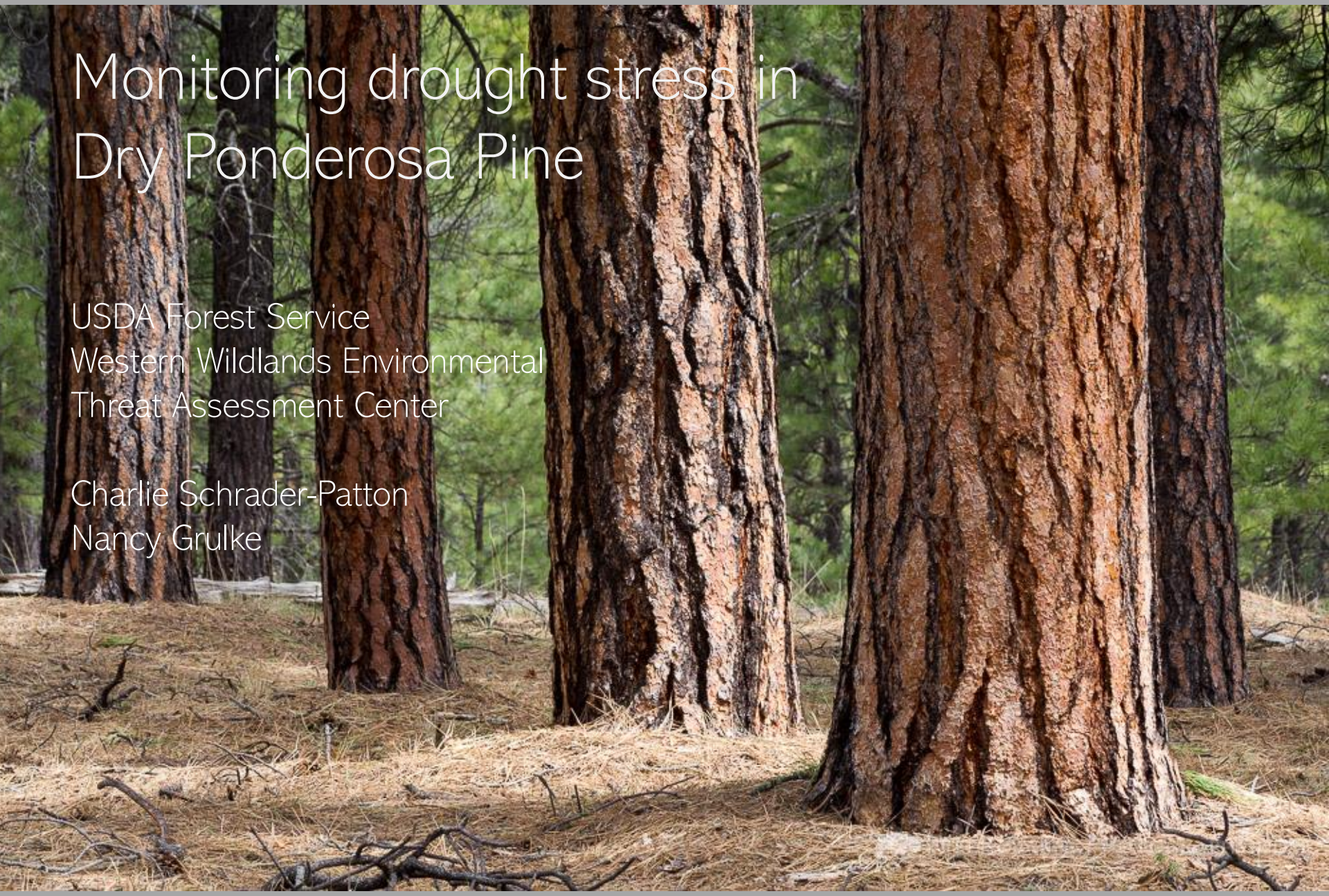
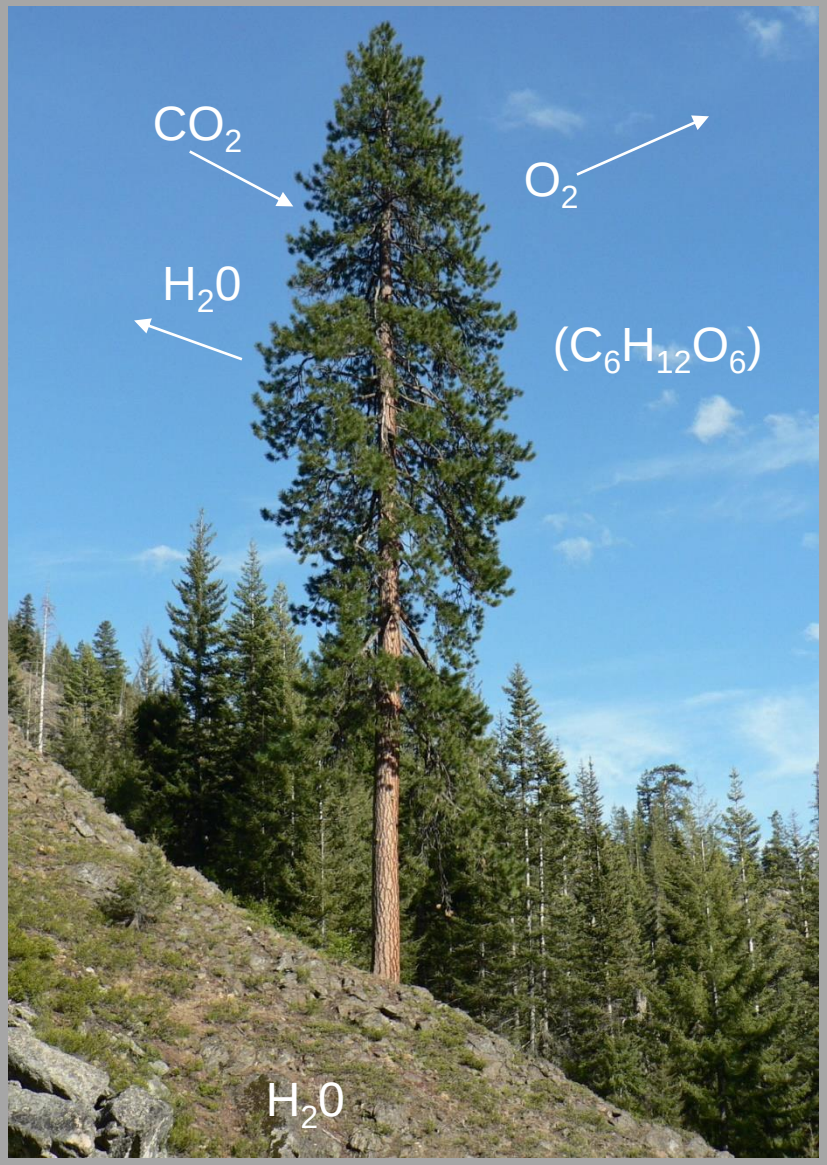
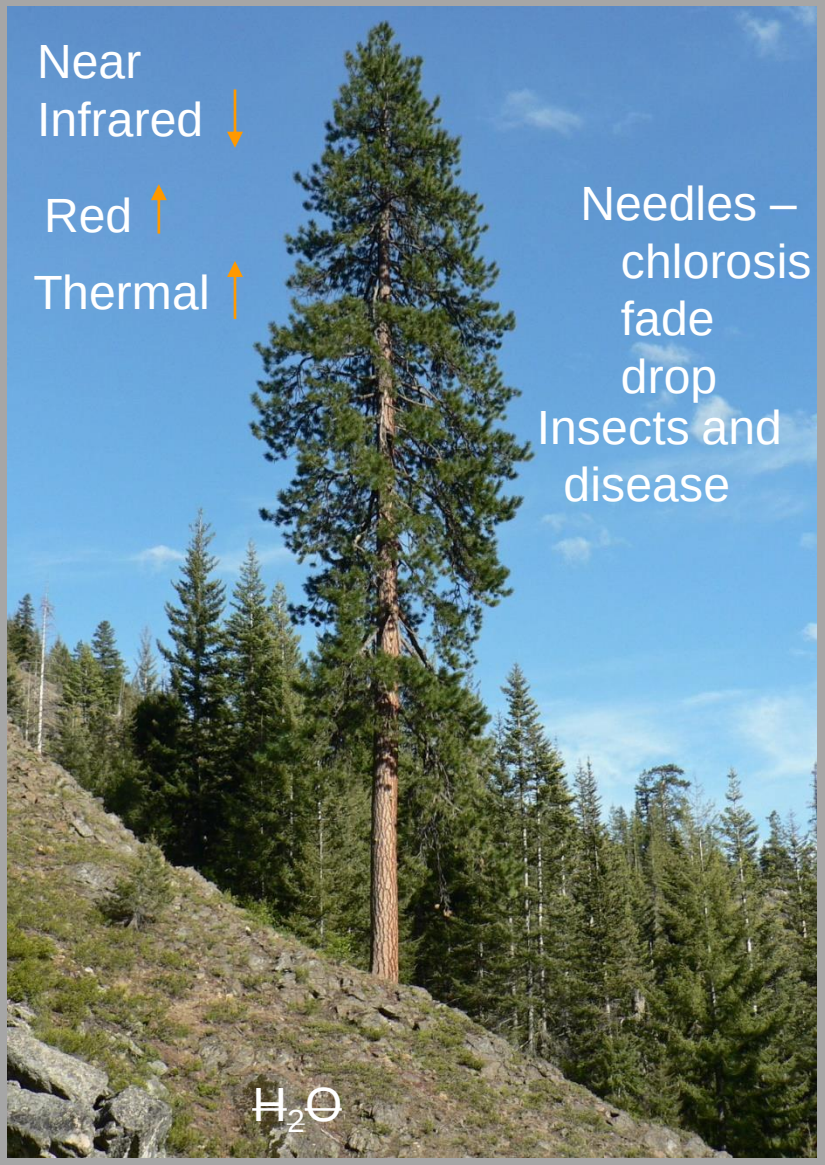


Monitoring drought stress in Dry Ponderosa Pine

USDA Forest Service
Western Wildlands Environmental Threat Assessment Center

Charlie Schrader-Patton
Nancy Grulke

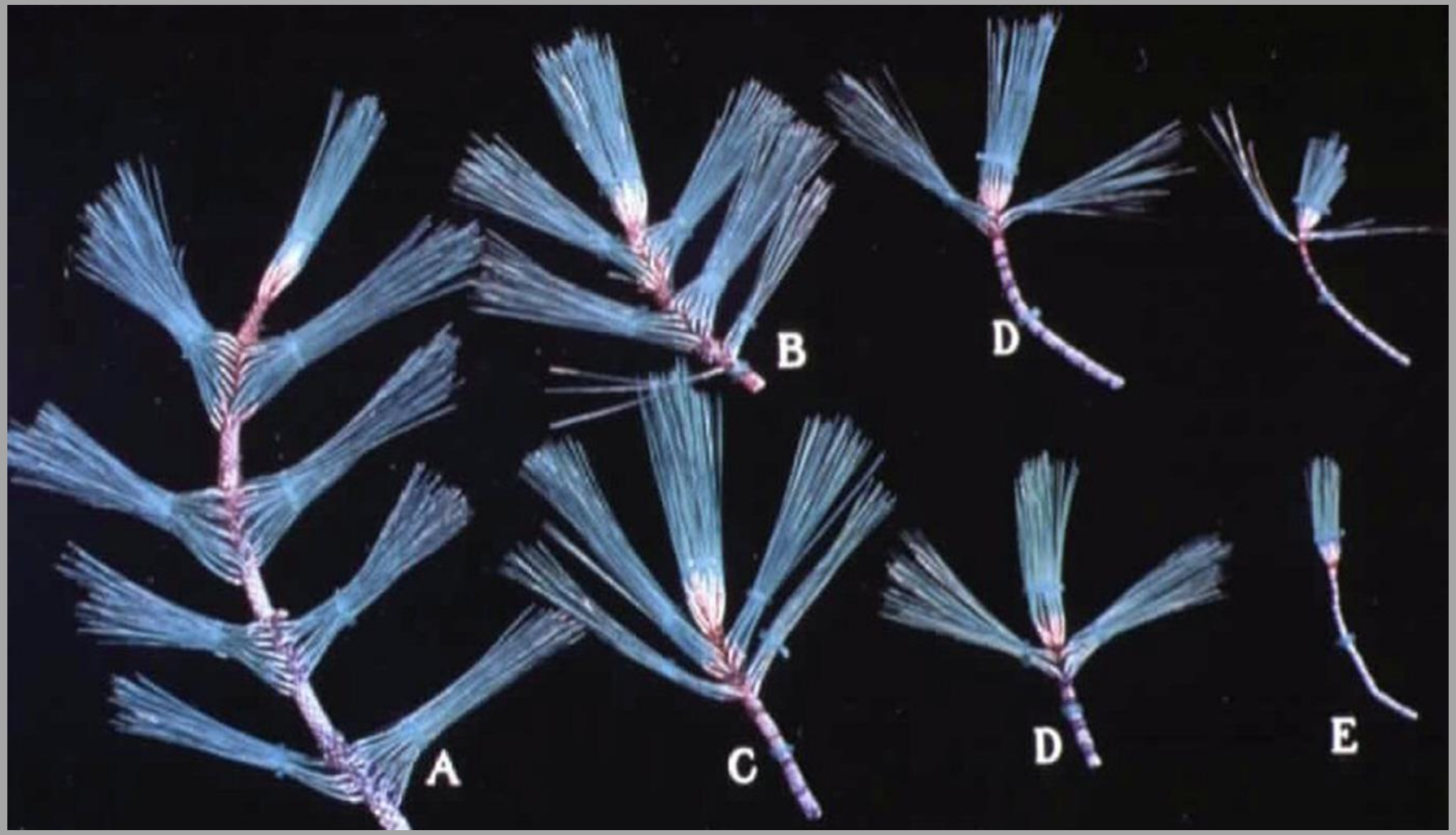

CO_2
O_2
H_20
$(C_6H_{12}O_6)$
H_20


Near Infrared
Red
Thermal
Needles – chlorosis fade drop
Insects and disease
~~H_2O~~

Identifying low vigor trees…what makes a sick tree look sick..

Chlorosis

Loss of older needle age classes


A
B
C
D
D
E

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UGA2254015b

1) Establish relationship between qualitative vigor assessments and quantitative measurements:

- Are the trees that look poor have the data behind them?

- Yes, statistical significance for chlorosis, # of whorls, branch diameter, dwarf mistletoe for trees qualitatively ranked as ‘good’, ‘fair’, ‘poor’

2) Establish relationship between qualitative vigor assessments and crown spectral data from imagery:

- Are the trees that look poor have the data behind them?

- Yes, statistical significance for NDVI, NIR, GCC, DVI (spectral indices) for trees qualitatively ranked in two classes: as ‘poor’ and ‘not poor’

Image processing/modeling

- 4-Band, 30cm aerial imagery
  - Red, Green, Blue, Near-Infrared

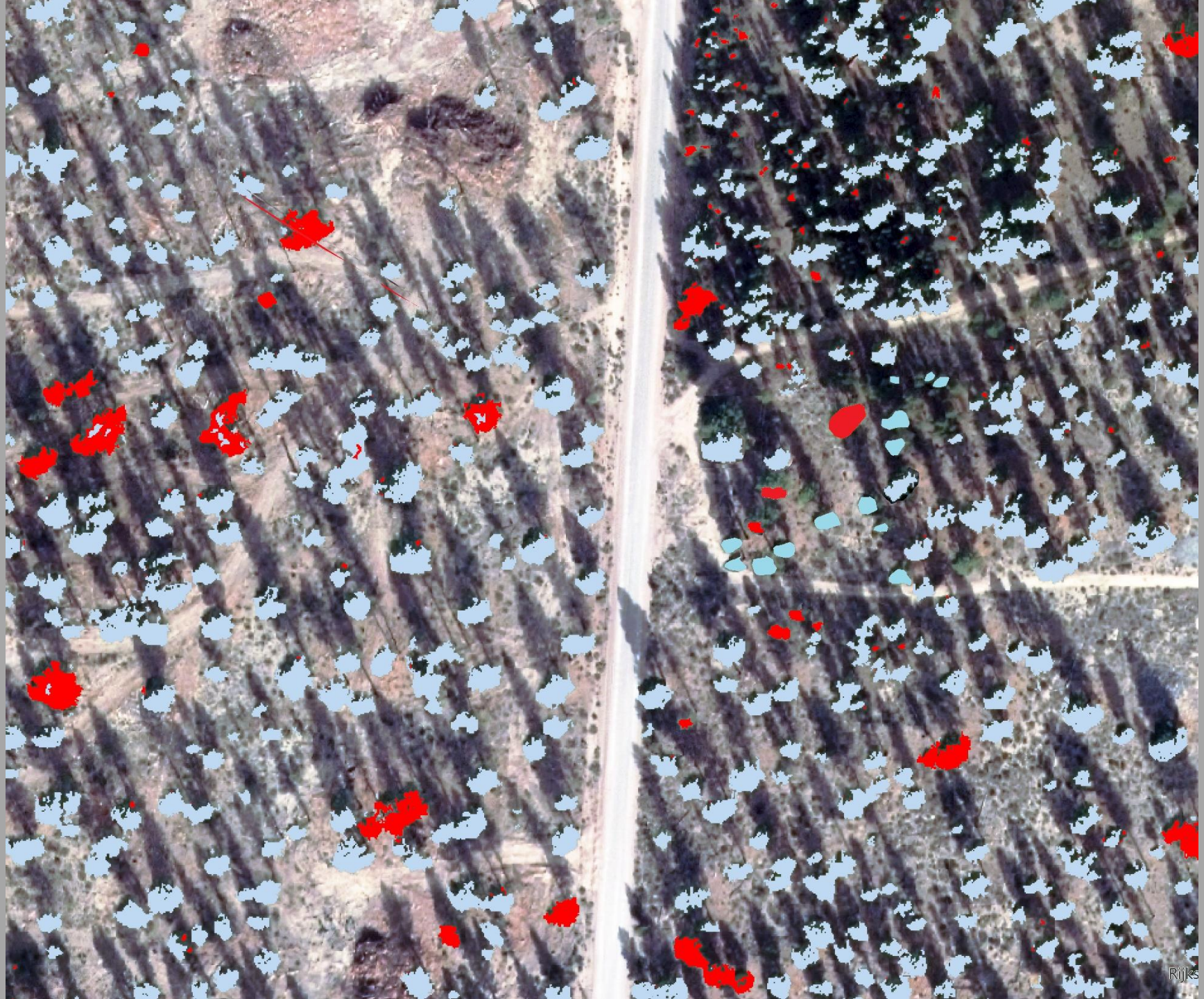
- Tree crowns as objects

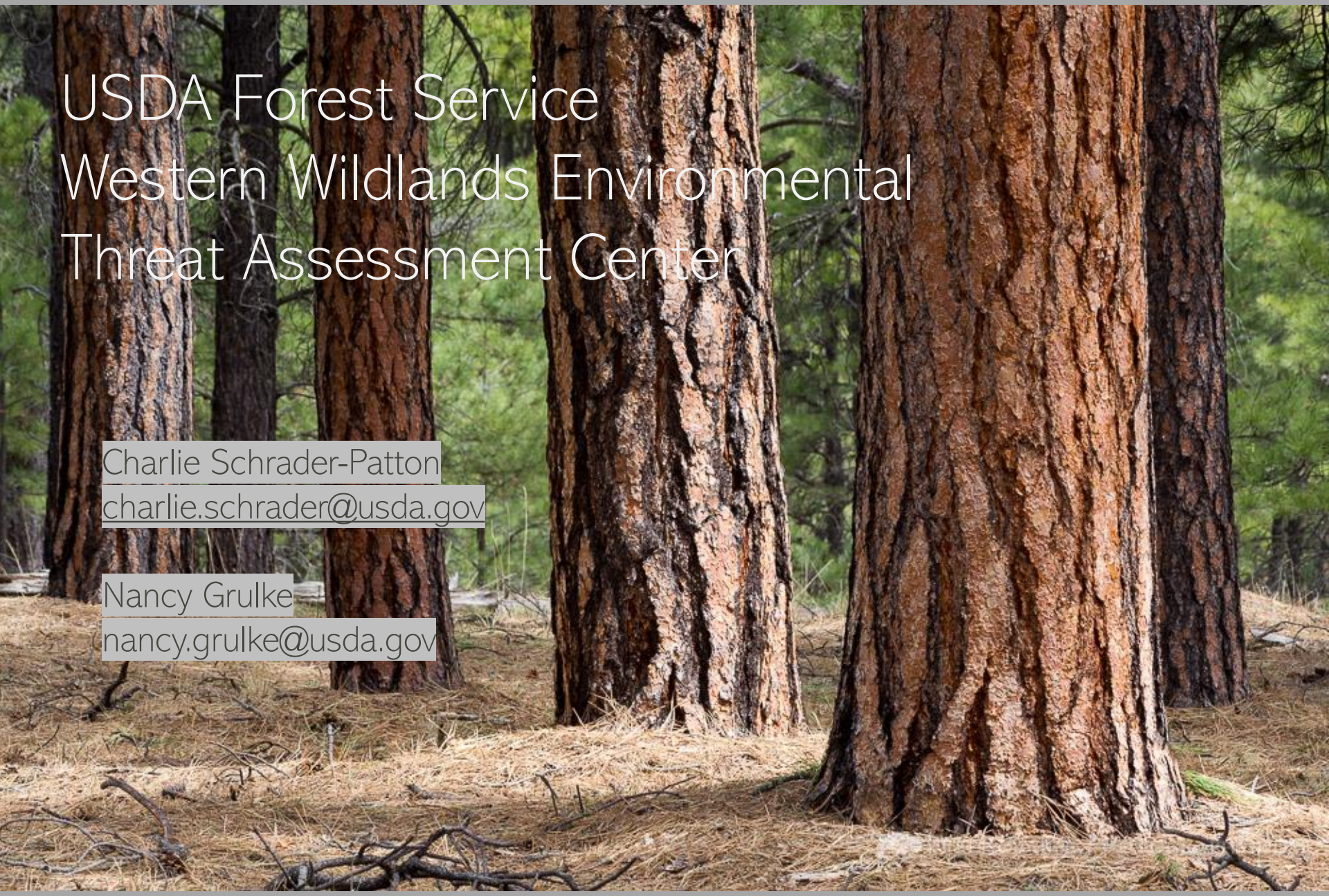
- Random Forests machine learning
  - Predictors – 11 spectral derivatives
    - NDVI, EVI, GCC, RCC, R, G, B, NIR

- 3 different silvicultural prescriptions, plus control

Results

- 77% accuracy in mapping
  - -two classes of trees:
    - poor and not poor.
- Treatments
  - -Stands burned and thinned I highest vigor.
  - -Even thinning – higher vigor than patchy thinning.
  - - Stands burned twice (2006 and 2013 were higher in vigor than those burned once (2008)


Rijks



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