

# *Monongahela National Forest: Soil Survey Updates in the Red Spruce Ecosystem - New Interpretations*

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# Location: The Monongahela NF



- Approximately 1 million acres
- High elevation
- Steep slopes
- Rain shadow effect
- Hydrologically shallow soils
- Sedimentary geology
- Acidic environments
- Biodiversity hotspot



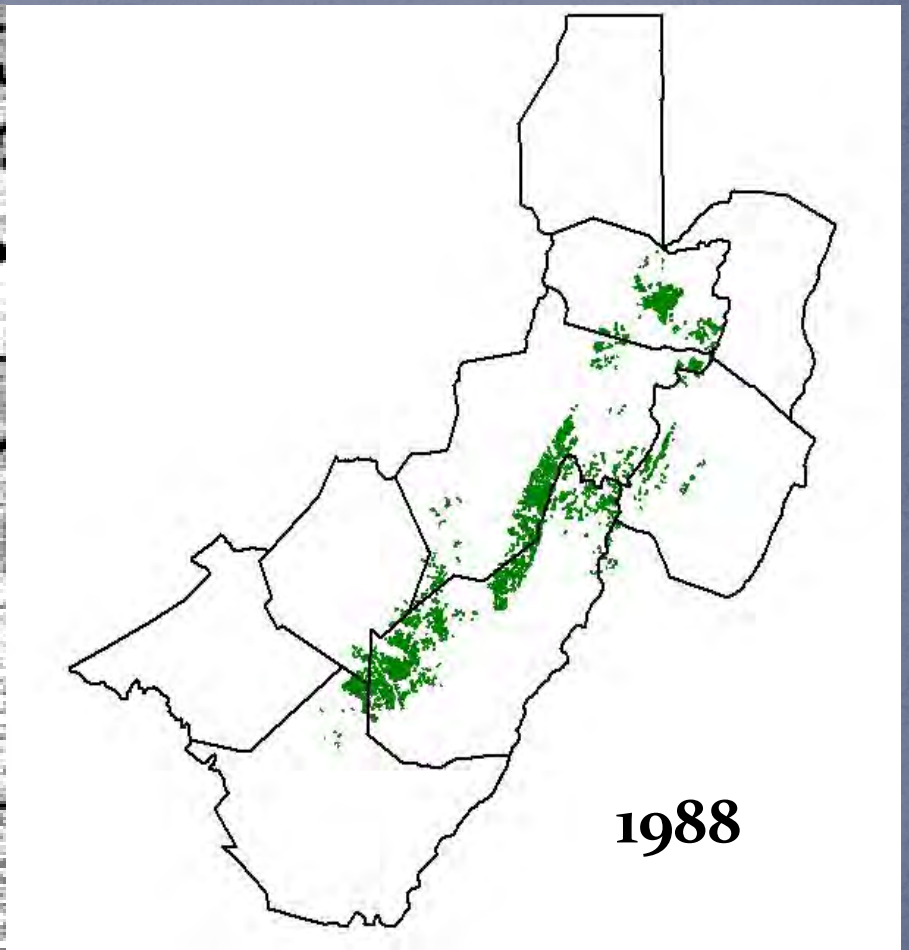
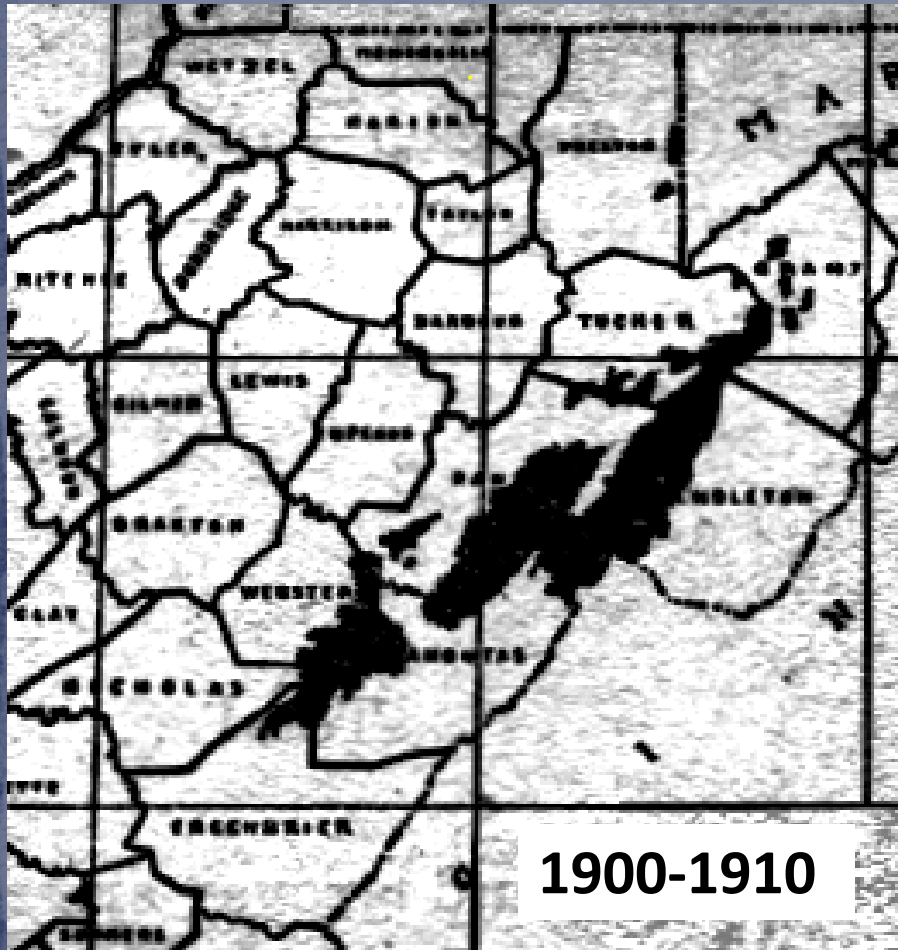
# High Elevation Soils (3,000-4,863 FT)

- Red Spruce Ecosystem
- Wildlife -Threatened and Endangered Species
- Management Prescription 4.1 provide Forest Plan Direction and Guidance
- NRCS National effort to conduct and Ecological Resource Inventory (ESI) and develop Ecological Site Descriptions





Red spruce coverage was reduced to  
10% of what once existed





Cheat Mountain, Pocahontas County on lands of the  
West Virginia Pulp and Paper Co., 1910. © McClain  
Printing Company





Much of the red spruce ecosystem looked like this post logging era resulting in a severe change in soil forming factors.



**High Ridges**



**Fragmented**



**Understory**



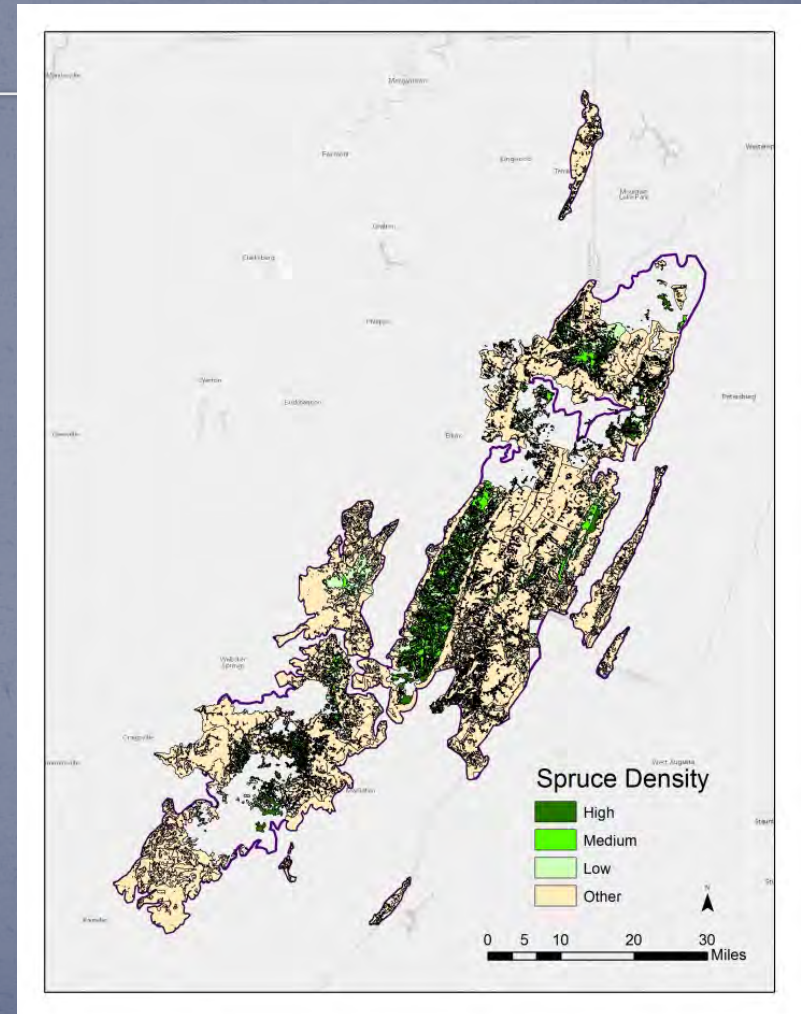
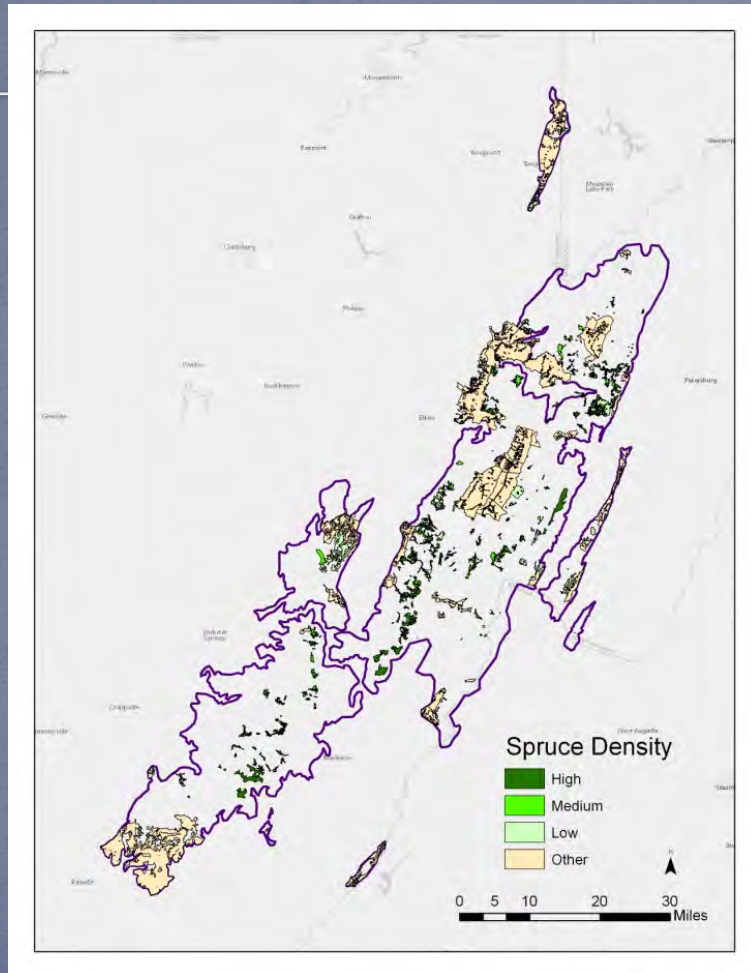


Slide Source: Love, KC. USFWS Spruce Mapping Project Collaborative 2012

# Red Spruce Mapping Progress

**November 04, 2011**

**August 16, 2012**





# Red Spruce Ecosystem Management

- 2007 – the MNF starts planning projects in the Upper Greenbrier Watershed
  - Watershed Restoration / Road Decommissioning
  - Timber Stand Improvement and Wildlife Habitat Improvement for T&E species (WV Northern Flying Squirrel)
  - Commercial Timber Removal
  - Red Spruce plantings
- Concerns about carbon management and timber harvest on landscapes that support current and historic red spruce
- 2009 – Initiative starts to have a better understanding and soil survey update of soils in this high elevation ecosystem
- 2011 – Ecological Site Inventory work begins in partnership with NRCS



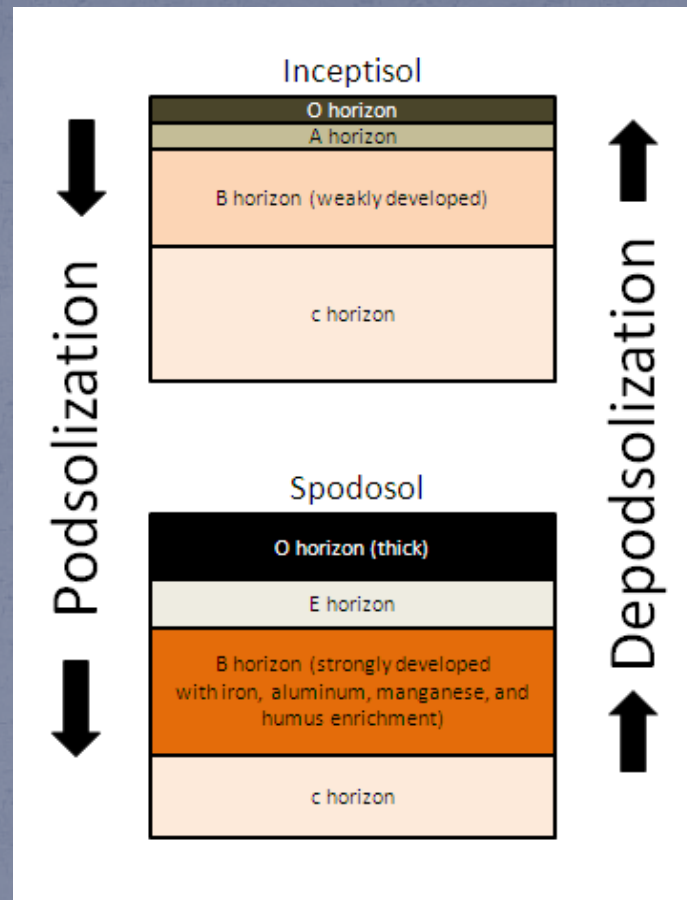
# The Soils:

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SPODOSOLS AND INCEPTISOLS...

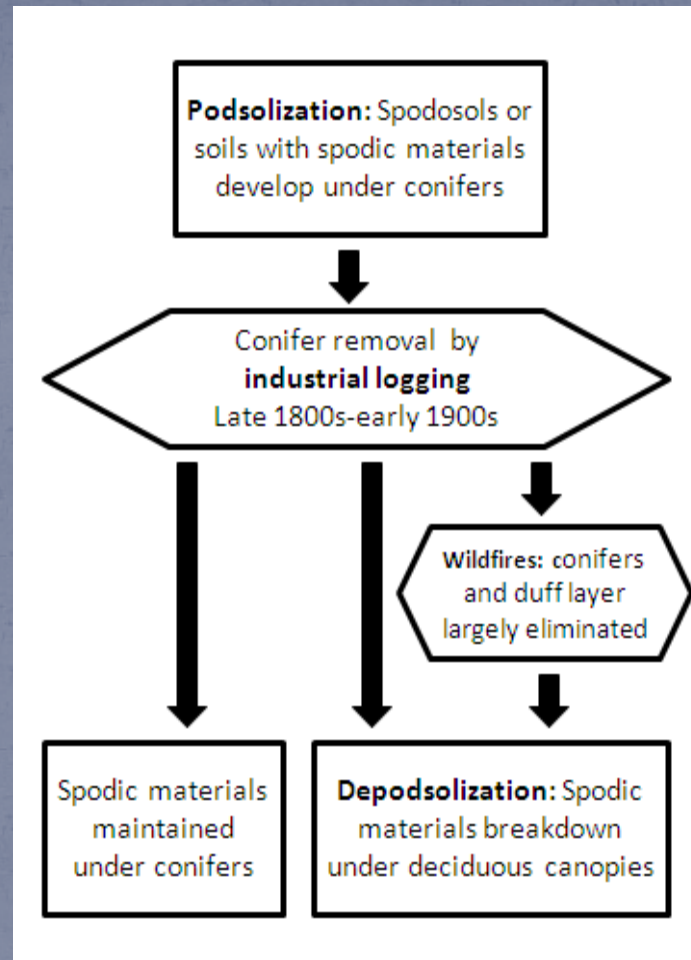






Schematic showing general soil property changes with podsolization and depodsolization.





Schematic showing vegetation-induced changes to spodosols or soils with spodic materials.



# SPODOSOLS ON THE SOIL SURVEY LEGENDS?

Spodosols in the Appalachian Mountains have been described since the 1930s, but have been historically under-mapped according to recent investigations by the United States Forest Service (USFS) and the Natural Resources Conservation Service (NRCS).





# National Cooperative Soil Survey

## collaborative: Spodosols vs Inceptisols

- Spodosols: soils that form as a result of eluviation and the accumulation of organic matter and aluminum and iron sesquioxides
- Gauley and Leetonia (11,500 ac) are the two Spodosols currently mapped in West Virginia
- Spodic Dystrudepts, weakly forming or developed soils with spodic morphology, have not been mapped in the United States
  - Chemung Formation (Devonian): gray and brown siltstone & sandstone with shale and conglomeratic interbeds; sparingly fossiliferous (USGS, 2012)
  - Price Group (Mississippian): hard gray massive sandstones with some shale (USGS, 2012)
  - Pottsville Group (Kanawha Formation) (Pennsylvanian): sandstone, shale, siltstone, and coal (USGS, 2012)



# National Cooperative Soil Survey collaborative: Spodosols vs Inceptisols

- Recent investigations by the USFS and NRCS suggest a correlation between the historic *Picea rubens* (red spruce) extent and spodic development on multiple geologic formations in the Monongahela National Forest – (Travis Nauman, PhD candidate)
- Future research should focus on analyzing soil samples for Al +  $\frac{1}{2}$  Fe from a statistical sampling design that encompasses multiple geologies, elevations, land covers, aspects, and hillslope profile positions in the Monongahela National Forest.



# New Soil Interpretations

- Incorporate recommendations for wildlife habitat
  - Foraging areas for T&E species
  - Habitat for Salamanders
- Recommendations for planting red spruce
- Traditional interpretations
  - Harvesting
  - Road building
  - Recreation



# Future Monitoring

- What should the Forest monitor when conducting active management in these ecosystems for the first time in a century?
  - Carbon
  - Mercury in stream chemistry
  - Soil quality changes
  - Soil temperature and soil moisture
- Climate change and resiliency



# Central Appalachian Red Spruce Initiative: CASRI

- Collaborative group of all interests
- Actively working to restore the red spruce ecosystem in the central Appalachian region

[www.restoreredspruce.org](http://www.restoreredspruce.org)



Questions?

