Smoldering combustion of organic soils on the North Carolina coastal plain

James Reardon, RMRS Fire Science Laboratory, Missoula, MT
Gary Curcio, IPA Fire Environment Consultants, Kinston, NC
Primary Objectives

• At present, tools for evaluating the potential for ground fire are limited and the guidelines used in fire planning and suppression are based largely on local experience.

• Indices such as the Keetch-Byram Drought Index which are commonly used to evaluate the risk or fire danger in organic soils are based only meteorological inputs and do not incorporate any soil properties or hydrologic inputs.

• This study demonstrates the use of a new alternative to estimate the smoldering potential of sustained smoldering in organic soils.
Flaming and Smoldering Combustion
Safety and Health Concerns

Pains Bay Fire: Dense Smoke on Highway 264 NC
Credit: Rob Shackelford, NCFS

Pains Bay Fire: Smoke Drift Map 6-24-2011
Suppression Activities

Potato patching

Fire Break and Sprinkler line
North Carolina Wetlands and Study Sites

Figure 4. Wetlands

Legend:
- Deepwater habitats
- Deepwater rivers
- Areas predominately wetland
- Rivers or streams predominately wetland

Pocosin
Swamp on a hill

Organic Soil Thickness
Hydroperiod
Fire Frequency
No Burn/ Burn Threshold

![Graph showing moisture content and mineral content percentages, with various vegetation types and the No Burn/Burn Threshold line.]

- Pocosin
- Upper Sphagnum
- Reindeer/Feather
- Sedge Meadow (middle)
- White Spruce duff
- Sedge Meadow (lower)
- Lower Feather
- Upper Feather
- Lower Sphagnum
Estimated Smoldering Probability
Root Mat Samples
Lower Muck Samples
Moisture Limits of Root Mat Soils

North Carolina Root Mat

Soil Type
- North Carolina Root Mat
- North Carolina Sapric
- Alaska Feather moss

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<th>Moisture Content</th>
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<td>Mineral Content</td>
<td>1.1%</td>
<td>2.7%</td>
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<tr>
<td>Estimated Smoldering Potential</td>
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Moisture Limits of Lower Muck Soils

North Carolina Sapric

Soil Type

- North Carolina Root Mat
- North Carolina Sapric
- Alaska Feather moss

Moisture Content

- 261

Mineral Content

- 0 0 0

Estimated Smoldering Potential

- 9.4% 9.4% 9.4%
Research Prescribed Burn
Green Swamp, Brunswick County NC

![Image of a prescribed burn]

![Image of a cleared area]

![Graph showing depth versus moisture content for root mat and muck soil, with ESP < 10%]
Root mat moisture content

![Box plot showing moisture content (%)]

- **Driving Crk**
  - Upper Rootmat
  - Lower Rootmat

- **Meyers Tract**
  - Upper Rootmat
  - Lower Rootmat

**Burn Site**

Moisture Content (%)
Soil moisture and estimated smoldering potential at Pocosin Lakes NWR
Summary

• The lack of organic soil consumption on these research burns was consistent with our laboratory work and other burning conducted on similar sites.

• Acknowledgements

• We would like to thank the Nature Conservancy and the North Carolina Division of Forest Resources and the DOD at Camp Lejeune for their collaboration on this project.