Gridded Fire Danger Estimates for Spatially Continuous Fire Risk Monitoring

Corey Davis and Rebecca Ward, State Climate Office of North Carolina

Background

- Fire danger parameters describe the ability of the environment to support fire
- These parameters, including those in the **National Fire Danger Rating System (NFDRS)**, are frequently used in monitoring both local and statewide conditions
- Calculations are based on weather data including air temperature, precipitation, and relative humidity
- Because this weather data was traditionally only available from a handful of weather station observations, the fire danger parameters were sparsely available, requiring interpolation between stations

Keetch-Byram Drought Index

- **KBDI** is commonly used in fire danger monitoring as an indicator for the amount of mop-up needed (e.g., reducing residual smoke) in the event of a fire
- Values from 0 to 800 represent the depth of soil dryness
- KBDI calculation is based on recent daily temperatures & precipitation + historical annual average precipitation
  - Because it includes precipitation, KBDI values can have large local variations, especially in spring and summer

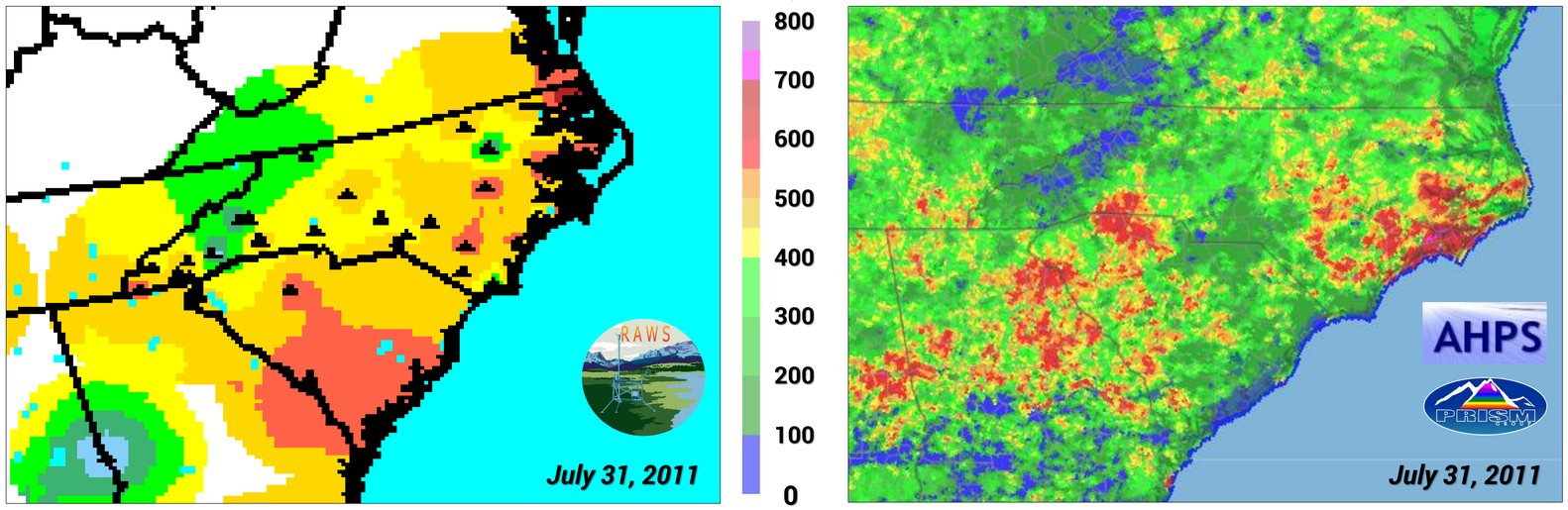
Development

- A gridded KBDI dataset was developed as part of the NIDIS-funded Coastal Carolinas Drought Early Warning System project investigating coastal zone fire risk
- Uses daily precipitation data from NWS AHPS + daily temperature & annual average precipitation from PRISM

Evaluation

- The gridded KBDI product was evaluated against point-based KBDI values at weather station locations
- Gridded KBDI slightly underestimated point values with annual maximum values 136.7 less, on average
  - Attributed to PRISM max. temperature underestimation

KBDI from interpolated point data → ***Gridded KBDI from AHPS & PRISM data***



View gridded KBDI data on the State Climate Office's Water Portal or Fire Weather Portal:

http://climate.ncsu.edu/water/map *http://climate.ncsu.edu/fwip*

Other Indices in Development

- The **Energy Release Component (ERC)** provides a measure of the fuel load, including both fine/flashy fuels and larger fuels, that might burn if a fire were to start
- From the ERC value, the **Adjective Rating** describing the fire danger rating level (below) can be determined
- The NFDRS2016 system introduced new ERC equations to replace decades-old versions that needed human input
- For ERC calculations, gridded temperature, relative humidity, and precipitation data are available from NOAA's Real-Time Mesoscale Analysis dataset

Image from smokeyzone.com

ERC Calculation Steps

GOAL: Have gridded ERC, Adjective Rating datasets ready by spring 2017

1. *Calculate **Equilibrium Moisture Content** using temperature and relative humidity data*
2. *Calculate **dead fuel moisture content** and **Growing Season Index** to estimate greenness*
3. *Input these calculated values into NFDRS algorithms to find **Energy Release Component***
4. *Calculate the **Adjective Rating** based on the historical ERC distribution at each location*