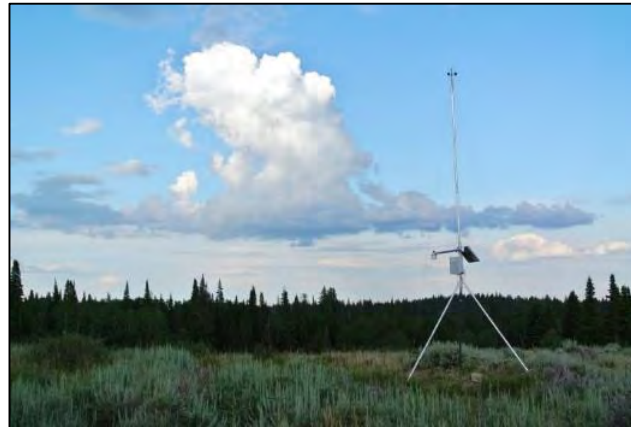Virginia Tech
Invent the Future

A Guide to Practical Weather and Climate Information for Loggers

Drew Ellis, VT Geography

Virginia Loggers Association Conference
Virginia Tech, Skelton Conference Center
August 18, 2017

Virginia Tech | College of Natural Resources and Environment
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Weather v. Climate

Weather is the state or condition of the atmosphere at a particular time and location…a "snapshot".

Blacksburg (VT Airport) – Friday, August 18					
	Ta	Td	Cloud	Wdir	Wspd
1 pm Observation:	84°F	70°F	PCldy	SW	12 mph

Meteorology is the study of the physics and dynamics of the atmosphere for the purpose of <u>predicting</u> **weather** over <u>short time periods</u> (hours-to-days).

Climate is the statistical representation of the variation in the weather of a location over a "long" time interval - 30 years establishes the climate baseline (means, deviations, extremes).

Blacksburg, August 18	MaxT	MinT	Precip
1981-2010 Climate Normals:	82°F	59°F	0.11 in
1952-2017 Climate Records:	94°F	46°F	1.99 in
	(1988)	(1979)	(1994)

Loggers: "Weather Is Important"

"Limitations to attaining maximum production based on size of logging business"

Northern Forest Logging Industry (ME, NH, VT, NY)

Leon BH, Benjamin JG. 2012: *A Survey of Business Attributes, Harvest Capacity and Equipment Infrastructure of Logging Businesses in the Northern Forest.* Univ of Maine

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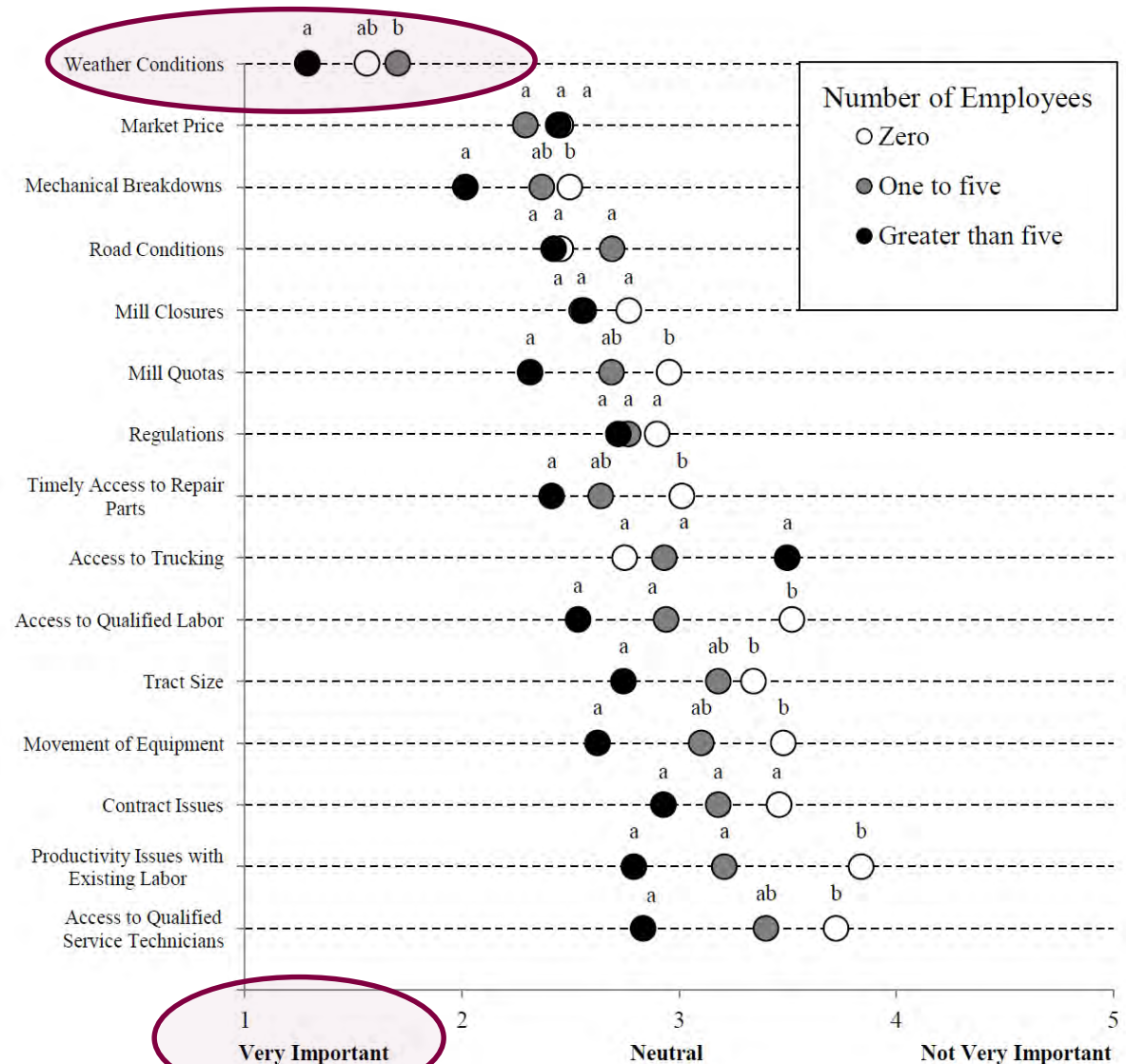
Weather and Logging

Too wet, too dry, too hot, too cold.

- Impacts site/road conditions – adjustments for rain/mud, snow/ice, severe weather

- Affects production, costs, safety

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Climate and Logging

Weekly-monthly-seasonally too wet, too dry…soil moisture.

Drought:
◦ wildfire risk
◦ disease
◦ infestation

Long-term:
◦ warmer
◦ wetter?

Carbon dioxide concentration at Mauna Loa Observatory

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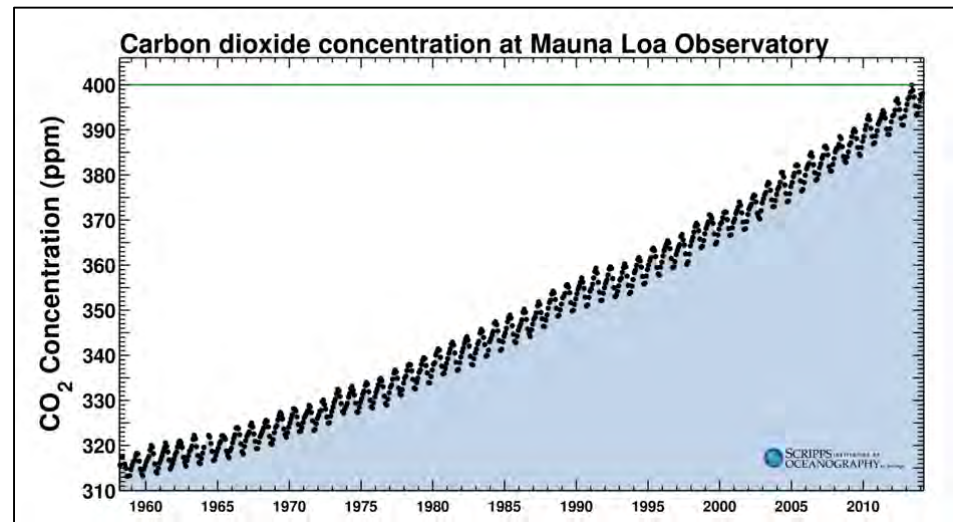
Real-Time Weather – "Nowcasting"

<u>Nowcasting</u> – minutes-to-hours based on current conditions/recent trends; useful for immediate decisions
<u>N</u>ational <u>W</u>eather <u>S</u>ervice (NWS)
(www.weather.gov)

local <u>NWS</u> <u>F</u>orecast <u>O</u>ffice (NWSFO); area of responsibility – <u>C</u>ounty <u>W</u>arning <u>A</u>rea (CWA)

NWSFO CWAs

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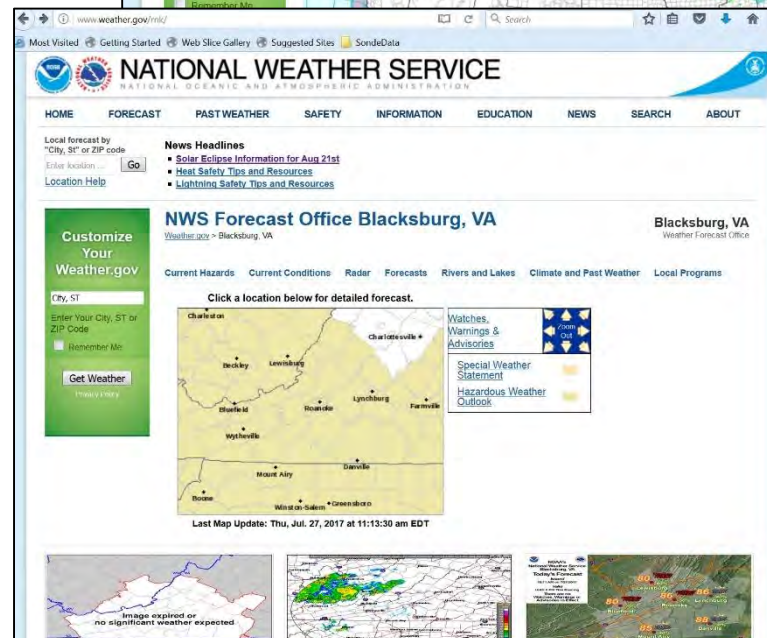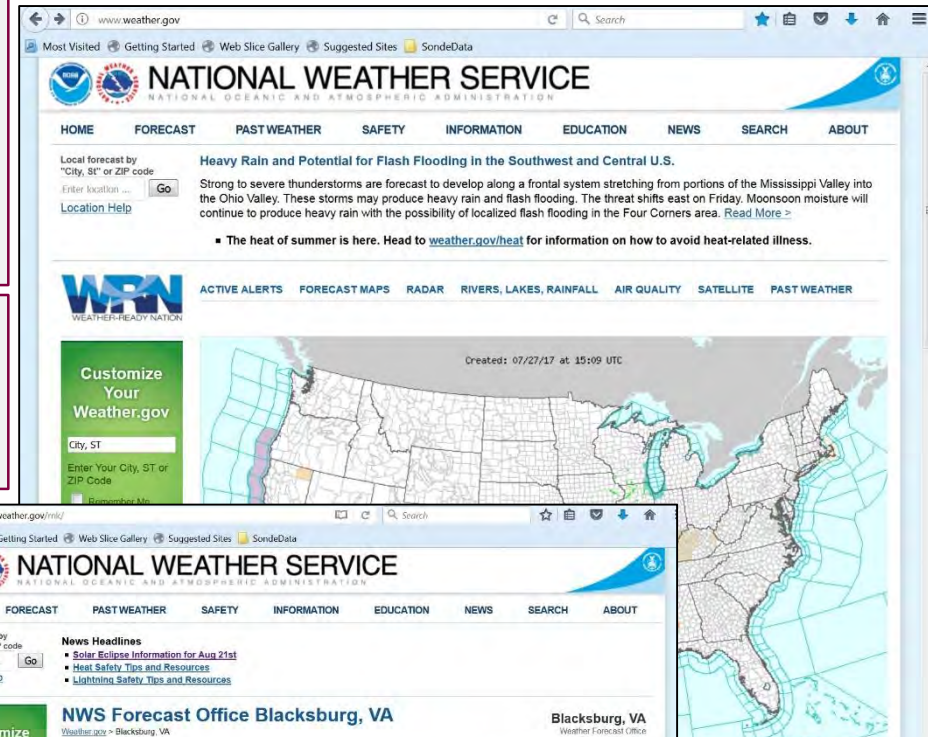
Real-Time Weather – "Nowcasting"
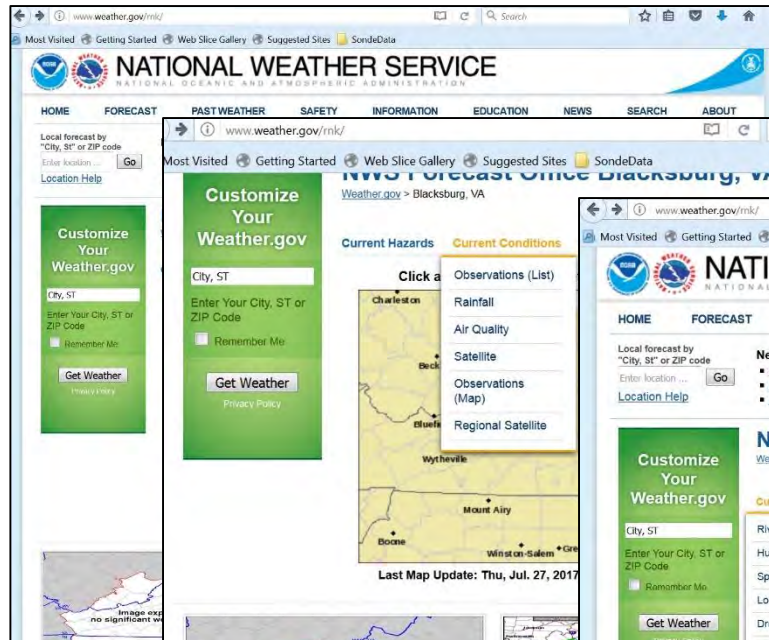
Mapped Data – Poor Delivery

NWS *Enhanced* Data Display
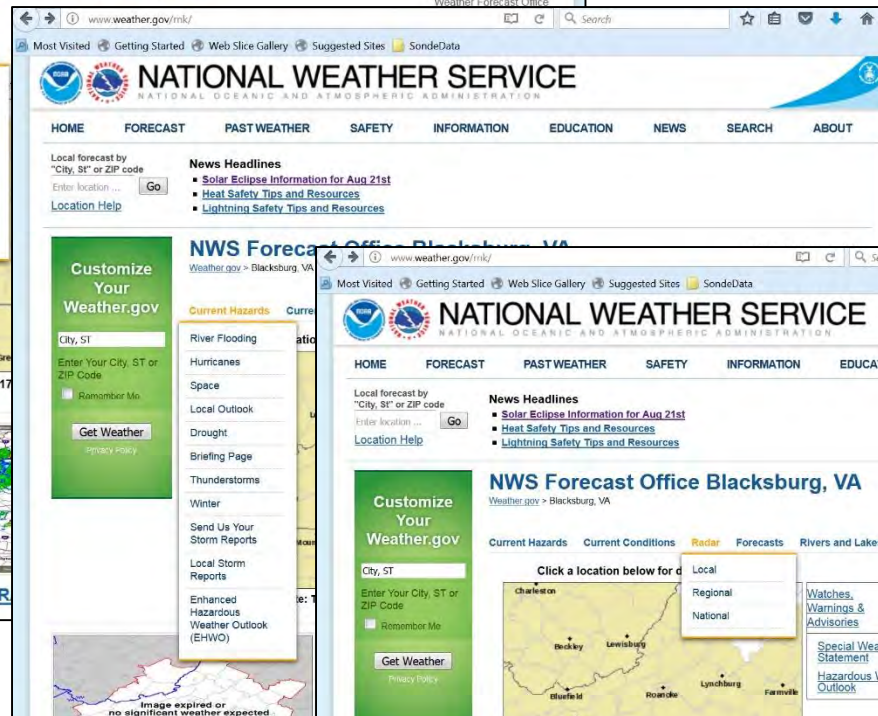
No Lightning Data

NWS using private-sourced and satellite-derived data.

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Real-Time Weather – "Nowcasting"

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Real-Time Weather – "Nowcasting"

MesoWest – mesoscale data display
(mesowest.utah.edu/index.html)

Select a state of interest:
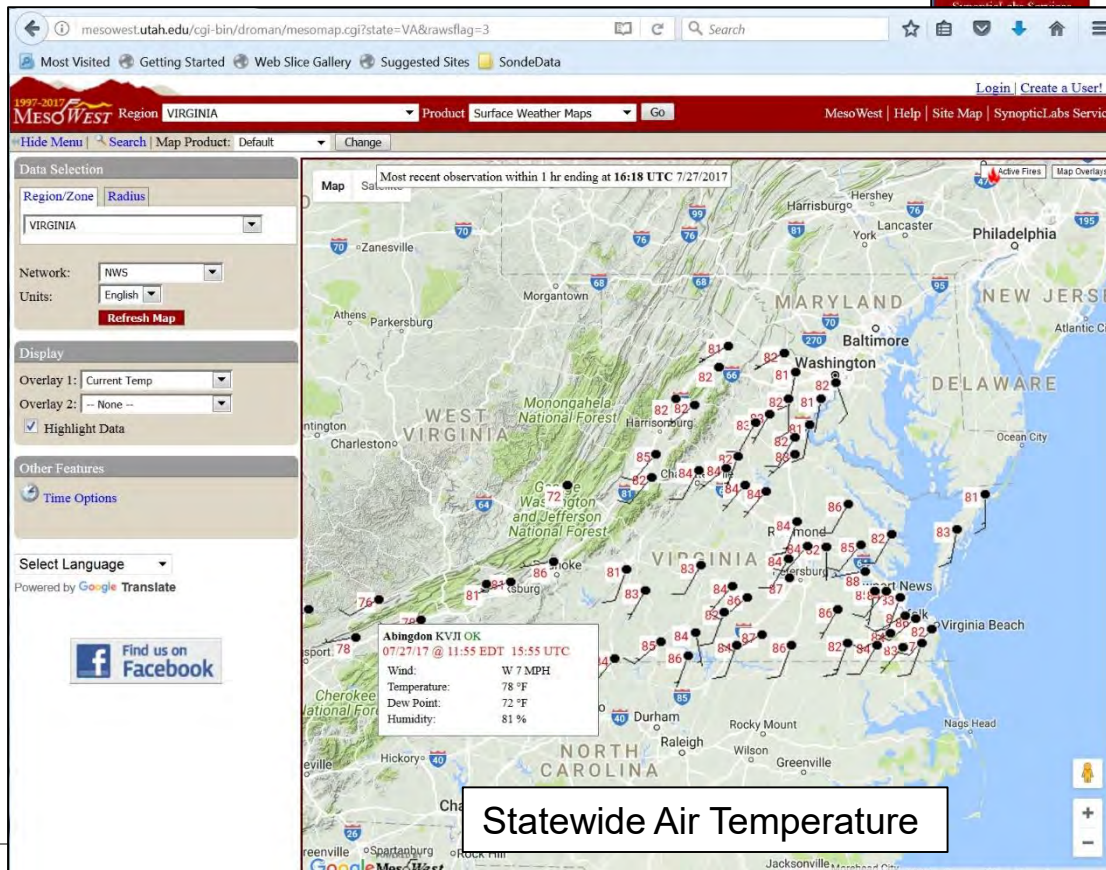
Statewide Air Temperature

Points to direction from which the wind is coming.

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Real-Time Weather – "Nowcasting"

Zoomed 24-hr Precipitation
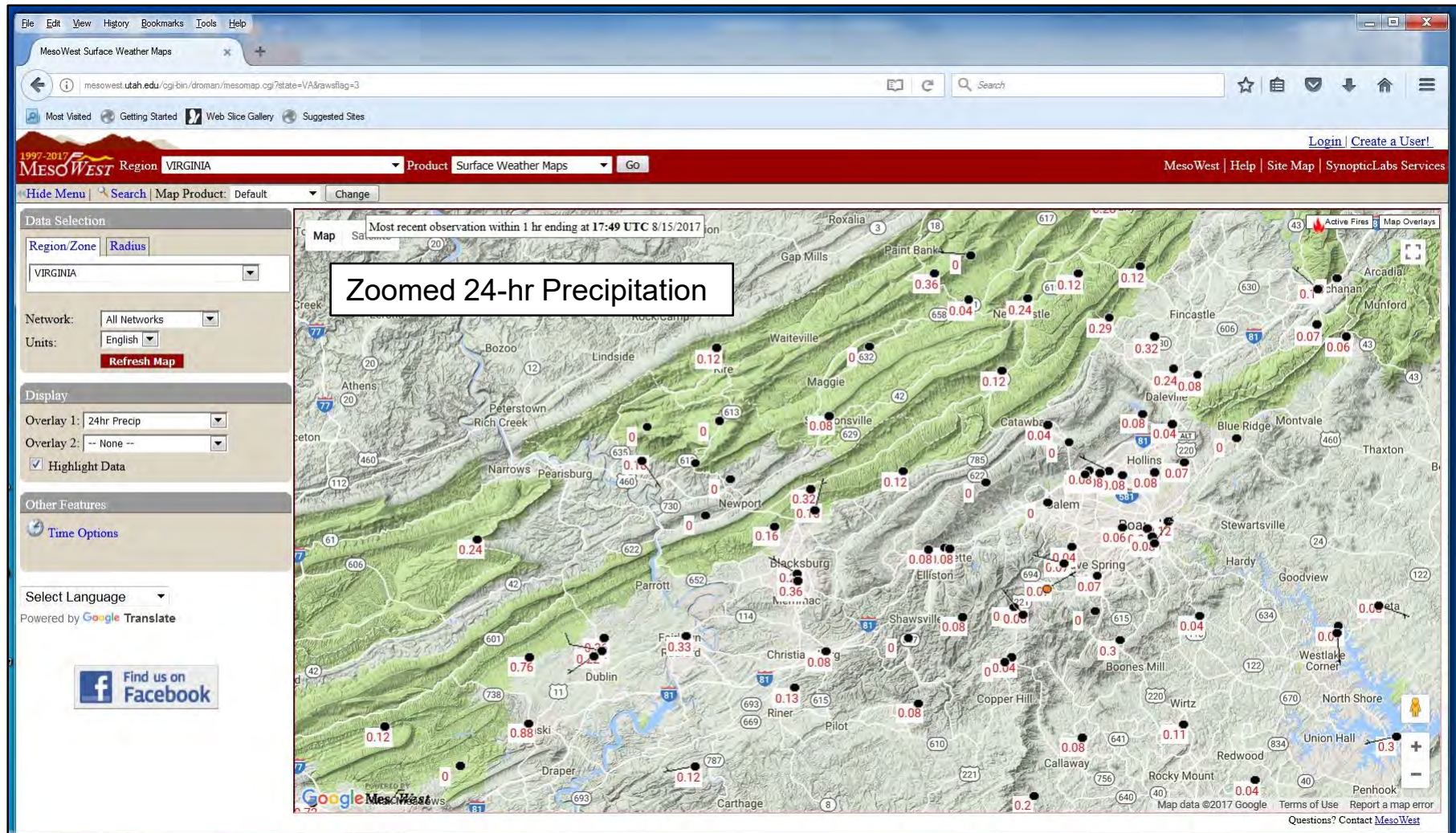
Real-Time Weather – "Nowcasting"
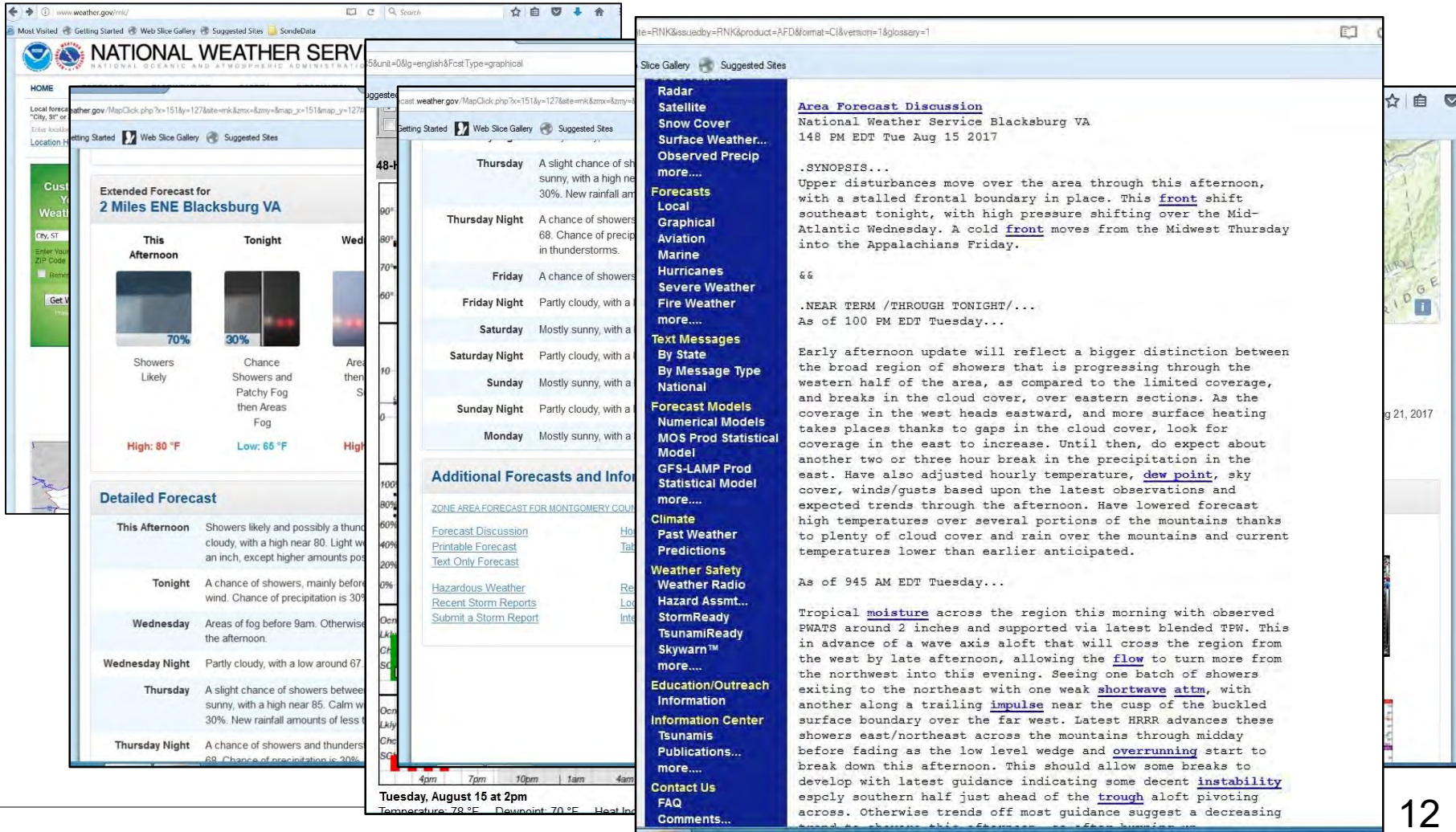
LightningMaps.org – global-to-local real-time cloud-to-ground lightning strike data display (www.lightningmaps.org)
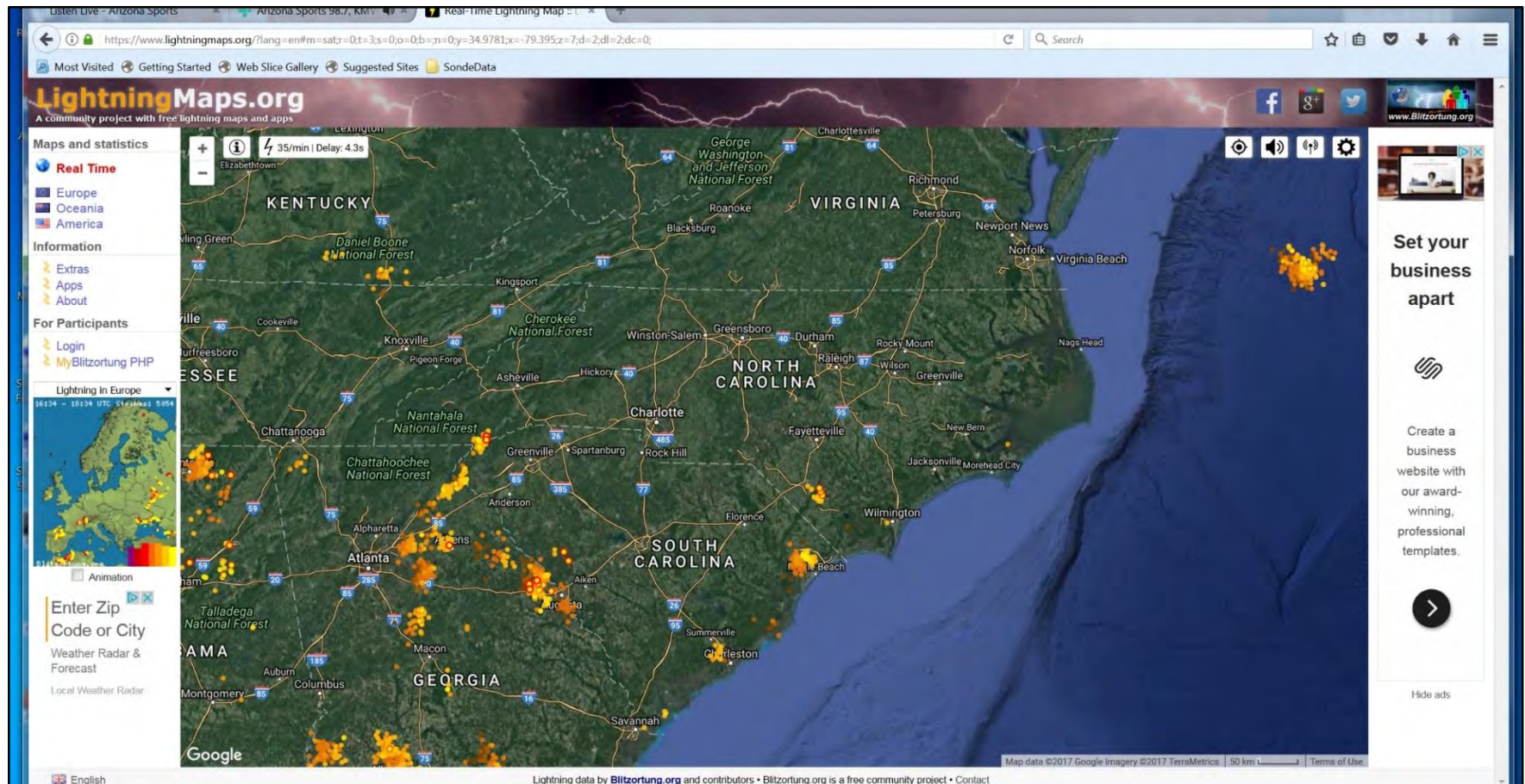
Weather Forecasts – "Near-Term" & "Short-Term"

Near-term: to 12-18 hours / Short-term: 1-3 days   www.weather.gov

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Weather Forecasts – "Near-Term"

High Resolution Rapid Refresh (HRRR) Model | College of DuPage (weather.cod.edu)

Weather Depiction – 1 through 18 hrs, 1-hr steps

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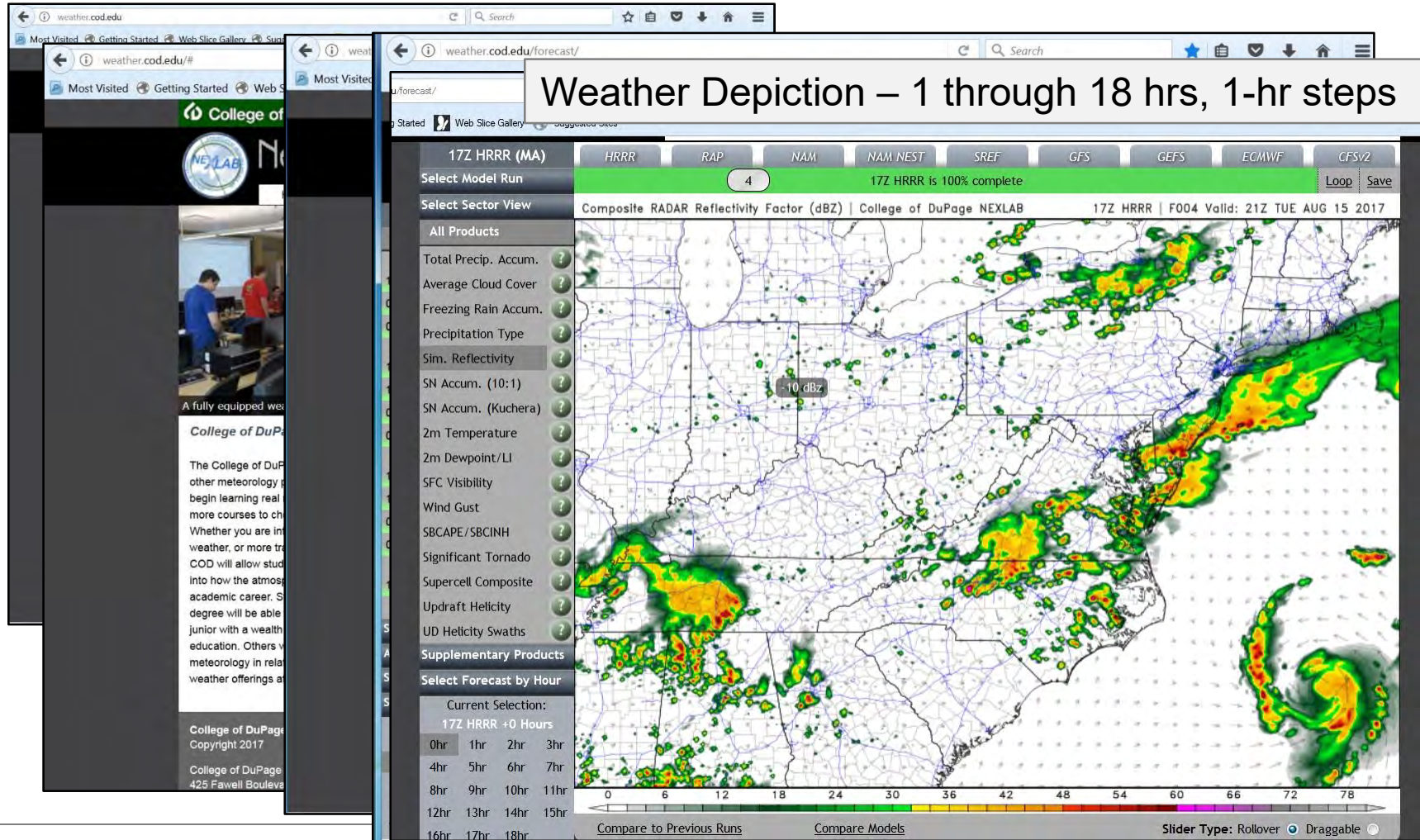
Weather Forecasts – "Short-Term"

North American Mesoscale (NAM) Model (1-84 hrs, 3-hr steps)	Global Forecast System (GFS) Model "The American" (0-384 hrs, 3-hr steps)

European Centre for Mid-Range Weather Forecasts(ECMWF) Model
"The Euro" (0-168 hrs, 24-hr steps)

Wednesday, 1 am Model Runs: 3-hr Precipitation Ending at 1 pm Friday
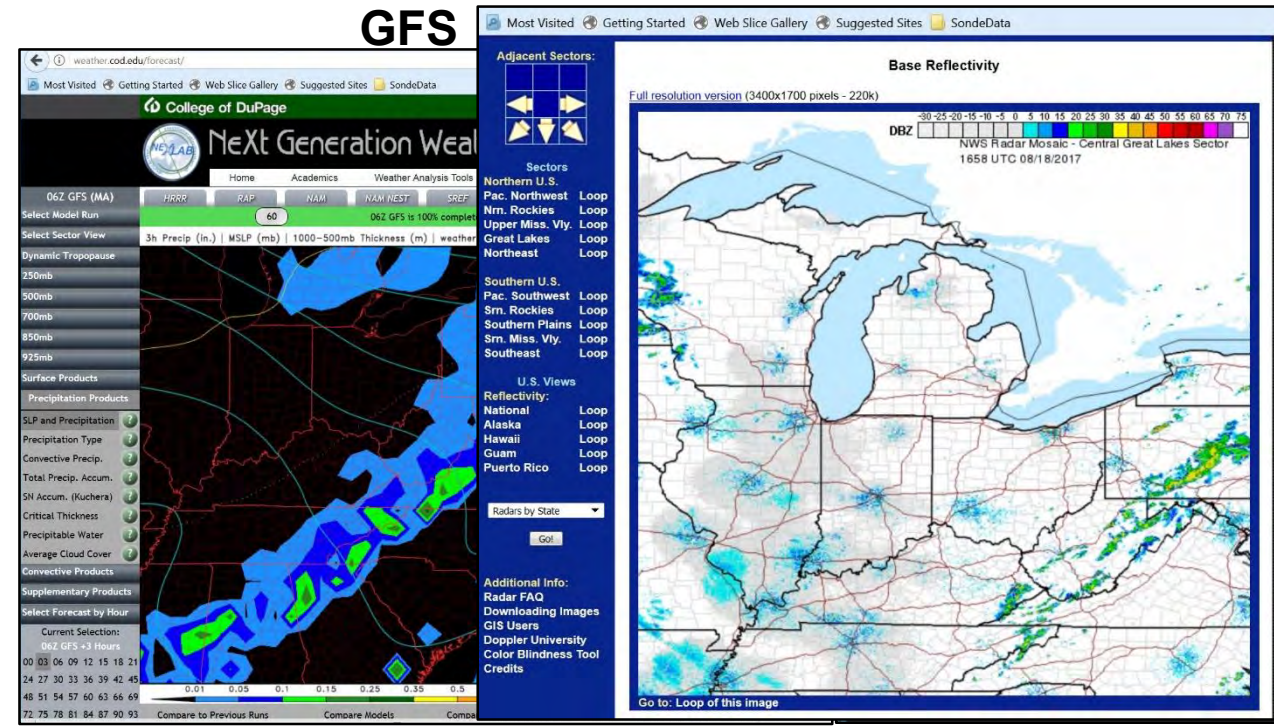
GFS   **NAM**
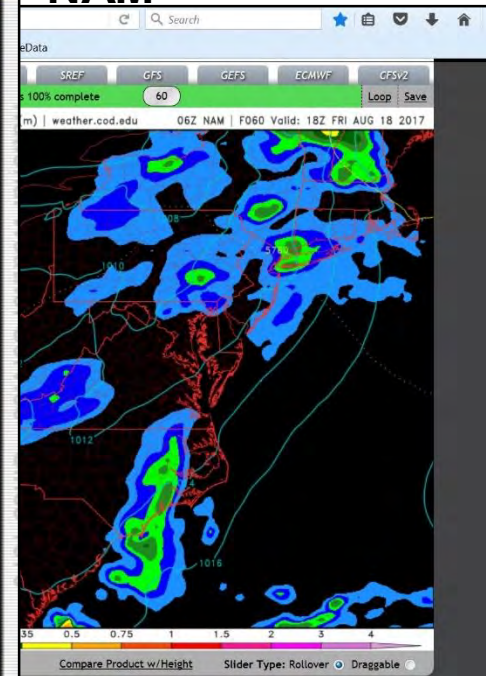
Weather Forecasts – "Short-Term" & "Long-Term"

Long-term: 3-7 days
Weather Prediction Center (WPC) (www.wpc.ncep.noaa.gov)
National-level guidance for local FOs (general, excess rain, winter weather)

72-Hour Probability of Snowfall Accumulating >= 12 Inches
Valid from 12Z Fri Jan 22, 2016 - 12Z Mon Jan 25, 2016
Issued: 0851Z Fri Jan 22, 2016

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![Virginia Tech - Invent the Future]
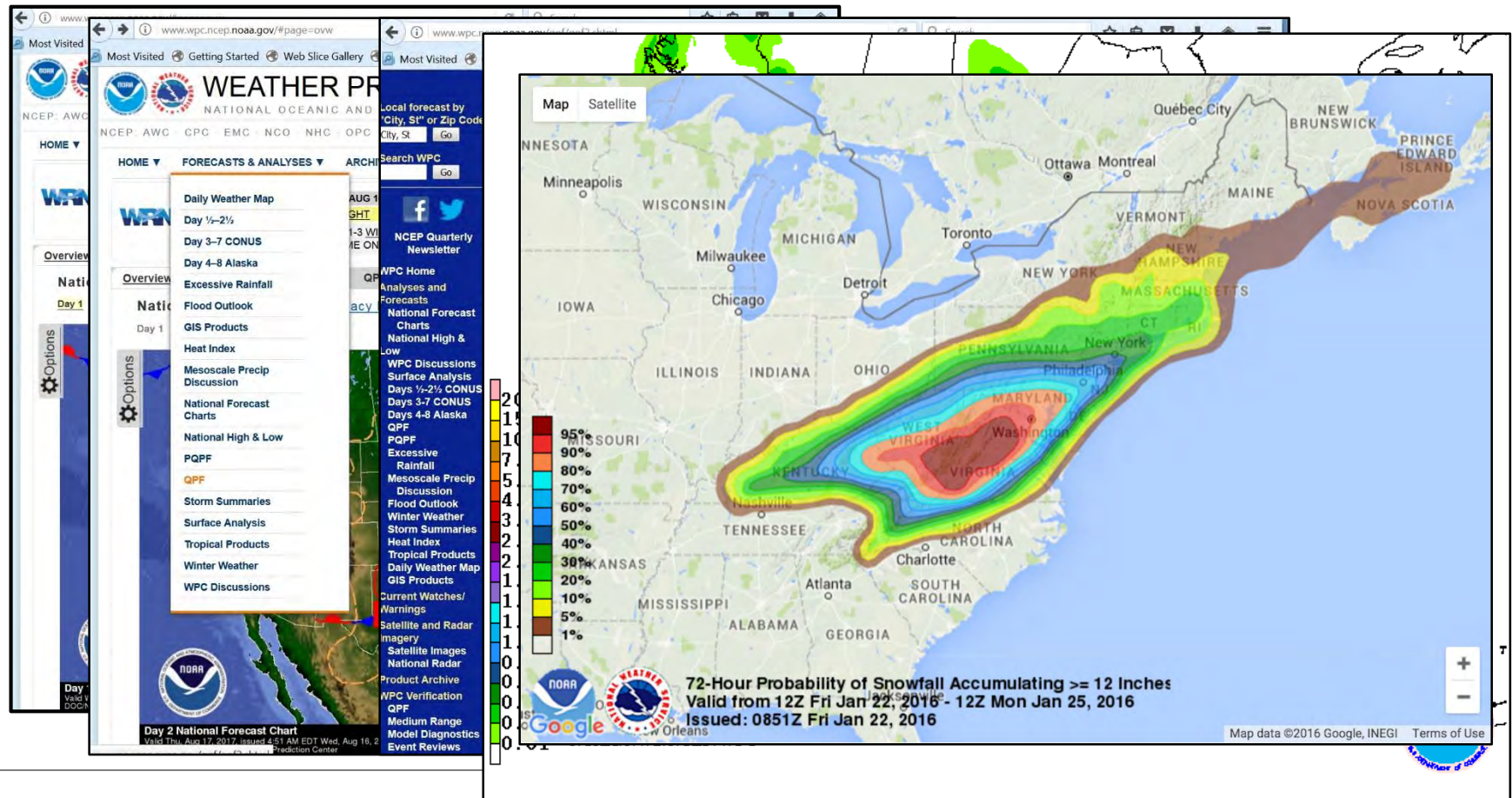
Weather Forecasts – "Short-Term" & "Long-Term"

Storm Prediction Center (SPC) (www.spc.noaa.gov)
National-level guidance for local NWSFOs (severe, fire weather)

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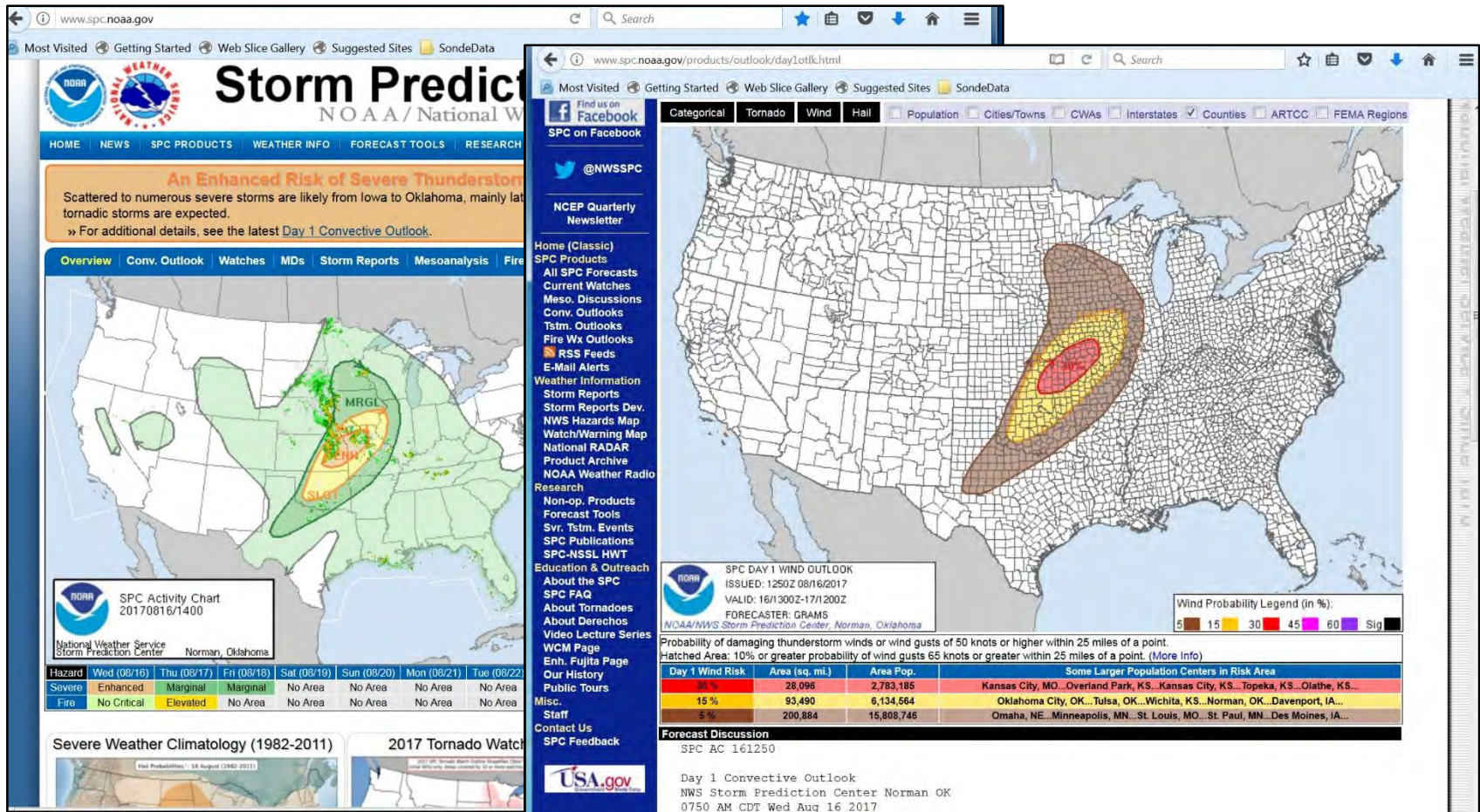
Weather Forecasts – "Short-Term" & "Long-Term"

River Forecast Centers (RFCs) (water.weather.gov/ahps)
Regional-level guidance for local NWSFOs; Virginia – Mid-Atlantic, Southeast
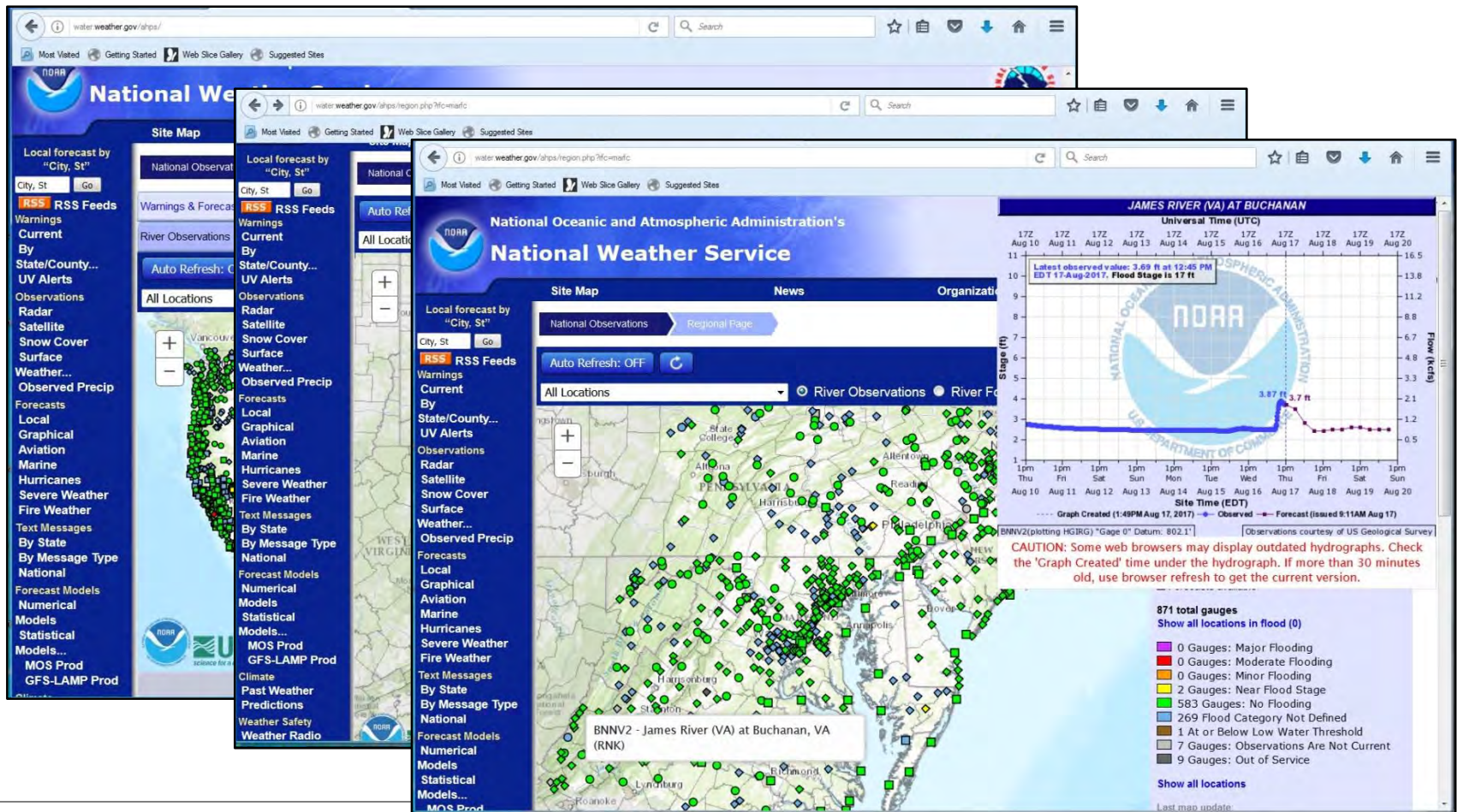
Weather Forecasts - Caveats

Weather Forecasts (In general, NWS recommended over derivatives and private forecasts.)

<u>Nowcasts (minutes-hours)</u> – Combining weather data trends with theoretical knowledge and local experience – *very high accuracy* (warnings/advisories)

<u>Near-term (-12/18 hours)</u> – Translating mesoscale numerical weather forecasts (e.g., HRRR) to local gridded forecasts; models begin with current conditions and react to broader atmospheric conditions simulated by coarser models; forecasters consider model biases and local idiosyncrasies – *high accuracy* (caveat – avoid precipitation specifics during convective season of late spring through early fall)

<u>Short-term (1-3 days)</u> – Translating forecasts from mesoscale and global models (e.g., NAM, GFS, ECMWF); mesoscale models benefit from higher resolution but are blind to larger circulation, while global models lack representation of local features; issues compound through time – *high accuracy day 1, good accuracy days 2 and 3* (caveat – focus on general conditions (max/min temperature, precipitation probability) for days 2 and 3, as timing/magnitude of events becomes questionable)

Weather Forecasts – Caveats, Guidance

<u>Long-term (3-7 days)</u> – Translating forecasts from global models (e.g., GFS, ECMWF); model issues compound through time – *high accuracy for generalities, low accuracy for details* (caveat – focus on trends – warmer/cooler and drier/wetter – and generalities of large events (blizzard, severe weather outbreak, dangerous heat/cold))

General Guidance

Regularly monitor weather forecasts (sub-daily) – most profound forecast changes occur after new balloon data are fed into models twice daily (12Z and 00Z, or 7 am and 7 pm local early-November to mid-March…8 am and 8 pm during daylight savings time). Fresh model runs late-night (midnight) and midday.

Recognize that forecasters tend to be conservative beyond three days – e.g., high-confidence snowstorms often enter the 7-day forecast period as a 30% chance. Reading the forecast discussion will provide context.

Long-range and climate forecasts are hedged-bets. Safely portrayed as "leans".

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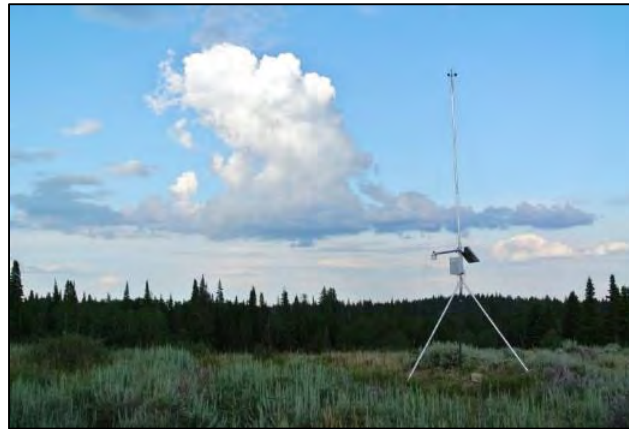
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Weather/Climate Forecasts – "Long-Term"/"Long-Range"

Long-Range: 6-14 days (Experimental: 3-4 weeks)
Climate Prediction Center (CPC) (www.cpc.ncep.noaa.gov)
Outlooks – general patterns of temperature and precipitation

Start:
33% Above
33% Normal
33% Below
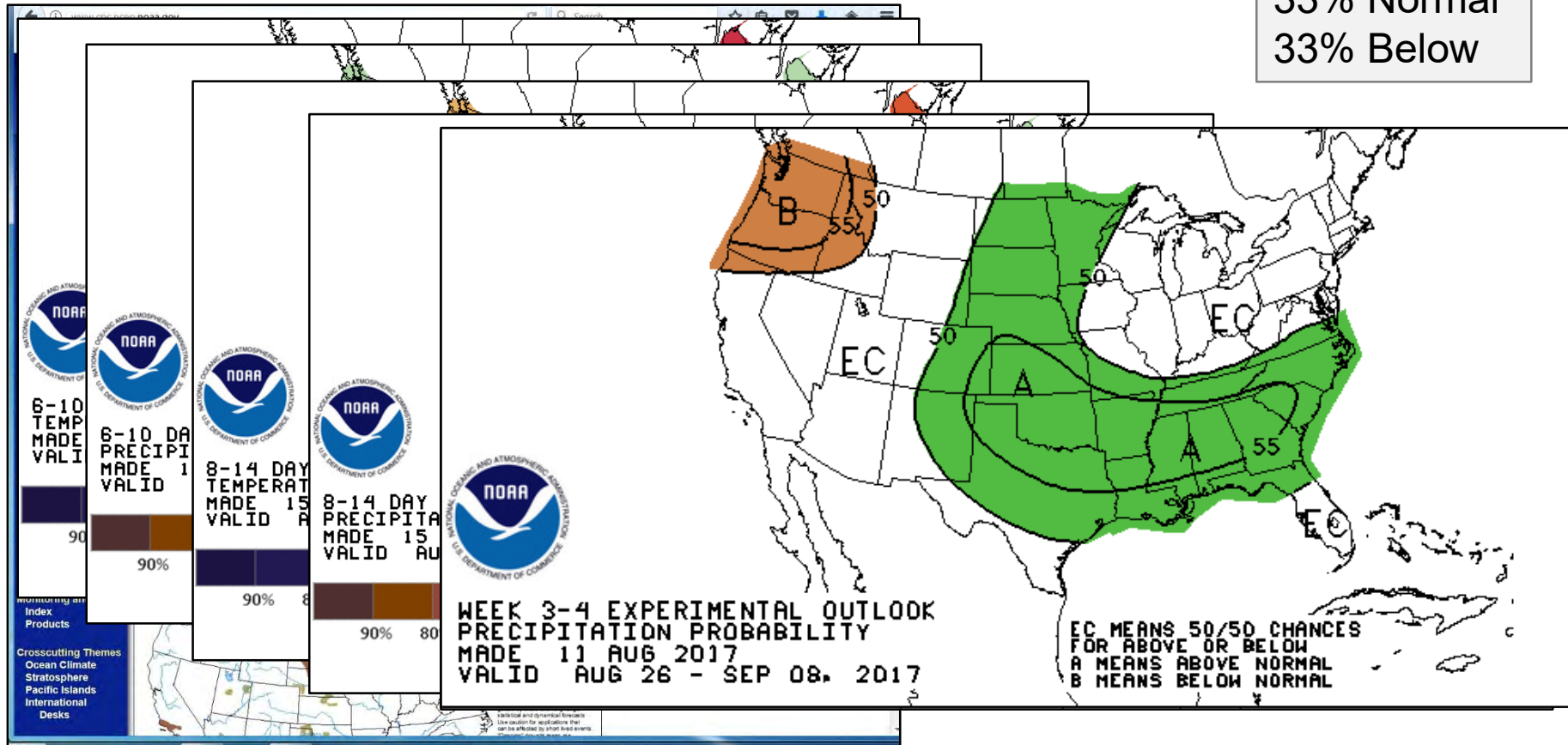
Climate Forecasts – Monthly, Seasonal

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for July 20 - October 31, 2017
Released July 20, 2017

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan 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).

Author:
David Miskus
NOAA/NWS/NCEP/Climate Prediction Center

Drought persists
Drought remains but improves
Drought removal likely
Drought development likely

http://go.usa.gov/3eZ73

Climate Forecasts – 21st Century
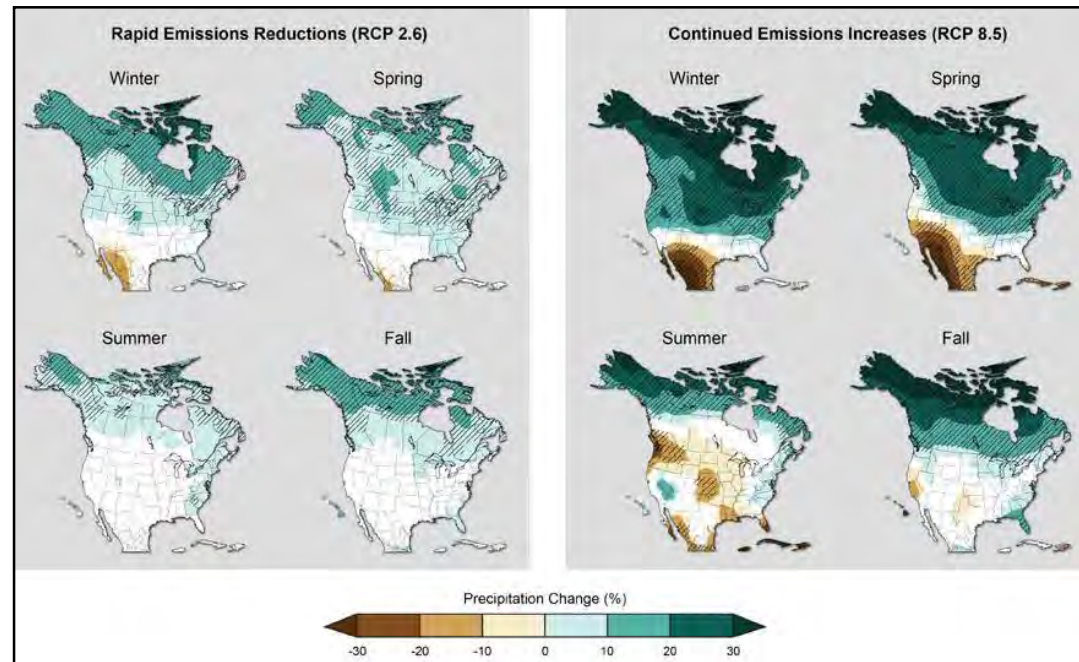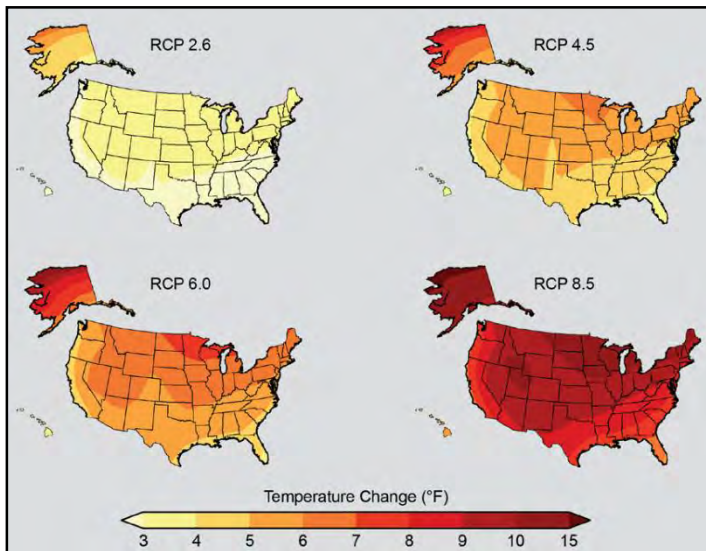
Global Climate Model forecasts using greenhouse gas (GHG) "representative concentration pathways" (RCP2.6/RCP8.5 = declining/increasing GHG emissions)

Projected Precipitation Change 2071-2100 (v. 1970-1999)

Projected Temperature Change 2071-2100 (v. 1970-1999)

Source: *Global Climate Change Impacts in the United States*, National Climate Assessment (2013)