

Comparing Metrics of Forest Health Between Acadia National Park and Surrounding Forestlands

Jesse S. Wheeler¹, Kathryn M. Miller¹, Fred W. Dieffenbach² and Brian R. Mitchell²

Northeast Temperate Network, National Park Service Inventory & Monitoring Program

¹Acadia National Park, Bar Harbor, ME 04609

²Marsh-Billings-Rockefeller National Historical Park, Woodstock, VT 05091



Acadia National Park
National Park Service
U.S. Department of the Interior

Introduction & Methods

The Northeast Temperate Network (NETN) has been monitoring forest health annually in Acadia National Park (ACAD), and biennially in 9 additional parks in New England, New York, and New Jersey since 2006. The NETN forest monitoring program uses a protocol based on the USDA Forest Service's Forest Inventory and Analysis (FIA) program, which has been monitoring forest resources in the eastern US since the 1930s.

By using similar methods as FIA, we can examine regional trends with the larger FIA dataset, and compare NETN park forests with the surrounding matrix of forestlands. For comparisons with ACAD, we calculated metrics from FIA plots in the same Ecological Subsection as the park. Where FIA methods were compatible, we calculated and rated the ecological integrity metrics that were developed for the NETN forest monitoring program.

Figure 1. Proportion of forest land and ownership and FIA plot locations within the Maine Eastern Coastal Ecological Subsection (211Cb).

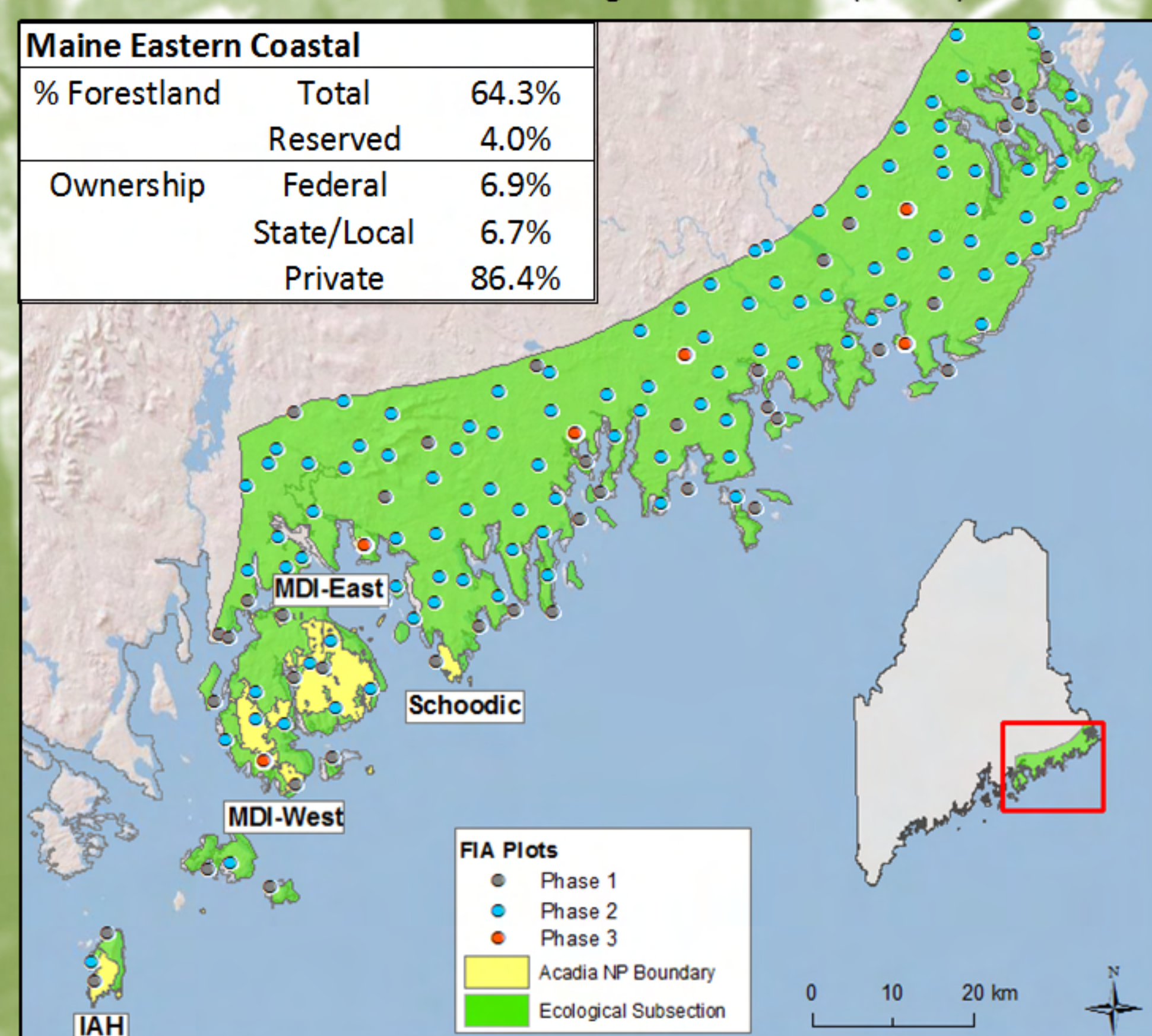
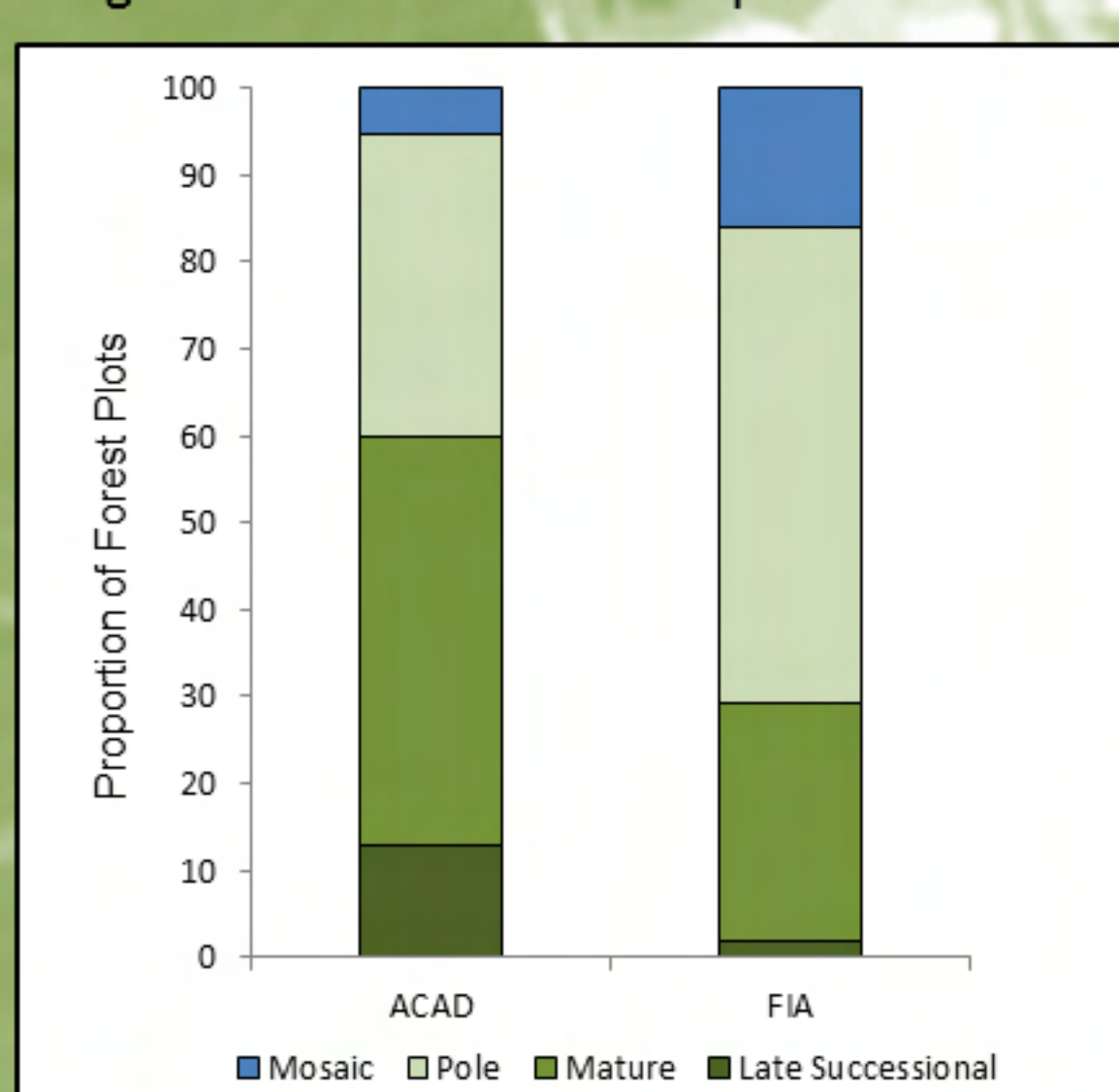


Figure 2. Proportion of forest by structural stage class for ACAD and FIA plots.



Kate Miller photo



Evan Heck photo

Results

While over 60% of the area surrounding ACAD is forested, the vast majority of these forests are under private ownership (Figure 1). Forest lands in the surrounding matrix are also primarily managed for timber production, whereas forests in ACAD are protected from harvesting.

The proportion of forest plots in mature (stand age ≥ 82 yrs) and late successional forest (stand age ≥ 112 yrs) is higher in ACAD than surrounding forestlands (Figure 2). Specifically, ACAD has about twice the percentage of forest plots (60% of ACAD plots, 29% of FIA plots) that are mature or late successional (Davis stages of spruce/fir forest succession).

The proportion of snags and size of snags also vary between ACAD and surrounding forestlands (Figure 3). FIA plots have a lower density of snags than ACAD but have a slightly higher percentage of large snags ≥ 30 cm diameter at breast height (DBH).

Indicators of old growth forests including structural complexity, such as coarse woody debris (CWD) volume and density of live trees over 30 cm DBH (Figure 4), are more abundant in ACAD than the surrounding matrix of more intensively managed forests.

Conclusion

These results suggest that forests in ACAD may represent regionally significant, older forest habitat within a matrix of more intensively managed forests.

Ecological Integrity Metrics Comparisons (ACAD / FIA)

Course Woody Debris and Snag Abundance

Figure 3. Comparison between ACAD and FIA of a) total snag density, b) density of large snags ≥ 30 cm DBH and c) percent of all trees that are snags.

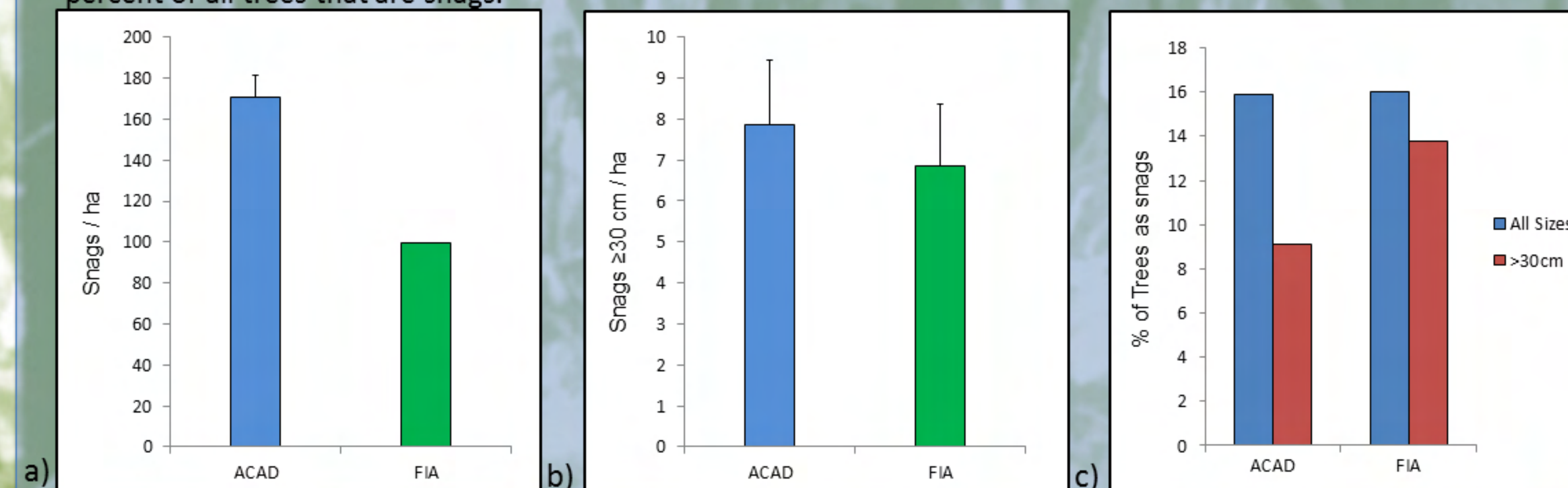
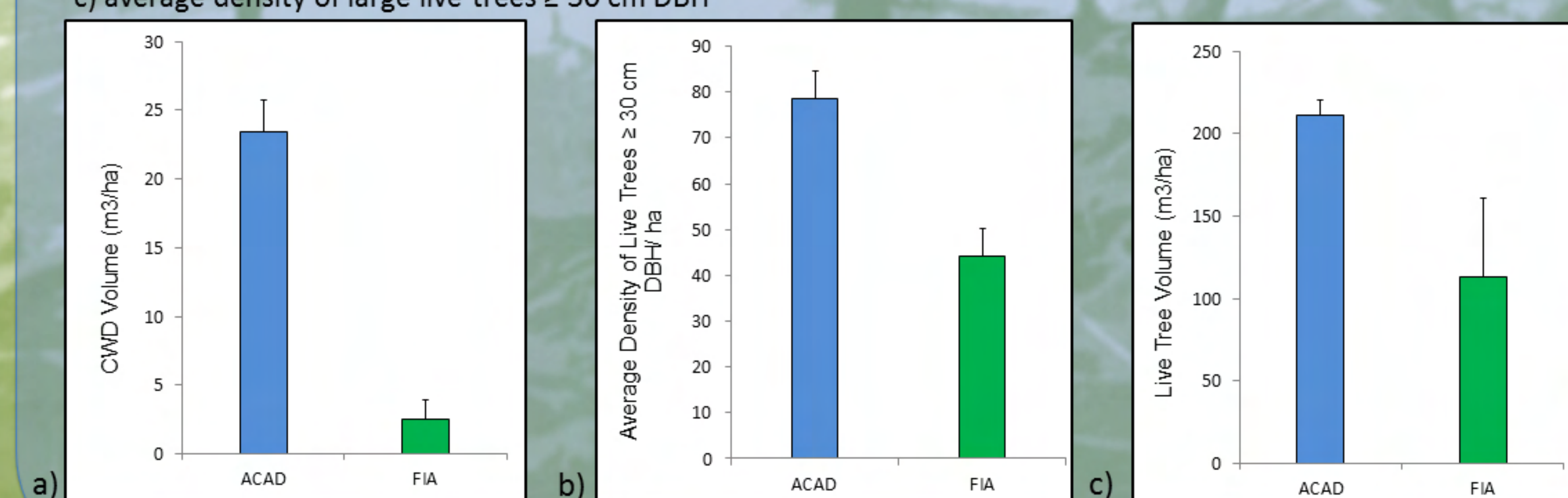


Figure 4. Comparison of Acadia NP and FIA forests for: a) live tree volume, b) course woody debris volume, and c) average density of large live trees ≥ 30 cm DBH



Davis Stages of Spruce / Fir Forest Succession

Old Growth Complex structure

- Advanced regeneration of shade-tolerant climax species
- Layered, multi-aged canopy with trees over 30 cm DBH
- Abundant CWD and snags in various stages of decay and sizes



Evan Heck photo

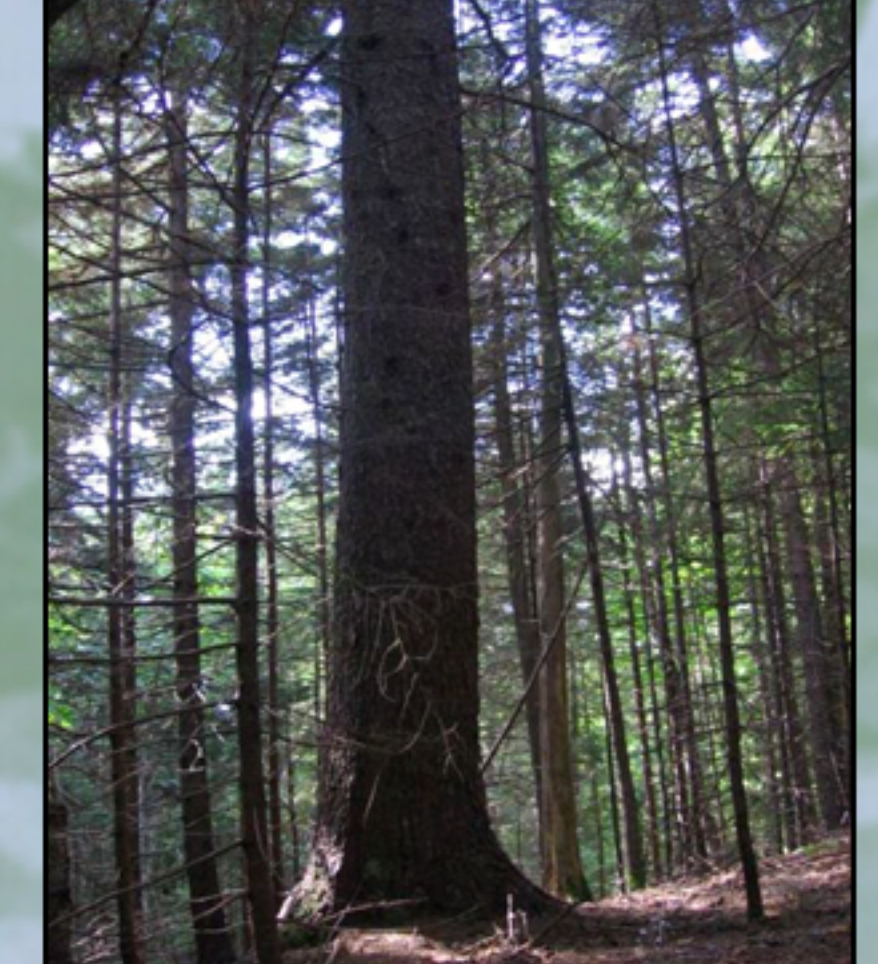
Stage 5: Mature - Mean stand age: 82 years

Stage 7: Old Growth - Mean stand age: 163 years

Stage 6: Late Succession - Mean stand age: 112 years



Evan Heck photo



Evan Heck photo

Background Image: Old-Growth stand on Bernard Mountain, ACAD. Kate Miller photo