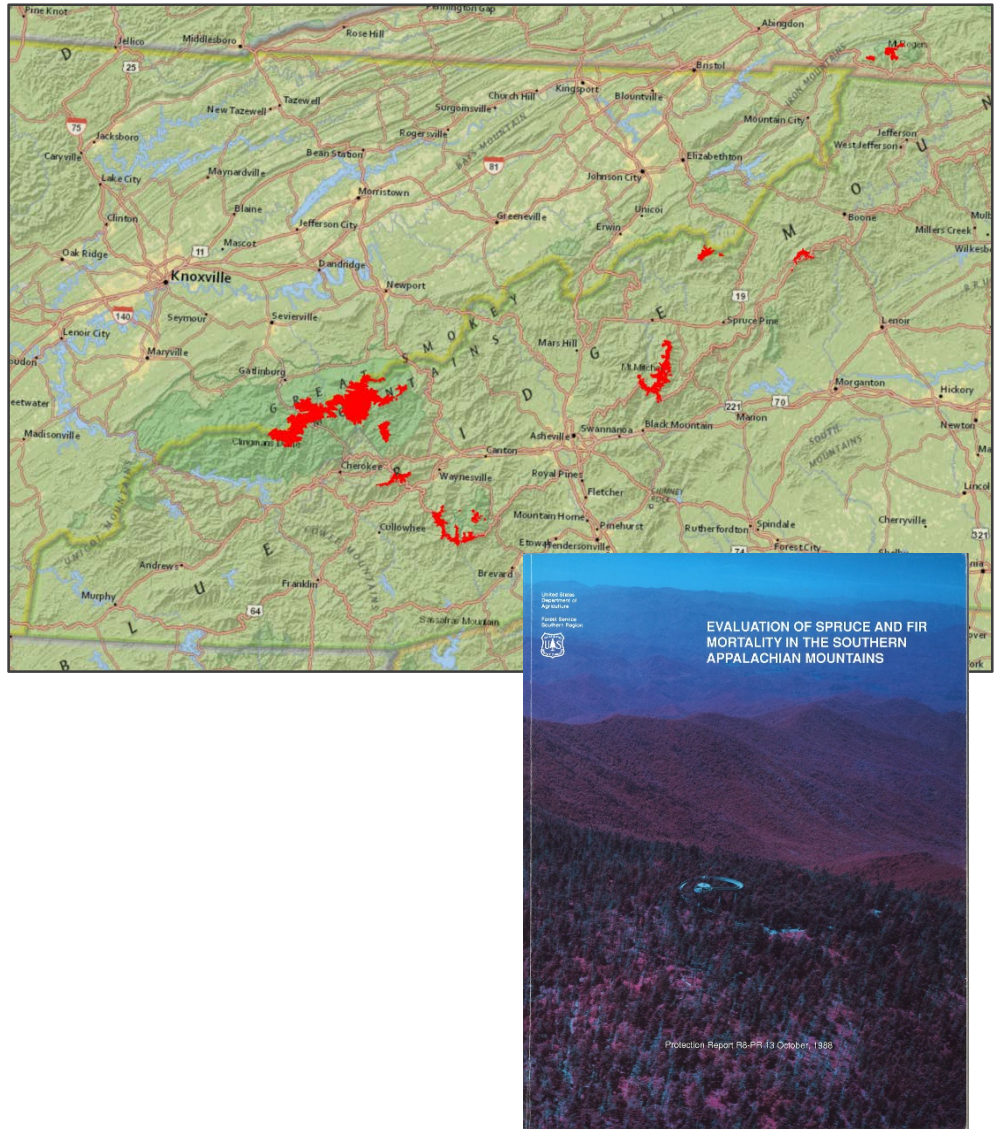
Pyle and Schafale 1985





Dull et al. 1988

- Forest Service report - Evaluation of spruce and fir mortality in the Southern Appalachians
  - Black Mtns
  - Great Smoky Mountains NP
  - Roan Mountain
  - Balsam Mtns
  - Grandfather Mountain
  - Mount Rogers and White Top Mountain



Dull et al. 1988

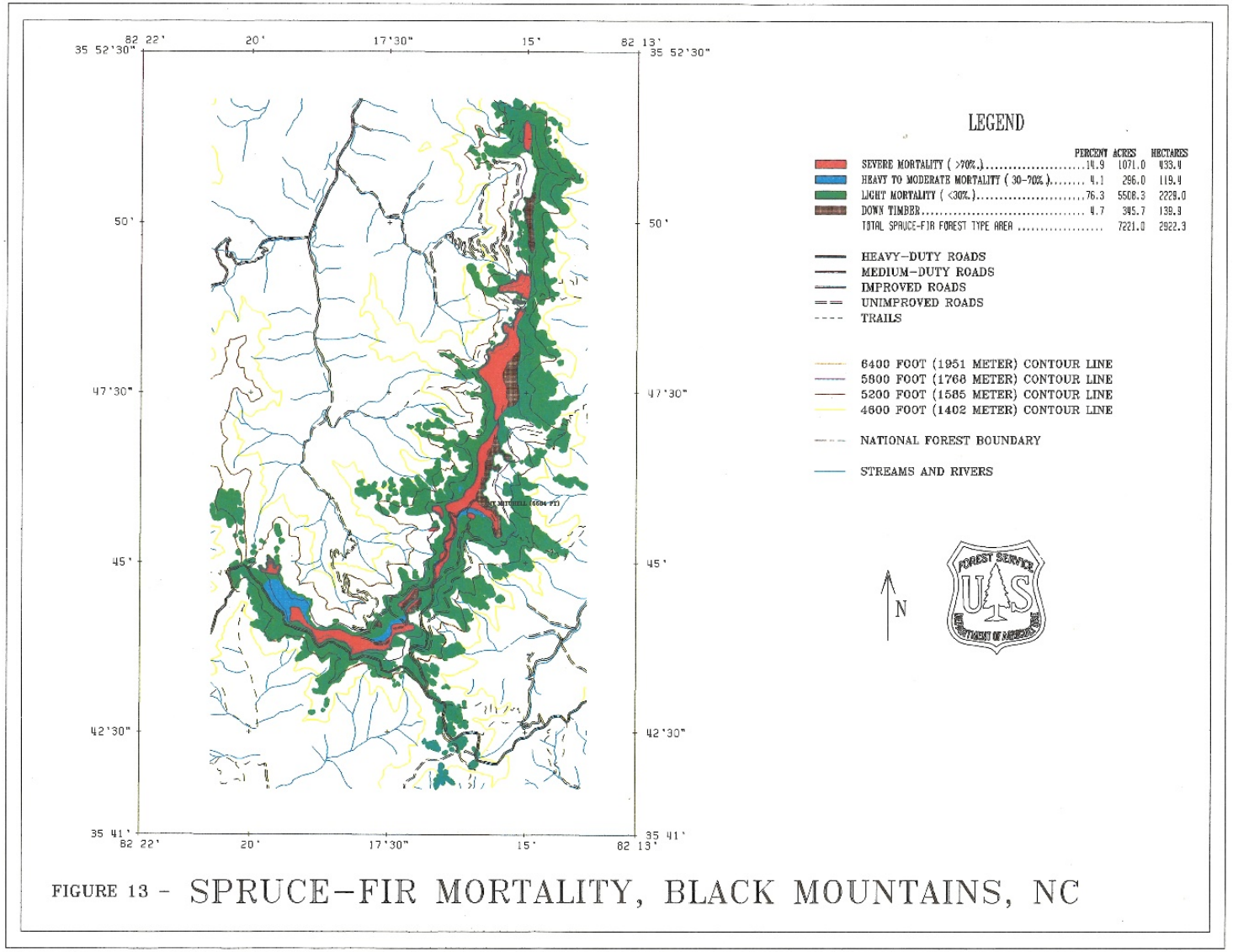
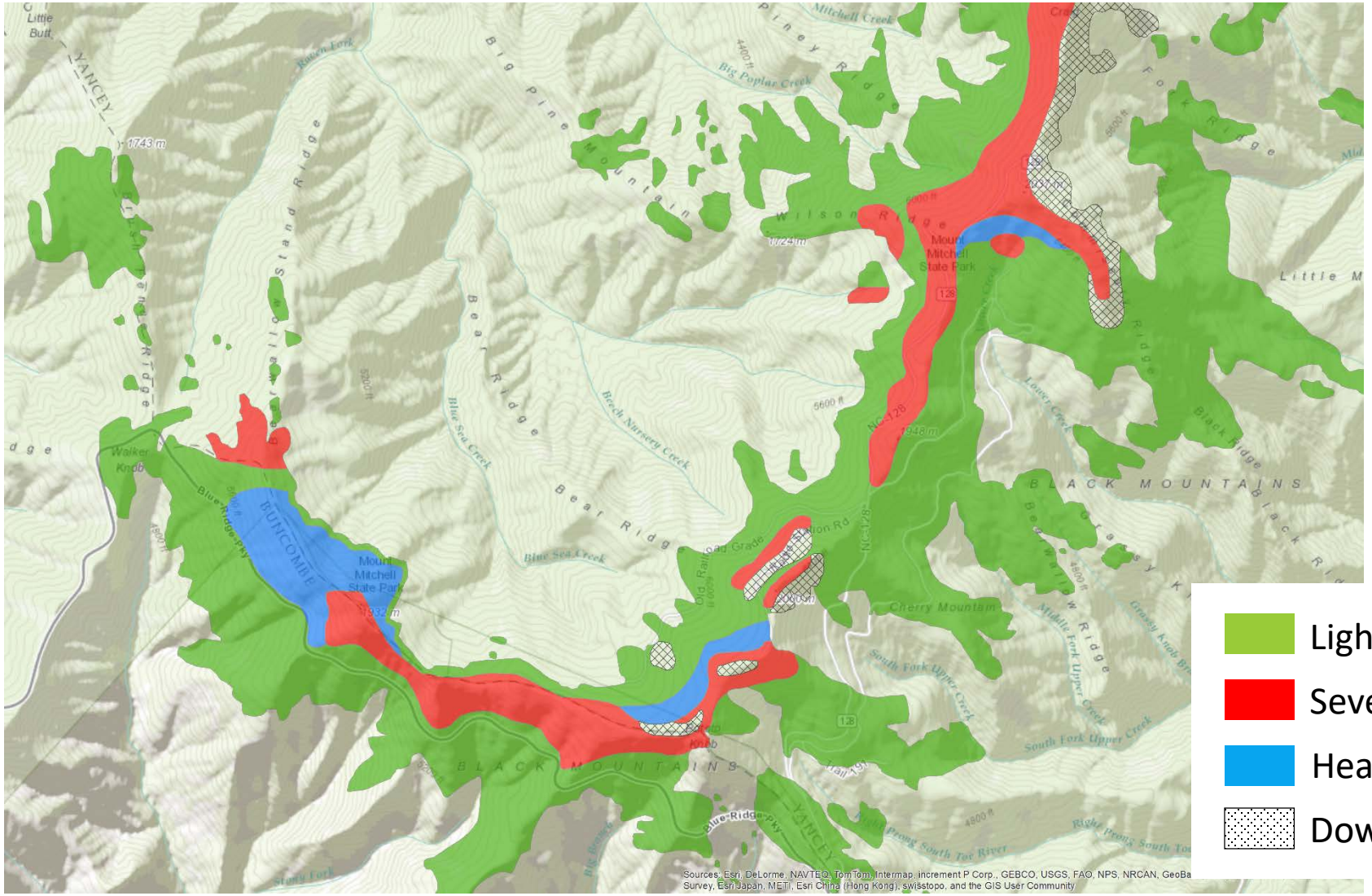


FIGURE 13 - SPRUCE-FIR MORTALITY, BLACK MOUNTAINS, NC

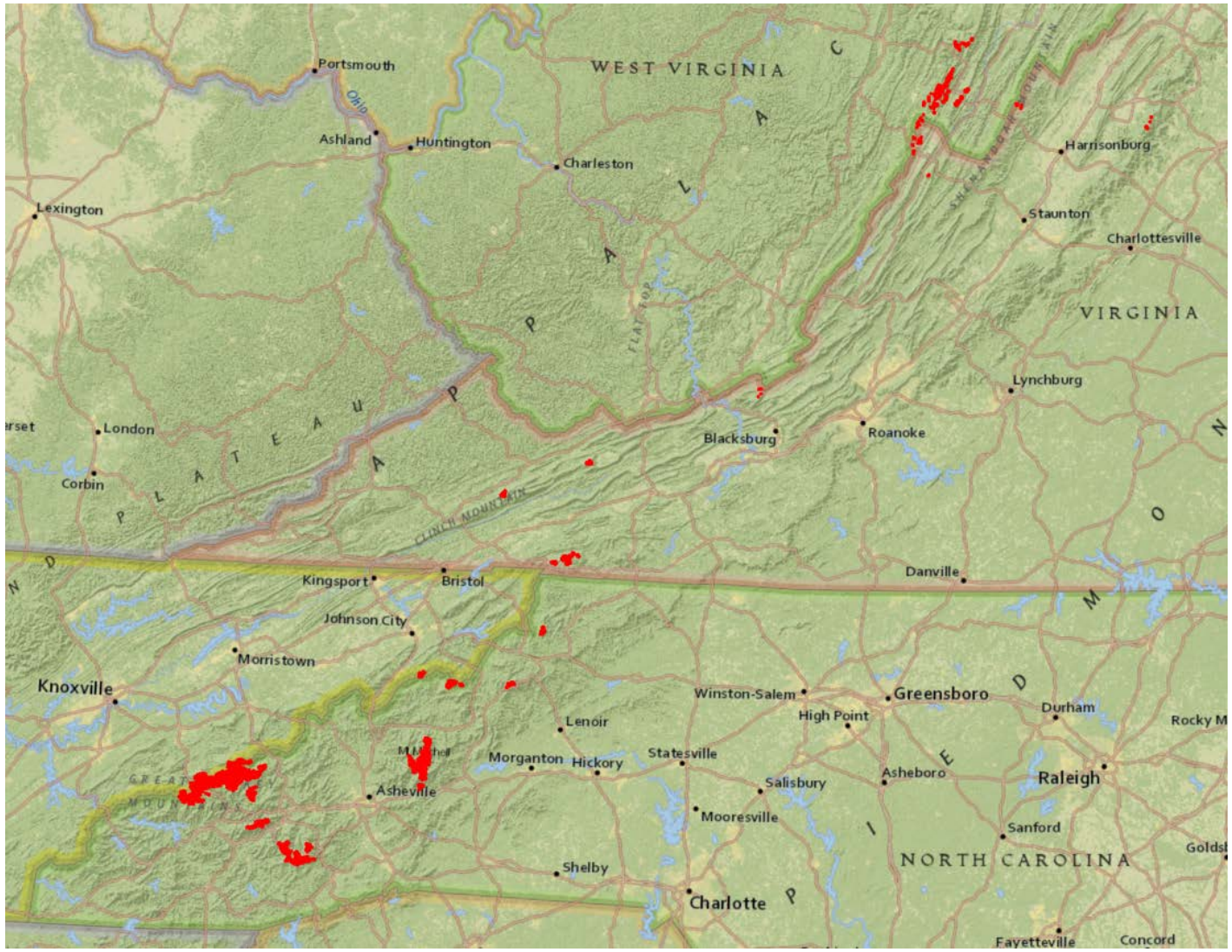
Dull et al. 1988



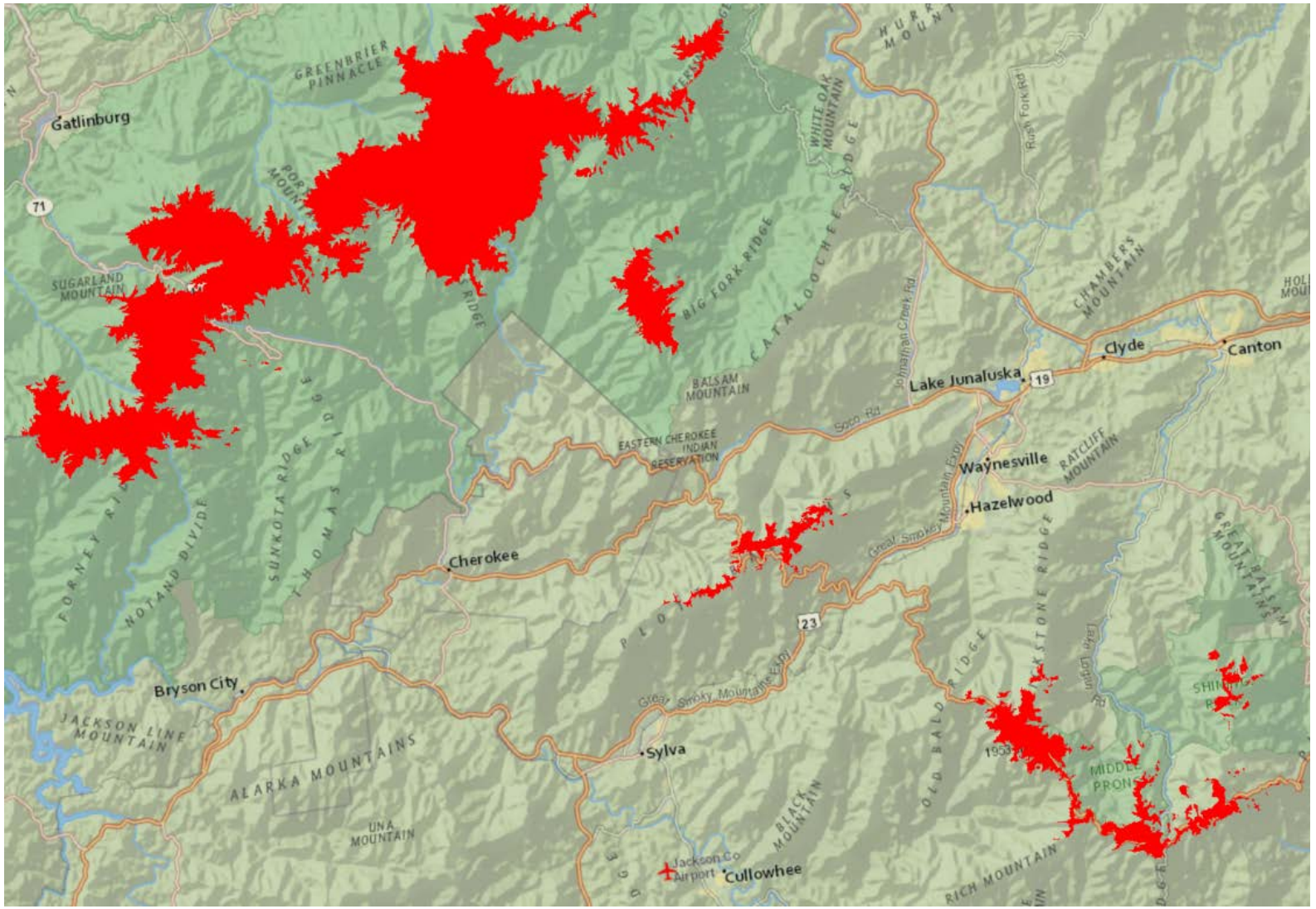
SAMAB Southern Appalachian Assessment 1996

- Southern Appalachian Extent
  - Maybe just areas in and around National Forests
- Coverage derived from delineations of photointerpretation of 1:24,000 color infrared photography. (Photography - 1985)
  - USDA Forest Service data and TVA data were appended to combine a complete coverage for the Great Smoky Mountains National Park, Cherokee National Forest, Jefferson National Forest, and Shenandoah National Park
- Single Spruce-Fir class

So. App. Assessment 1996



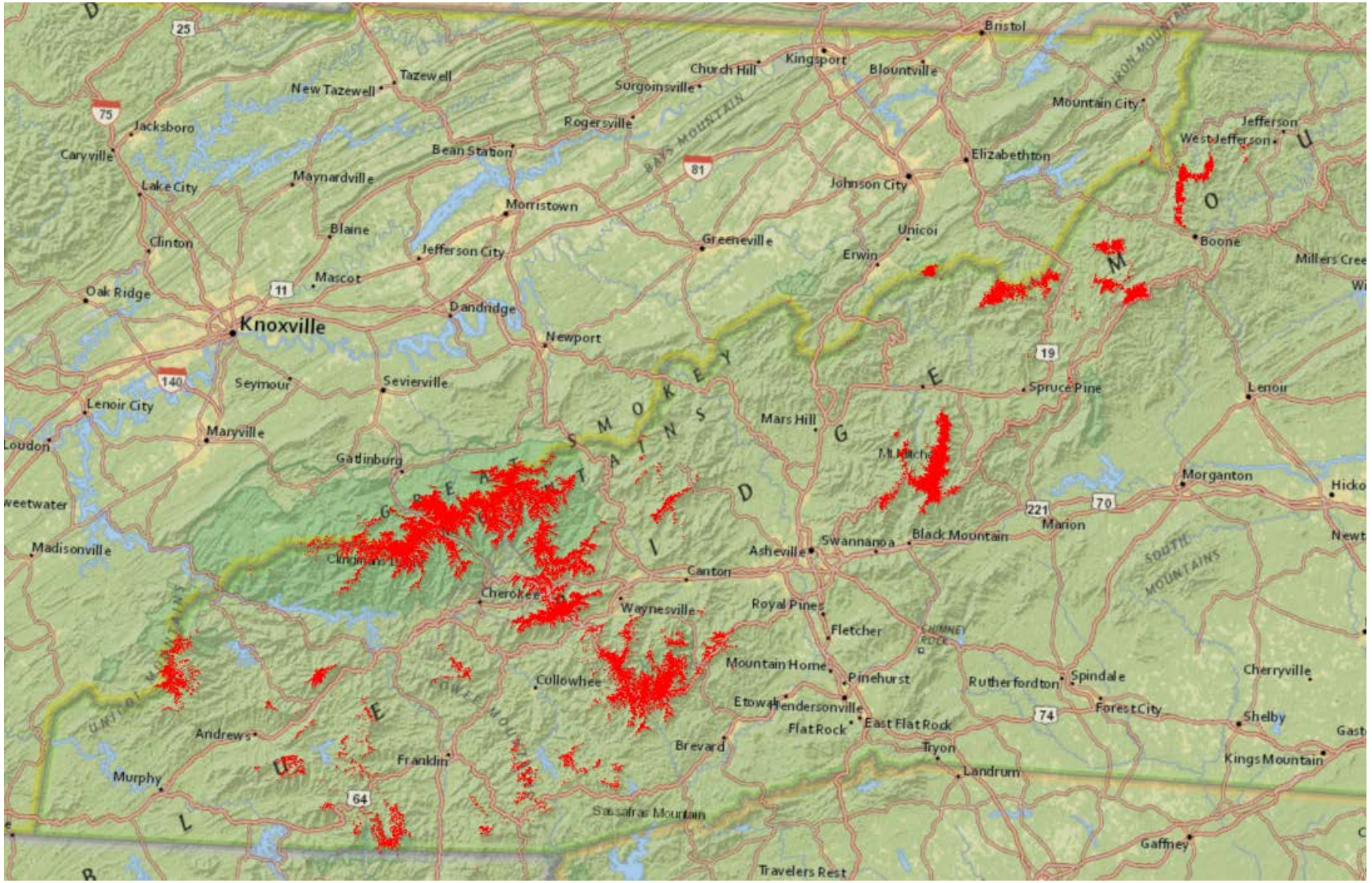
So. App. Assessment 1996



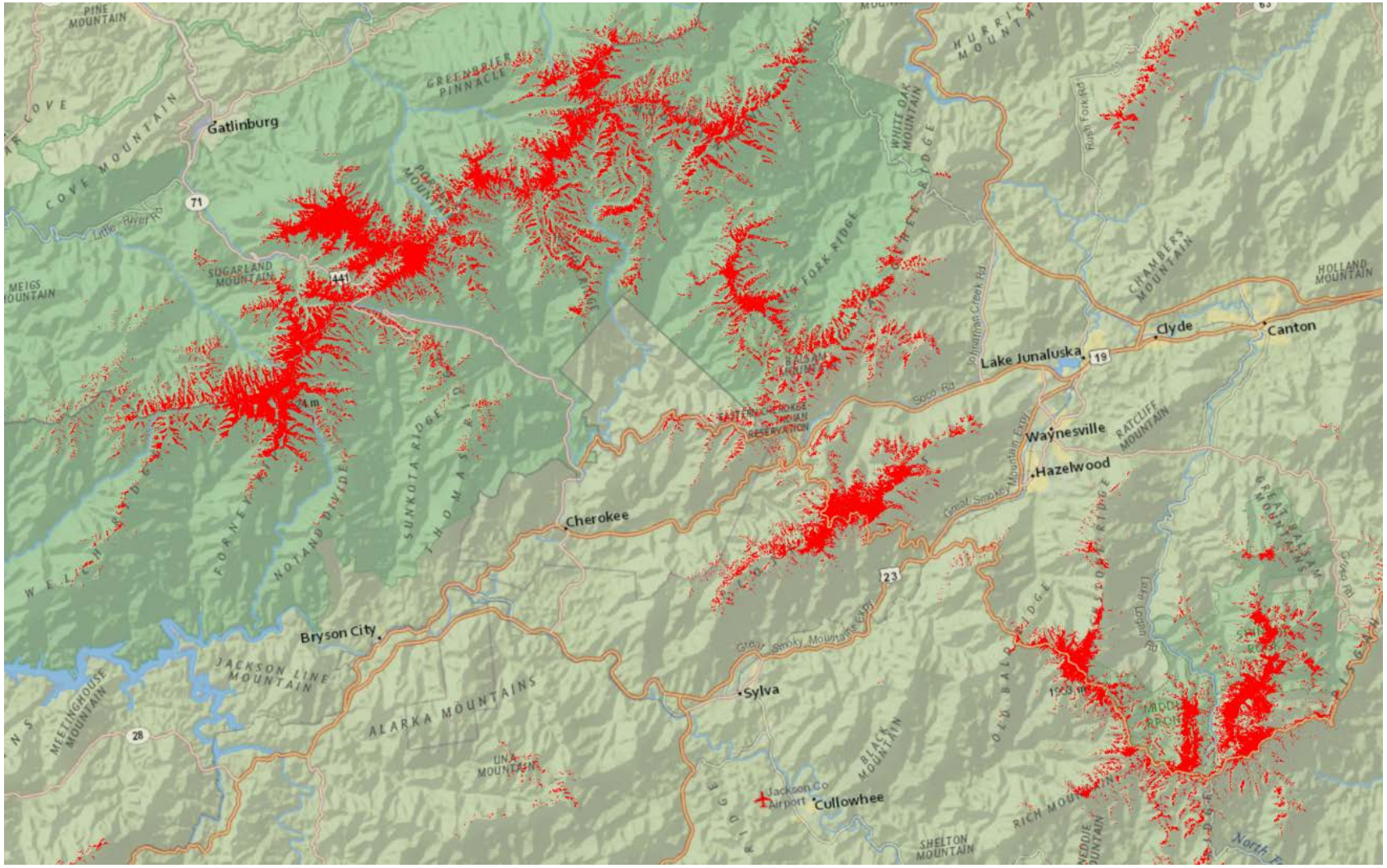
USFS Ecological Zones

- Southern Appalachian Extent
- Predicted distribution of 11 principal forested ecological zones in the Southern Appalachian Mountains. The extent of ecosystems was predicted by mathematical models based on environmental variables (climate, geologic, topographic, and others)
- 3 approximations, most recent 2011

Ecological Zones



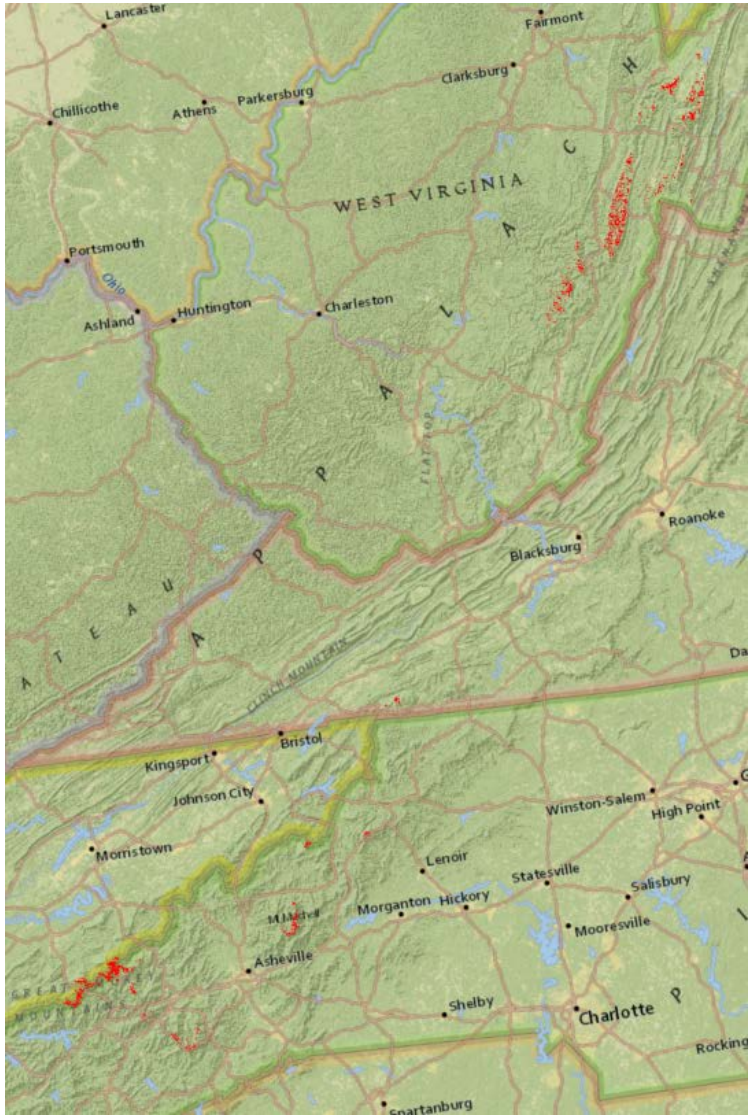
Ecological Zones

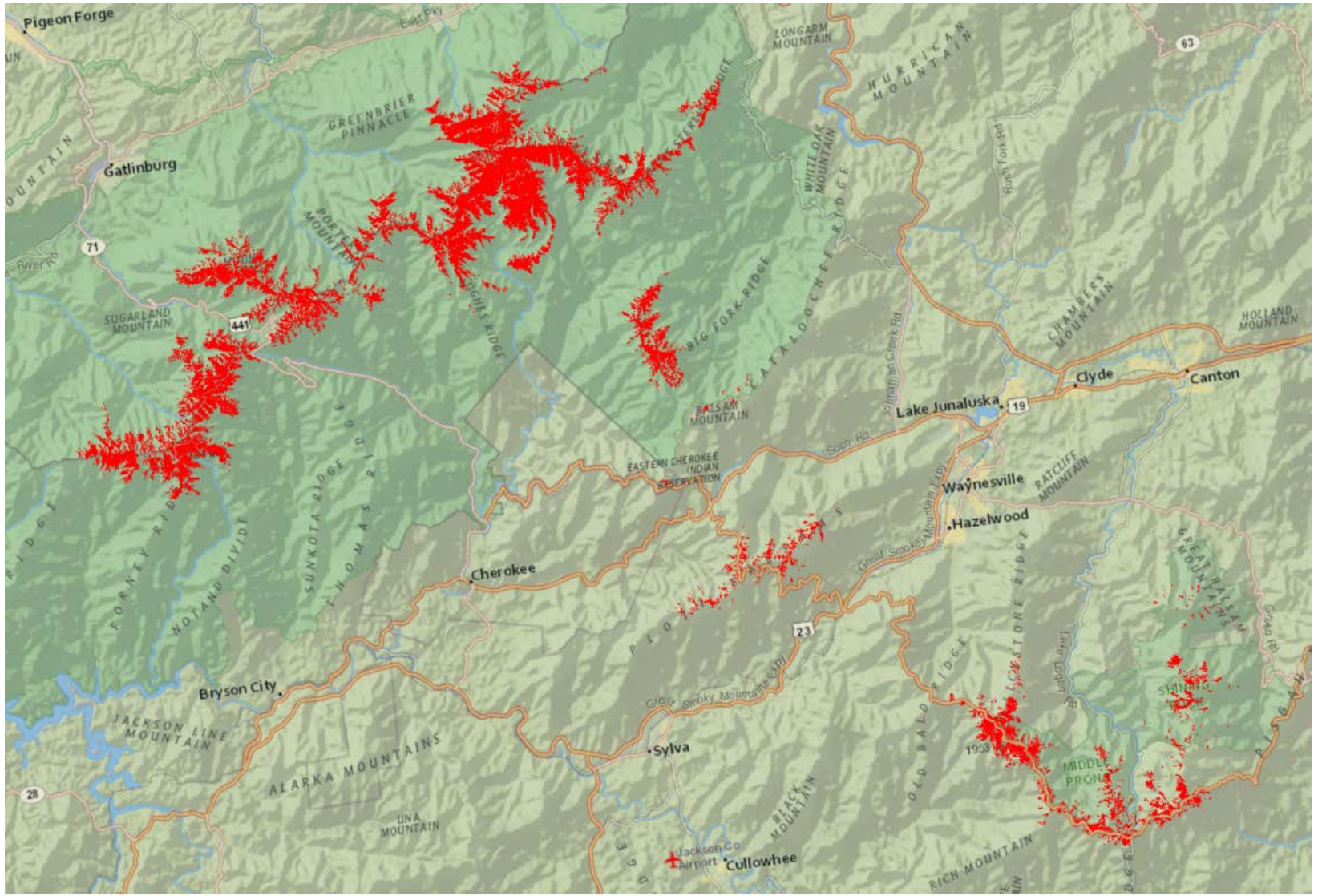


GAP Landcover datasets

- North Carolina GAP
  - Landsat thematic mapper (TM) imagery acquired in 1991 and 1992
  - North Carolina Extent
- Southeast GAP Landcover
  - Landsat thematic mapper (TM) imagery acquired in 1999 and 2001
  - North Carolina and Virginia Extent
- USGS National GAP Landcover – 2011
  - Seamless dataset for lower 48 states
  - North Carolina, Virginia, West Virginia

National GAP 2011



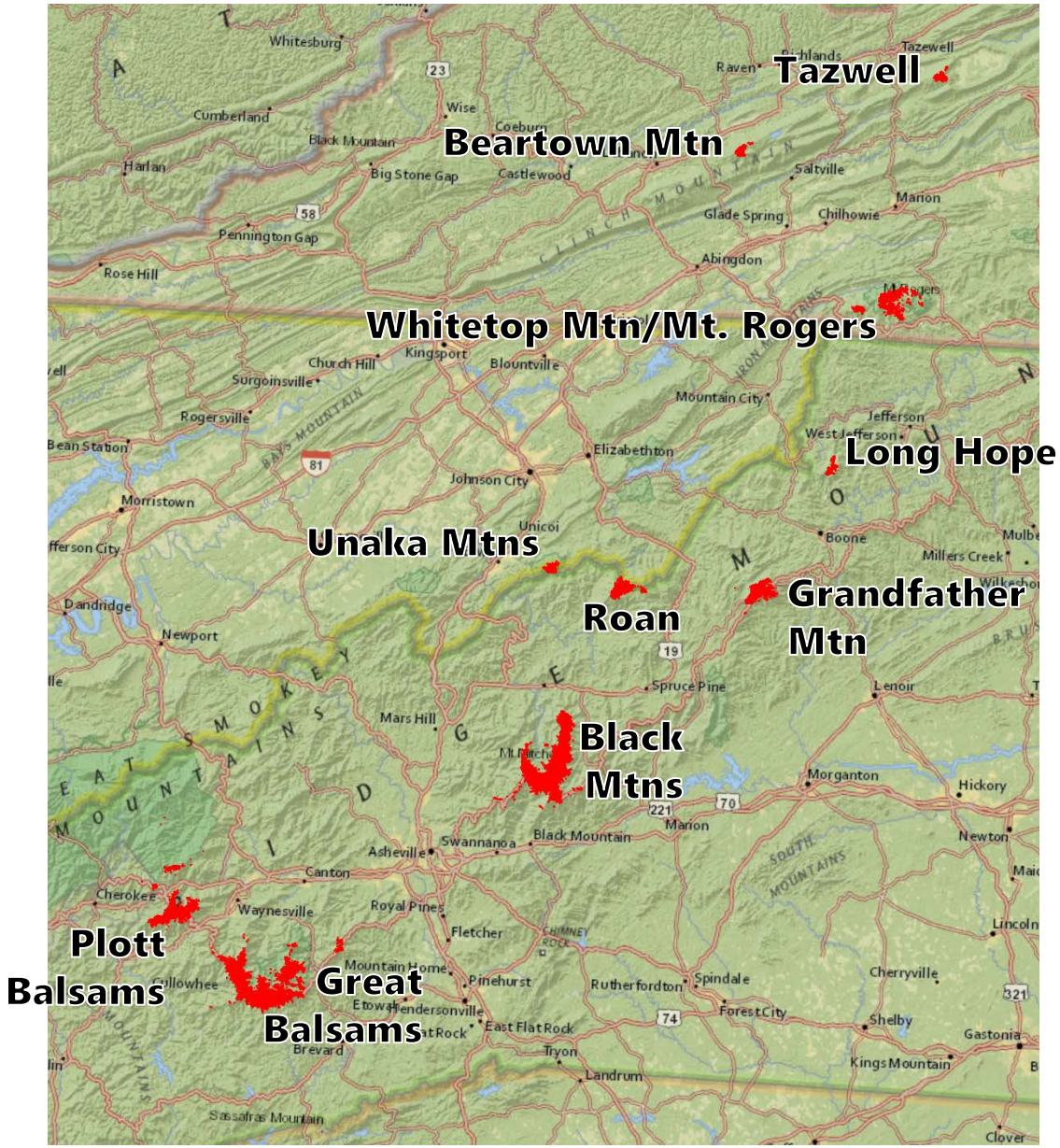


SASRI Spruce Units

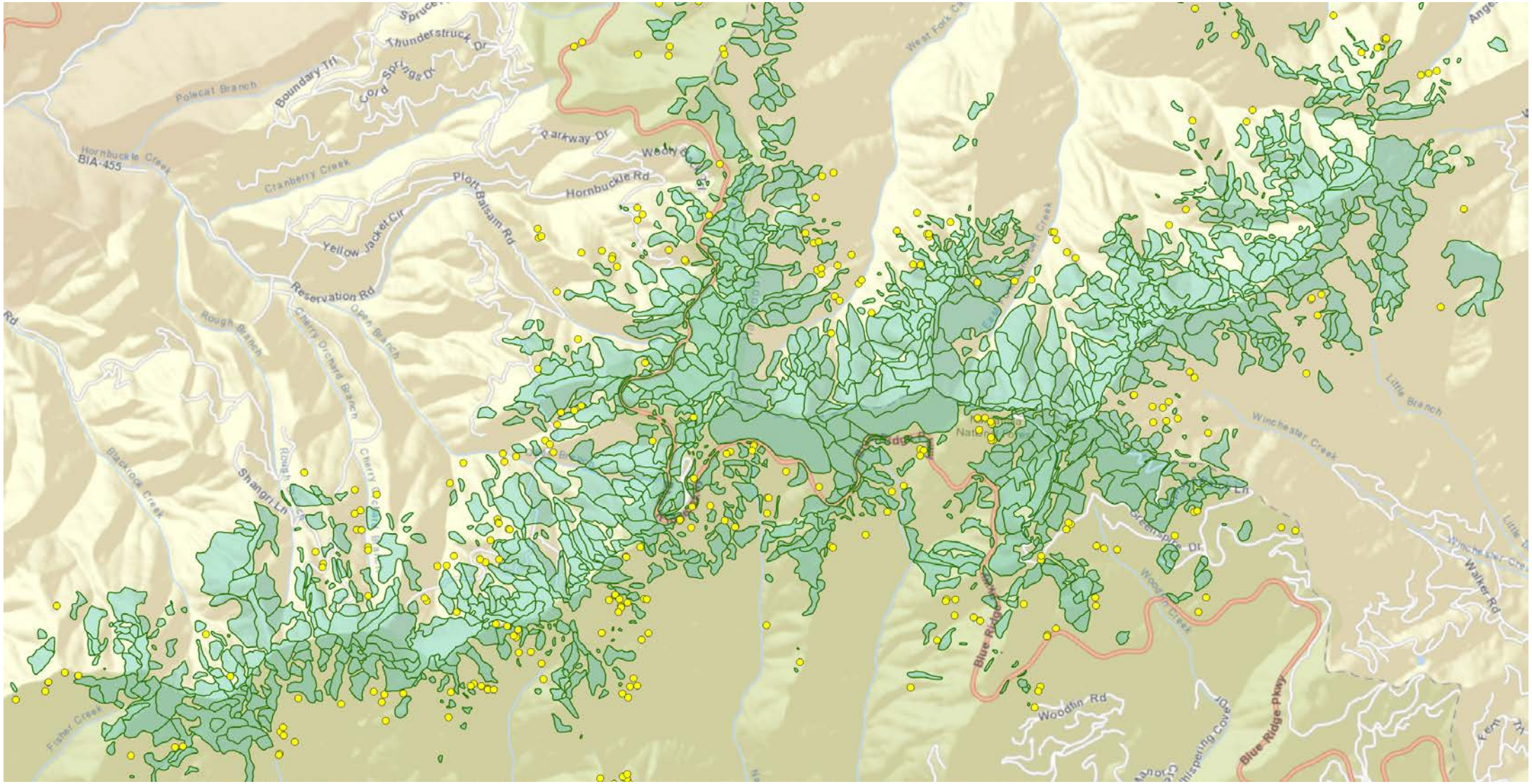
- Polygon data drawn around current spruce “patches” based on overstory and understory density of spruce
  - Digitized from aerial imagery
- Entire So. Appalachian coverage except GSMNP
- Attribute Data:
  - Spruce overstory class and structure
  - Overstory condition and composition
  - Hemlock overstory
  - Spruce Understory
  - Non-spruce Understory

SASRI Spruce Units

- 11,174 polygons
  - Size ranged from 0.003 Ha to 95.6 Ha in size
  - Mean size was 1.2 Ha
- Additionally **7,080** point locations of individual trees were identified
  - Locales where trees were too sparse to represent a polygon.



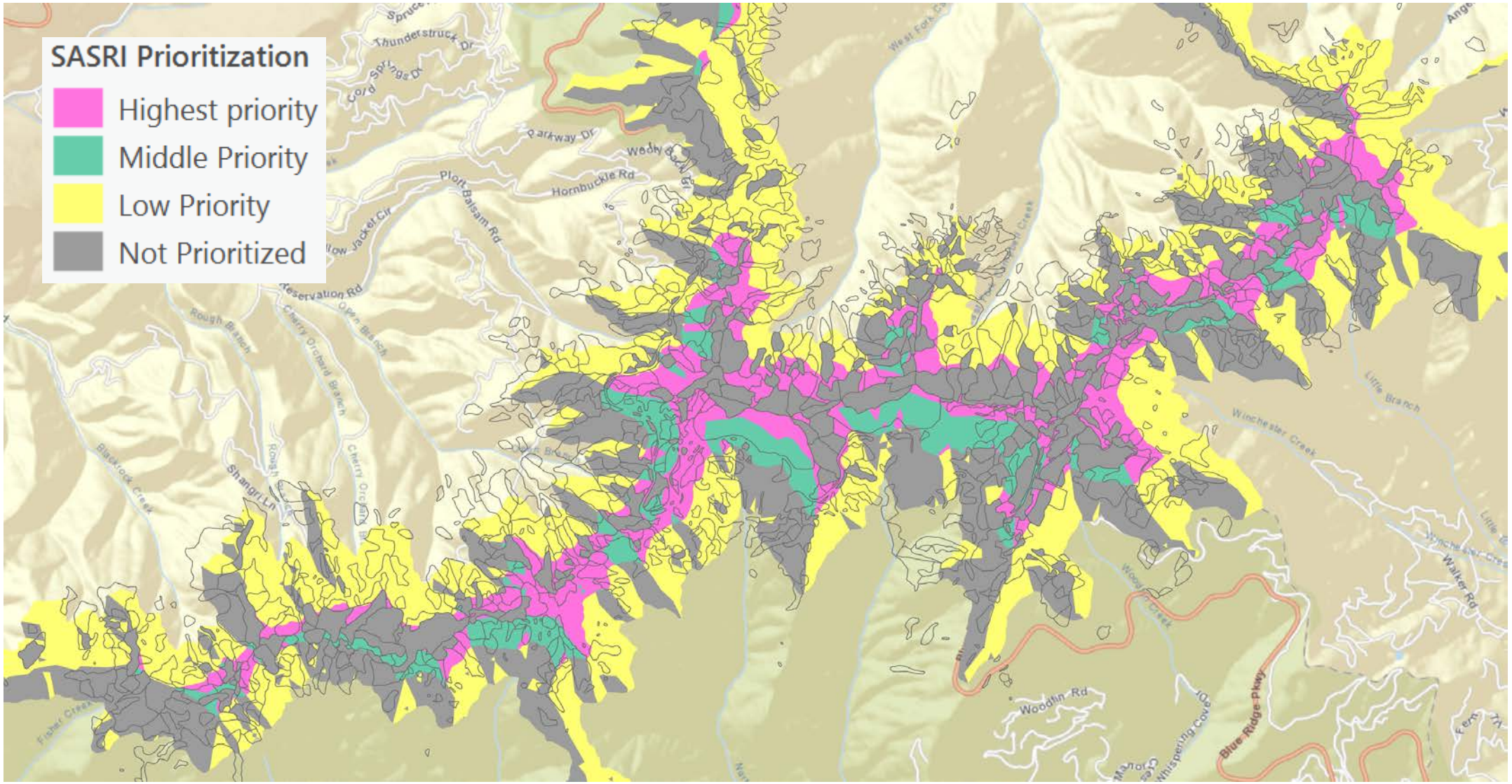
SASRI Spruce Units



SASRI Spruce Restoration Prioritization

- Prioritized areas based upon **Elevation, Aspect, Spruce Density, and Disturbance History**
- Southern Appalachian extent
- Prioritization considerations
  - Higher elevations given higher priority
  - Mesic aspects given higher priority
  - Areas known to have been logged given higher priority
  - Areas with less than 25% spruce density

SASRI Spruce Units



Spruce Unit Accuracy Assessment

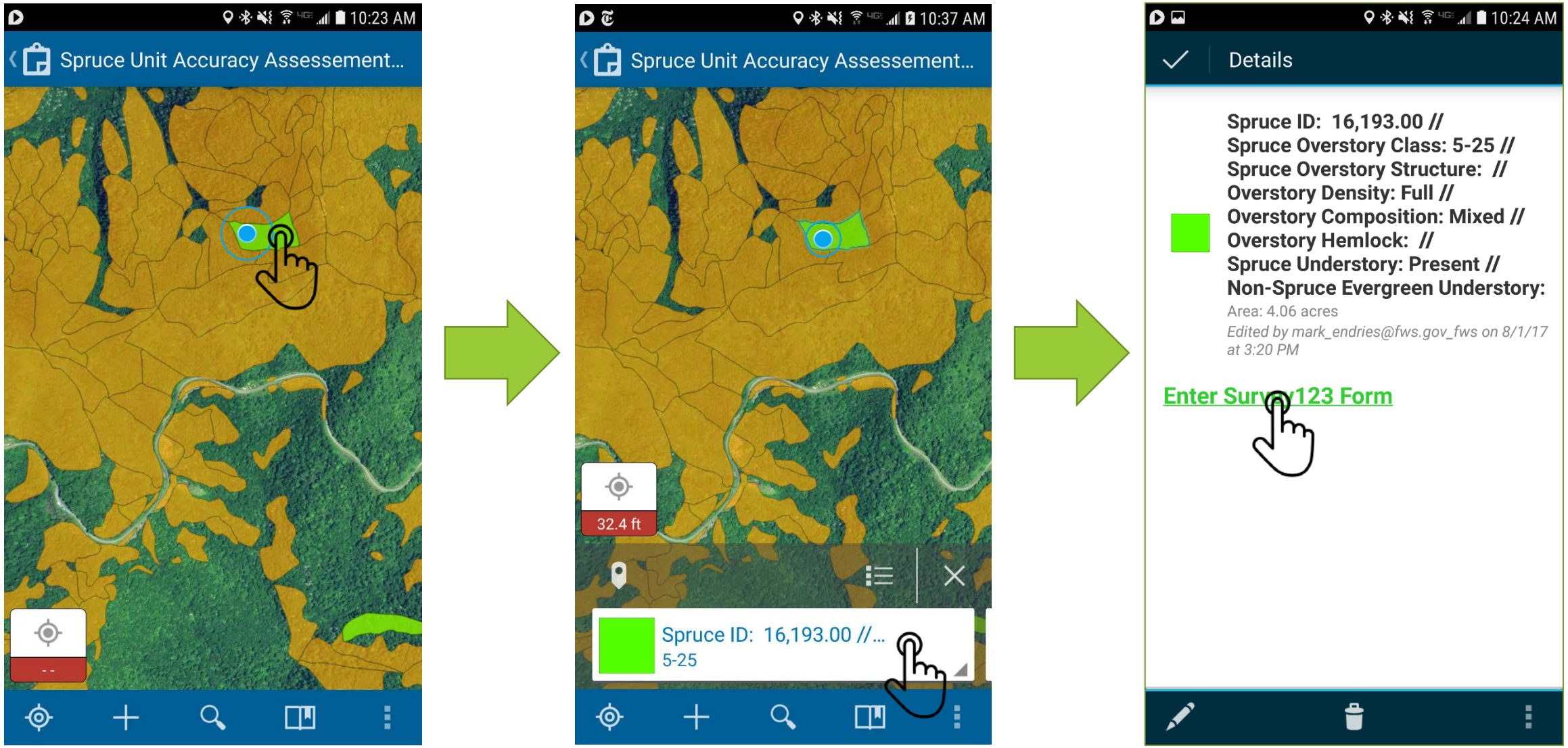
Accuracy Assessment

- Collect field data to generate an accuracy assessment on the Spruce Unit dataset
- Field Apps created
  - ArcGIS Collector – The map part
  - Survey123 – The field data form part
- Collects point locale and attribute data on the Spruce units

ArcGIS Collector

- Provides an aerial imagery map, spruce units, accuracy assessment target spruce units, with locator provided from device's GPS
- Tapping on a spruce unit will allow a link to initiate a Survey123 form.
- Spruce Unit ID is passed along to Survey123

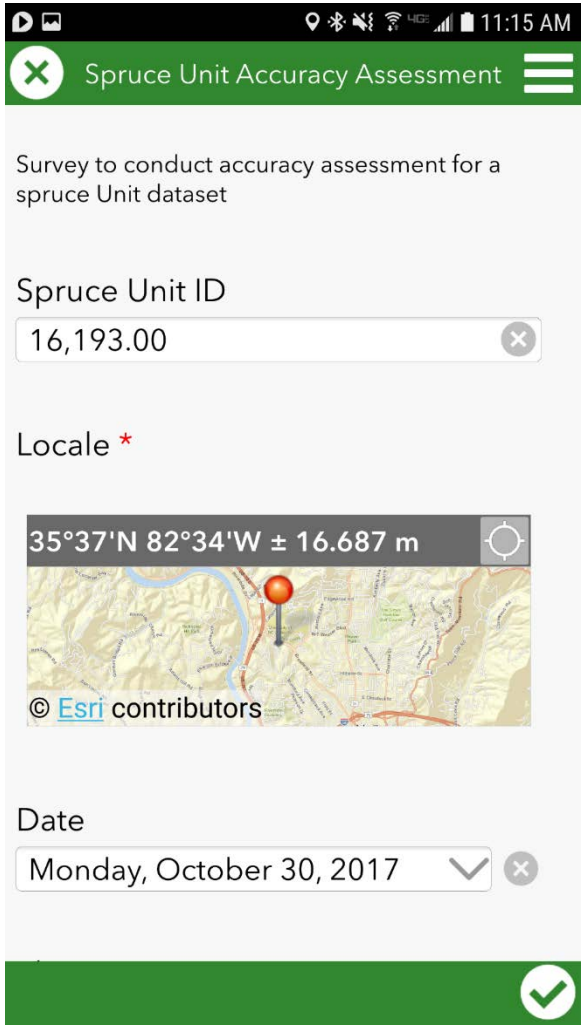
ArcGIS Collector

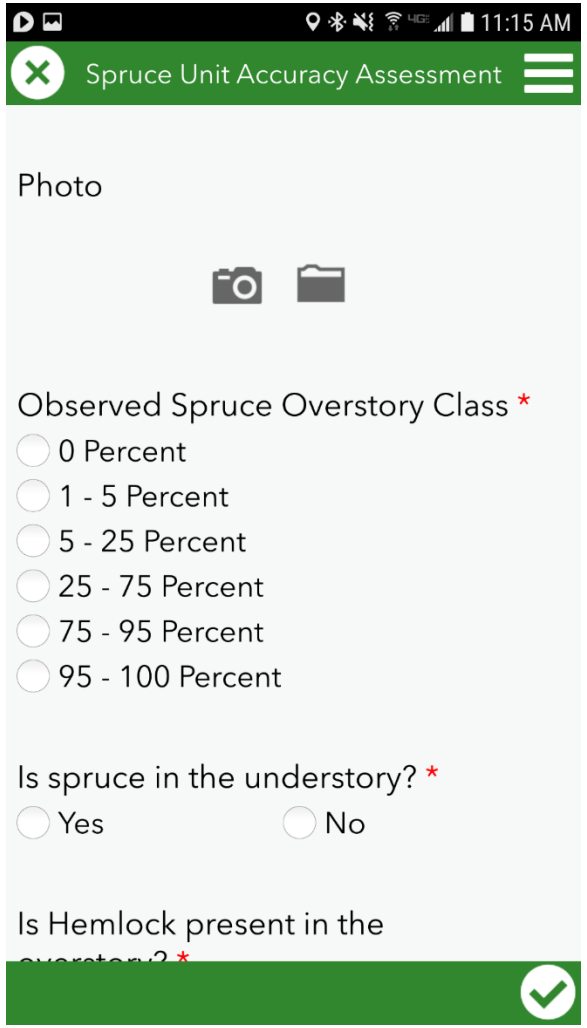


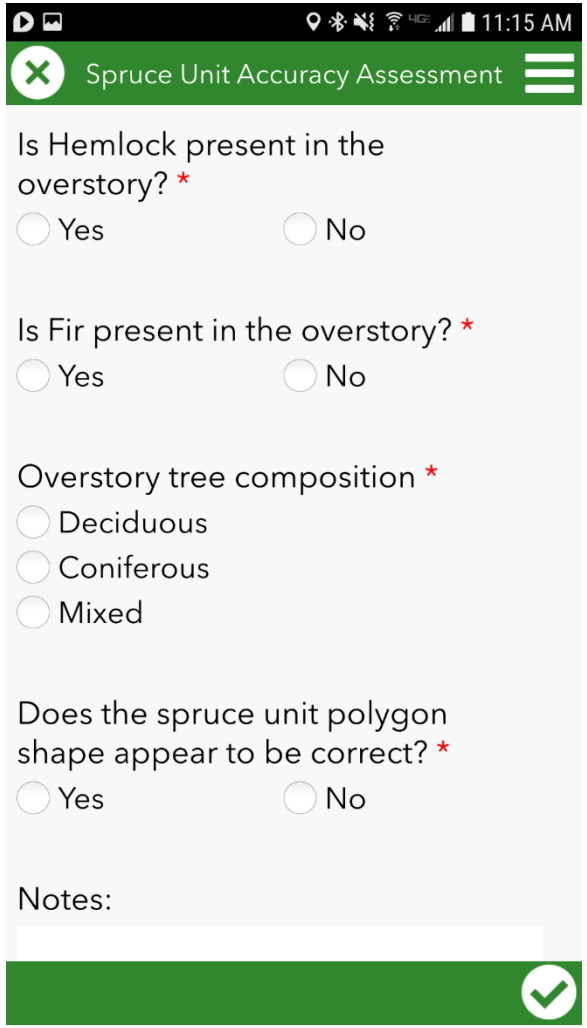
Survey123

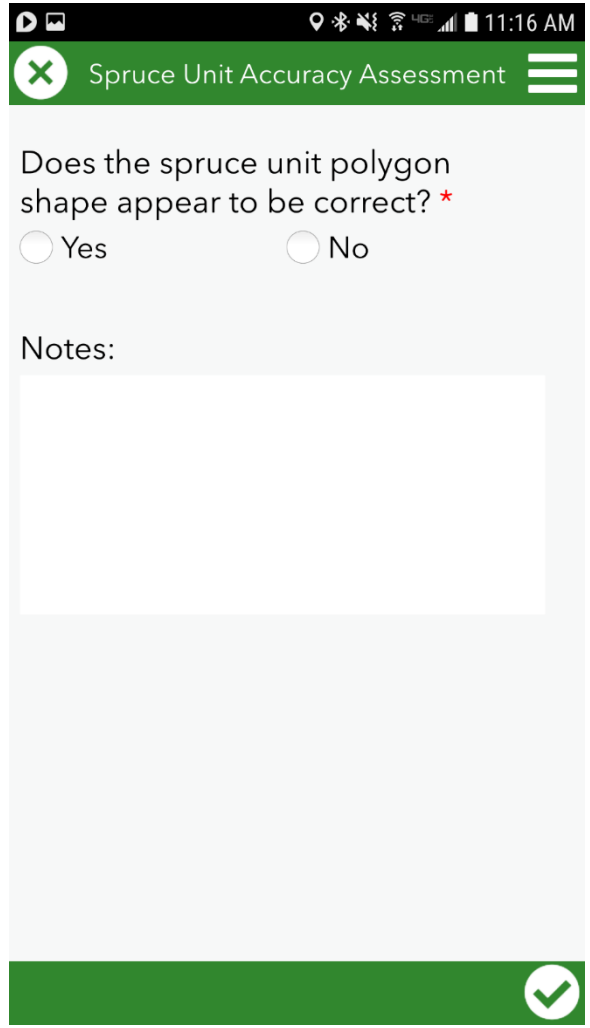
- Website and Mobile App
- Allows for custom field data form creation.
- All data is stored locally and can be uploaded to a central server (Cloud)
- Website access to data gives visualization and summarization capabilities

Survey123

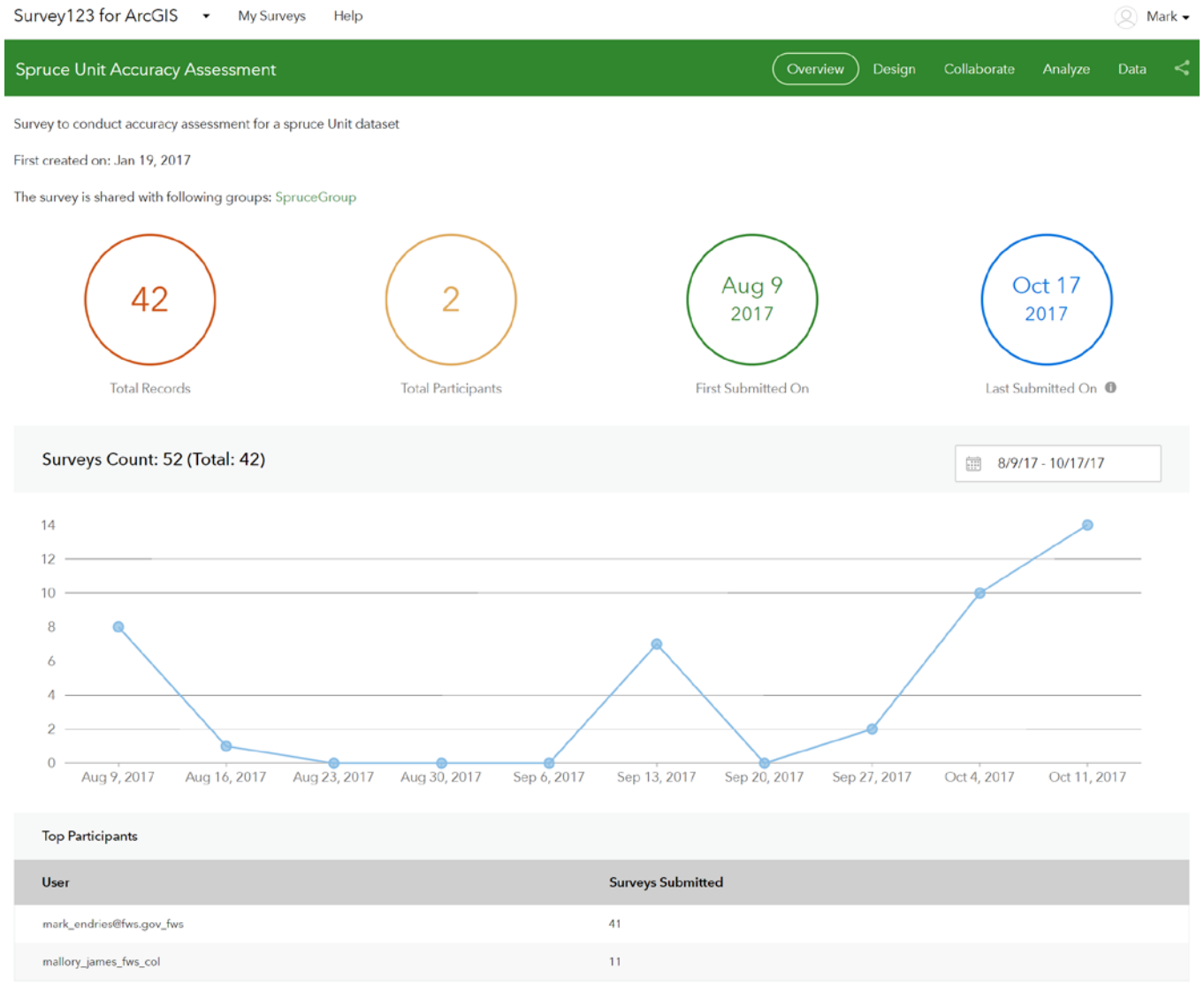

11:15 AM
Spruce Unit Accuracy Assessment
Survey to conduct accuracy assessment for a spruce Unit dataset
Spruce Unit ID
16,193.00
Locale *
35°37'N 82°34'W ± 16.687 m
© Esri contributors
Date
Monday, October 30, 2017


11:15 AM
Spruce Unit Accuracy Assessment
Photo
Observed Spruce Overstory Class *
0 Percent
1 - 5 Percent
5 - 25 Percent
25 - 75 Percent
75 - 95 Percent
95 - 100 Percent
Is spruce in the understory? *
Yes
No
Is Hemlock present in the


11:15 AM
Spruce Unit Accuracy Assessment
Is Hemlock present in the overstory? *
Yes
No
Is Fir present in the overstory? *
Yes
No
Overstory tree composition *
Deciduous
Coniferous
Mixed
Does the spruce unit polygon shape appear to be correct? *
Yes
No
Notes:


11:16 AM
Spruce Unit Accuracy Assessment
Does the spruce unit polygon shape appear to be correct? *
Yes
No
Notes:

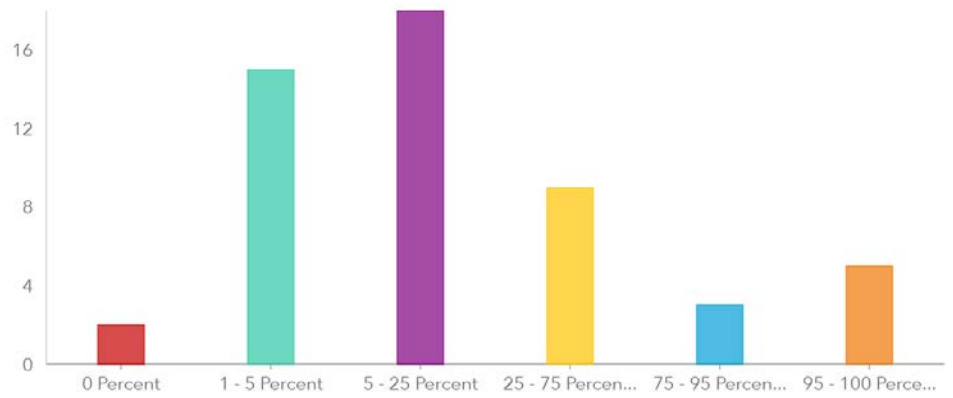
Survey123 Website



Survey123 Website

Observed Spruce Overstory Class *

Column Bar Pie Map



Hide Table

Empty Categories Sort

Answers	Count	Percentage
0 Percent	2	3.85%
1 - 5 Percent	15	28.85%
5 - 25 Percent	18	34.62%
25 - 75 Percent	9	17.31%
75 - 95 Percent	3	5.77%
95 - 100 Percent	5	9.62%

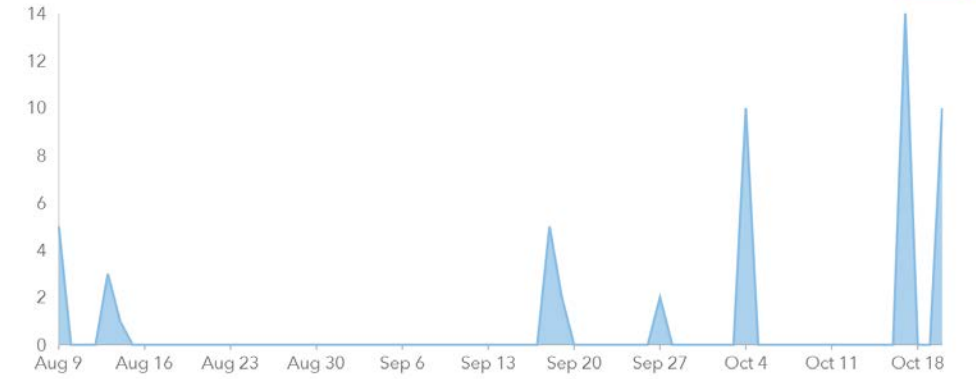
Answered: 52 Skipped: 0

Date

Histogram

Tip: drag on the chart to zoom in the data.

Reset

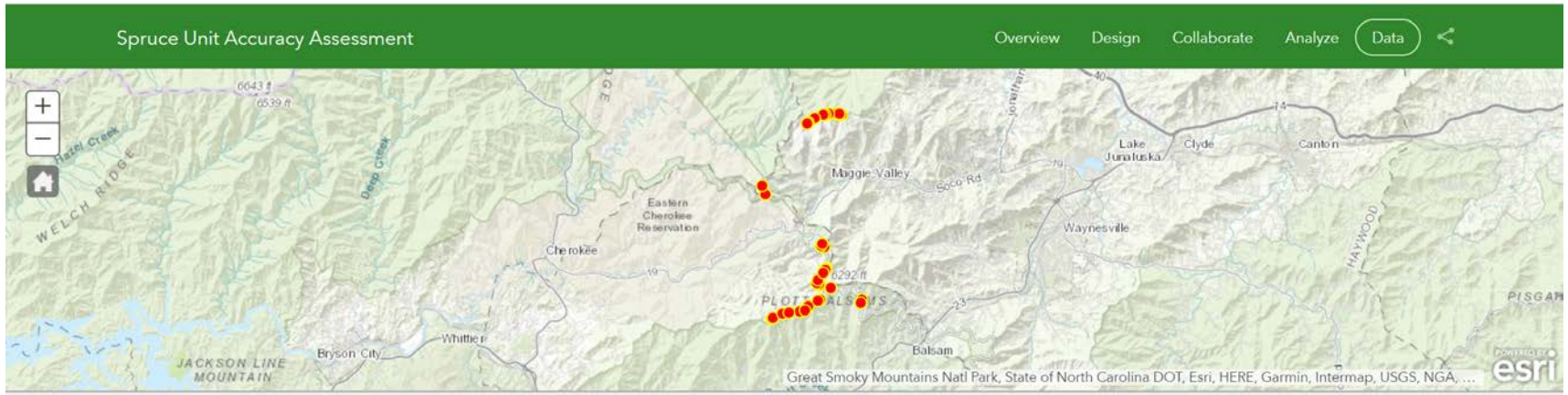


Hide Table

Date	Count
Aug 9, 2017	5
Aug 13, 2017	3
Aug 14, 2017	1
Sep 18, 2017	5
Sep 19, 2017	2
Sep 27, 2017	2
Oct 4, 2017	10
Oct 17, 2017	14
Oct 20, 2017	10

Answered: 52 Skipped: 0

Survey123



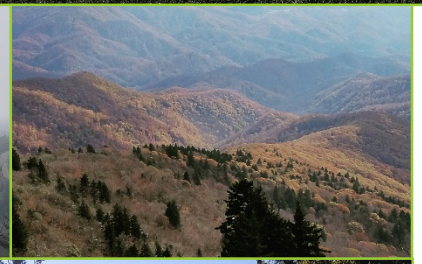
surveyPoint (Features: 52, Selected: 0)

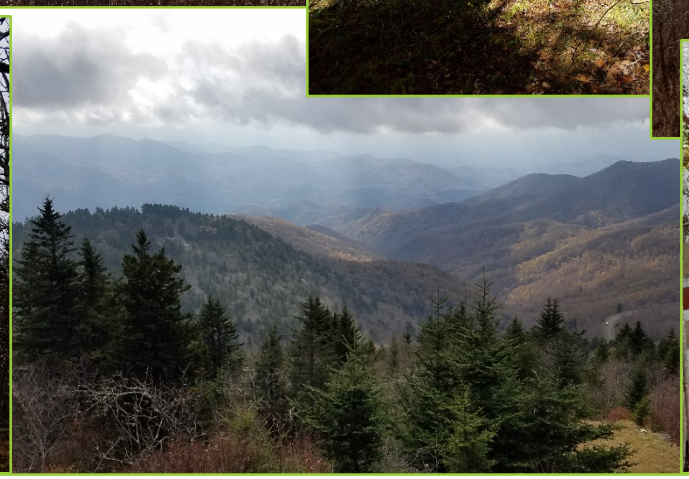
Date	Observed Spruce Overstory Class	Is spruce in the understory?	Is Hemlock present in the overstory?	Overstory tree composition	Does the spruce unit polygon shape appear to be correct?	Notes:	Spruce Unit ID	Spruce Unit ID	Is Fir presen overstory?
Aug 9, 2017	5 - 25 Percent	Yes	No	Mixed	Yes	1% fir composition		21,323.00	Yes
Aug 9, 2017	5 - 25 Percent	Yes	No	Mixed	Yes	Basically impossible to survey whole polygon, best estimate.		21,341.00	No
Aug 9, 2017	25 - 75 Percent	No	No	Mixed	Yes	Viewed from above, couldn't see understory.		21,343.00	No
Aug 9, 2017	25 - 75 Percent	No	No	Mixed	Yes	Some stunted spruce but no samplings.		21,402.00	No
Aug 9, 2017	25 - 75 Percent	No	No	Mixed	Yes	In bear enclosure . Skippingpoly		21,392.00	
Aug 13, 2017	95 - 100 Percent	Yes	No	Coniferous	Yes			21,330.00	No
Aug 13, 2017	95 - 100 Percent	Yes	No	Coniferous	Yes			21,330.00	No
Aug 13, 2017	95 - 100 Percent	Yes	No	Coniferous	Yes			21,330.00	No
Aug 14, 2017	5 - 25 Percent	No	No	Mixed	Yes			21,334.00	Yes

Open in Map Viewer | Expand Table | Show Individual Response | 8/9/17 - 10/17/17 | CSV | Download

Spruce Unit Accuracy Assessment

Spruce Unit Accuracy Assessment





Spruce Unit Accuracy Assessment

- Looking for assistance with data collection
  - Crowd source data collection
- You will need to bring your own mobile device
- I can authorize you a free ArcGIS account to log into the field apps and collect data.
  - Account is required for access
  - Grandfather Mtn is already participating!
- Then collect data as you find yourself in and among the spruce!

Spruce Unit Accuracy Assessment Volunteer

- Step 1: Contact me if interested
- Step 2: I set you up with an ESRI Online Account
- Step 3: Download ArcGIS Collector and Survey123 on your mobile device, log in using your new account, download Spruce Apps
- Step 4: We have a meeting or conference call to discuss how to use the apps and steps for data collection
- Step 5: Get out and into spruce
- Step 6: Collect data and upload it to the cloud!

Thanks!

Mark Endries

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Training Outline

- Lesson 1: Name
  - Provide brief description, if desired.
- Lesson 2: Name
  - Provide brief description, if desired.
- Lesson 3: Name
  - Provide brief description, if desired.

Lesson 1: Objectives

- List the intended outcomes for this training session.
- Each objective should be concise, should contain a verb, and should have a measurable result.
- Tip: Click and scroll in the notes pane below to see examples, or to add your own speaker notes.

Lesson 1: Content

- Add text here.
- To add a picture, chart, or other content in the right column, click the appropriate icon.
- To add a slide, click New Slide on the Insert menu, or press CTRL+M.

Lesson 1: Wrap-up

- Summarize important points.
- Allow time for questions.

Lesson 2: Objectives

- List the intended outcomes for this training session.
- Each objective should be concise, should contain a verb, and should have a measurable result.

Lesson 2: Content

- Add text here.
- To add a picture, chart, or other content in the right column, click the appropriate icon.
- To add a slide, click New Slide on the Insert menu, or press CTRL+M.

Lesson 2: Wrap-up

- Summarize important points.
- Allow time for questions.

Lesson 3: Objectives

- List the intended outcomes for this training session.
- Each objective should be concise, should contain a verb, and should have a measurable result.

Lesson 3: Content

- Add text here.
- To add a picture, chart, or other content in the right column, click the appropriate icon.
- To add a slide, click New Slide on the Insert menu, or press CTRL+M.

Lesson 3: Wrap-up

- Summarize important points.
- Allow time for questions.

Summary of Training

- List important points from each lesson.
- Provide resources for more information on subject.
  - List resources on this slide.
  - Provide handouts with additional resource material.

Assessment and Evaluation

- Prepare a quiz or challenge to assess how much information participants learned.
- Survey participants to see if they found the training beneficial.