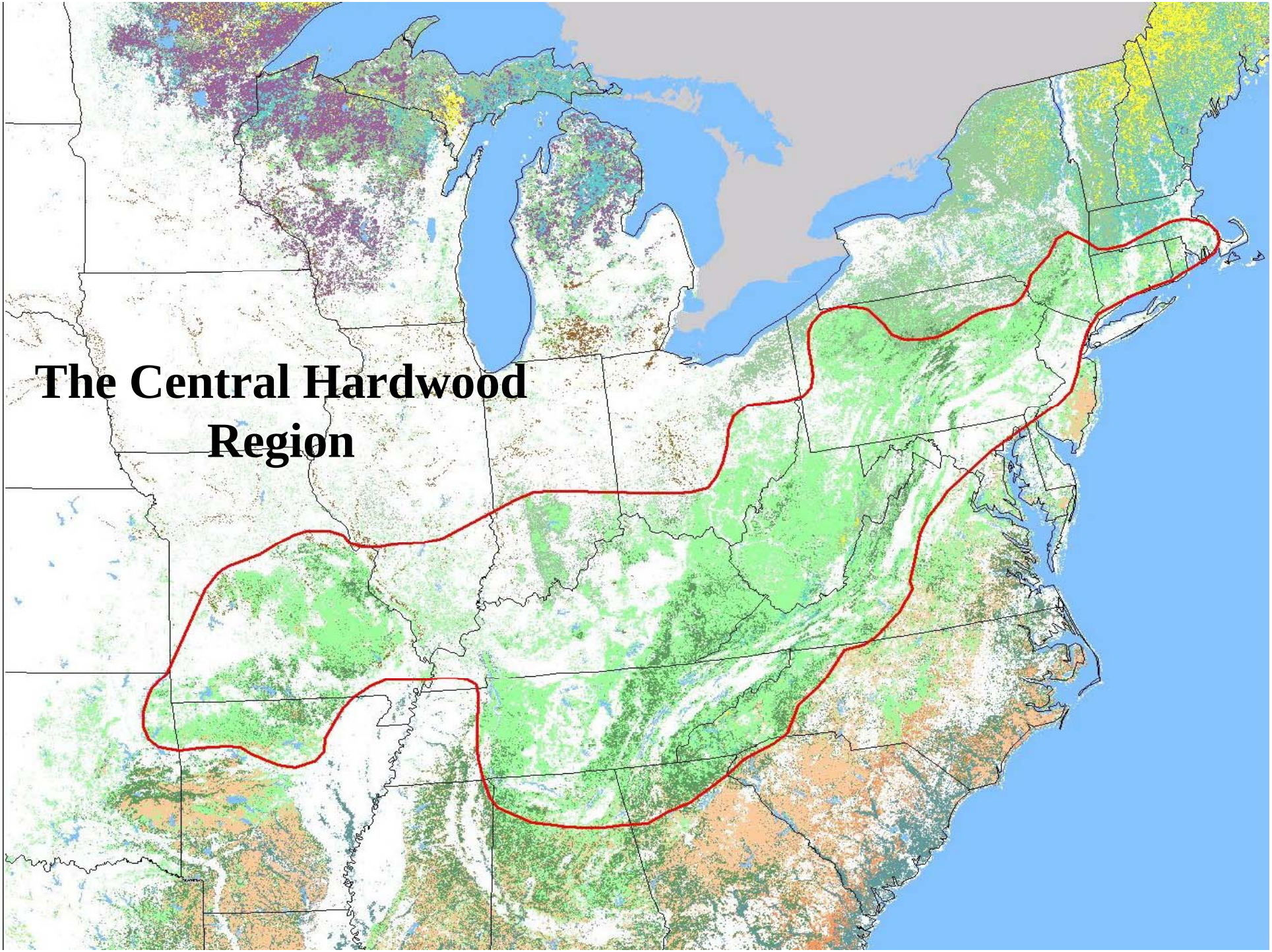
Fuel Loading in the Central Hardwoods

Presenter:
Jeremy Kolaks
Graduate Research Assistant
University of Missouri - Columbia


The Central Hardwood Region

<u>Question</u>: Why is fuel loading information important in the Central Hardwood Region?

<u>Answer</u>:

1. **Historic land use and agency policy has changed vegetative structure.**

2. **Little to no fuel loading information exist for the area.**

3. **Managers use treatments that concern or affect fuel loading on a regular basis.**

Pre-Settlement (circa 1820)

- **Pre-settlement accounts of the Missouri Ozarks describe open woodlands with little or no underbrush.**

- **This open forest structure was the result of an anthropogenic fire regime, dominated by light surface fires.**

- **The Mean Fire Interval (MFI) was 17.7 and 12.4 years during the Native American Depopulated (1580-1700) and Repopulation Period (1701-1820) Period, respectively.**

Settlement (1821-1940)

- **By 1910 a majority of the Ozarks had been completely cut over to feed the westward expansion of the United States.**
- **Shortleaf pine (*Pinus echinata* Mill.) was highly valued by lumbermen.**
- **Oak was typically hewn into railroad ties.**
- **Harvesting was done with no consideration to the regeneration of future forest.**

Settlement (contd.)

- **Cut-over land was bought by settlers and frequently burned to control oak sprouting and encourage the growth of pasture.**

- **The MFI = decreased to 3.1 years**

- **Accumulation of slash resulted in frequent intense fires undoubtedly having an effect on pine regeneration and recruitment.**

Suppression

- **In the 1930's state and federal agencies began suppressing wildfires.**

- **Fire crews were formed, towers erected, and public educations programs started.**

- **The statewide fire rotation length (1970 to 1989) increased to 326 years.**

- **In the Arkansas Ozarks, the MFI increased to >80 years for the period 1921 – 2000.**

Today's Forest

- **A 66 percent reduction in relative pine abundance from historic levels.**
- **Shortleaf pine range reduced from an estimated 2.6 million ha to 162,000 ha in 1976.**
- **Suppression created conditions favorable to the development of dense oak forest.**
- **All indications suggest fuel loadings have been allowed to increase, unchecked by periodic fire.**

Management Today

- **Currently state/federal agencies and private organizations are using prescribed fire, harvesting, thinning, or combinations of the these treatments as management tools.**

- **In 2002 they applied prescribed fire to 24,000 ha in Missouri.**

- **In many cases these treatments are used in the restoration of habitat and biodiversity.**

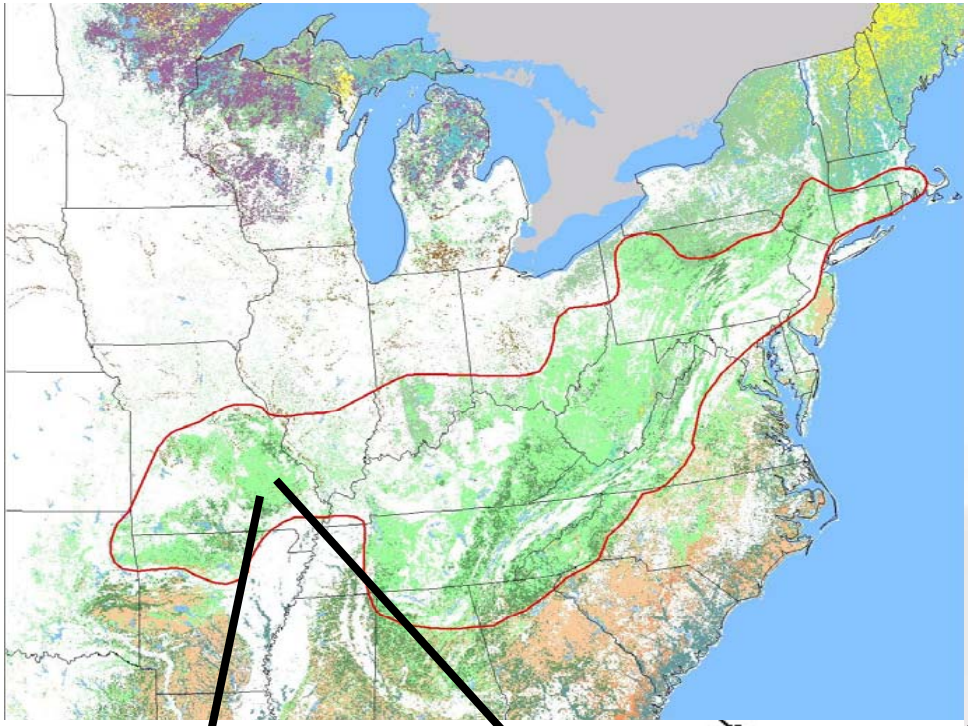
- **However, the effects of management activities on fuels are poorly understood. Even baseline fuel loadings are not known for the area.**

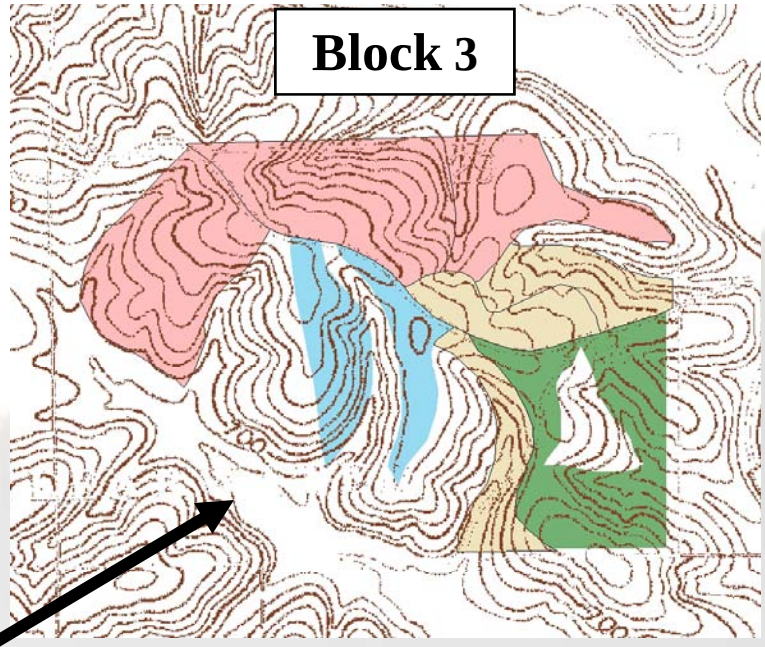
Purpose

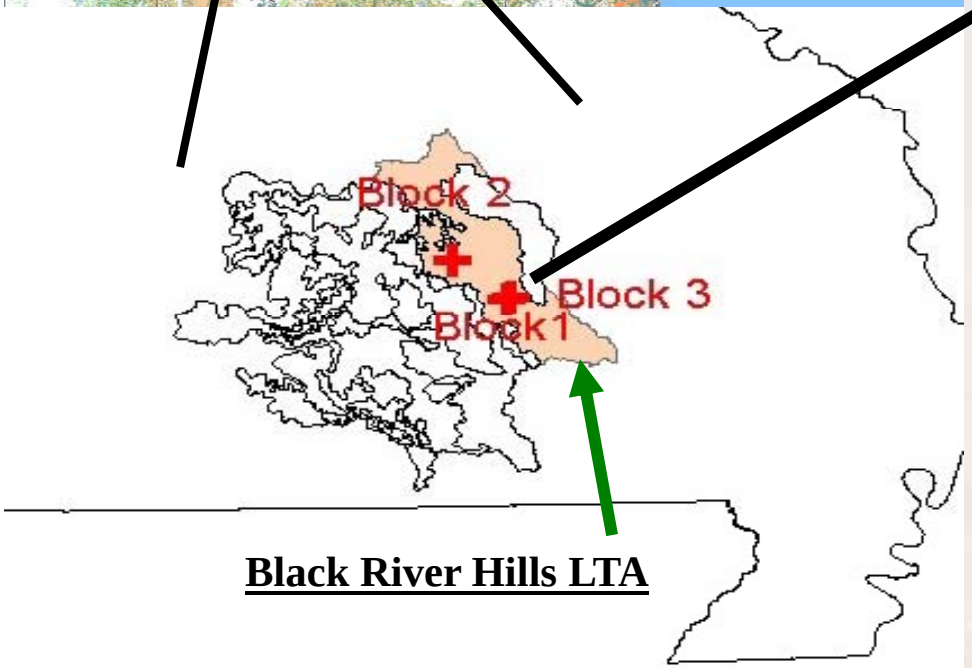
1. **Determine existing fuel loads.**
2. **Determine whether aspect (exposed, ridge, and protected) has an affect on fuel loading.**

Study Area

- **Located in the southeastern Missouri Ozarks on land managed by the Missouri Department of Conservation.**
- **Installed within the Black River Oak-Pine Woodland/Forest Hills Land Type Association.**
- **Stands had no management or fire for 30 years.**
- **Stands were fully stocked oak-hickory and oak-pine forest types.**

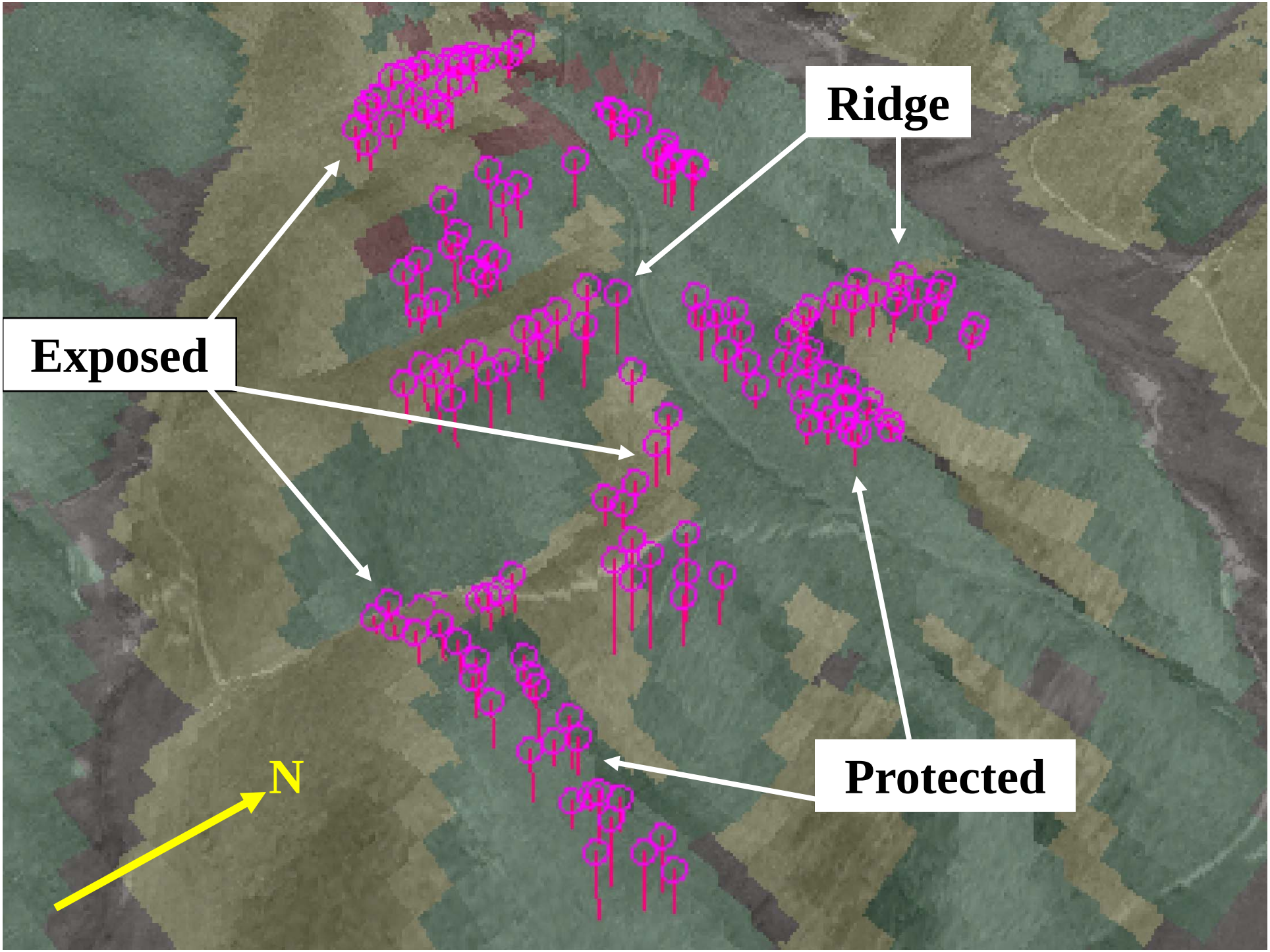






Black River Hills LTA

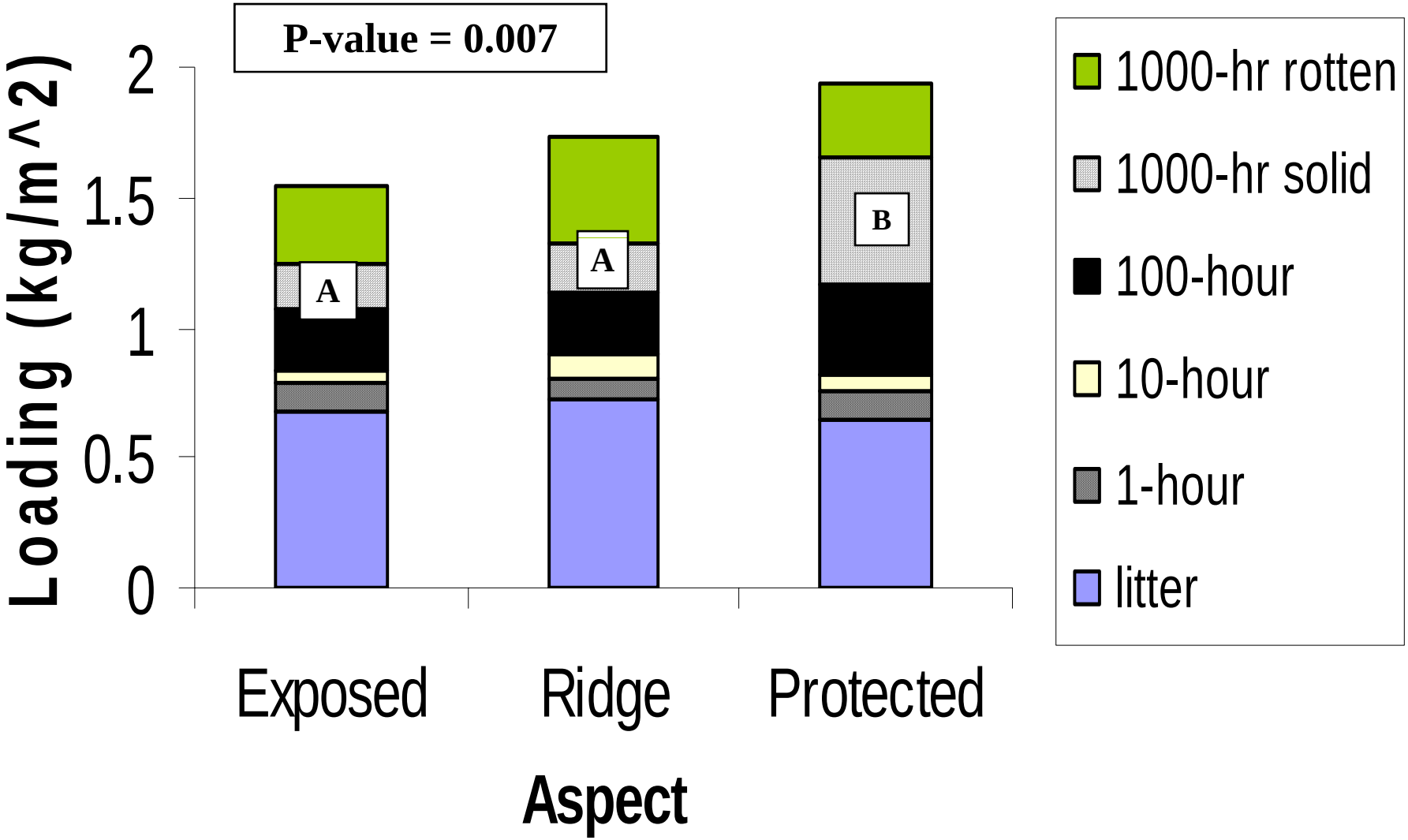
Replicated across three complete blocks of twelve stands each (3 aspect classes X 4 treatments) making each stand an aspect/treatment unit.

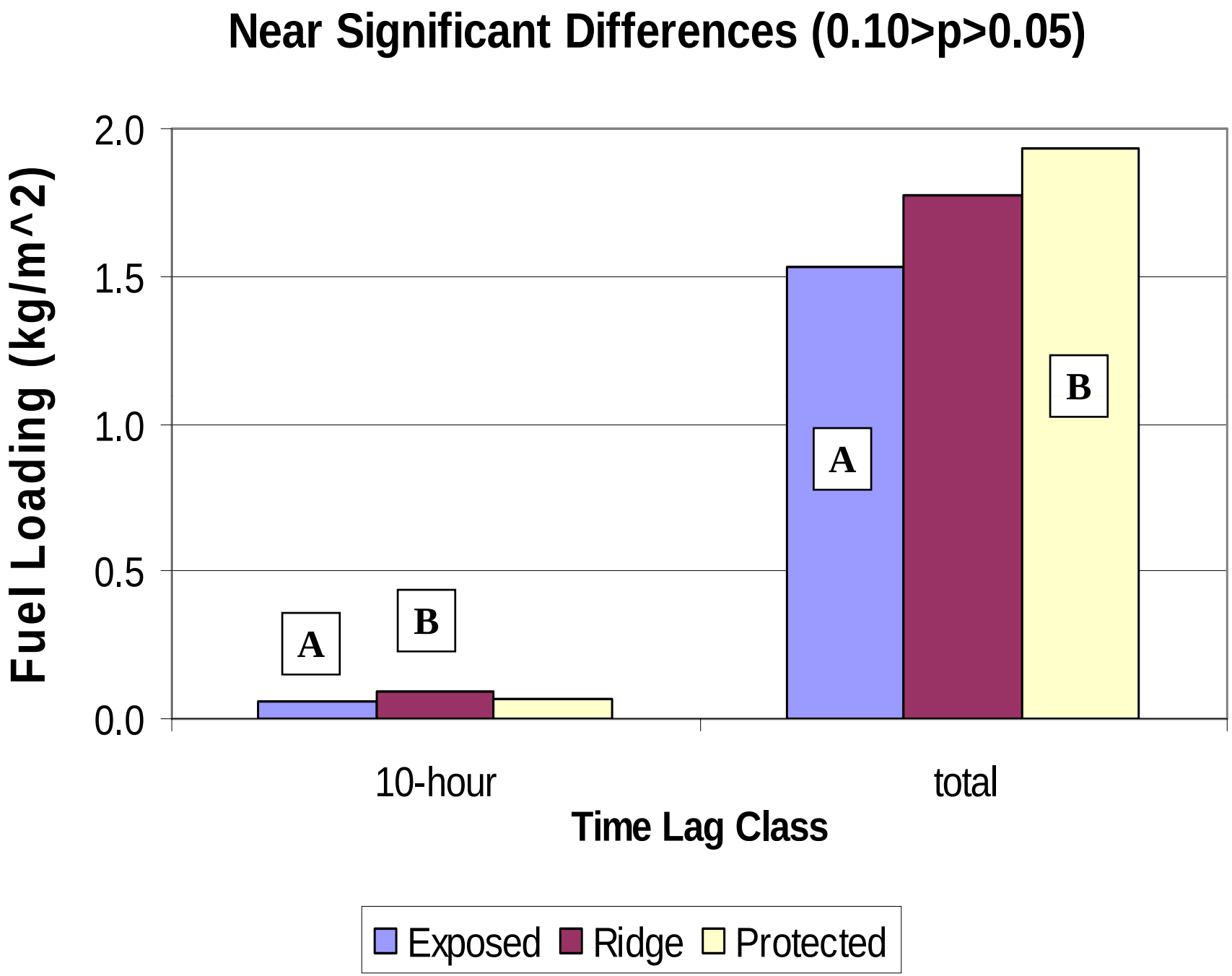

Ridge
Exposed
Protected
N

Data Collection

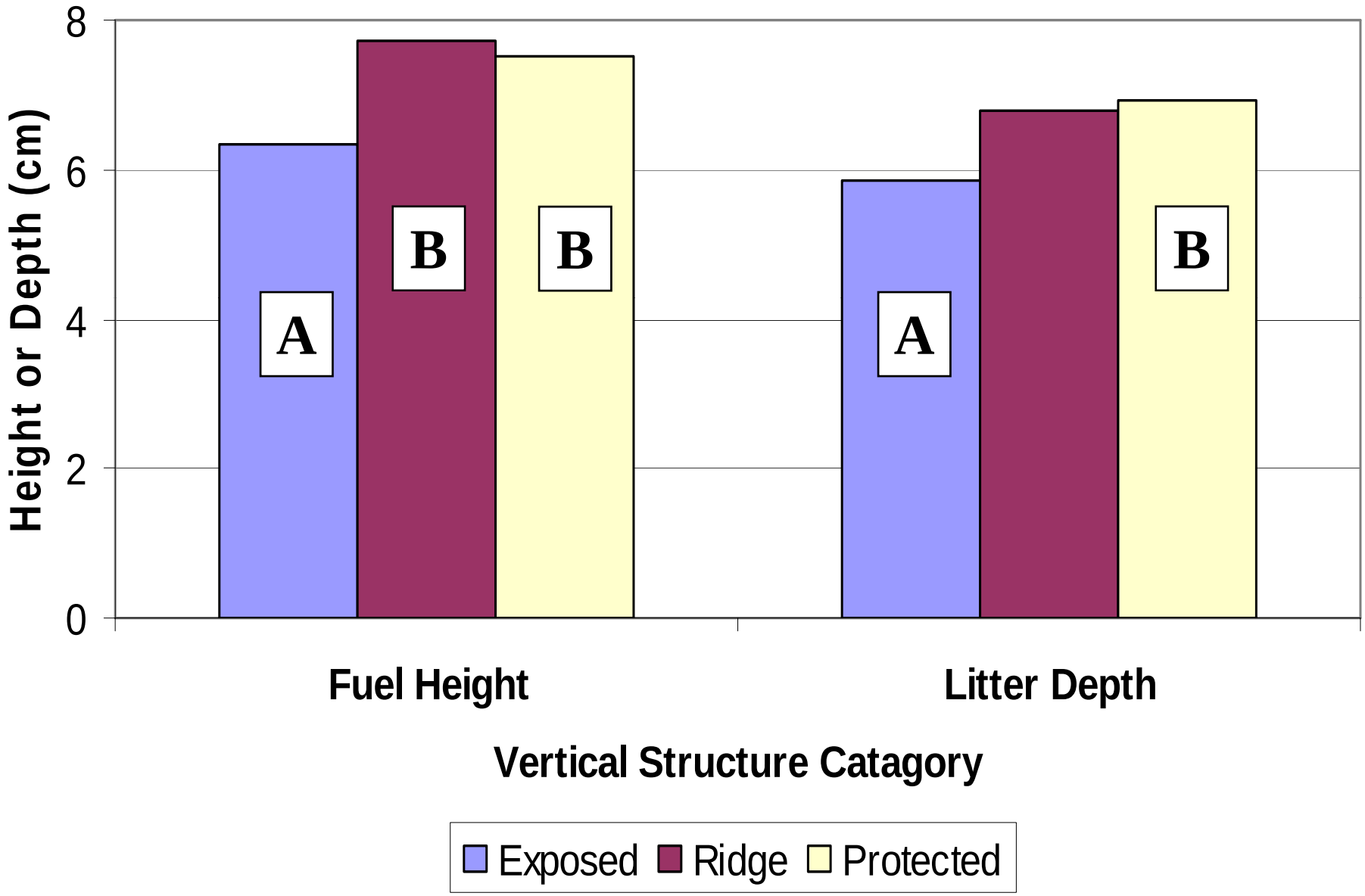
- **Data were collected from 15 randomly chosen points within each stand using a modified transect intercept method.**
- **Woody fuel was separated into four size classes: 1, 10, 100, 1000-hour fuels. 1000-hour fuels were separated into solid or rotten categories.**
- **Litter was collected from 0.2 m^2 clip plots located at the end of each transect.**
- **Fuel height, litter depth, and duff depth were measured at 1.5 m intervals along the 15.2 m long transect starting at 0.3 m.**

Fuel Loading by Aspect and Timelag Class

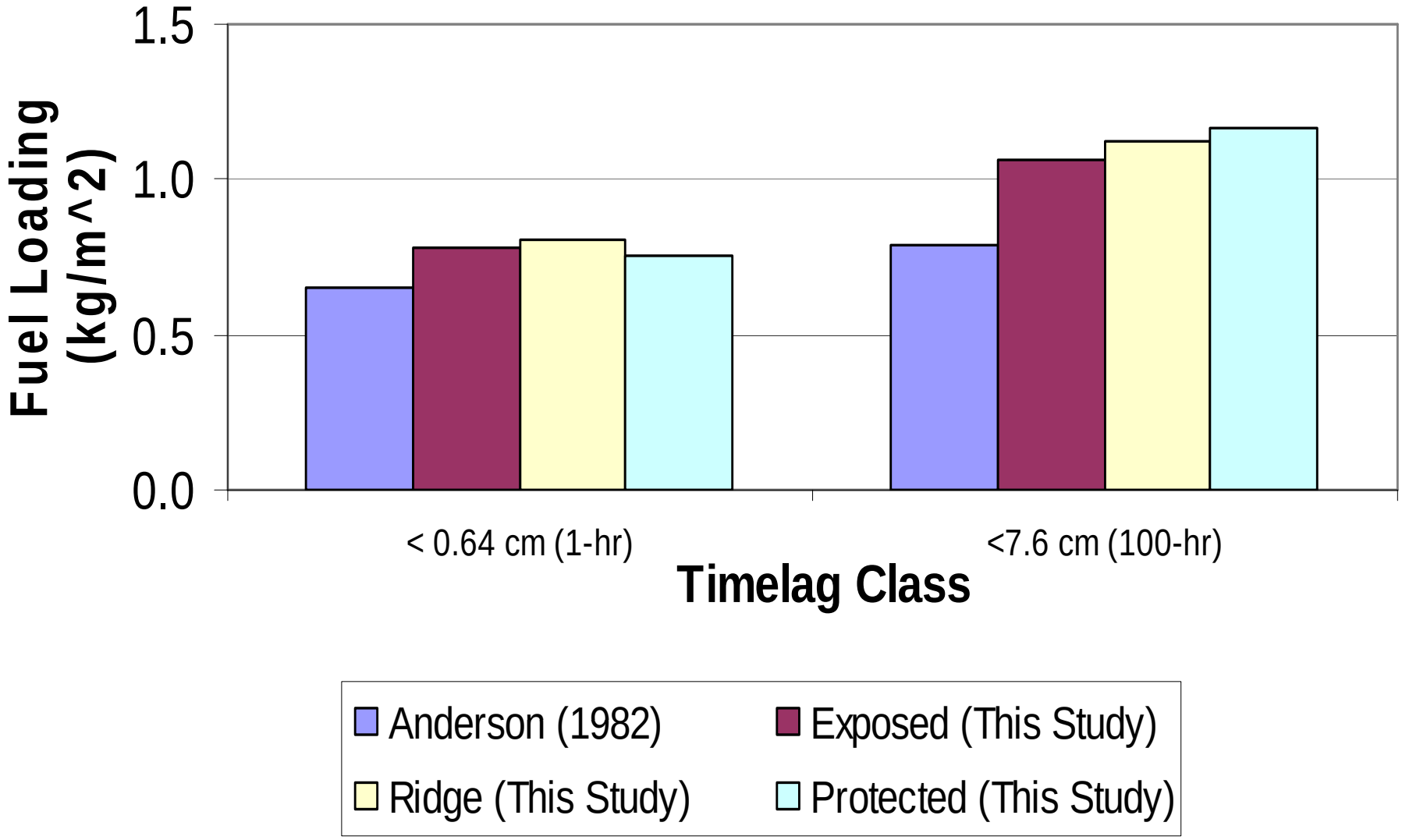



Near Significant Differences (0.10>p>0.05)
Fuel Loading (kg/m^2)
2.0
1.5
1.0
0.5
0.0
A
B
A
B
10-hour
total
Time Lag Class
Exposed
Ridge
Protected

Near Significant Difference (0.10>p>0.05)



Comparison of Fire Behavior Fuel Model 9 to Our Results



Conclusions

- **Aspect does not significantly effect total fuel loading.**
- **Aspect significantly affected 1000-hour rotten fuels under fully-stocked forested conditions in the Central Hardwoods of Missouri.**
- **With exception to 1000-hour rotten fuels, a single fuel loading value may be reliably used to predict fire behavior on any slope.**
- **Differences in fuel loading due to landscape position may exist at smaller levels of ecological classification.**
- **Constants for calculating fuel loading in the Central Hardwood Region need to be developed.**

Bruce Cutter

Edward Loewenstein

Keith Grabner

George Hartman

John Kabrick

Thanks

- **Sandra Clark, Nick Cahill, Michael Garcia, Erin McMurry, William Dijak and others.**
- **Missouri Department of Conservation: Garwood, Ellington, and Ironton Work Teams, and Resource Science Division**
- **USDA Forest Service: North Central Research Station and Mark Twain National Forest**
- **Dr. Mark Ellersieck, UMC Ag Experiment Station Statistics**
- **Jason Jenkins, UMC Extension and Ag Information (select photographs)**