



# **Use of Weather and Climate Information in Agricultural and Forestry Decision-making**

**Linda Joyce, USDA Forest Service**

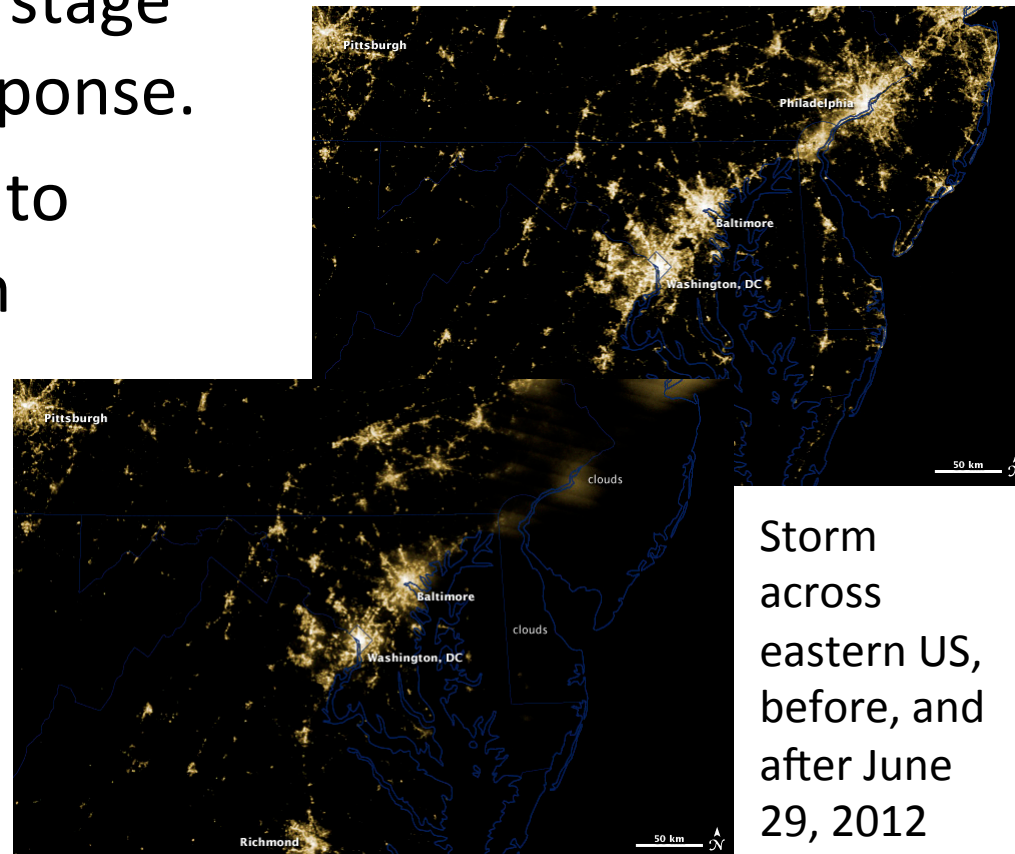
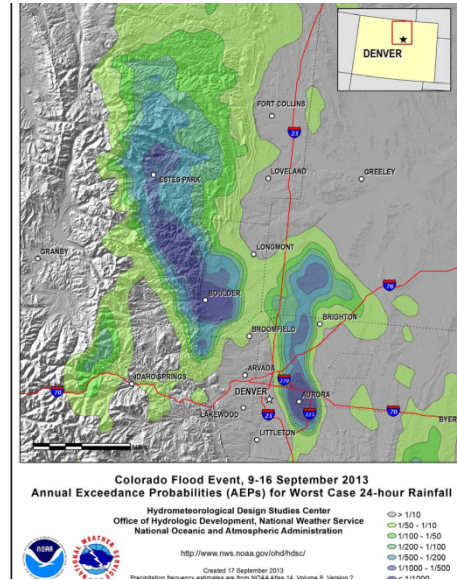
**July 9, 2014**

# **Weather/Climate Information in Agricultural and Forestry Decision-making**

- **Historical Climate Data**
  - Fine-scale historical climate data, relevant to resource of interest, quality assured
- **Extreme Events and Weather Alerts**
  - Prediction of Extreme Events
  - Alerts, cognizant of response time, future novel conditions
- **Short-term forecast – day to months to year**
  - Fine scale relevant climate variables, accurate tbd by user
- **Climate Change Projections**
  - Climate variables used in management, fine-scale
  - Consistency of projection information across ownerships, across scale

# Extreme Events

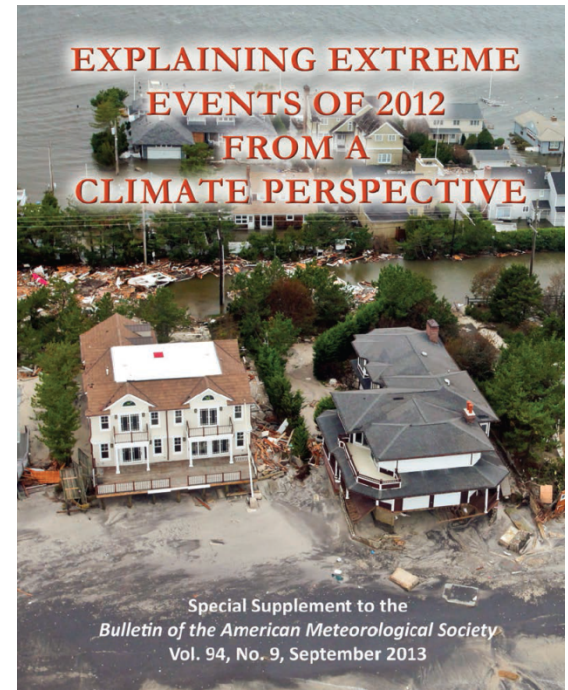
- Real-time agricultural and forestry response needed to some extreme events.
- Past experience sets the stage for the management response.
- Is the event attributable to specific forcings? Human caused?  
Natural Variability?
- In either case, it is an opportunity to reflect.



Storm  
across  
eastern US,  
before, and  
after June  
29, 2012



# Extreme Events

- Research needs:
  - Attribution of extreme events
  - Prediction of extreme events
- Types of Extreme events
  - 2013 Flood in Northern Colorado
  - 2012 Drought, Great Plains
  - 2013 September snowstorm, South Dakota/Wyoming
- Conditional Forecasts
  - Timing of Alert
  - Alerts for novel events





# Short-term Forecasts

## NATIONAL WEATHER SERVICE

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Fair  
**81°F**  
27°C

Humidity 42%  
Wind Speed S 6 mph  
Barometer 30.15 in  
Dewpoint 55°F (13°C)  
Visibility 10.00 mi  
Heat Index 81°F (27°C)  
Last Update on 8 Jul 4:15 pm MDT



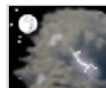
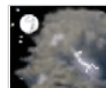

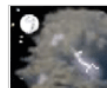
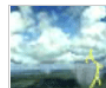
Current conditions at  
**Fort Collins (awos) (KFNL)**  
Lat: 40.46°N Lon: 105.01°W Elev: 5016ft.  
[More Local Wx](#) | [3 Day History](#) | [Mobile Weather](#)

Fort Collins CO

7 Day Forecast

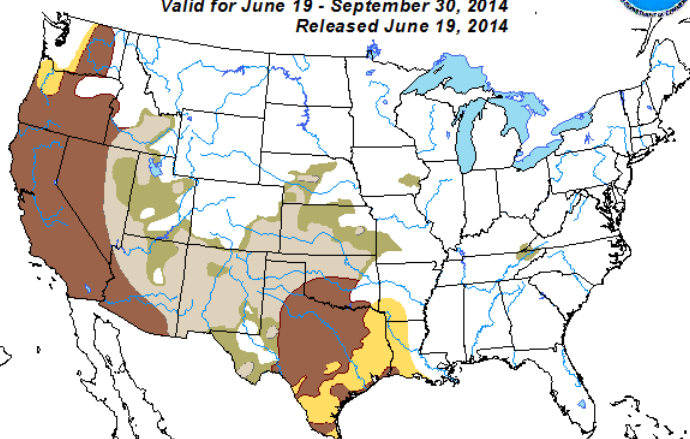
For More Weather Information:

[Denver-Boulder, CO Local Forecast Office](#)





LATE AFTERNOON	TONIGHT	WEDNESDAY	WEDNESDAY NIGHT	THURSDAY	THURSDAY NIGHT	FRIDAY	FRIDAY NIGHT	SATURDAY
								
	Partly cloudy 61°F	20% Isolated Thunderstorms High: 93°F	30% Chance Thunderstorms Low: 60°F	30% Chance Thunderstorms High: 90°F	20% Slight Chc Thunderstorms Low: 61°F	30% Chance Thunderstorms High: 89°F	Low: 61°F Slight Chc Thunderstorms	Chance Thunderstorms High: 89°F

[Topographic](#)
[Click Map For Forecast](#)

## U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period Valid for June 19 - September 30, 2014 Released June 19, 2014



### KEY:

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

Author: David Miskus, Climate Prediction Center, NOAA

[http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/season\\_drought.html](http://www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.html)

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity).

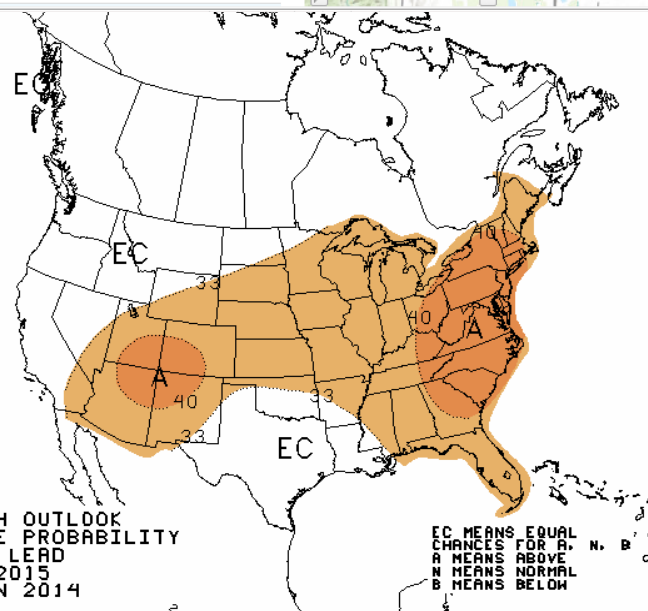
For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The tan area areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain.

The Green areas imply drought removal by the end of the period (D0 or none)

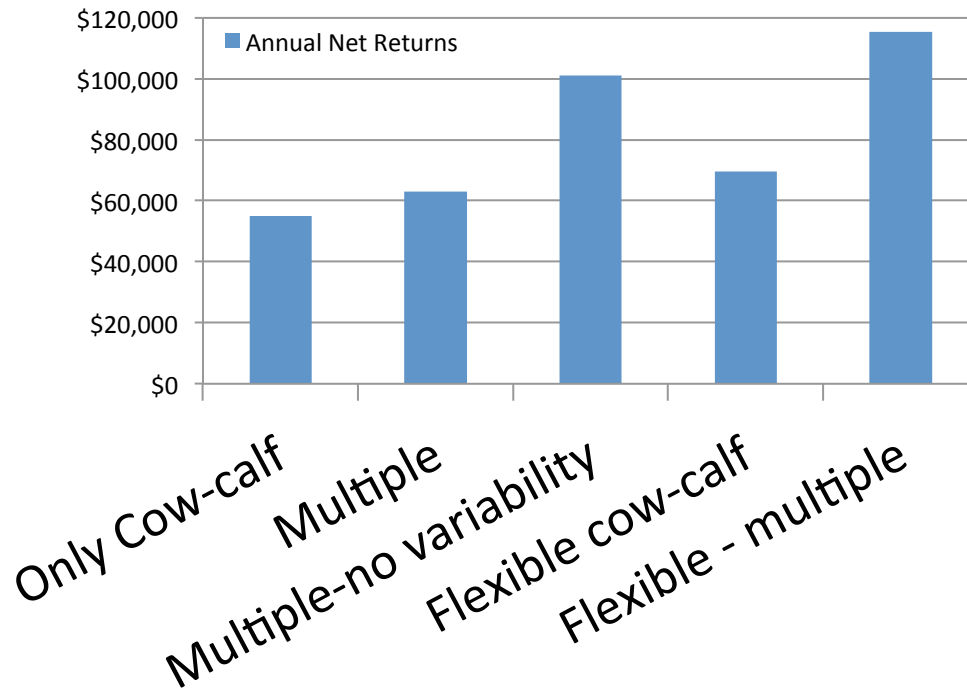


THREE-MONTH OUTLOOK  
TEMPERATURE PROBABILITY  
12.5 MONTH LEAD  
VALID JAS 2015  
MADE 19 JUN 2014



EC MEANS EQUAL  
CHANCES FOR A, B, N, B  
A MEANS ABOVE  
N MEANS NORMAL  
B MEANS BELOW

# Flexible Grazing Strategy Depends on Short-term Meteorological Forecasts



- Multiple – no variability – second highest net returns; variability is a significant challenge to revenue
- Flexible – multiple yields the greatest annual net returns – higher costs, dependent upon accurate short-term climate forecast (90 days)

Multiple – Cow-calf and yearling operations

Flexible – can shift numbers and/or operations

# Short-term Forecasts

- Research needs
  - Fine scale short-term forecasts
  - Fine-scale prediction of on-going drought that spans a season, a year, or multiple years; Tradeoff analysis involving predictions of continued drought would likely improve the reactive management to drought
- Additional dialogue with stakeholders about certainty of the short-term forecasts

# Full-Stack Risk Management

Only Climate offers Full-Stack Risk Management made up of Federal coverage and proprietary products like Total Weather Insurance™



## The Climate Technology Platform™

The Climate Technology Platform™ consists of hyper-local weather monitoring, agronomic modeling and high resolution weather simulations.

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- Hyper-local weather monitoring provides assessments of field and sub field-level environmental conditions by incorporating dozens of public and private environmental observation networks and remote sensing systems, coupled with various proprietary and published models to remotely assess weather, soil, and other environmental conditions.
- Sub field-level agronomic modeling, which represents the intersection of agronomy and data science, predicts outcomes based on soil, weather events, farming practices, Climate's leading edge research and other key variables.
- High-resolution weather simulations provide insight into how an increasingly unpredictable climate will impact your operation by incorporating long-range trends, current conditions, forecasts, and climate signals, research and models into a dynamic, full-season probabilistic weather forecast at a very high resolution for each field.



# **Climate Projections**

## **Cacophony across the United States**

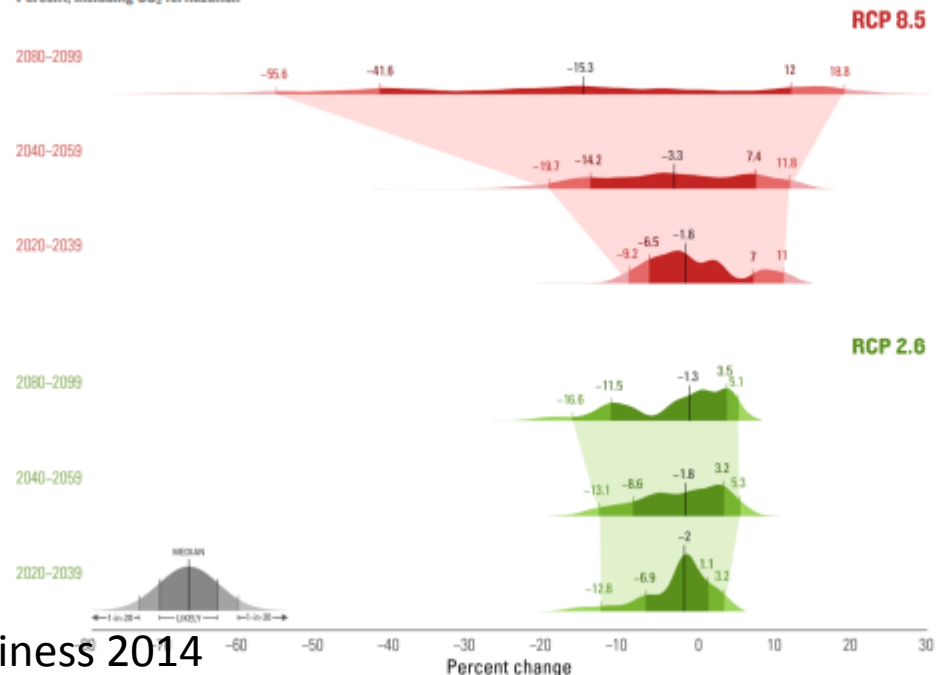
- Northern Great Plains
  - Scenarios and projections developed for use by: National Park Service, Bureau of Land Management, Forest Service, Bureau of Reclamation, Academic studies
  - Different scenarios, different climate models, different downscaling techniques, different baseline periods
  - Results presented for different future periods
- Challenging, if not impossible, to compare the climate projections or vulnerability assessment using these projections

# Framing Risk with Climate Projections

- Research needs - WCRP Grand Challenge (draft) -- Definition of usefulness: informing the risk management and decision making space.
  - Provide information that constitutes a solid and targeted basis for decision making concerning risk management and response options in specific sectors and contexts.



Figure 6.3: Change in national yield of grains, oilseeds, and cotton  
Percent, including CO<sub>2</sub> fertilization



# On-going Dialogue

- Prediction and attribution of extreme events
- Conditional forecasts of extreme events
- Shared understanding of extreme events and response time needed by the manager
- Improved short-term meteorological forecasts at fine spatial scale
- Framing risk in the context of climate projections – adaptation