

# Drought and Fire Material



# Moisture in the forest floor



# Moisture is the main climatic factor limiting forest distribution

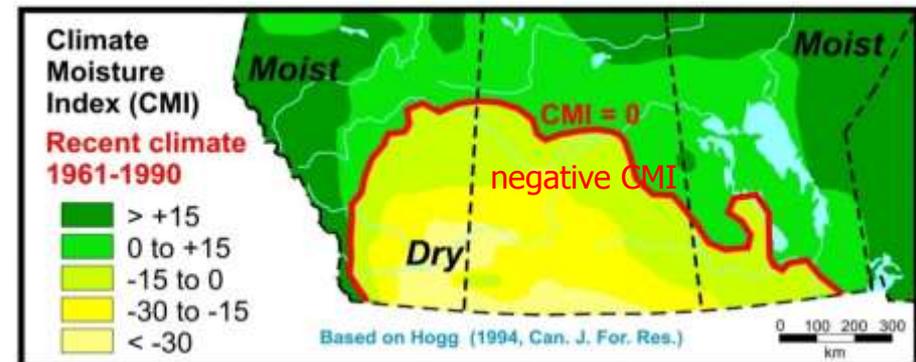
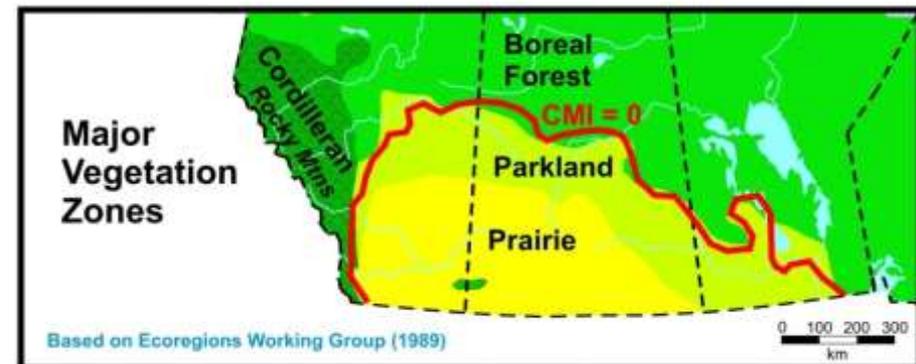
The forest-parkland boundary coincides with “zero-line” of a Climate Moisture Index (CMI)

$$\text{CMI} = P - \text{PET}$$

units in cm/year

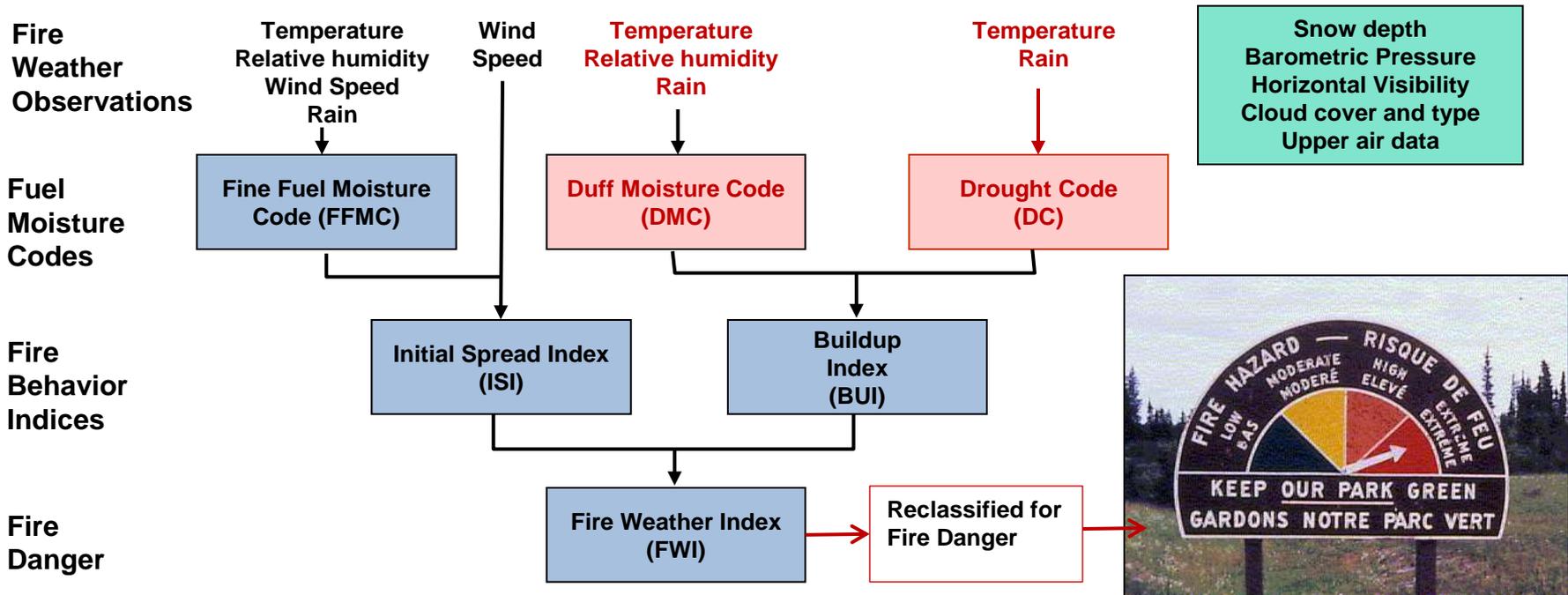


water runoff



# The CFFWIS

- CFFWIS: Canadian Forest Fire Weather Index System
- Fire research began in 1925
- Modern modular system developed by 1970 and last revised in 1984
- Drought Code (DC) component developed in 1966 (Turner)
- Local noon weather correlated to late afternoon burning conditions

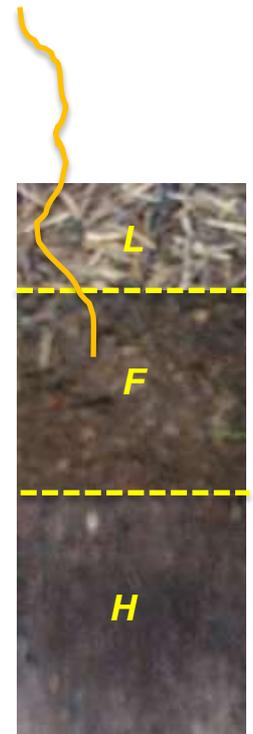


# Drought Code

The Canadian Forest Fire Weather Index (FWI) System allows for the carry-over of fall conditions to the spring.

Fuel moisture codes represent moisture at three forest floor depths:

<u>Moisture Code</u>	<u>Depth</u>	<u>Layer</u>	<u>Woody Fuel</u>	<u>Precip Threshold</u>
<b>FFMC</b>	0-2 cm	Litter layer L	Fine twigs, needles, etc	0.5mm
<b>DMC</b>	2-5 cm	Fibric layer F	Bark, small branches	1.5mm
<b>DC</b>	5+ cm	Humic layer H	Logs, large branches	2.8mm



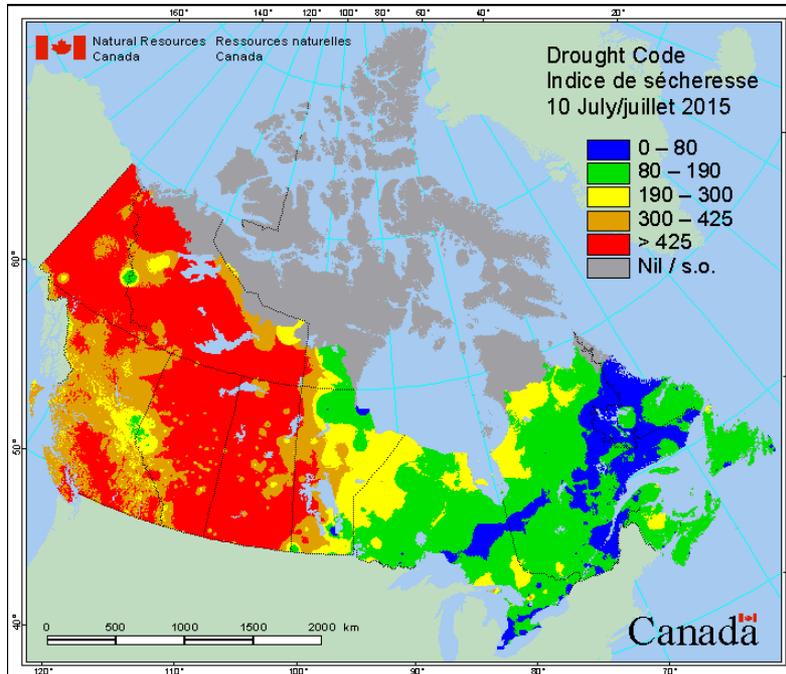
Drought Code (DC) based on forest floor moisture capacity of ~200mm



# Drought effects on forests



# DC Values



## Normal Values

- **High**
  - Western and northwest lowlands
  - Central plains
- **Low**
  - Central BC coast, Rockies
  - Eastern half of Canada

Interpretation (w.r.t. fire) depends on region and vegetation

	<u>East</u>	<u>West</u>	<u>Smoldering</u>	<u>Fuel Load</u>	<u>Smoke (peat)</u>
Low	0-79	0-150	Low	Low	Little
Moderate	80-189	151-299			
High	190-299	300-499	Middle layers	Moderate	
Very High	300-424	500-749			
Extreme	425+	750+	Deep, over winter?	High	Much

# Aspen Dieback

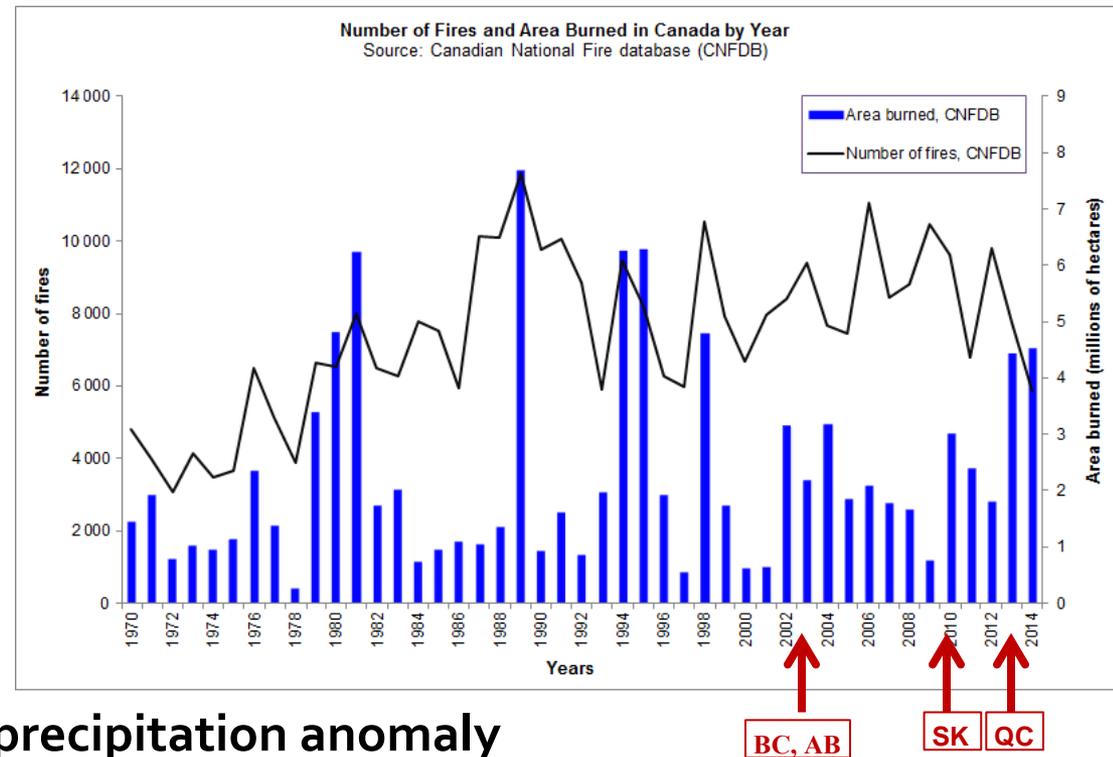
- Spring fires active before green-up of grasses, broadleaf trees
- Aspen dieback prolongs the leafless stage
- Canadian Forest Fire Behaviour Prediction System: D<sub>1</sub>, M<sub>1</sub>, M<sub>3</sub> consider leafless aspen



Drought-induced aspen mortality in Alberta (Michaelian et al. 2011)

# Fire seasons and drought

- Drought makes forest susceptible to disturbance
- Drought may result in large area burned
  - Need not be widespread
- Number of fires likely increases with drought
- Most area burned during drought with triggers:
  - Lightning
  - Human activity
- Seasonal fire severity forecast uses climate model precipitation anomaly



# Summary/conclusions

- **Drought**
  - **May increase the number of fires, and possibly burned area**
  - **Helps indicate depth of burn, fuel consumption, and difficulty of extinguishment**
  - **May prolong leafless aspen stage: trees more likely to burn**



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# Drought Monitoring and Contribution to Wildfire Prediction

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# Impact on fire prediction

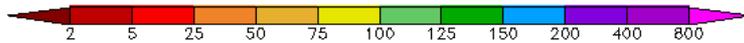
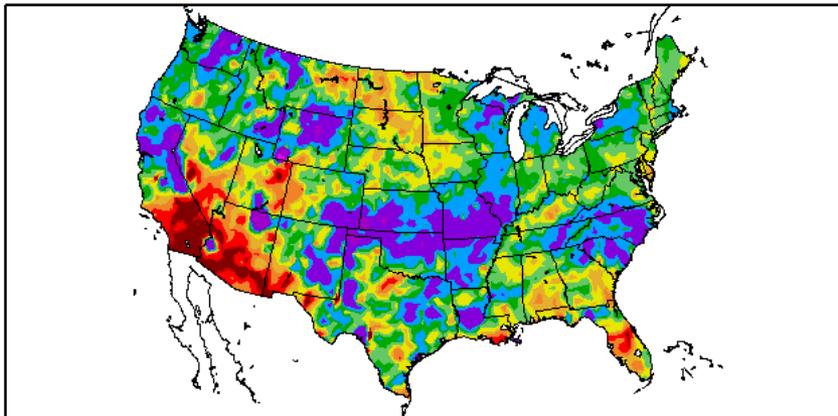
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- ❖ Complex relationship between drought and wildfires.
- ❖ Short term drought can increase probability of ignition and fire spread in fine fuels (grasses, brush).
- ❖ Long term drought can have devastating effects on all scales of fuels, increasing the potential for ignition and the availability of fuels.
- ❖ Drought end (precipitation event) can increase fine fuel growth that can then carry fire through weakened forests.
- ❖ Drought alone cannot predict fire activity or effects.

# Drought monitoring

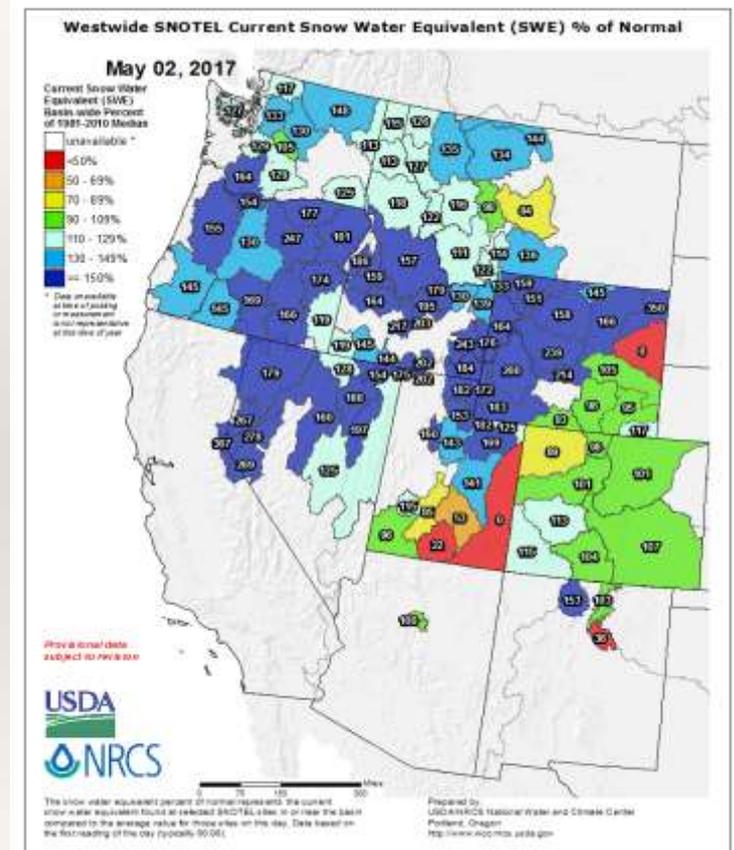
## Precipitation

Percent of Normal Precipitation (%)  
4/1/2017 - 4/30/2017



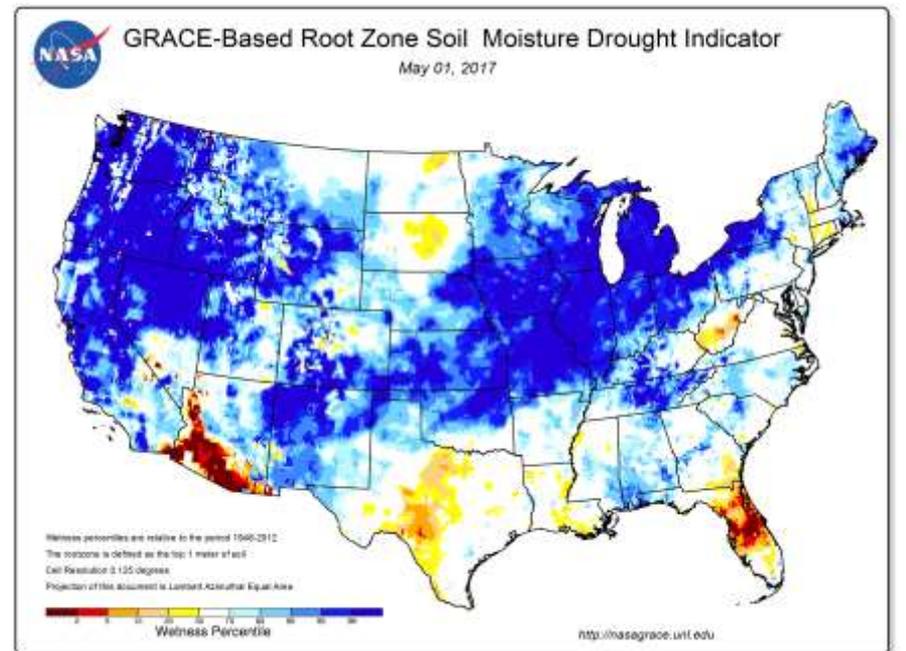
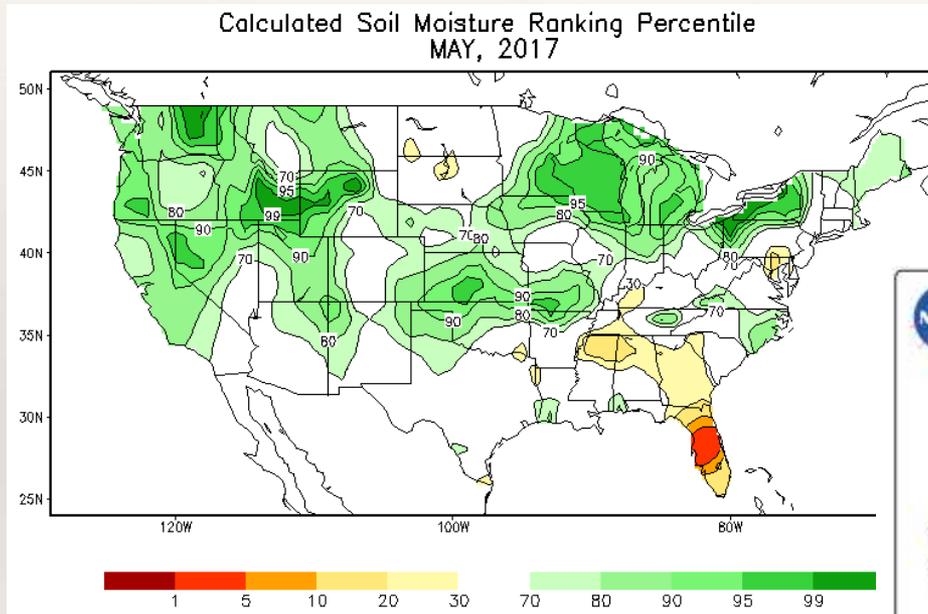
Generated 5/11/2017 at HPRCC using provisional data.

Regional Climate Centers



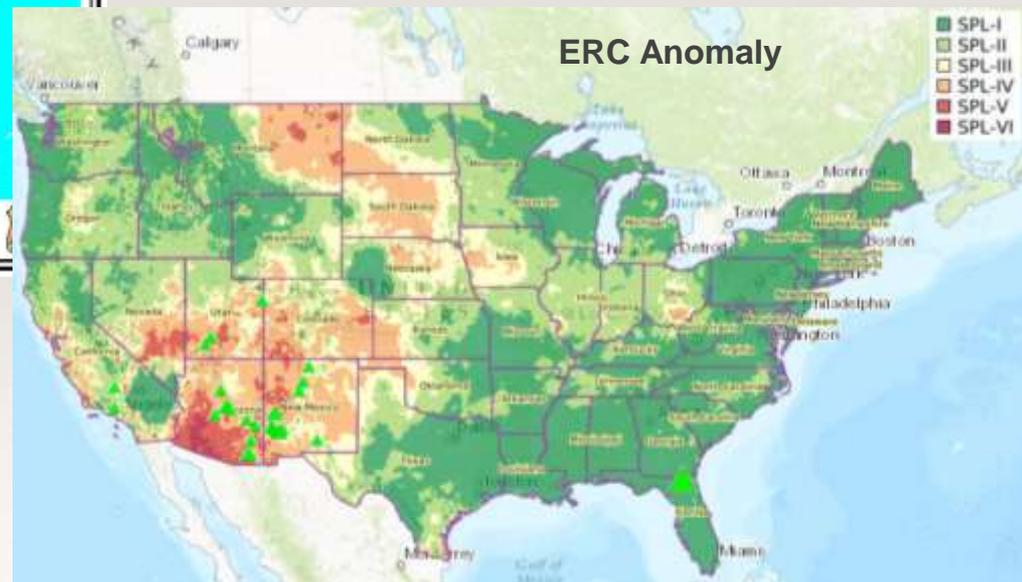
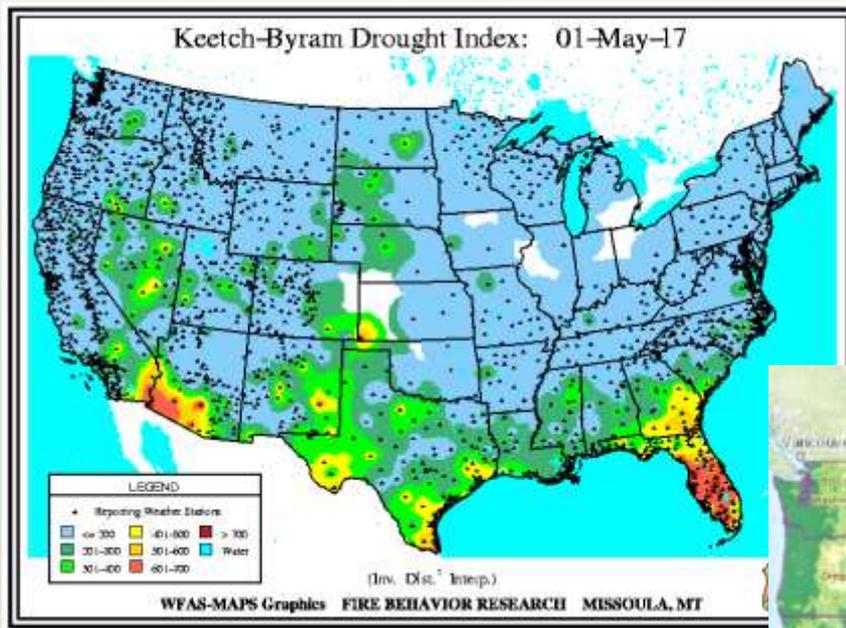
# Drought monitoring

## Soil Moisture



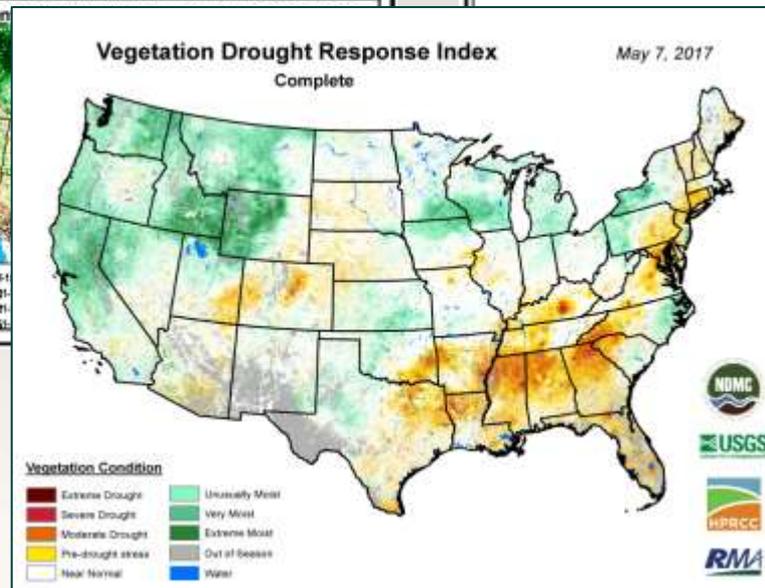
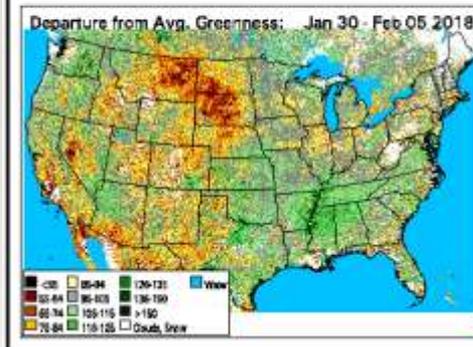
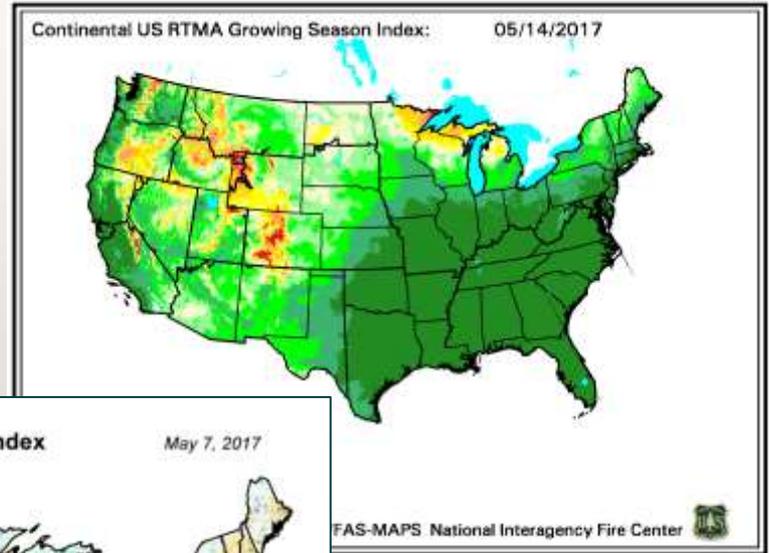
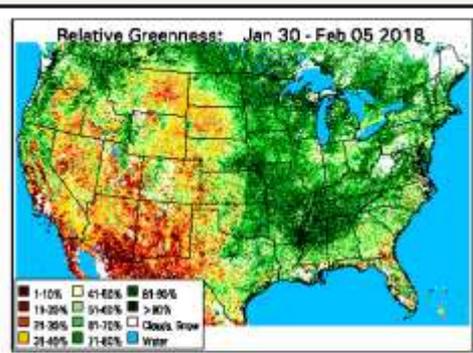
# Drought monitoring

## Fire Danger Indices



# Drought monitoring

## Vegetation Indices

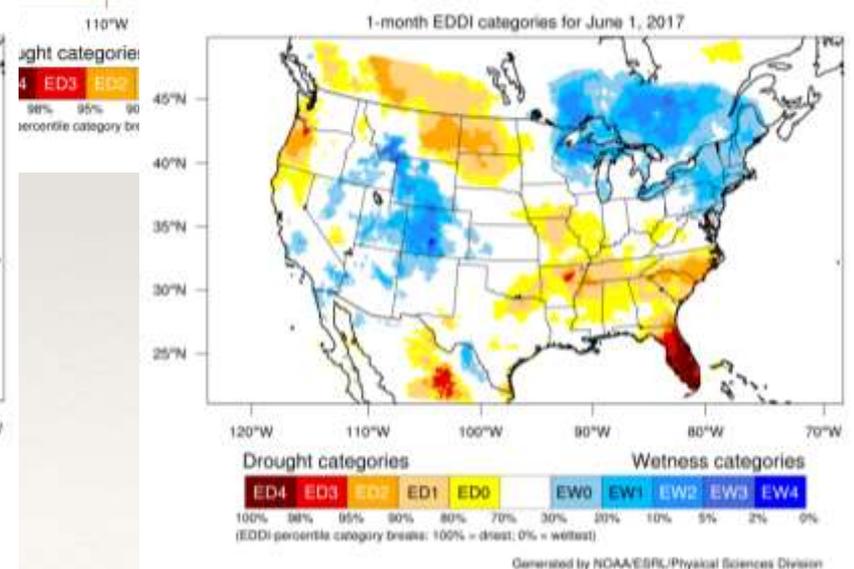
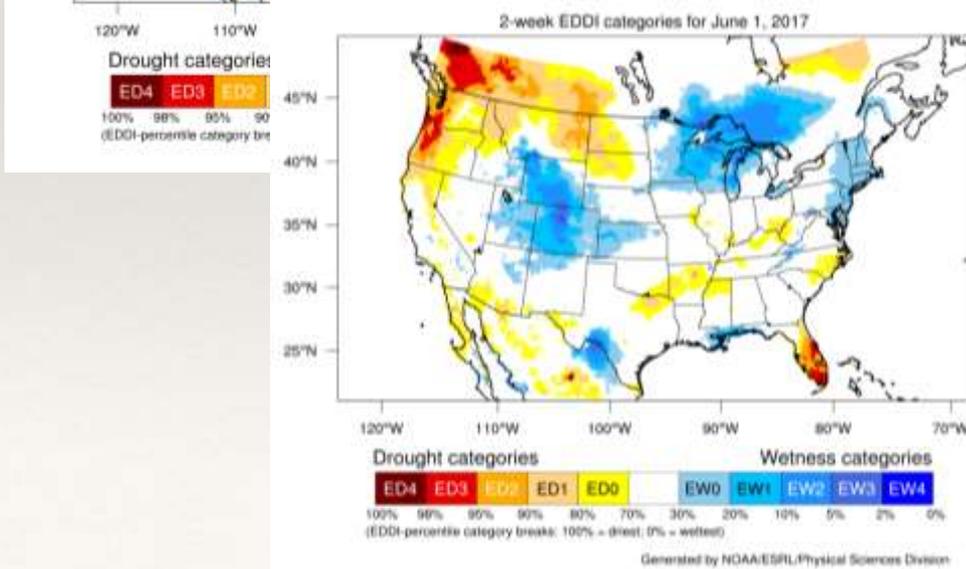
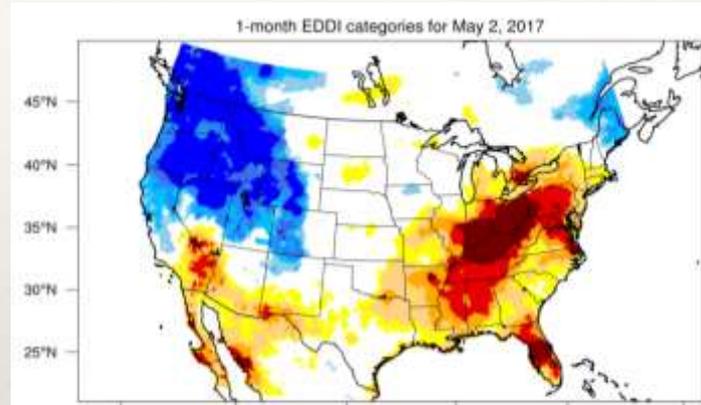
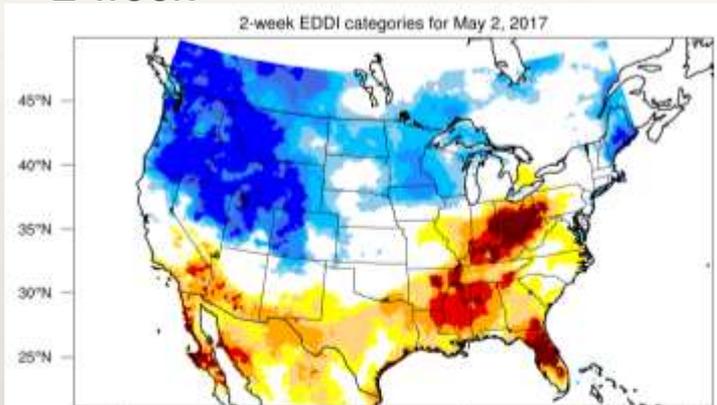


# Drought monitoring

## “New” tools

2 week

1 month



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# Questions

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