Ghosts of the red spruce forest: The need for an evolving soil survey for ecological sites

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Evolving?

• Soils change
  – Spatially and temporally dynamic
    • ‘complex adaptive systems’ (Monger and Rachal, 2013)

• Paradigms change
  – Taxonomy
  – Soil series
  – Politics -> $$
  – ESDs in east
Investigation of red spruce (*Picea rubens*) ecotone

- Investigated ecological transition
  - Conifer-hardwood
- Typic Dystrudepts map units
- Found Spodosols
  - Wildell series (Haplorthod)
  - Mandy reclassified to spodic Dystrudept
Red Spruce – Spodic Connection
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- Spruce-Hemlock assoc. with higher spodic probabilities
  - Wilcoxon rank sum test w/ contin correction (p=0.0052)
  - Welch 2-sample t-test (p=0.0077)
  - Null: zero shift
  - Alt: spruce-hem > none

n = 1031 witness tree points

(data from Thomas-Van Gundy et al, 2012)
Pedoecological Map

– Contraction of red spruce
– Decrease in O-horizon depths
– Depodzolization
  • Erosion
  • Loss of E expression
  • Loss of B horizon humics
Soils Change

- Different features in the soil change at different rates

From: (Monger and Rachal, 2013)
Soil surveys should change

- Soil monitoring
- Management paradigm
- Ecological sites
- Soil series discrepancies
- Separately map contrasting soil processes
  - Temporal scale
  - Scale

Era of unprecedented change

• Land use change (disturbance), anthropogenic climate change, fire suppression, timber harvest, grazing

Wasteland after post-harvest fires on crest of Cabin Mountain, WV (from Clarkson, 1964; photo by H.A. Allard)

Prolific gullying on the Navajo reservation, AZ
Thanks!