



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

**Northern Great Plains Inventory & Monitoring Network**

# **Long-term Monitoring of Forest Health, Structure, and Fuels in National Park Units of the Black Hills**

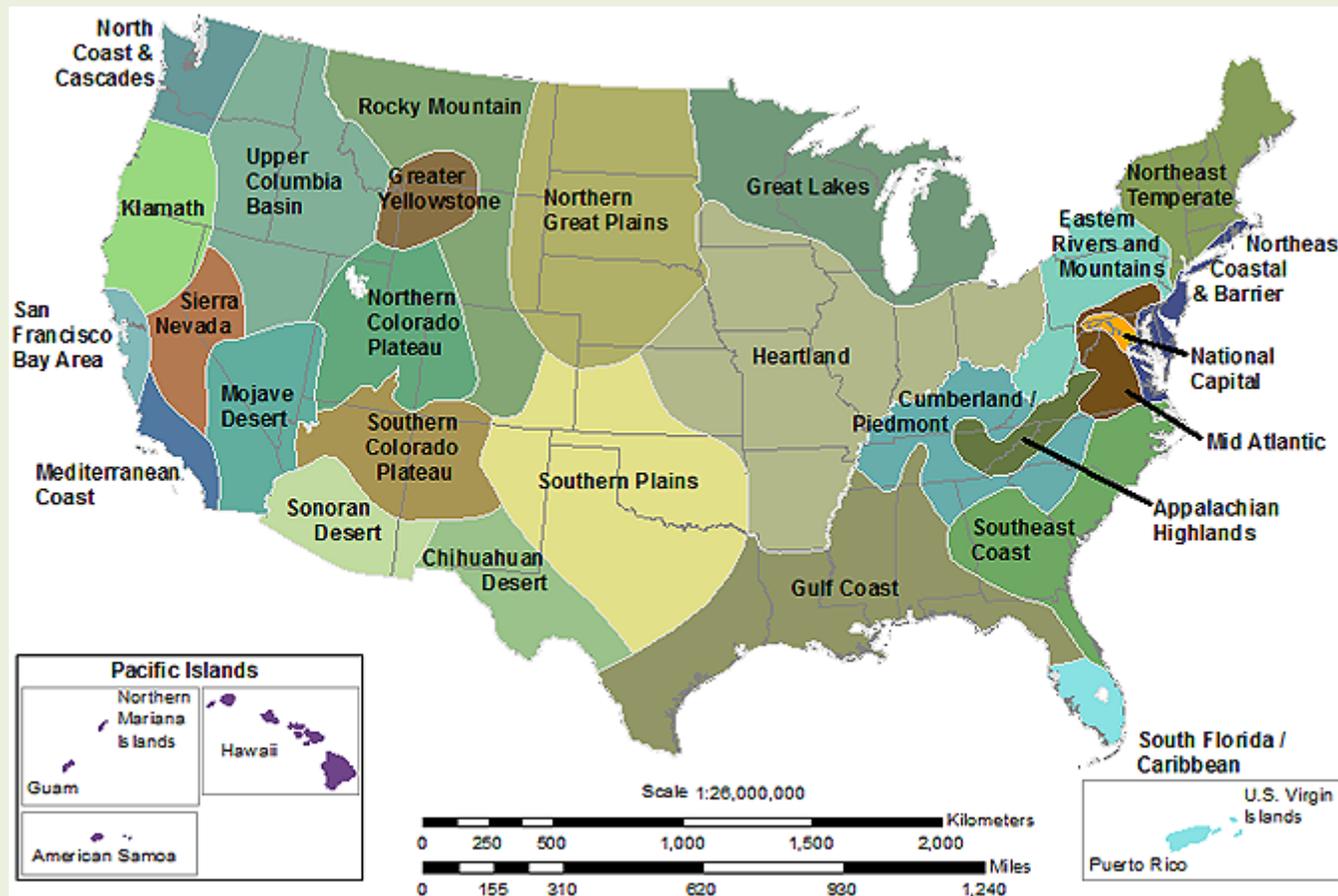
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(presenter)



Black Hills Area Botanist  
and Ecologist Workshop  
March 2012

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# The Northern Great Plains Network is one of 32 networks designed to assist national park units with inventory and long-term monitoring of natural resources



# **NGPN will monitor forest health, structure, and fuels in 4 parks in the Black Hills**



- Mount Rushmore National Memorial (MORU)
- Jewel Cave National Monument (JECA)
- Wind Cave National Park (WICA)
- Devils Tower National Monument (DETO)

# Program Objectives



- Capture baseline data on the status of forests in Devils Tower, Wind Cave, Jewel Cave, and Mount Rushmore
- Document long-term trends in forest communities
- Explore the relationship between changes in plant communities and climate change, fire, forest management, and other disturbances
- Provide information to assist park managers in decision-making



# Sampling Design

- Long-term plots are at random locations within a park and are representative of the forested areas
- Number of plots is proportional to the size of park
- Forests surveyed every 5 years

<b>Park Units</b>	<b>Mount Rushmore</b>	<b>Jewel Cave</b>	<b>Wind Cave</b>	<b>Devils Tower</b>
Number of plots	60	60	80	75



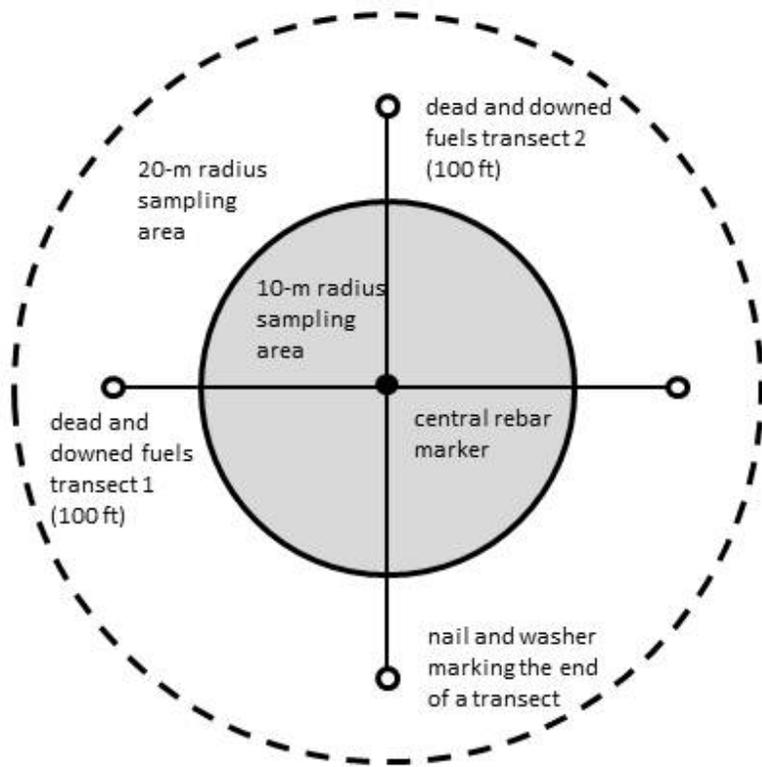
### Northern Great Plains Inventory and Monitoring Network Plant Community Monitoring



Long-term  
plots  
cover  
large  
areas of  
the parks



<b>Park Units</b>	<b>Years sampled</b>
Mount Rushmore	2010, 2016, 2021, 2026....
Jewel Cave	2011, 2016, 2021, 2026....
Wind Cave	2012, 2017, 2022, 2027....
Devils Tower	2013, 2018, 2023, 2028.....



- Trees, poles, tall shrubs, and seedlings are recorded in 10-m radius from the center of a plot
- Dead and downed fuels are measured along 2 perpendicular 100 ft transects
- Where there are fewer than 5 trees, radius is extended to 20 m





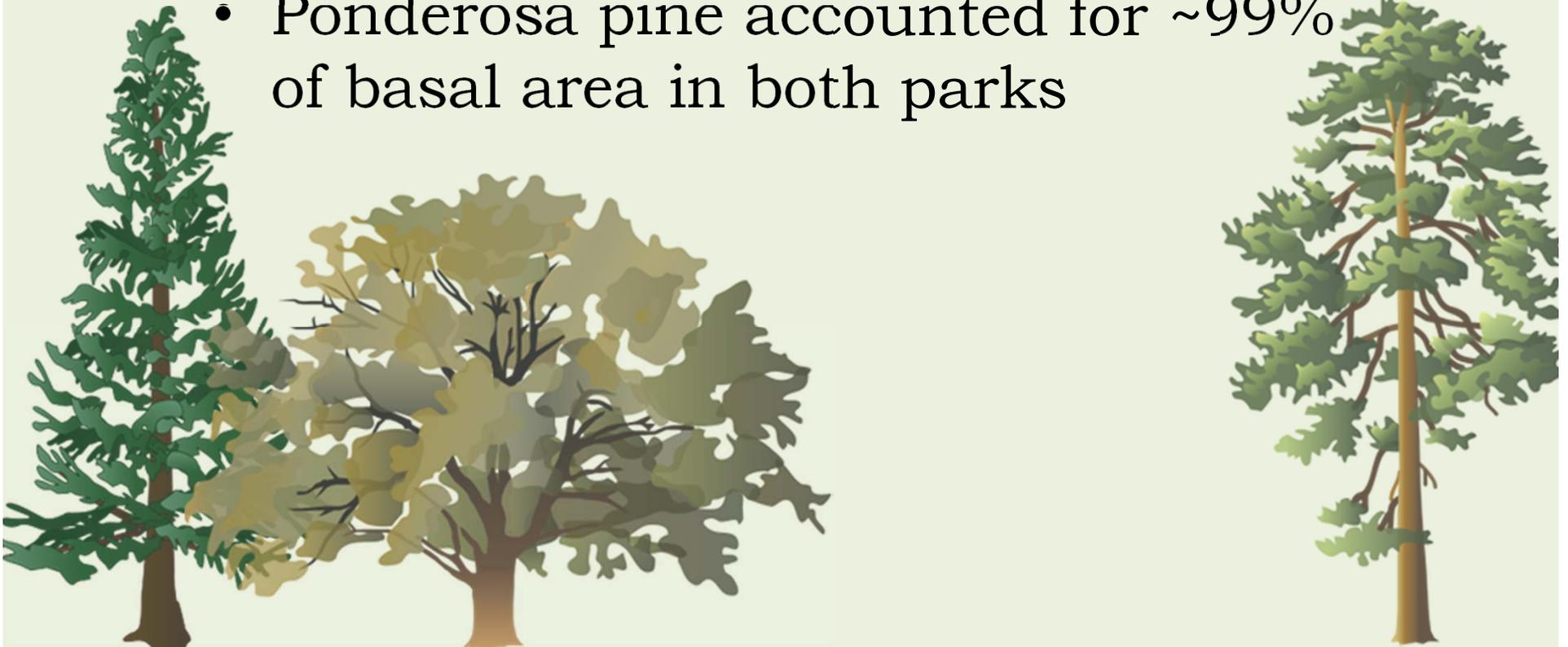
## **Disturbance & Target Species**

- Survey natural and anthropogenic disturbances in the plot area
- Assess the cover of targeted exotic species
- Document any occurrences of rare plants



# Monitoring Results

- 60 forest plots and 2879 mature trees in Mount Rushmore in 2010
- 60 forest plots and 929 mature trees in Jewel Cave in 2011
- Ponderosa pine accounted for ~99% of basal area in both parks



# Mount Rushmore and Jewel Cave have different forests



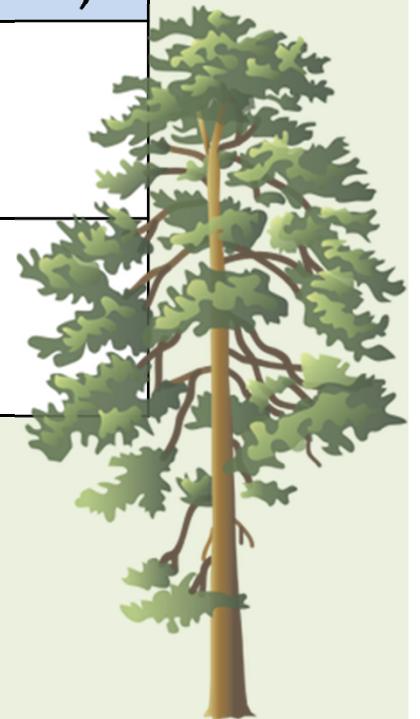
- In 2010, Mount Rushmore 50% had recent thinning activity, 33% was old growth forest, 57% had evidence of past fires, and 23% had mountain pine beetles.



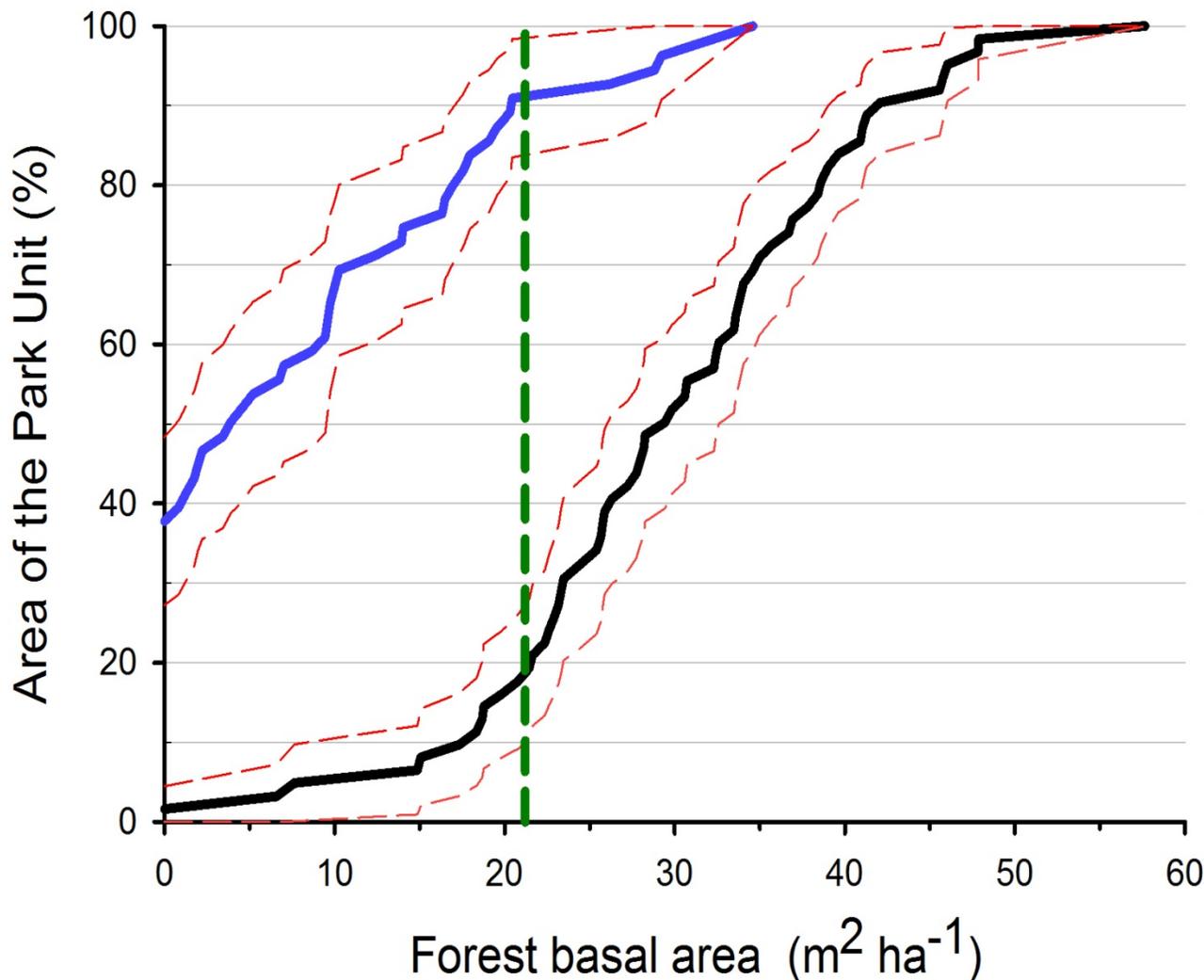
- In 2011, 100% of Jewel Cave had evidence of past fires and we found no evidence of mountain pine beetles.

Basal area was much higher in Mount Rushmore but seedling densities were similar in the two parks

Park	Basal area (m <sup>2</sup> /ha)	Seedling density (stems/ha)
Mount Rushmore	30 ± 1.1	8446 ± 3264
Jewel Cave	8 ± 1.3	7060 ± 1196



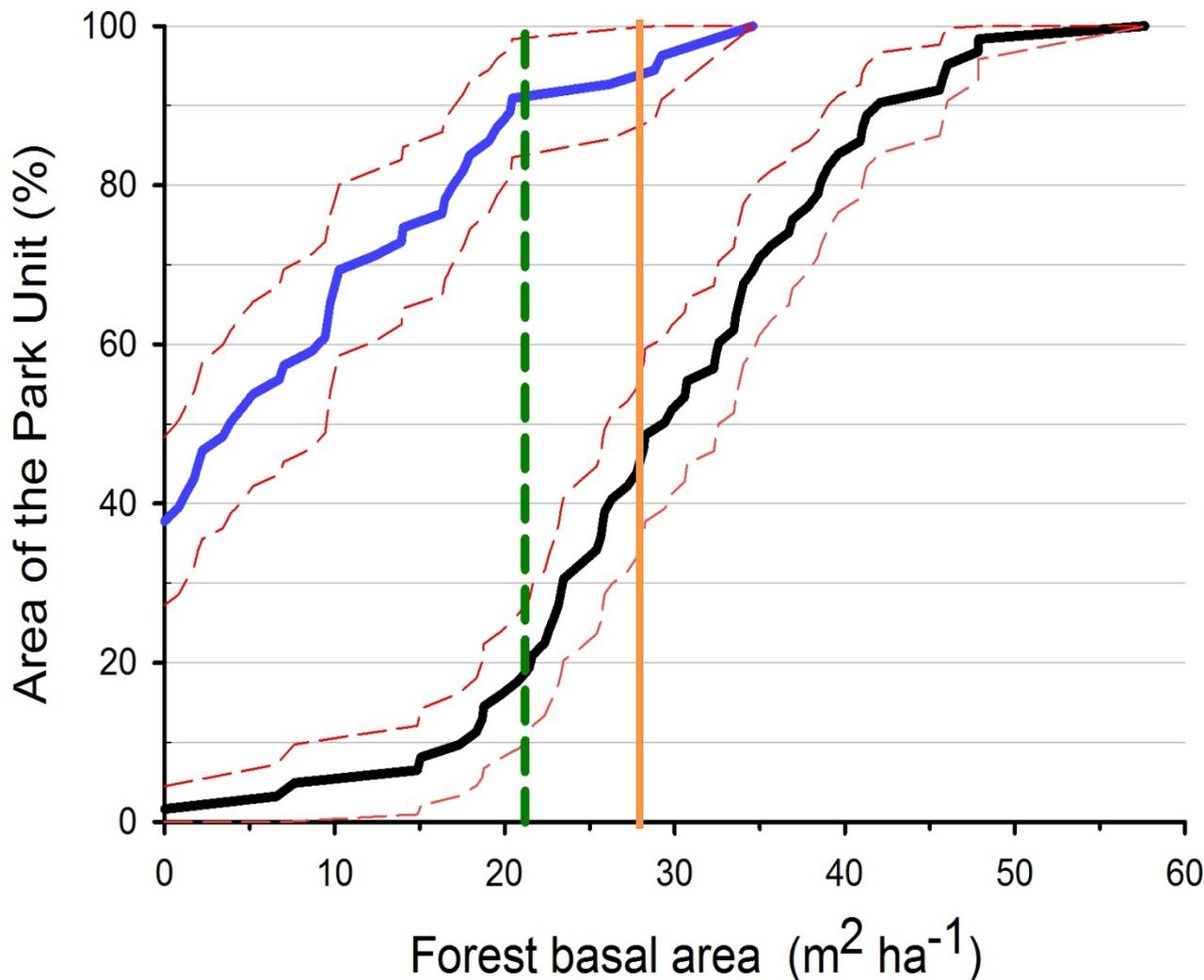
Over 80% of MORU forests and less than 10% of JECA forests are denser than the average of the Black Hills National Forest



- MORU (2010)
- - - 95% confidence intervals
- JECA (2011)
- - - BHNF (2006)



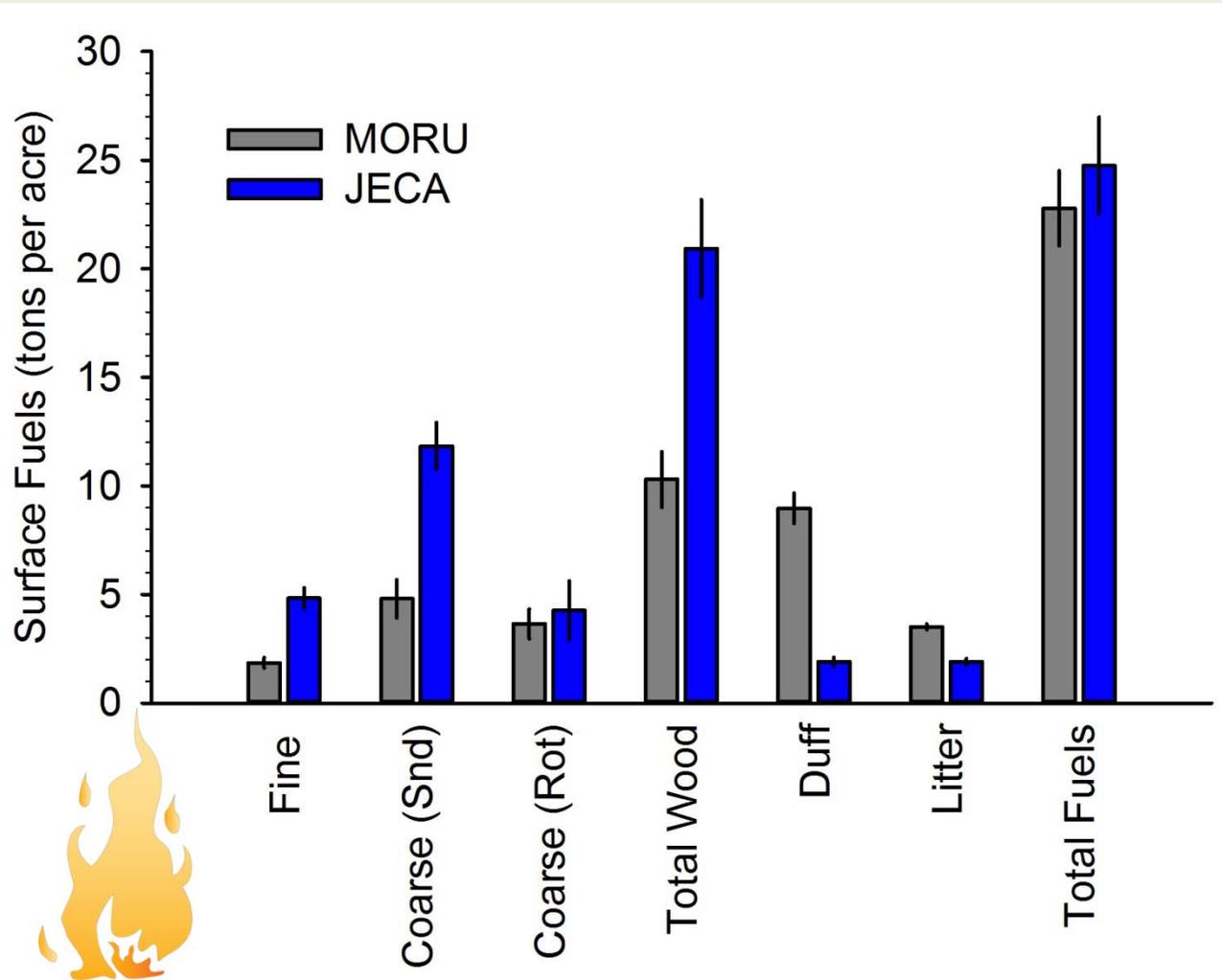
Over 50% of MORU forests and less than 10% of JECA forests are at increased risk of mountain pine beetle infestation



- MORU (2010)
- 95% confidence intervals
- JECA (2011)
- BHNF (2006)



# Mount Rushmore and Jewel Cave have a similar total fuel load but fuel composition differs



# Conclusions and Future Directions

- Our current data provide a snapshot in time of the status of forest health and structure at 2 national park units
- The 2010 Mount Rushmore data will provide a baseline understanding of forest composition prior to a large-scale thinning project



# Conclusions and Future Directions



- Subsequent surveys will allow us to detect change over time or as a result of disturbances (e.g. fire and beetles) or management actions
- Surveys at Wind Cave (2012) and Devils Tower (2013) will increase our understanding of those parks and the Black Hills region

# Questions?



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