Understanding the Vulnerability of Everglades Peat Soils to Smouldering Combustion

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The Paradox of Fire in the Everglades

"the herbaceous Everglades and the surrounding pinelands were born in fires…they can survive only with fires…they are dying today because of fires."

– Egler 1952 (sensu Gunderson and Snyder 1994)

Photo: J Wallace

Understanding Wetland Fire Behavior

Impacts of Smouldering Peat Fires

- Ecological Impact
  - Loss of soil carbon & elevation
  - Increased radiative forcing

www.geocities.ws

- Human Impact
  - Reduced visibility
  - Health risk

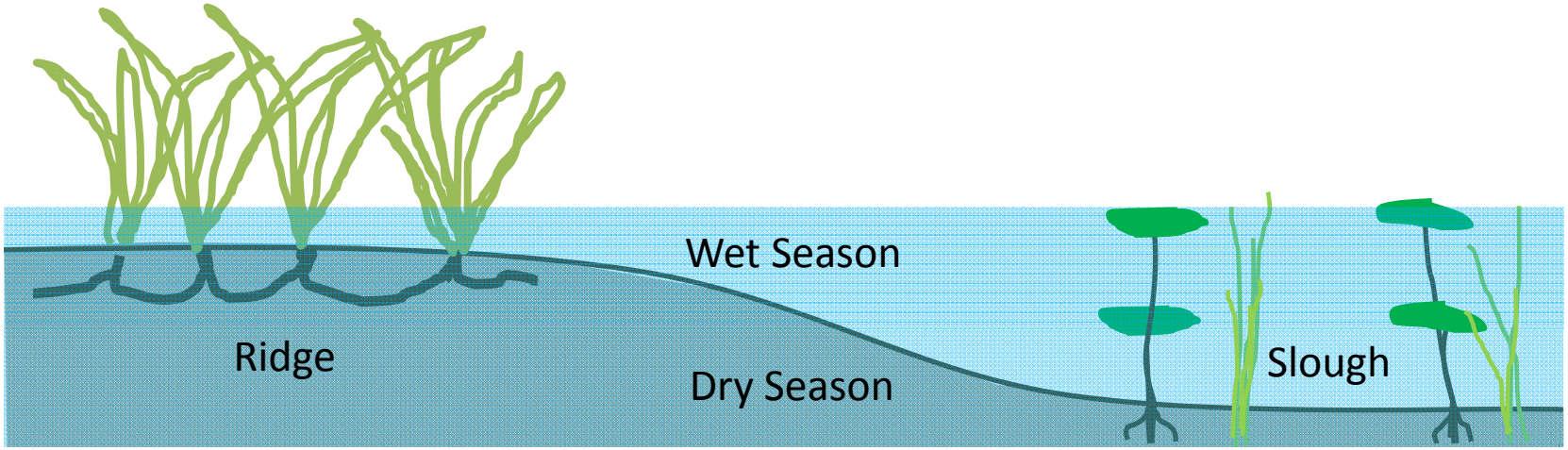
www.washingtonpost.com

www.nytimes.com

- Management Impact
  - High suppression costs

Controls on Fuel Condition

- Fuel properties influenced by water table
- Slight elevation makes the difference between being flooded seasonally or year round

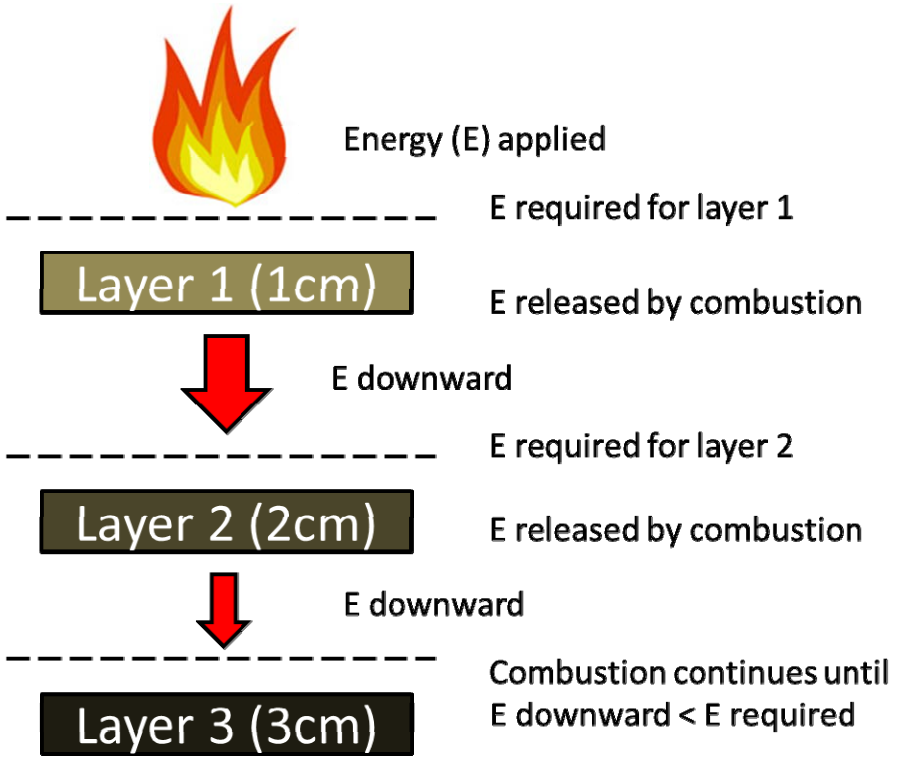


WCA 3AS
Ridge and Slough

June 2010

June 2011

Modeling Depth of Burning in Peat Fuels



(Benscoter et al. 2011- Int. J Wild. Fire*)*

Sampling Everglades Soil Properties

- 2011 soil core collection
  - WCA 3A & 3B

- 5 cores per location
  - 10cm dia., 50cm deep
  - 1cm depth intervals

Trade-offs in Soil Vulnerability to Combustion

- No difference in projected combustion vulnerability
- North WCA 3A
  - Mineral content
- South WCA 3A
  - Moisture
- Negative feedback to reburning?

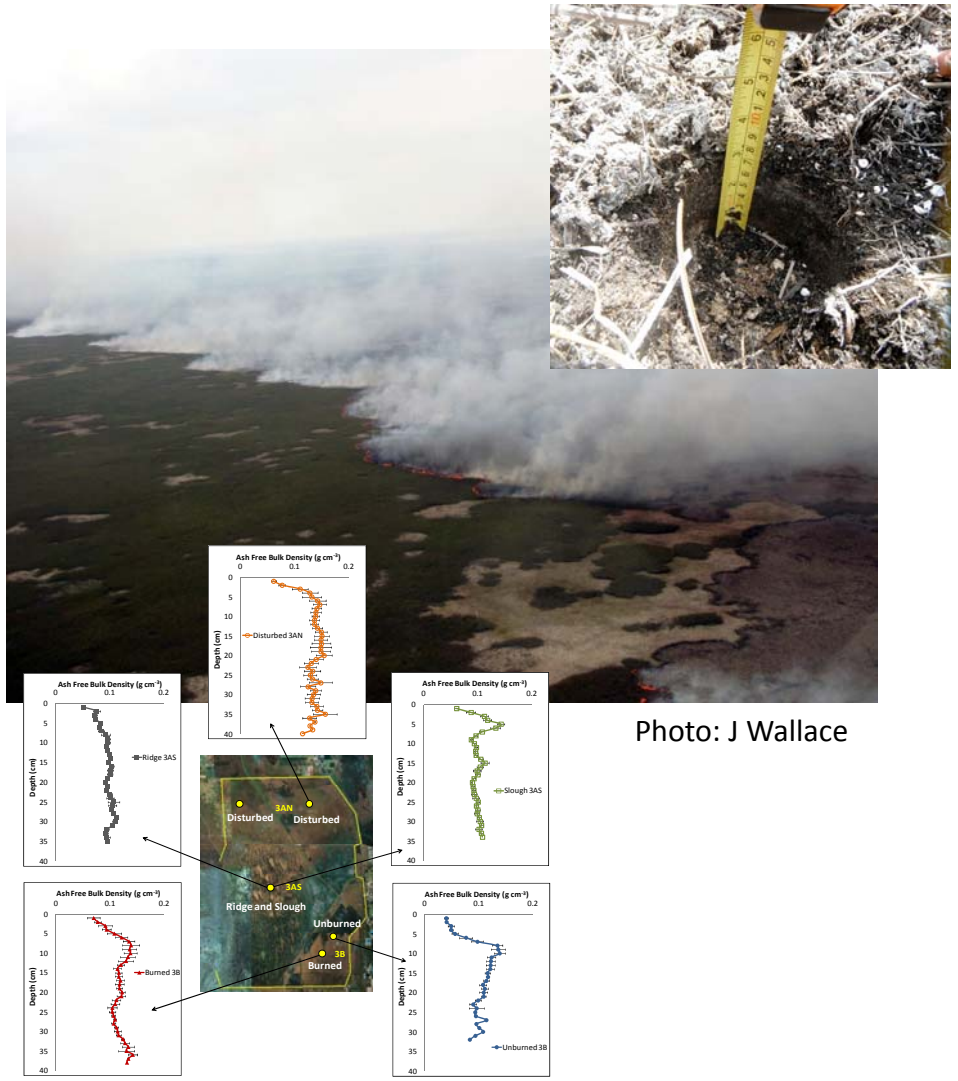
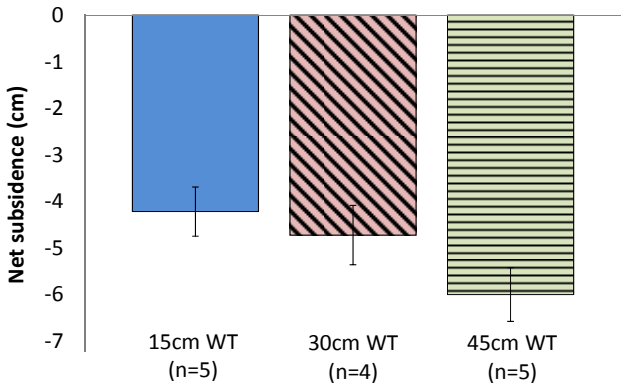


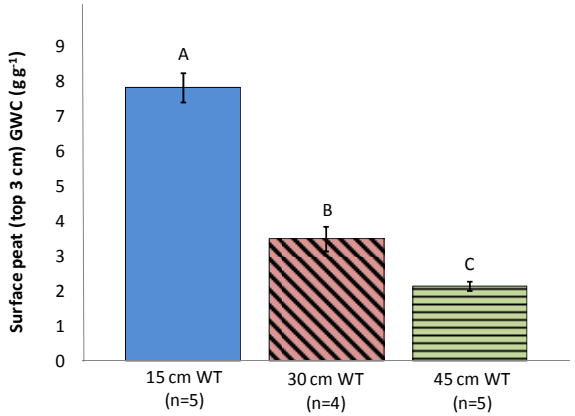
Photo: J Wallace

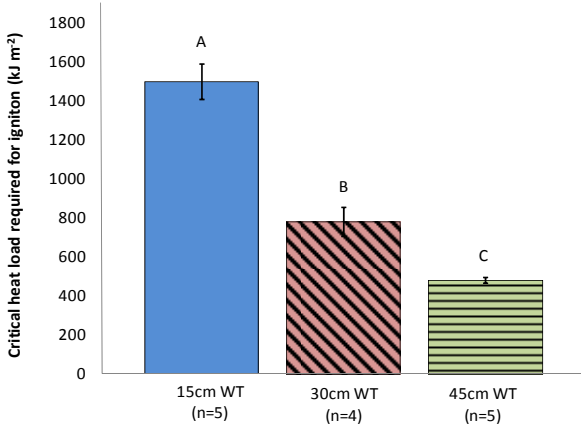
Nungesser et al. 2014– Env. Man.
J Johnson, FAU Env Sci MS

Water Table Controls on Fuel Properties

- Soil core water table manipulation
- Subsidence & soil moisture







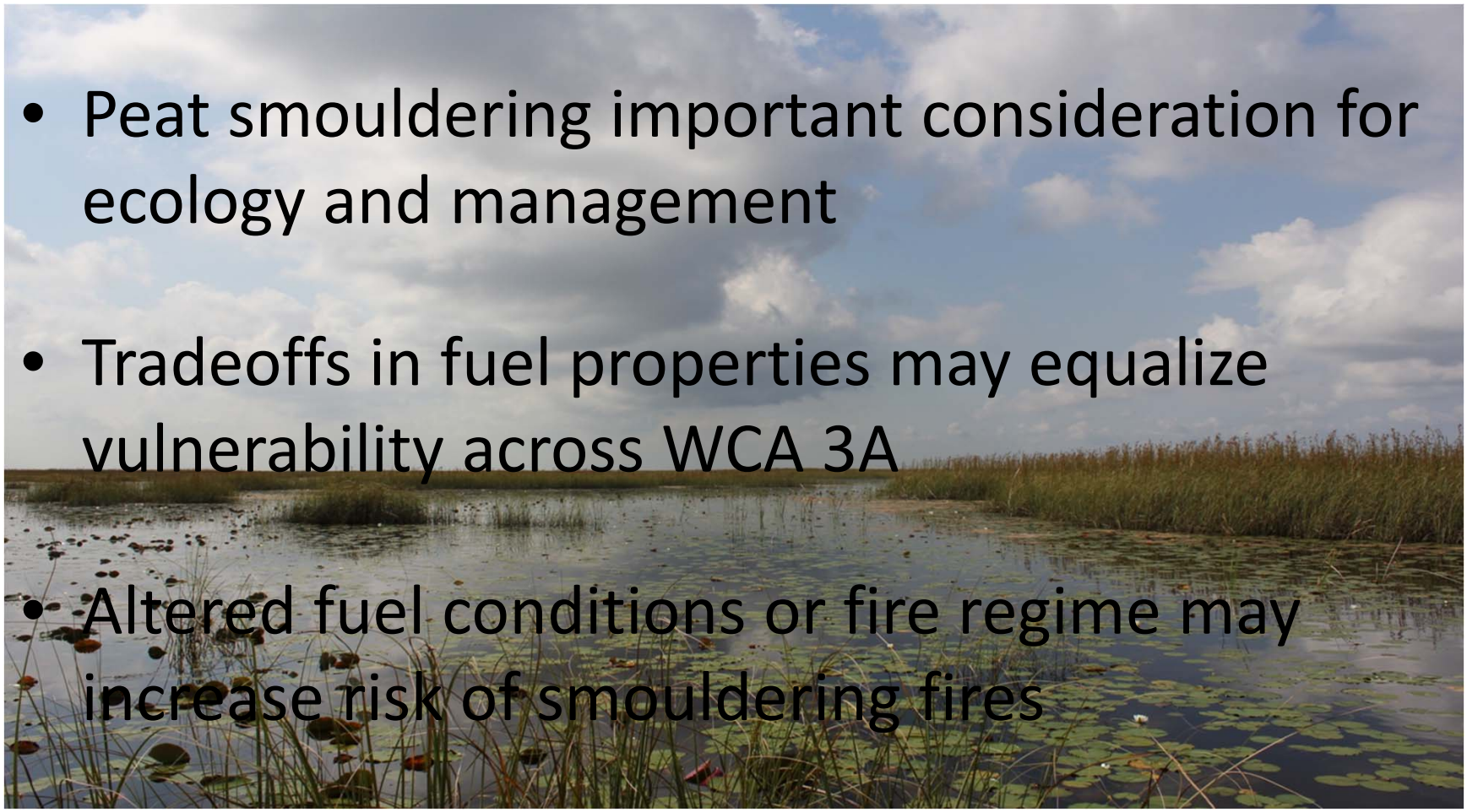
Johnson et al. in prep.

Soil Moisture Influence on Smoke Emissions

- USFS Fire Sciences Laboratory Burn Chamber

- Manipulate soil moisture conditions (100-300%)
- Soil moisture influence on combustion products
  - Pyrogenic (black) carbon

The Risk of Smouldering in the Everglades



- Peat smouldering important consideration for ecology and management
- Tradeoffs in fuel properties may equalize vulnerability across WCA 3A
- Altered fuel conditions or fire regime may increase risk of smouldering fires

Acknowledgements

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(Photo: J Johnson, SWS SAC Student Photo Contest)