

Development of a Global Evaporative Stress Index

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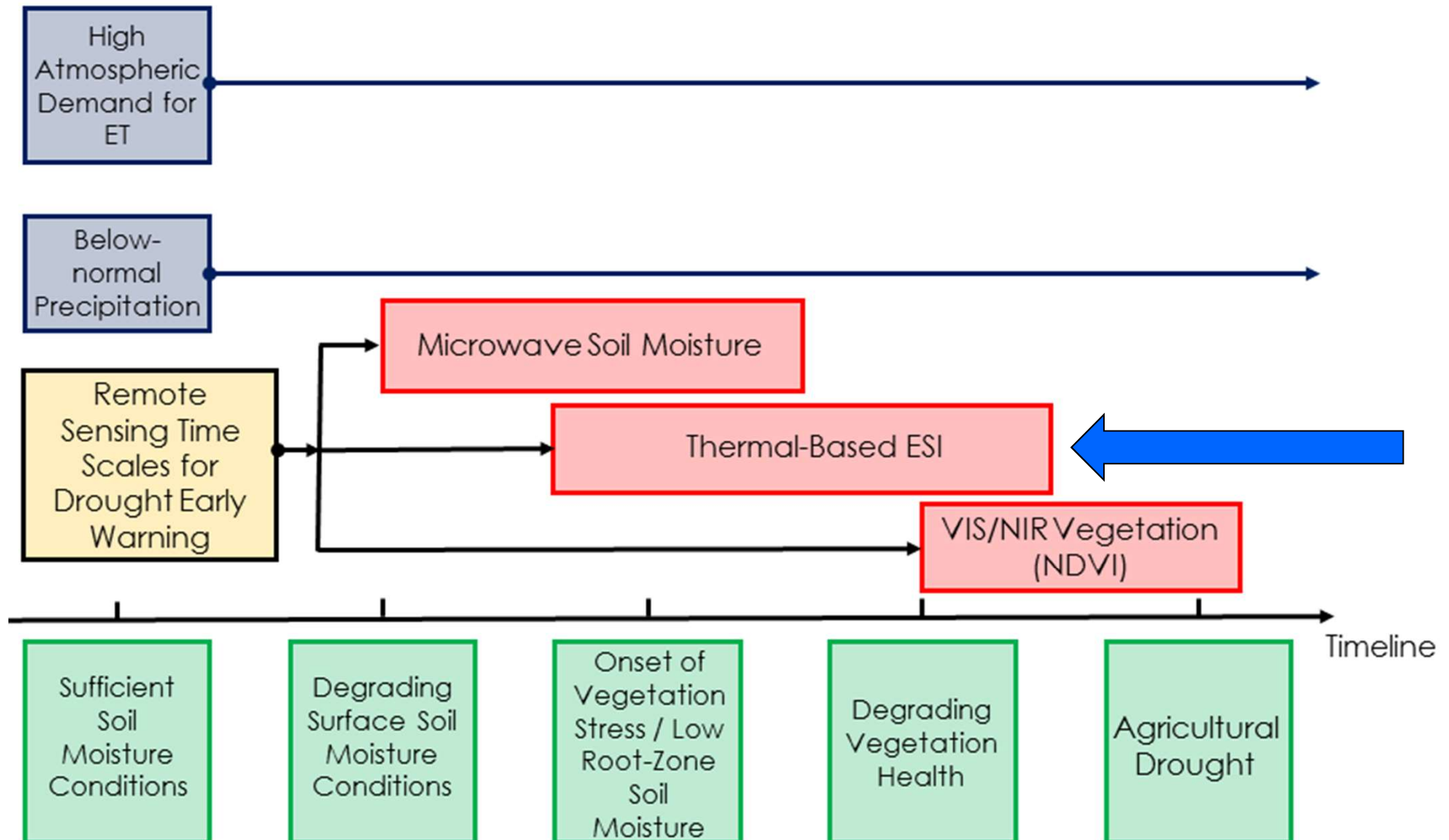
U. of Wisconsin

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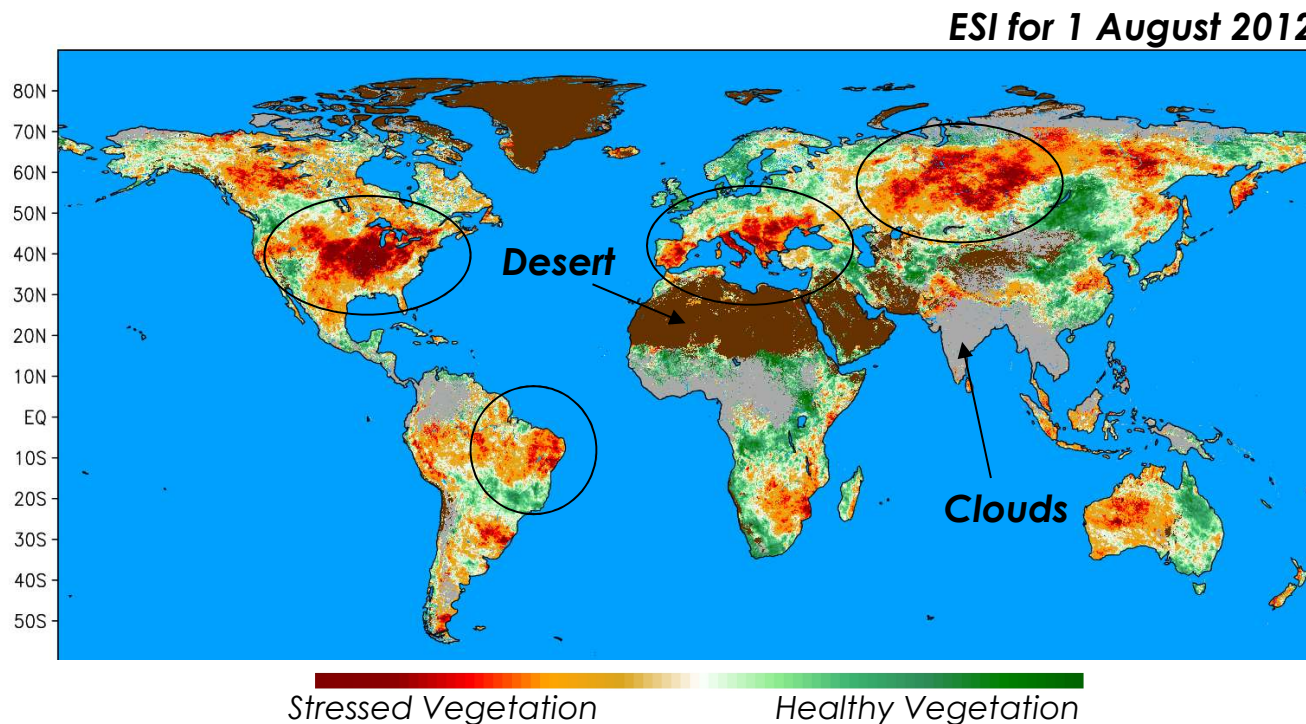


How Agricultural Droughts Evolve:



ALEXI ESI represents temporal anomalies in the ratio of actual ET to potential ET.

- ESI does not require precipitation data, ***the current surface soil moisture state is deduced directly from the remotely sensed land surface temperature.***
- Signatures of vegetation stress are manifested in the LST signal before any deterioration of vegetation cover occurs (as may be observed from NDVI).



Who currently using ESI:



Agriculture and
Agri-Food Canada



WORLD
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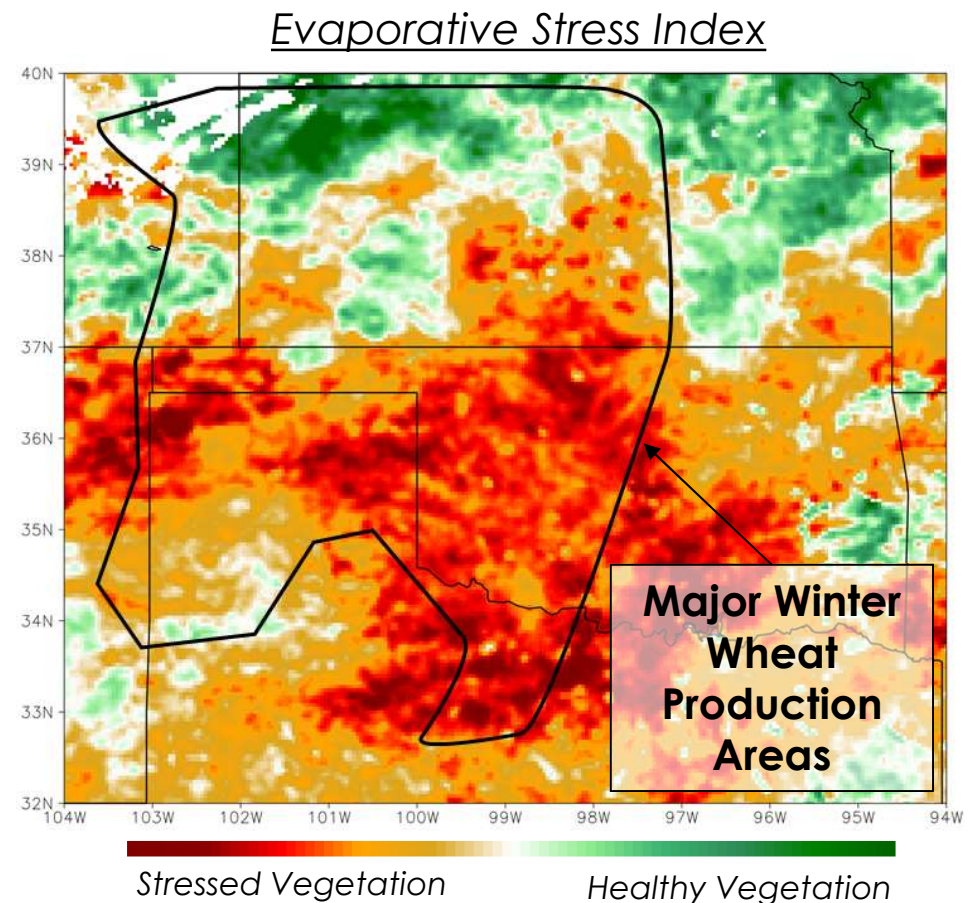
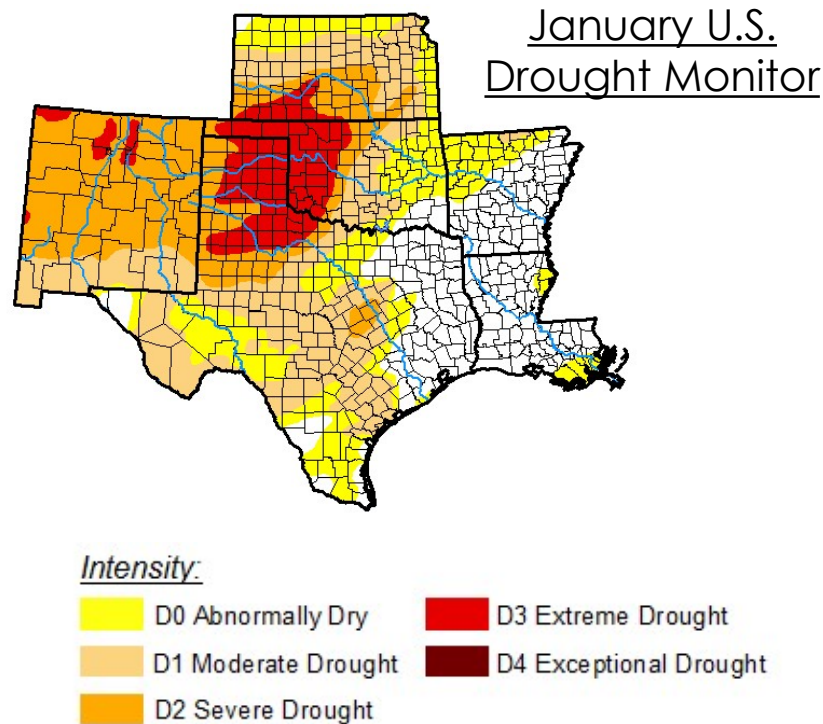


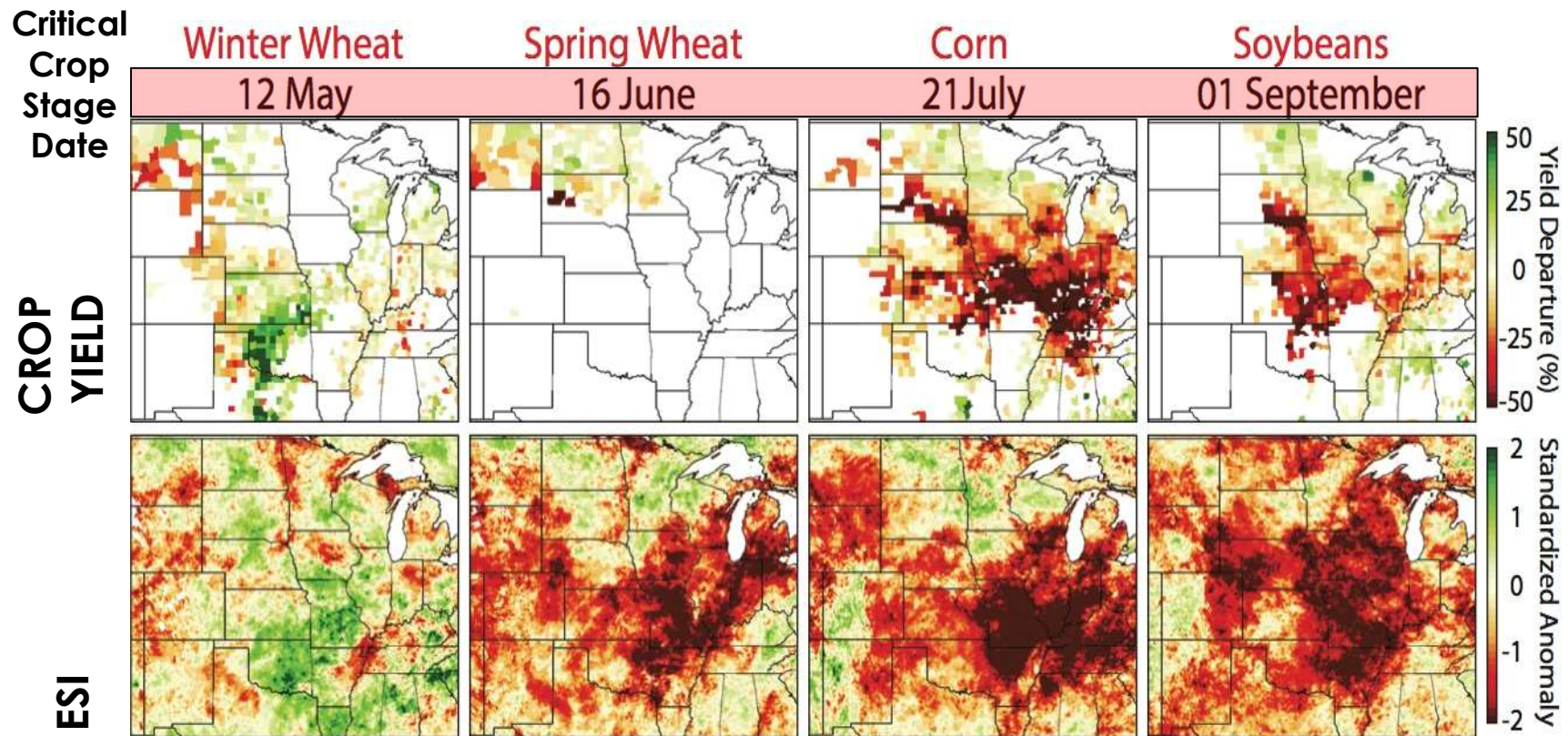
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How ESI is used by a decision maker:

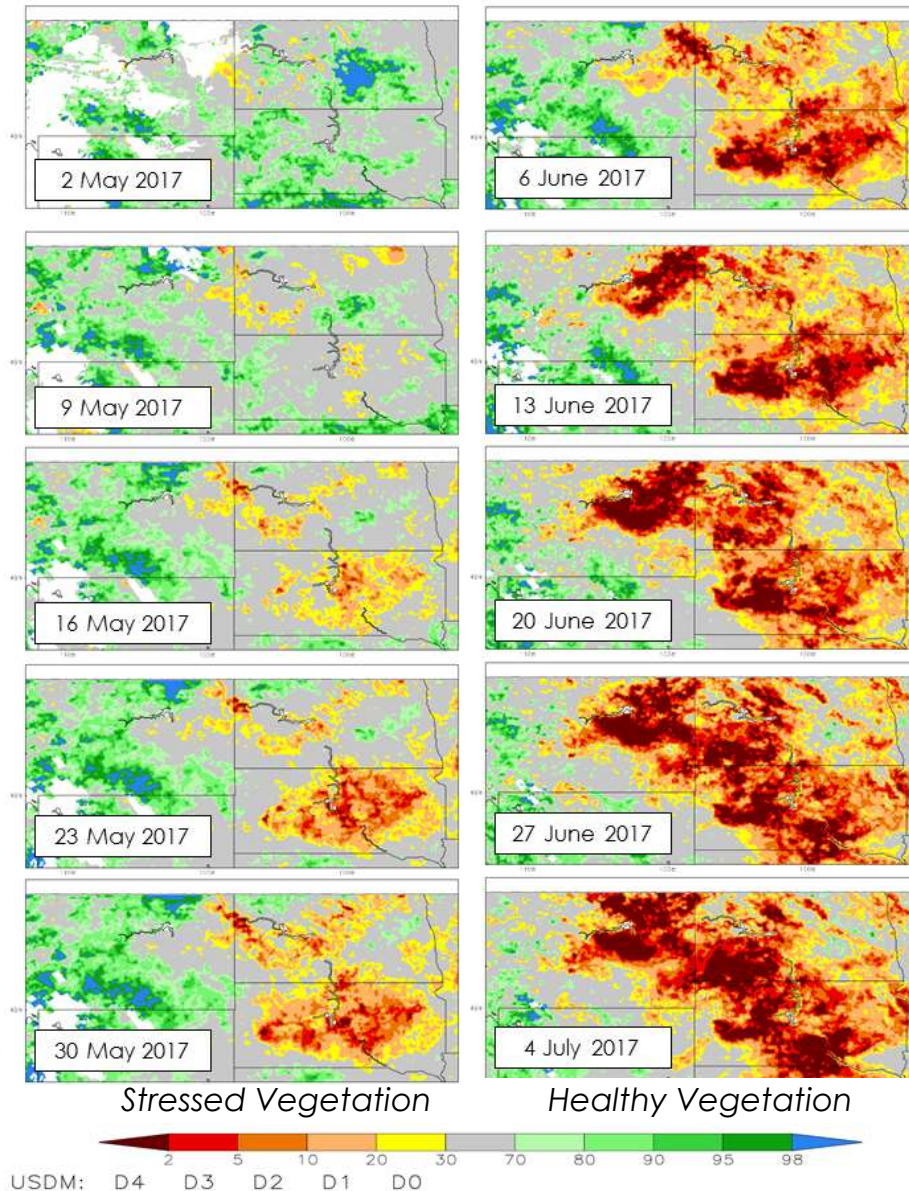
- According to the USDA, 44% of the winter wheat crop is currently in poor/very poor condition, which is a record for the January 2018 assessment.
- ESI showed stressed vegetation collocated where the most significant drought conditions were observed.





- Examine drought conditions during critical crop stages
- ESI had strongest correlation to the wheat, corn, and soybean yield departures
- Key takeaway: Can we reliably produce accurate predictions in near-real-time?

Providing Early Warning of Flash Droughts

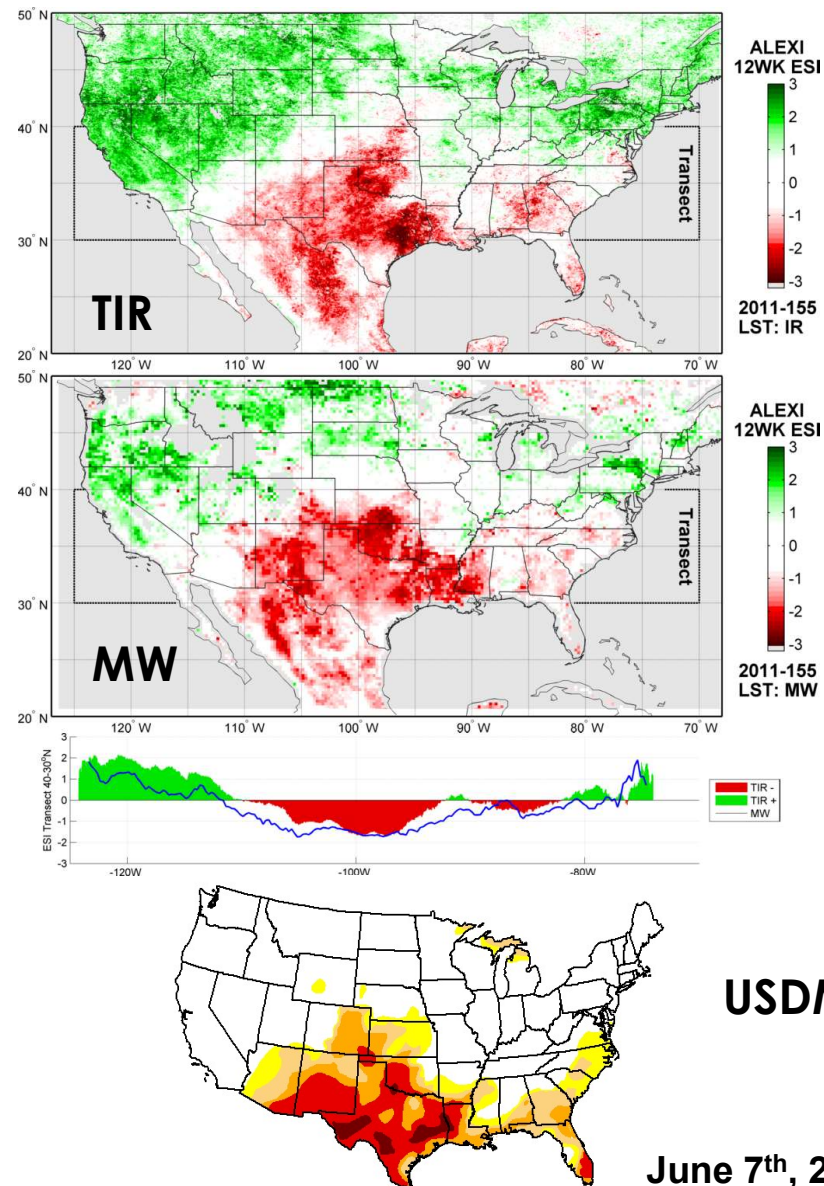


Flash drought are rapid onset drought events typically driven by:

- 1) precipitation deficits
- 2) warmer than average
- 3) strong winds
- 4) clear skies

• Key takeaway: ESI provides early warning of the onset of “flash droughts” providing stakeholders additional time for mitigation strategies or a more representative assessment of the current drought situation (e.g., USDm).

- LST from thermal infrared (~ 11 micron) wavelengths are only available over cloud-free pixels.
- LST from microwave (37 GHz) wavelengths provide “all-sky” sensing capabilities.
- Key takeaway: The integration of MW LST fills in a significant gap over persistently cloudy regions (e.g., equatorial tropical regions) providing a means for assessing vegetation stress in areas that weren't reliable with a TIR-only system.



Why this is important:

- ✓ *ESI conveys early warning of vegetation stress and drought through land surface temperature (LST)*
- ✓ *LST-based indicators provide an independent check on precipitation and vegetation-based drought indicators*
- ✓ *Broad applications in global water and food security*

Entire ESI Archive available at (updating in real-time at NASA SPoRT and provided by NASA SERVIR):

<https://gis1.servirglobal.net/data/esi/>