NC STATE UNIVERSITY

Refining Priorities for Drought Communication Prototypes

Project Nighthawk Team
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NORTH CAROLINA CLIMATE OFFICE

CISA

NOAA

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

NIDIS

Webinar Purpose and Agenda

- **Introduction**
- **Guided discussion:**
  - **Review results** from Initial Project Survey
  - **Review and prioritize** ideas for drought information and communication strategies
- **Open discussion**
- **Wrap-up** and **next steps**

Introductions

Project Team

North Carolina Climate Office, NOAA's Carolinas Integrated Sciences and Assessments

NOAA's Sectoral Applications Research Program (SARP) ***"Coping with Drought in Support of the National Integrated Drought Information System (NIDIS)"*** Competition

Webinar Participants

NORTH CAROLINA Drought Management Advisory Council

NATIONAL WEATHER SERVICE

NORTH CAROLINA Environmental Quality

USGS

DUKE ENERGY®

US Army Corps of Engineers®

+ many public and municipal water systems

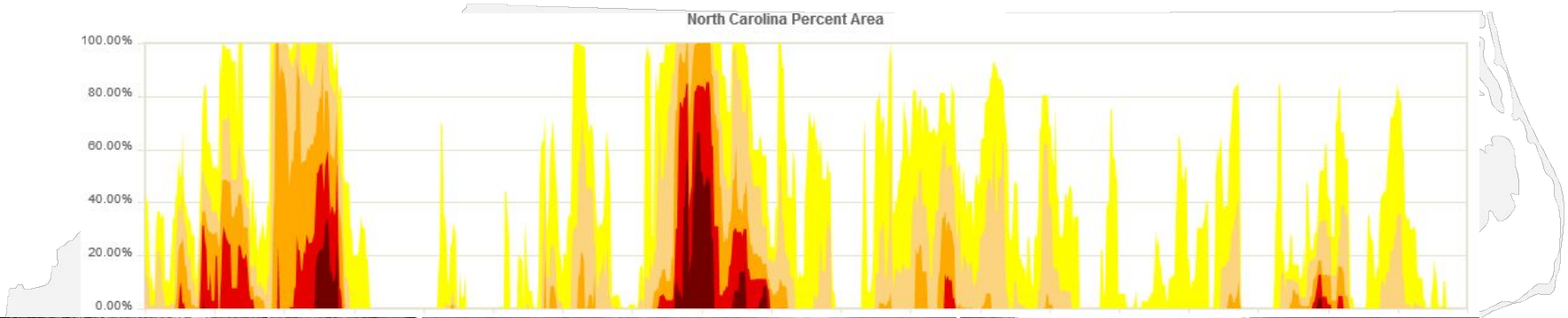
Informed Consent

More information at ***http://climate.ncsu.edu/nighthawk***

- Participant selection
- Potential benefits and risks of participation
- Confidentiality

Project Background

Drought is a part of North Carolina's climate



From Jerald Robinson, USGS

From WRAL

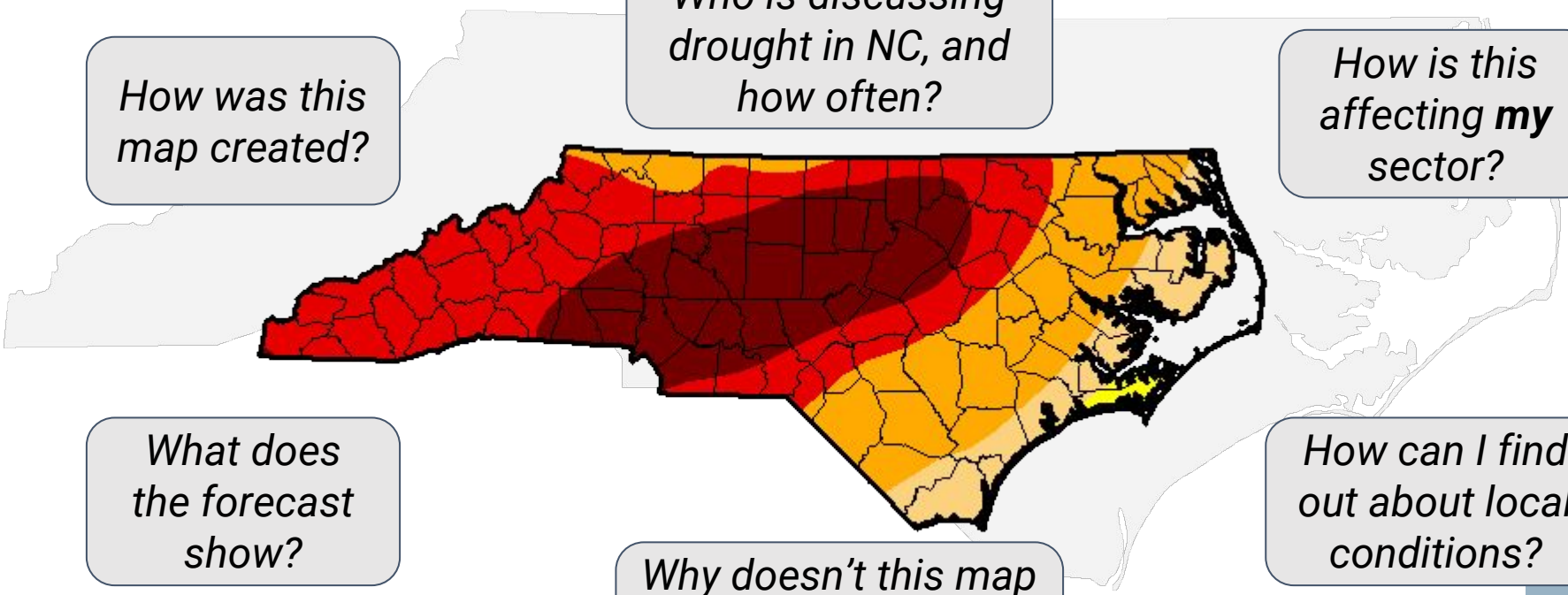
From Ryan Rasmussen, USGS

Project Background

How was this map created?

Who is discussing drought in NC, and how often?

*How is this affecting **my** sector?*



What does the forecast show?

*Why doesn't this map reflect conditions I'm seeing in **my** area?*

How can I find out about local conditions?

Project Background

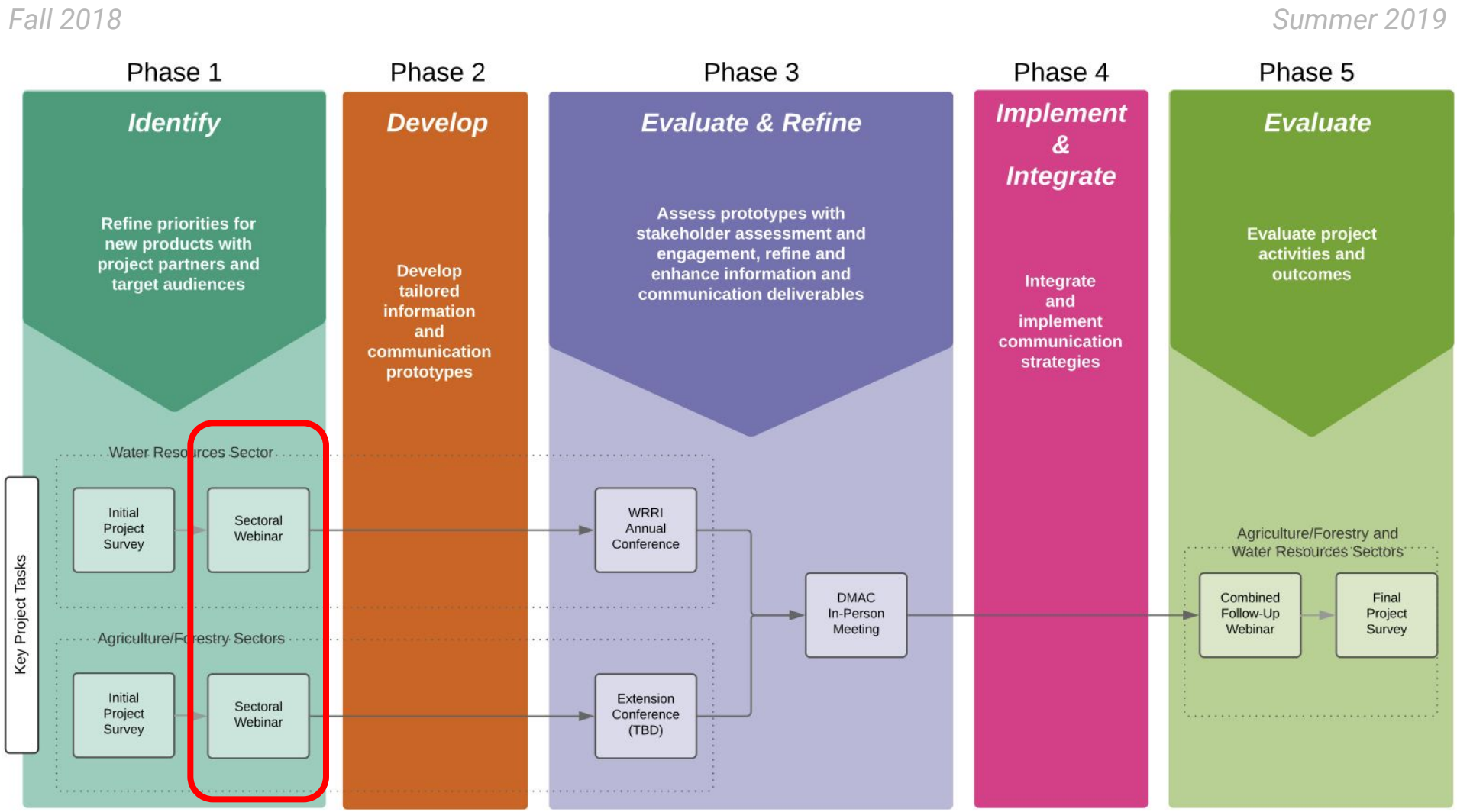
Goal: Provide ***relevant***, ***accessible***, and ***actionable*** drought-related information to decision makers tailored to specific sectors

Official Title: "*Innovating Approaches to Drought Communications with North Carolina Decision Makers*"

Codename: *Project Nighthawk*

The common nighthawk. Photo by Andy Reago and Chrissy McClarren, shared under CC BY 2.0.

Project Nighthawk Phases



Initial Survey - Overview

- 183 invitations sent to:
  - Public water systems in NC
  - Serving populations of 5,000 or more
- Open for responses from Oct. 12 to Nov. 2

Opened	40	22% of invitees
Completed	22	12% of invitees
Partially completed	18	5-81% completion rate

Initial Survey - What We Asked

1. Communication Channels & Formats

2. Weather, Climate, and Drought Information
   - geographic scale
   - decision calendars
   - usefulness of specific resources

3. Drought Monitoring Processes
   - US Drought Monitor
   - North Carolina drought monitoring

4. Impacts and Additional Information Needs

Communication Channels

- Along with developing resource prototypes, this project seeks to find and use preferred communication channels
- Survey asked which formats were most useful for respondents and their constituents
- Responses indicate room for improvement among current drought communications

Communication Channels

Retrieve on your own ⟷ **Info. is sent to you**

Outlooks & Forecasts

And they're off: Solvers compete for up to $800,000 in prizes in the Subseasonal Forecast Rodeo!

The Bureau of Reclamation is sponsoring this year-long, real-time forecasting competition, focused on western U.S. temperature and precipitation, in partnership with NOAA, USGS, and the U.S. Army Corps of Engineers. Forecasts are issued every other week and evaluated as observed data become available. To be eligible for cash prizes, teams must outperform benchmark existing forecasts. Winners are anticipated to be announced in September of 2018.

Follow the teams, see the latest scores

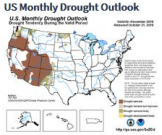
When will drought affect me? How long could it last? Choose a forecast product below to get information, forecasts, and outlooks on what could be ahead.

Read an explanation of the causes and variables going into the prediction of drought, from the National Drought Mitigation Center.

US Seasonal Drought Outlook

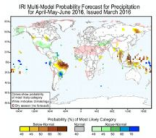
The Climate Prediction Center's (CPC) Seasonal Drought Outlook is issued monthly on the third Thursday of each month. The Outlook predicts whether drought will emerge, stay the same or get better in the next three months.

US Monthly Drought Outlook



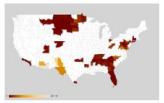
The Monthly Drought Outlook is issued at the end of each calendar month and is valid for the upcoming month. The Outlook predicts whether drought will emerge, stay the same or get better over the next 30 days or so.

Seasonal Climate Forecasts



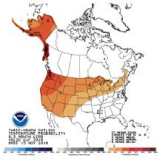
Worldwide predictions for temperature and precipitation from the International Research Institute for Climate and Society at Columbia University.

Drought Termination and Amelioration



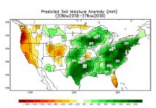
Users can generate maps to show probability of precipitation and the amount of precipitation to ameliorate or end a drought. (Sample image)

Temperature and Precipitation Outlooks



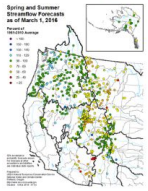
Temperature and precipitation forecasts for one to six months ahead.

GFS Soil Moisture Anomaly



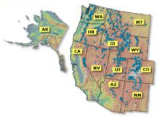
Predictions for the upcoming week or two weeks.

Streamflow Forecast Maps



Available in spring and summer for the western U.S., forecasts of percent of monthly average flow compared to data from 1981-2010. Click here to find actual conditions.

State Water Supply Outlook Reports



Data from the USDA for streamflow forecasts, reservoir storage and other hydrologic information for the Western states.

3-8 Day Fire Weather Outlook

Updates daily. For an interactive map with options to show layers depicting watches and warnings, weather outlooks, spot forecasts, click here

National Significant Wildland Fire Potential Outlook

Seasonal fire potential. Click for the current month or the next month.

Drought Alert

Drought Condition	Forecast Period
Development Likely	March 2017

This alert is a drought condition forecast for **your location near Garner, NC**. For more information and a map of the affected areas, please visit NOAA/NWS Climate Prediction Center's U.S. Monthly Drought Outlook.

Receive this alert from a friend or colleague?
You can sign up to receive alerts for your specific location.

Subscribe Now

Powered by SERCH LIGHTS,

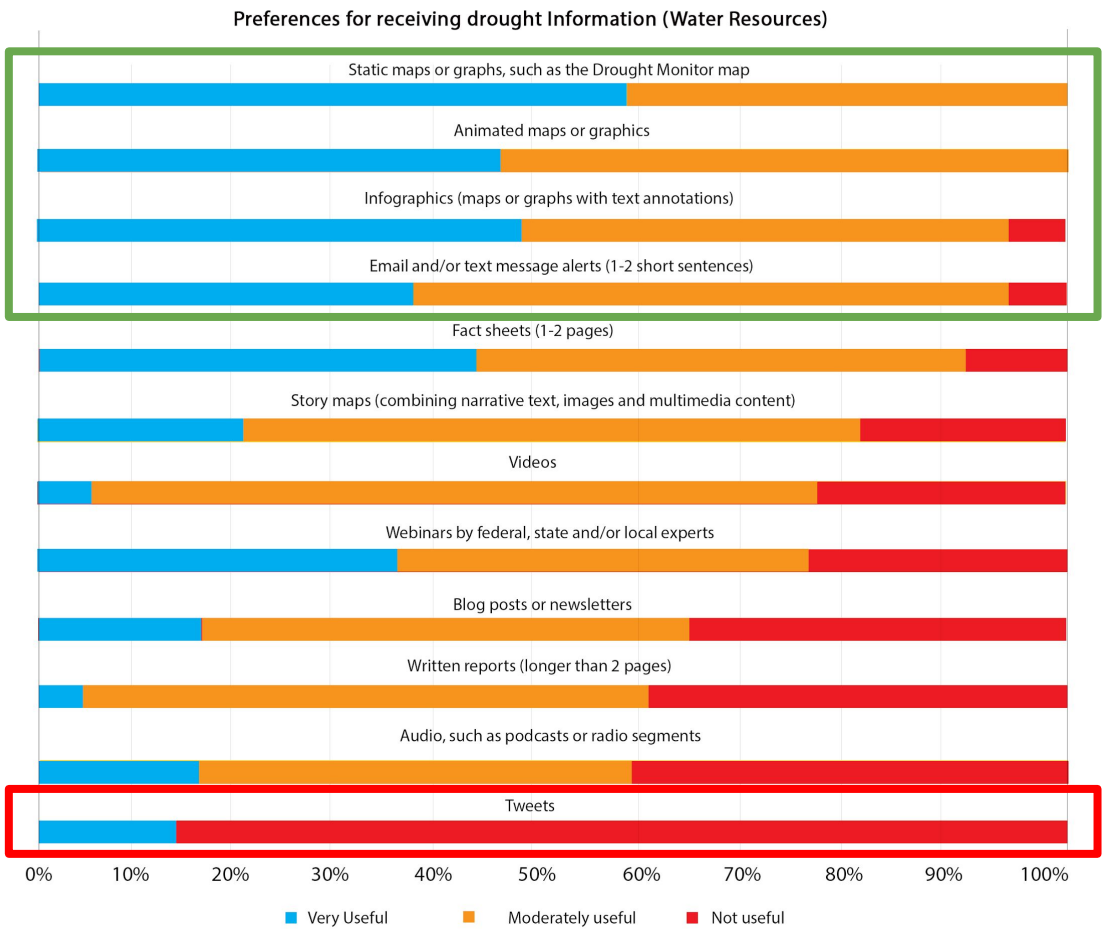
a product of the USDA Southeast Regional Climate Hub.

The Communications Spectrum

Raw Data | Maps & Charts | Synthesized Reports

Web-Based Tools | Email/Text Alerts | Infographics | Blogs, Factsheets, Audio, and Video

Listservs & Email Discussions | Social Media | Webinars

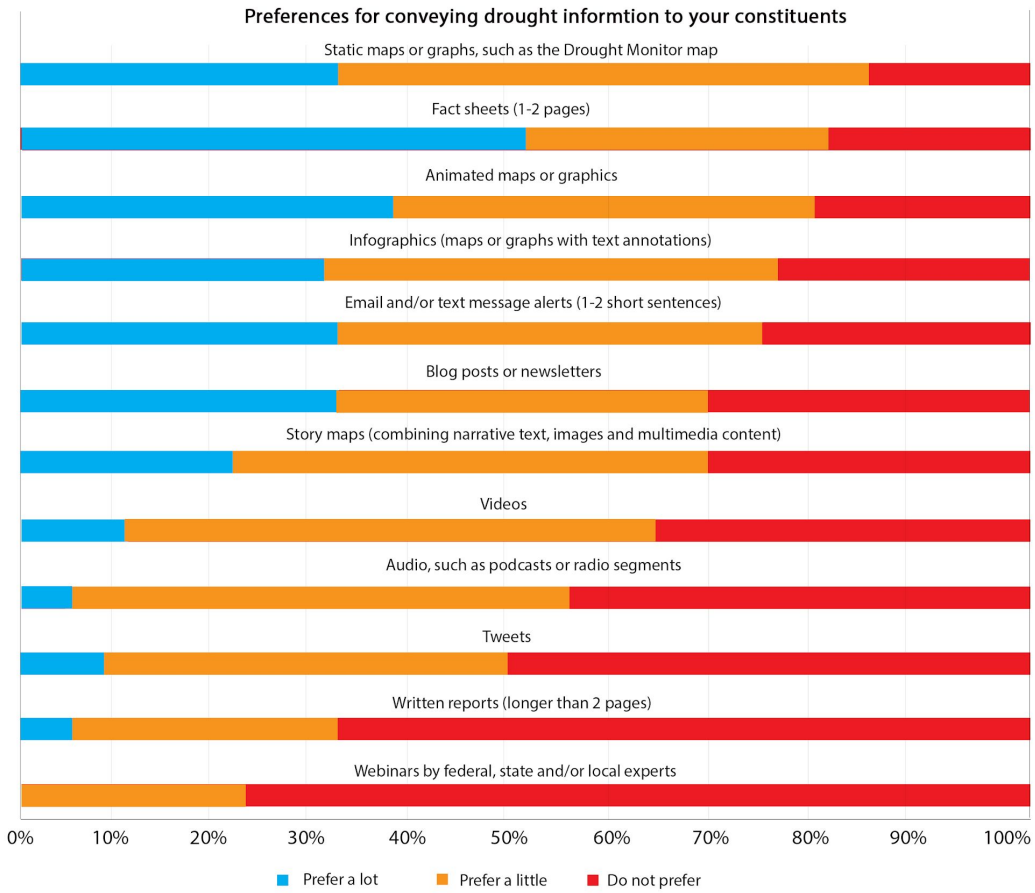


The Communications Spectrum

Raw Data | Maps & Charts | Synthesized Reports

Web-Based Tools | Email/Text Alerts | Infographics | Blogs, Factsheets, Audio, and Video

Listservs & Email Discussions | Social Media | Webinars



Communication Strategies

Takeaways so far: Information consumers prefer...

- At least **partially synthesized**/translated information
- Exploring **individually** on their own time
- In some cases, data and reports **pushed to them** (instead of going somewhere to find it)
- A **variety of formats**, from alerts to infographics to factsheets

How do you pass on information to your constituents? What do you consider before sharing with them?

What feedback have you received regarding communicating information? What has worked well (or not)?

Initial Survey - What We Asked

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   - decision calendars
   - usefulness of specific resources

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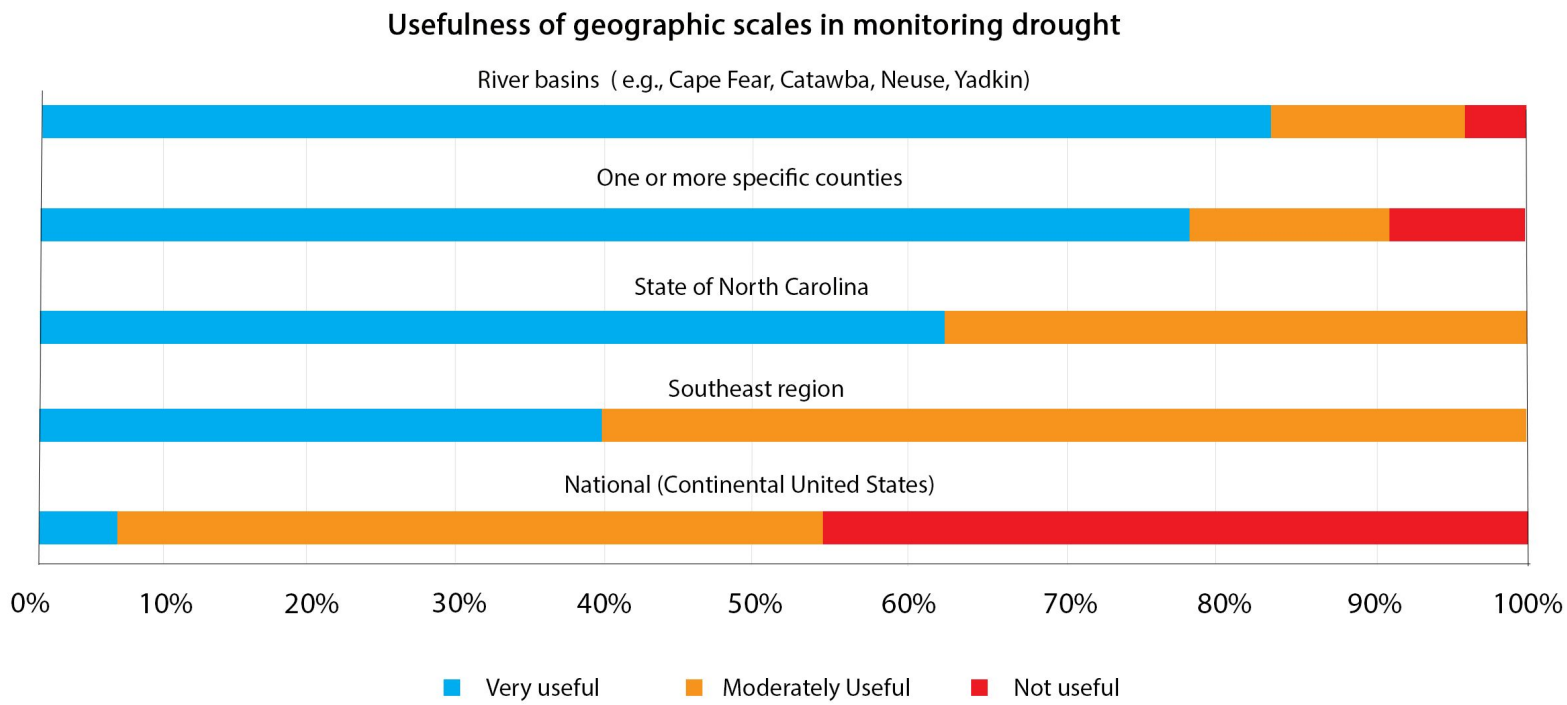
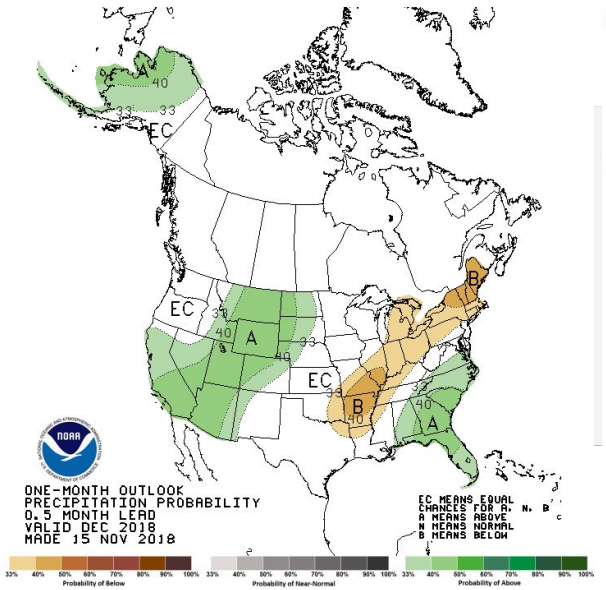
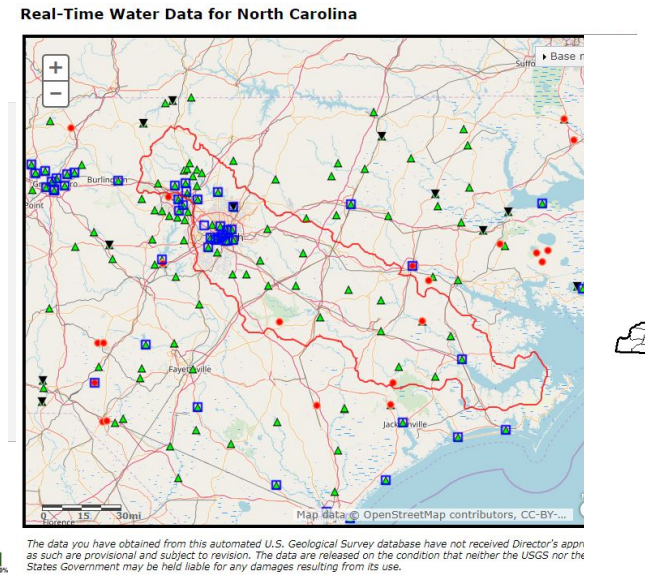
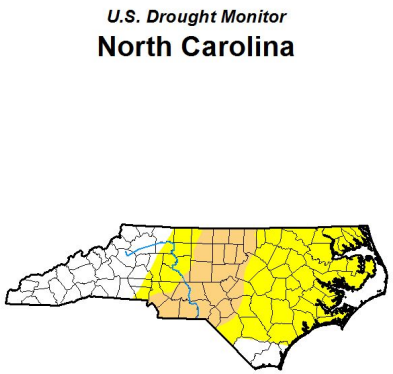
Geographic Scales

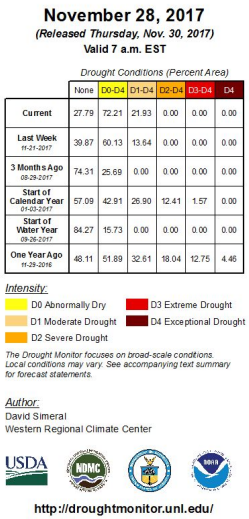


Geographic Scales





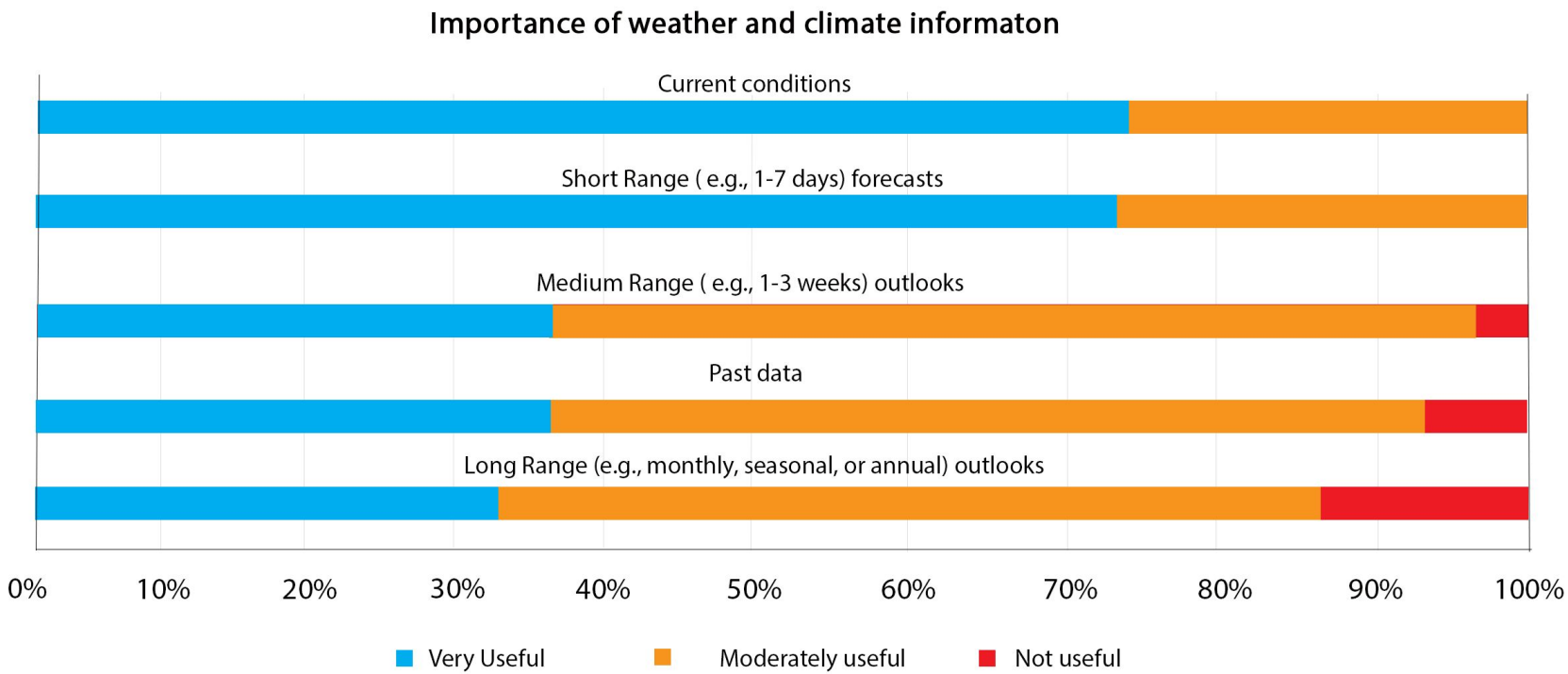




	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	27.79	72.21	21.93	0.00	0.00	0.00
Last Week 11-21-2017	39.87	60.13	13.64	0.00	0.00	0.00
3 Months Ago 08-29-2017	74.31	25.69	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	57.09	42.91	26.90	12.41	1.57	0.00
Start of Water Year 09-26-2017	84.27	15.73	0.00	0.00	0.00	0.00
One Year Ago 11-29-2016	48.11	51.89	32.61	18.04	12.75	4.46

Are there products you use now that are on national (or other) scales that would be more useful for you or your constituents if they were translated to local scales?

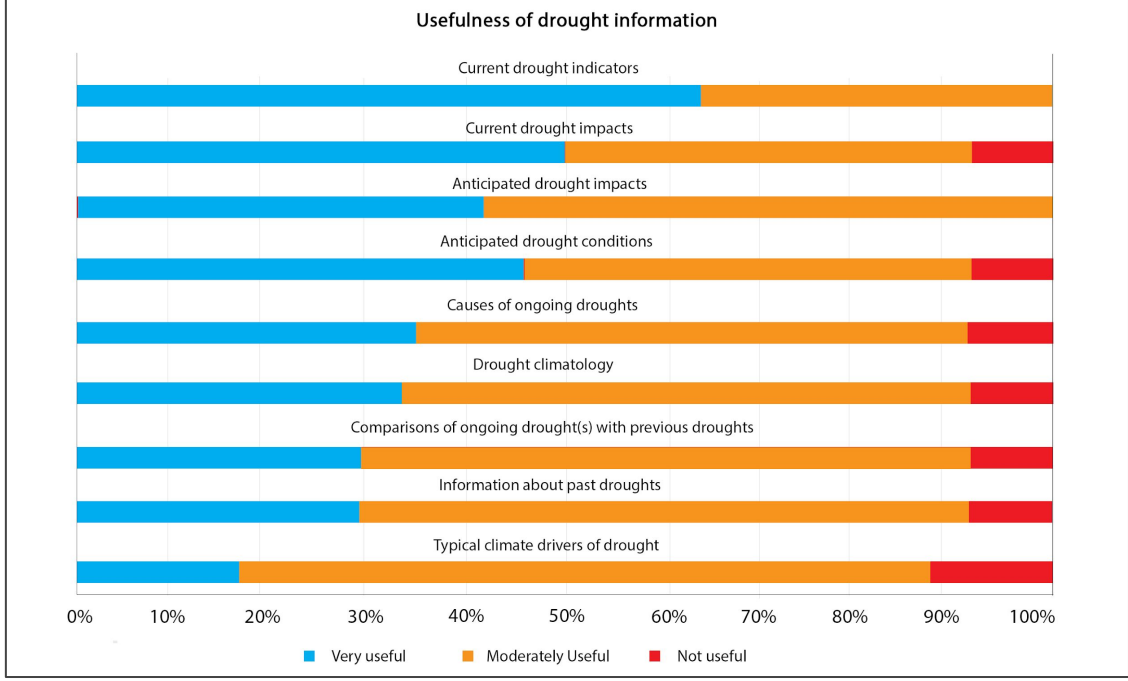
Information Timescales

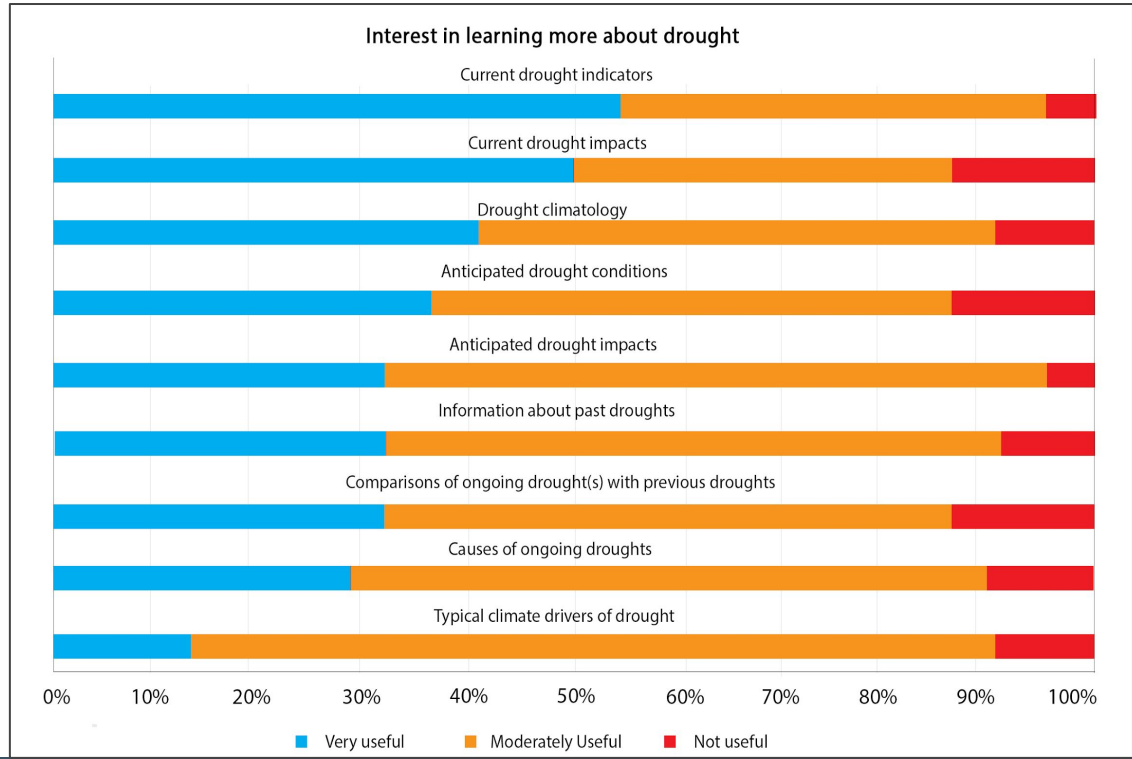


Usefulness of Drought Information

Takeaways - most useful information:

- **Current** drought indicators and impacts
- **Anticipated** drought conditions and impacts





Decision Calendars

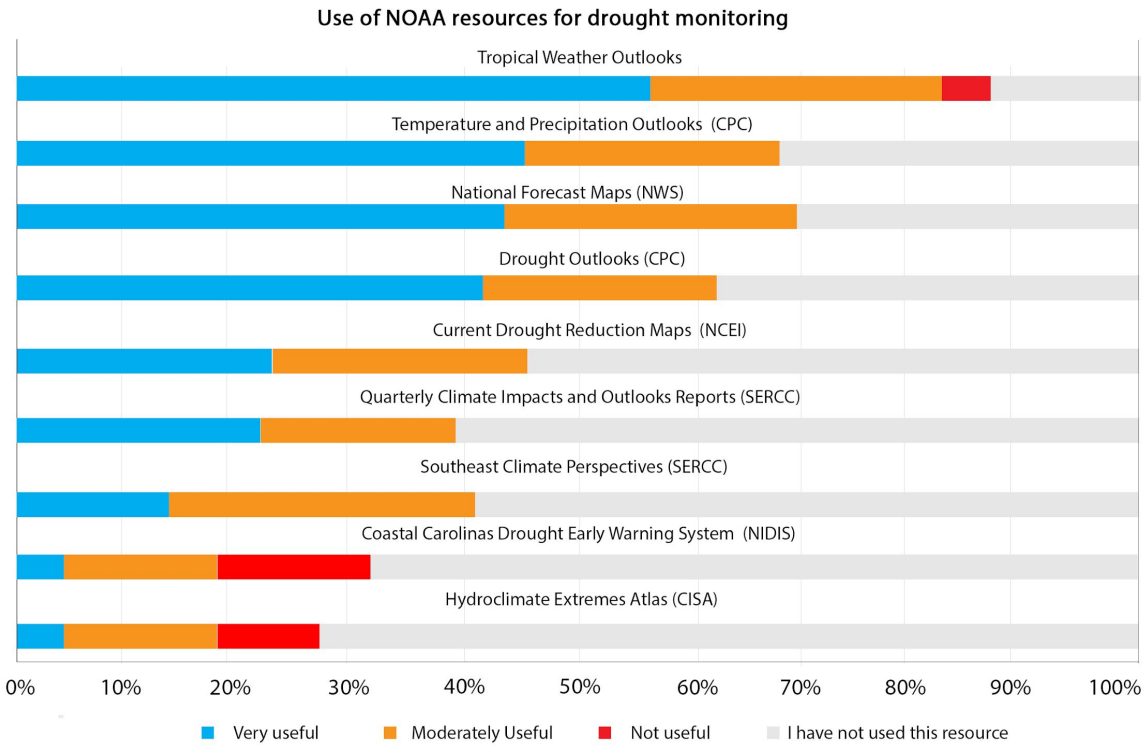
Current conditions and **short-range forecasts** are most useful for informing decisions about:

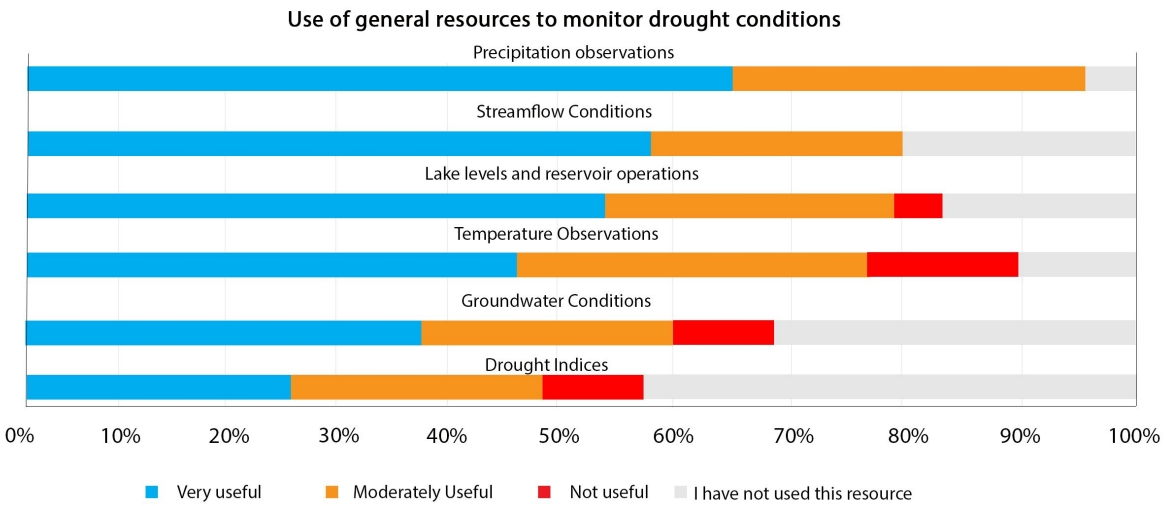
	Winter	Spring	Summer	Fall
Reservoir Management				
Water Conservation				
Communications				

Use of Drought Resources

Takeaways - most useful resources:

- **Precipitation** outlooks and forecasts
- **Streamflow** and **reservoir** levels
- Climate and drought index products used less often





Monitoring Drought

- Survey responses indicated a preference for precipitation and water level data
  - Where do you typically go to access this information? (TV news, The Weather Channel, AccuWeather, NWS, SCO, etc.)

- Typical decision points:
  - Monitoring water supplies and availability
  - Making water conservation decisions
  - Communicating with customers
  - Other?

- Other drought monitoring information exists
  - Are these less useful than precipitation and water level?
  - Are these useful, but not usable/accessible/discoverable?

Information Resources - Discussion

- To what extent are existing resources meeting your needs?
- How could they be improved?
  - **Visualization** (Are maps and graphics clear? Are they at the preferred geographic and/or time scales?)
  - **Availability** (Do you know where to find the information? Do you receive alerts or emails?)
  - **Clarity** (Are they unclear or too complex?)
  - **Usability** (Are they able to inform a specific decision or question?)
  - **Shareability** (Are you able to easily explain or transfer the information to a constituent?)
- Are you aware of how people are using and consuming this information?

Current Condition Resources

NC DMAC

NORTH CAROLINA
Drought Management Advisory Council

Home | Current Conditions | News | About | Contacts | Education | Archives | Links

Current Conditions

PUBLIC WATER SUPPLY SYSTEMS
- Water Use Restrictions
- Weekly Water Use

AGRICULTURE
- Crop Weather
- Crop Moisture Index

FORESTRY
- Current Keetch - Byram Drought Index

CLIMATE & OUTLOOK
- US Seasonal Drought Outlook
- Integrated Water Portal
- Real-time precipitation data
- Climatic Information

STREAMFLOWS & GROUND WATER
- Surface Water Conditions
- Streamflow Summary Plot
- Streamflow Gages by County
- Ground Water Conditions
- Drought Indicator Wells
- Streamflow Conditions - SERFC

RESERVOIRS & LAKE LEVELS
- Corps of Engineers
- Duke Energy
- Lake Gaston & Roanoke Rapids
- Cube Hydro Carolinas
- Tennessee Valley Authority

Home | Current Conditions | News | About | Contacts | Education | Archives | Links

http://www.ncdrought.org/current.php

NWS Raleigh http://www.weather.gov/rah/drought

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Local forecast by "City, St" or ZIP code
Enter location ... Go
Location Help

Heavy Snow Shifts into the Northeast Tuesday; Another Round of Heavy Rain and Mountain Snow for the West Coast

An unseasonably strong storm system will pivot across the Northeast states Tuesday before exiting off the coast Wednesday. This storm will bring around a foot of new snow to the eastern Great Lakes into Maine with isolated higher amounts possible. Unsettled weather has returned to the West with more heavy rain and mountain snow forecast from California into Washington through much of this week. Read More >

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City, ST
Enter Your City, ST or ZIP Code
Remember Me
Get Weather
Privacy Policy

Drought

Weather.gov > Raleigh, NC > Drought

Raleigh, NC
Weather Forecast Office

Current Hazards | Current Conditions | Radar | Forecasts | Rivers and Lakes | Climate and Past Weather | Local Programs

Drought Monitoring

Click here for latest Drought Information Product (issued ONLY when drought condition is D2 or greater):

Primary resources:

- National Integrated Drought Information System - NOAA's Drought Portal
- U.S. Drought Monitor
- NOAA Climate Prediction Center Drought Monitor
- NOAA Climate Prediction Center U.S. Soil Moisture Monitoring
- NOAA Climate Monitor

- NC Drought Management Advisory Council
- NC Division of Water Resources
- NC Division of Water Resources - Drought Monitoring
- NC Division of Water Resources - Statewide Water Conservation Status
- NC Division of Water Resources - Weekly Water Use
- NC Cooperative Extension - Agricultural Drought Information
- NCDC Drought Termination and Amelioration

- Precipitation estimates and archived precipitation estimates
- USGS all-in-one realtime water page
- USGS real-time stream flow data
- USGS real-time ground water data
- USGS duration graphs for selected North Carolina stations

Current Drought Situation:

Maps of the latest drought conditions can be found at the U.S. Drought Monitor.

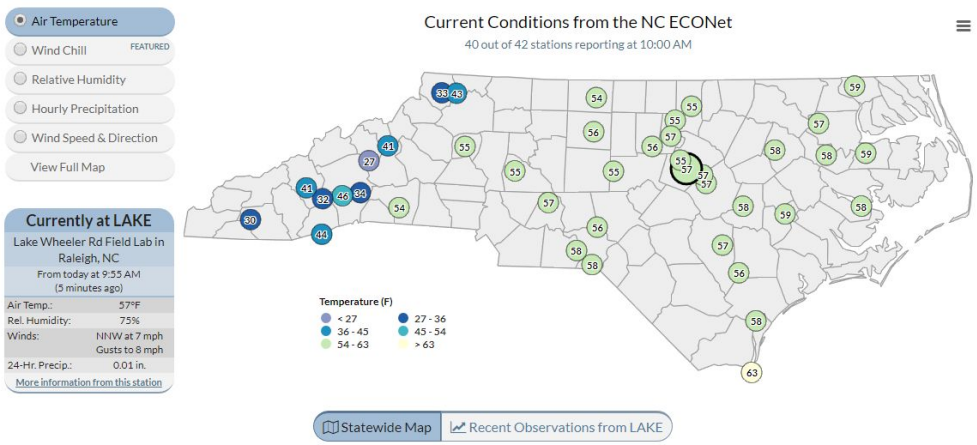
Archives can be found at the Drought Monitor Archive Page.

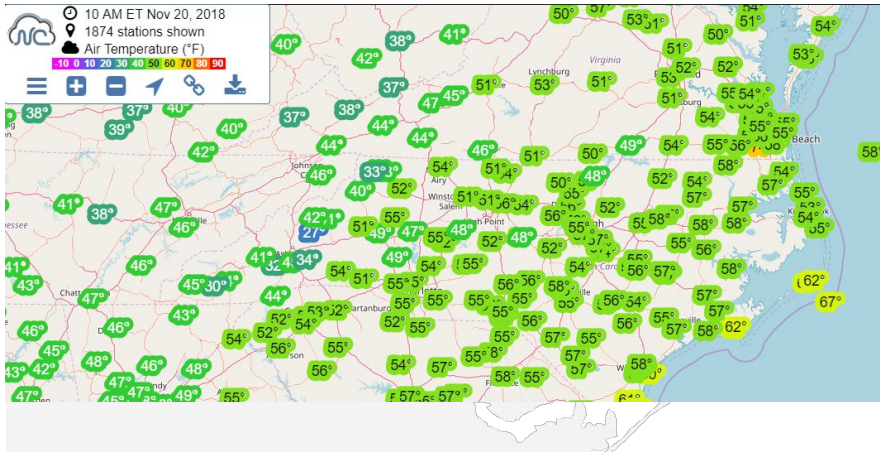
Precipitation/Temperature Outlooks:

Current Condition Resources

State Climate Office current conditions maps

https://climate.ncsu.edu/map

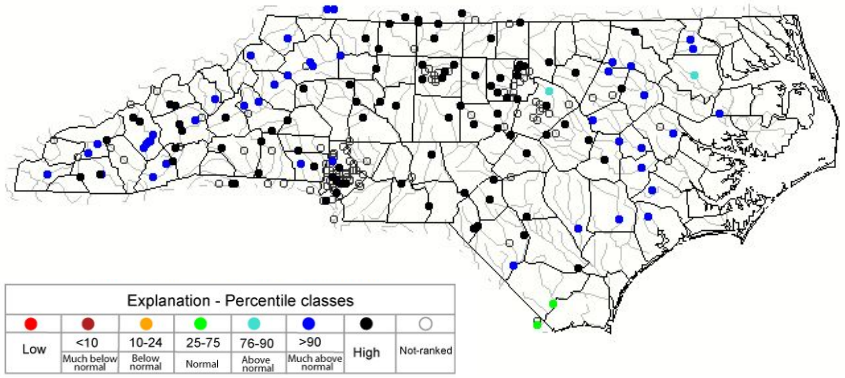




https://climate.ncsu.edu

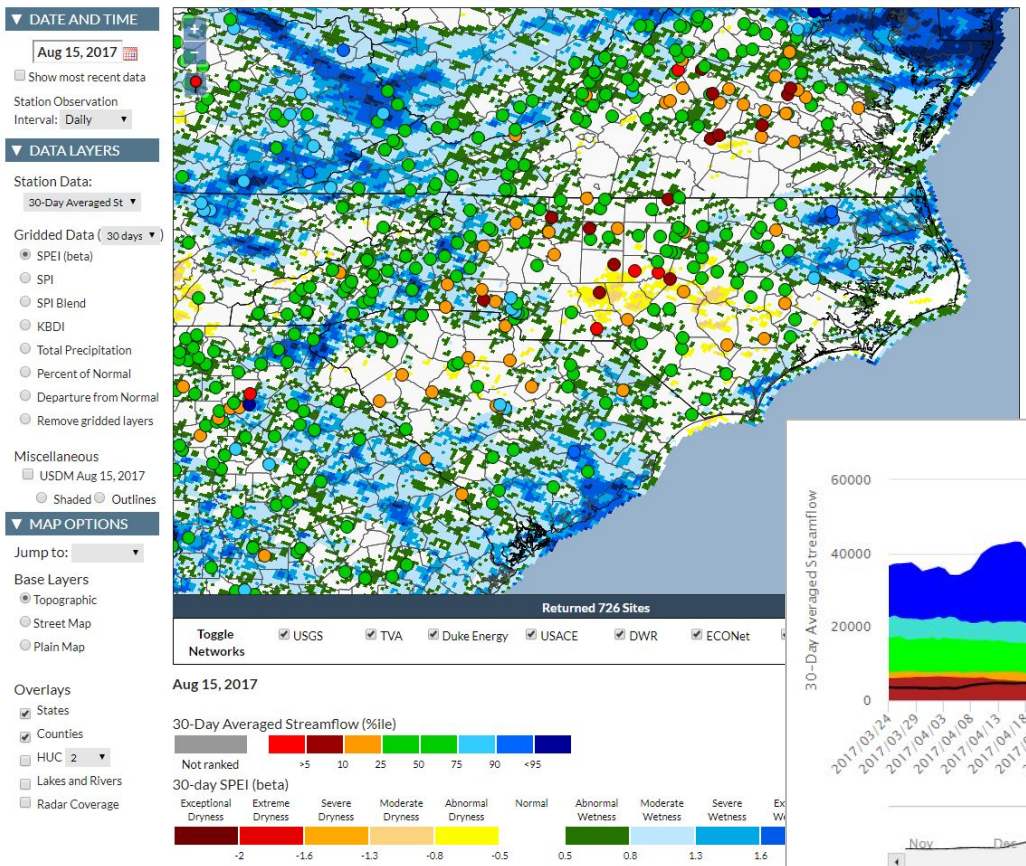
USGS streamflow maps

https://waterwatch.usgs.gov



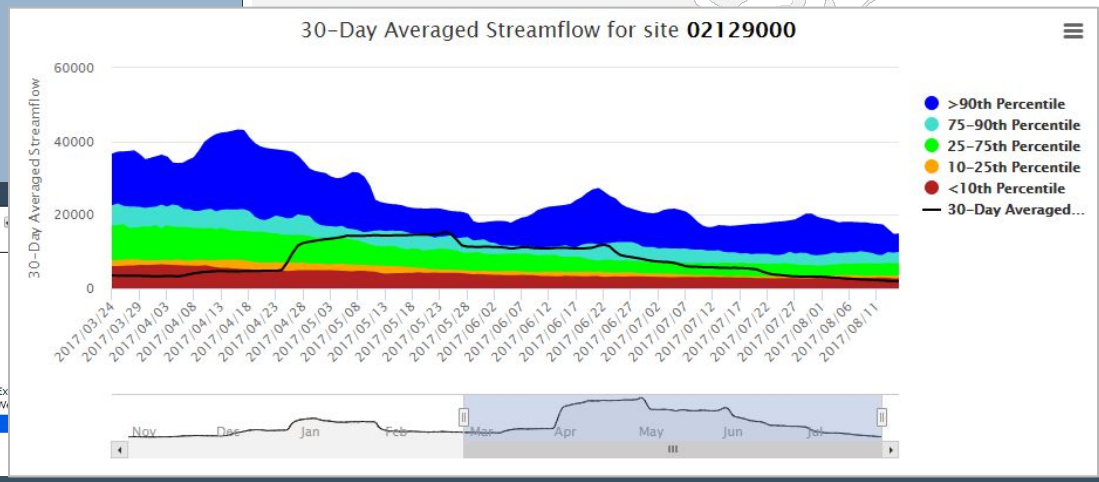
Current Condition Resources

SCO's Integrated Water Portal



High-resolution gridded drought indices and point-based groundwater, streamflow, and other water observations

https://climate.ncsu.edu/water/map



Current Lake Level Resources

US Army Corps

http://epec.saw.usace.army.mil

Click on Reservoir Name Below to go to Project Webpage:

	Kerr	Philpott	Falls	Jordan	Scott
0800 Elevation (ft-msl)	303.55	975.66	256.85	228.17	1030.27
Guide Curve (ft-msl)	297.00	971.50	251.50	216.00	1030.00

Lake and Guide Curve Levels for the past 180 days

Duke Energy

https://lakes.duke-energy.com

NAME OF LAKE	ACTUAL	TARGET	MINIMUM	MAXIMUM	DROUGHT STAGE	RANGE	DATE LAKE MESSAGE UPDATED
LAKE JAMES	97.7	96	93	100	ND	View	None
LAKE RHODHISS	101.0	97	94	100	ND	View	11/28/2018
LAKE HICKORY	97.2	97	94	100	ND	View	None
LOOKOUT SHOALS LAKE	95.9	97	94	100	ND	View	None
LAKE NORMAN	98.4	96.1	93.1	100	ND	View	None
MOUNTAIN ISLAND LAKE	98.9	96	94.3	100	ND	View	11/8/2018
LAKE WYLIE	98.7	97	94	100	ND	View	None
FISHING CREEK LAKE	99.3	98	95	100	ND	View	None
LAKE DEARBORN - GREAT FALLS	99.2	97.5	95	100	ND	View	None
CEDAR CREEK - ROCKY CREEK	99.7	97.5	96	100	ND	View	None
LAKE WATEREE	96.5	95.1	93	100	ND	View	None

TVA

https://www.tva.gov/Environment/Lake-Levels

Observed Data

Day	Time (Eastern)	Reservoir Elevation (behind dam)*	Tailwater Elevation (below dam)*	Average Hourly Discharge*
11/29/2018	5 AM	1,664.51	1,279.68	6,956
11/29/2018	6 AM	1,664.50	1,279.71	6,963
11/29/2018	7 AM	1,664.45	1,279.68	6,962
11/29/2018	8 AM	1,664.43	1,279.67	6,955
11/29/2018	9 AM	1,664.41	1,279.73	6,963
11/29/2018	10 AM	1,664.36	1,279.62	6,950
11/29/2018	11 AM	1,664.33	1,279.64	6,962
11/29/2018	noon	1,664.30	1,279.63	6,963
11/29/2018	1 PM	1,664.25	1,279.60	6,957

Cube Hydro

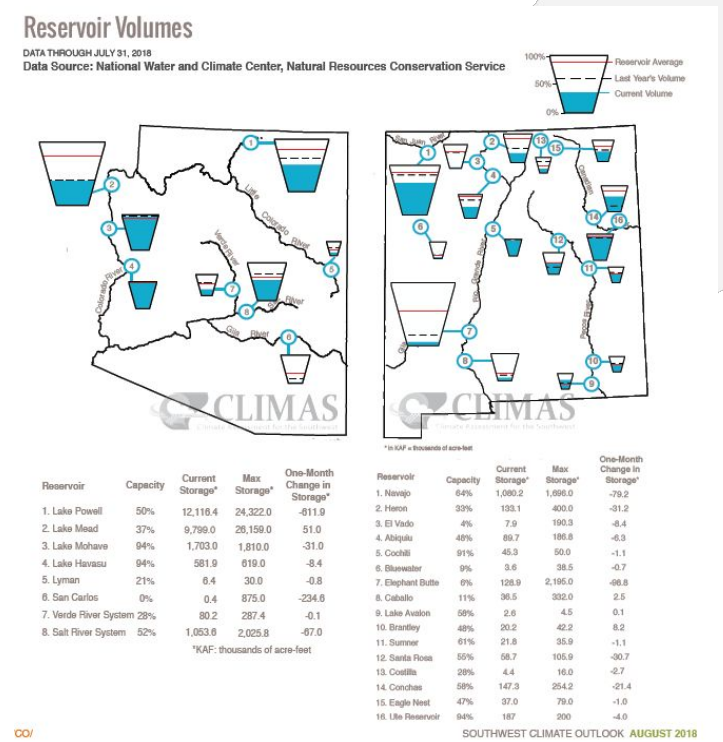
http://cubecarolinas.com/lake-levels/

Lake	Lake Elevation	Feet Below Full Pond	Fluctuation Forecast
High Rock	653.64-ft Yadkin Datum (622.54-ft USGS Datum)	1.36 feet	
Tuckertown	595.59-ft Yadkin Datum (564.29-ft USGS Datum)	0.41 feet	
Badin (Narrows)	540.28-ft Yadkin Datum (508.98-ft USGS Datum)	0.82 feet	
Falls	362.93-ft Yadkin Datum (331.73-ft USGS Datum)	1.07 feet	

Lake Level Visualizations

CLIMAS Reservoir Volumes

https://www.climas.arizona.edu



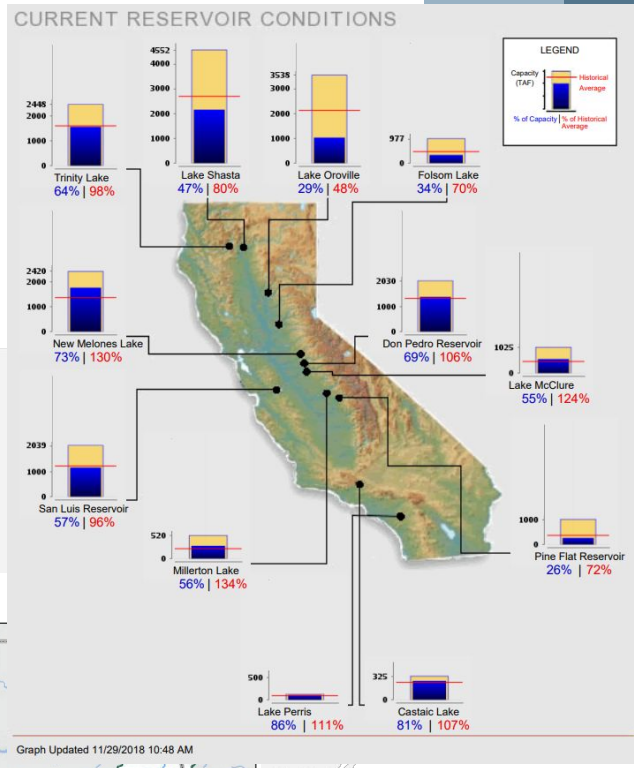
Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Lake Powell	50%	12,116.4	24,322.0	-611.9
2. Lake Mead	37%	9,799.0	26,159.0	51.0
3. Lake Mohave	94%	1,703.0	1,810.0	-31.0
4. Lake Havasu	94%	581.9	619.0	-8.4
5. Lyman	21%	6.4	30.0	-0.8
6. San Carlos	0%	0.4	875.0	-234.6
7. Verde River System	28%	80.2	287.4	-0.1
8. Salt River System	52%	1,053.6	2,025.8	-67.0

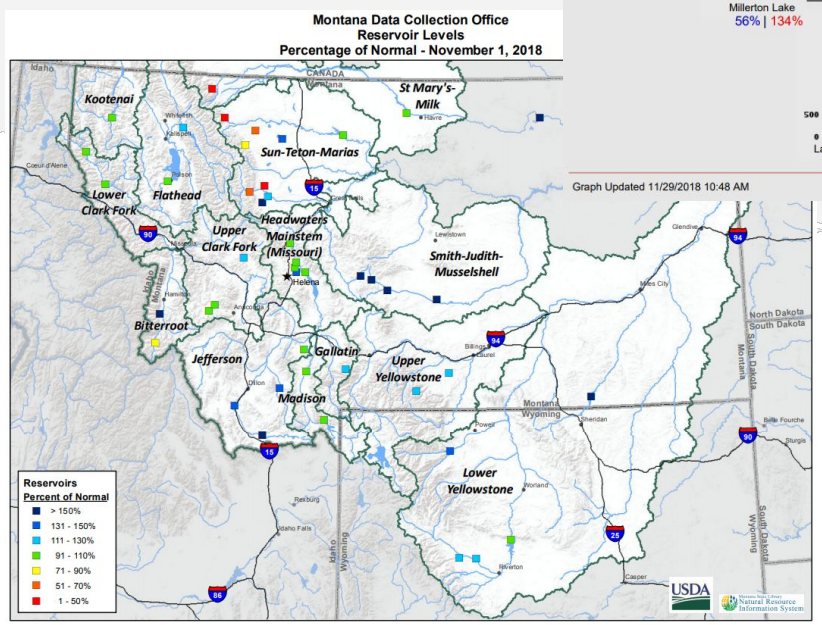
*KAF: thousands of acre-feet

Reservoir	Capacity	Current Storage*	Max Storage*	One-Month Change in Storage*
1. Navajo	64%	1,080.2	1,696.0	-79.2
2. Heron	33%	133.1	400.0	-31.2
3. El Vado	4%	7.9	190.3	-8.4
4. Abiquiu	48%	89.7	186.8	-6.3
5. Cochiti	91%	45.3	50.0	-1.1
6. Bluewater	9%	3.6	38.5	-0.7
7. Elephant Butte	6%	128.9	2,195.0	-66.8
8. Caballo	11%	36.5	332.0	2.5
9. Lake Avalon	58%	2.6	4.5	0.1
10. Brantley	48%	20.2	42.2	8.2
11. Sumner	61%	21.8	35.9	-1.1
12. Santa Rosa	55%	58.7	105.9	-30.7
13. Costilla	28%	4.4	16.0	-2.7
14. Conchas	58%	147.3	254.2	-21.4
15. Eagle Nest	47%	37.0	79.0	-1.0
16. Ute Reservoir	94%	187	200	-4.0

California Reservoir Conditions

http://cdec.water.ca.gov/reportapp/javareports?name=rescond.pdf





Montana Statewide Reservoir Levels

Short, Medium, and Long-Term

Short-term = 1-7 days; Medium-term = 1-3 weeks; Long-term = monthly-seasonal-annual

Where do you typically go for information about forecast conditions and outlooks?

For what purposes do you use those resources?

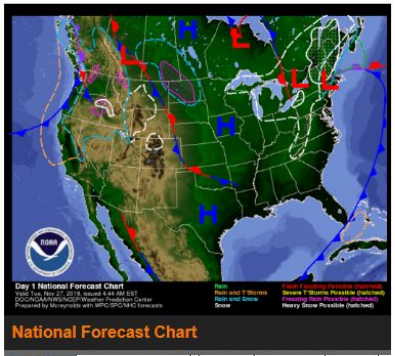
Do these resources meet your needs for monitoring, decision making, and communications?

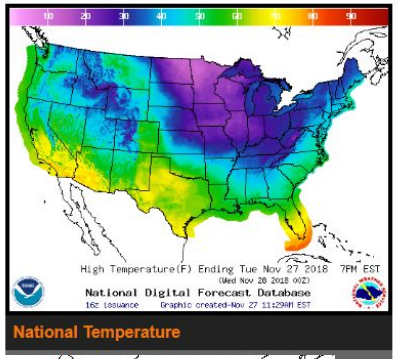
- Do you share that information with your constituents? If so, how?
- What would improve that communication/translation process?

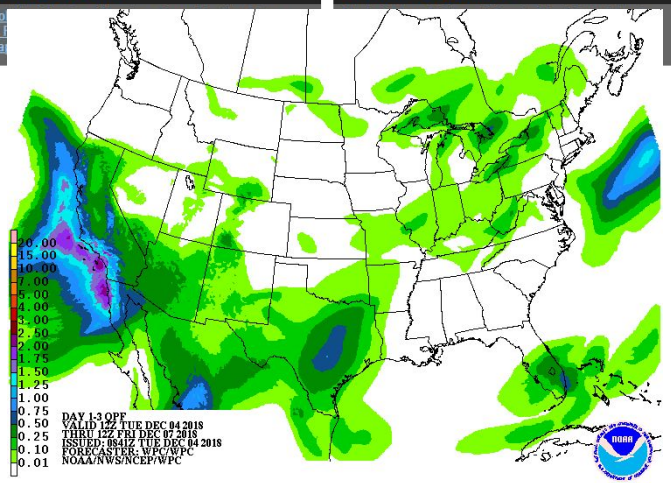
Short- to Medium-Term Resources

NWS Forecast Maps and Graphics

https://www.weather.gov

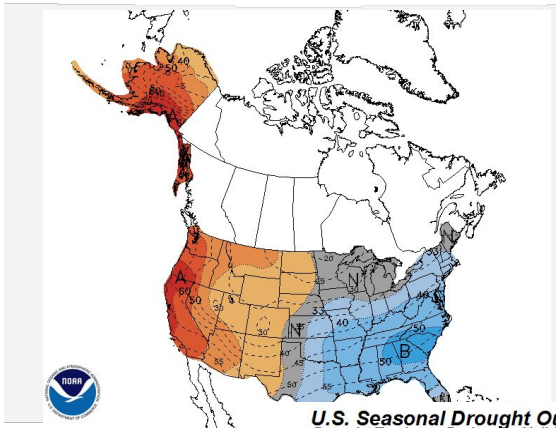


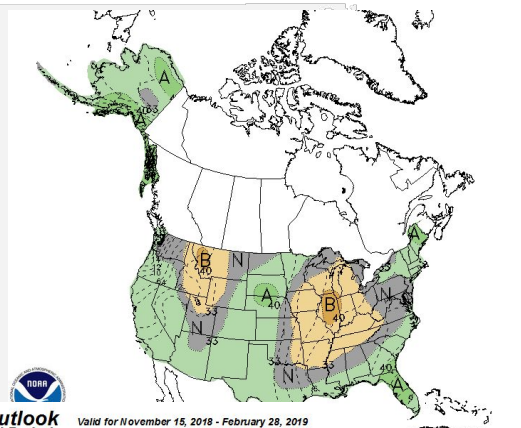


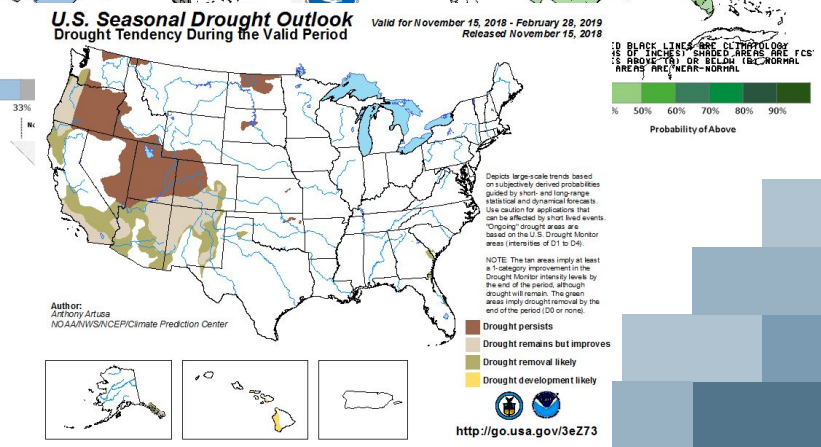


Climate Prediction Center outlooks

http://www.cpc.ncep.noaa.gov

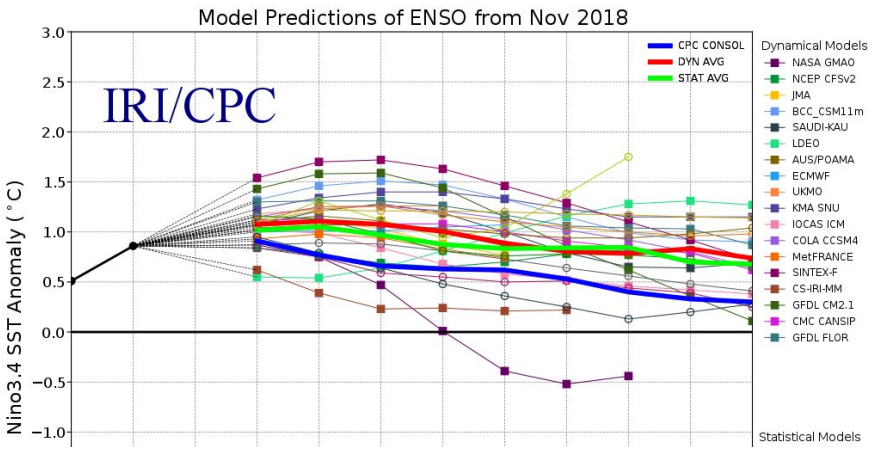


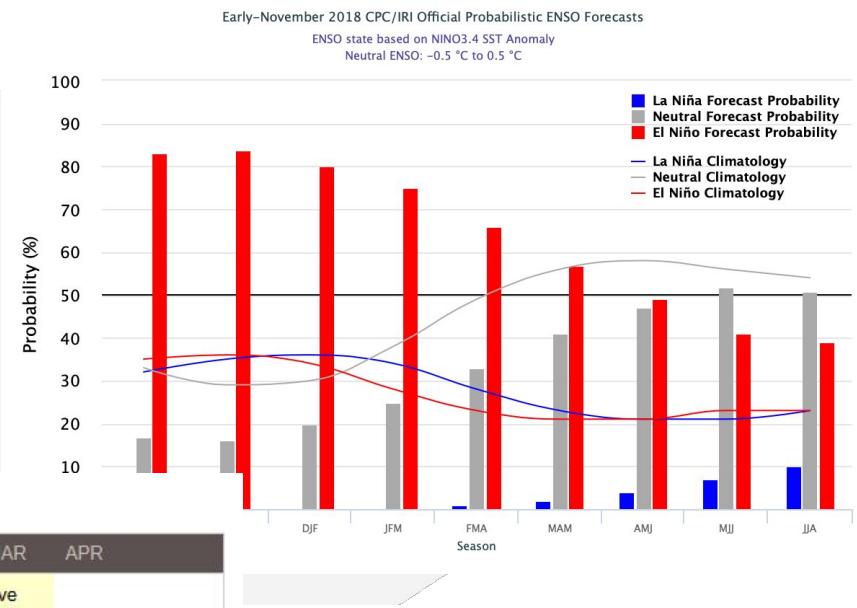




Long-Term Resources

ENSO model predictions https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/





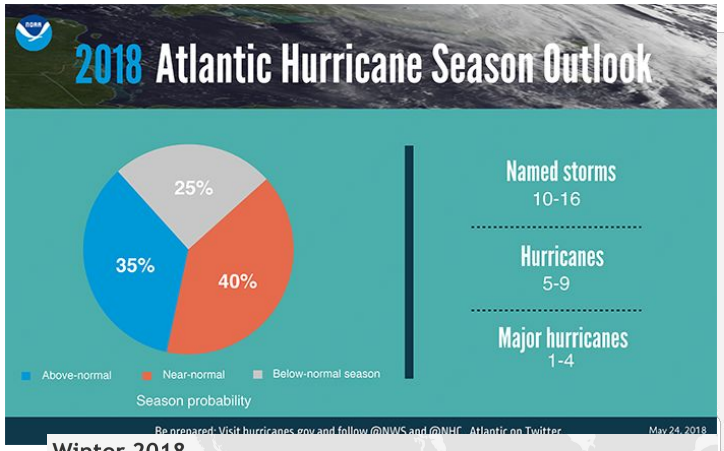
Timeline of Seasonal El Niño Impacts in the Southwest

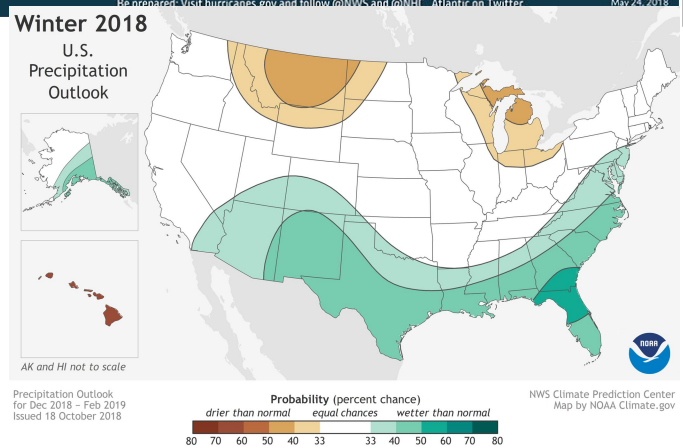
	SEP OCT	NOV	DEC	JAN	FEB MAR	APR
WEATHER & CLIMATE	Increased Tropical Storm Activity			Increased Chance of Above Average Precipitation		
			Risk of Extreme Cold Temps Reduced			
HUMAN HEALTH	Air Quality (Pollen)	Extended Season for Disease Vectors (Mosquitos)				
HYDROLOGY	Water Year Recap			Increased Flooding Potential		Potential La Niña Rebound
WILDFIRE	Growth of Fine Fuels - Wildfire Risk Potential					Fire Season

Seasonal El Niño Impacts on the SW USA, from CLIMAS (AZ-NM RISA)

Long-Term Resources

NWS seasonal outlooks https://www.weather.gov





SCO seasonal outlooks

https://climate.ncsu.edu/climateblog

Our Winter Outlook

We expect a ***weak to moderate El Niño*** persisting throughout the winter will be the main driver for our weather pattern. We have high confidence at seeing ***above-normal precipitation for the winter*** as a whole. However, it's worth remembering that 3 out of our 4 close analog years had at least one drier-than-normal month.

Overall, we expect ***near-normal temperatures on average***, with the jet stream pattern closest to the 1986-87 winter that saw a warm December followed by some east-coast troughing and cooler weather in January and February.

We should see a ***mix of cooler and warmer periods this winter***, with the greatest potential for cold air outbreaks from mid-December through late January. While some atmospheric patterns entering the winter seem favorable for wintry weather chances, these quickly evolving patterns have limited long-range predictability.

Historically in El Niño years, our best snow chances come in January regardless of what the polar jet stream is doing. Of course, remember that it only takes one big snow event -- or missed opportunity -- to define a winter.

While the forecast for February and early March is much less certain, recall from several recent years that if we see a late-winter warm-up, it can be followed by cooler springtime weather including a late-season freeze.

Initial Survey - What We Asked

1. Communication Channels & Formats

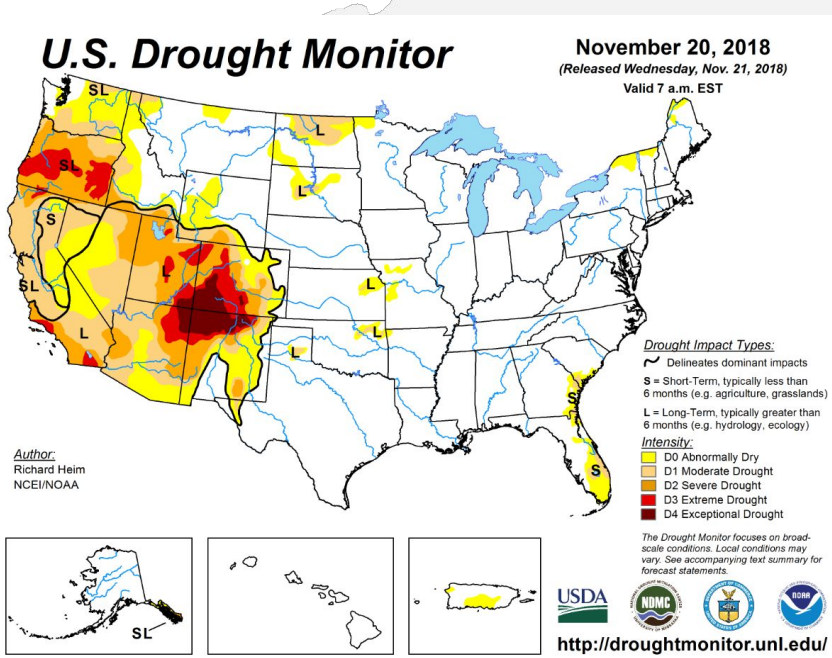
2. Weather, Climate, and Drought Information
   - geographic scale
   - decision calendars
   - usefulness of specific resources

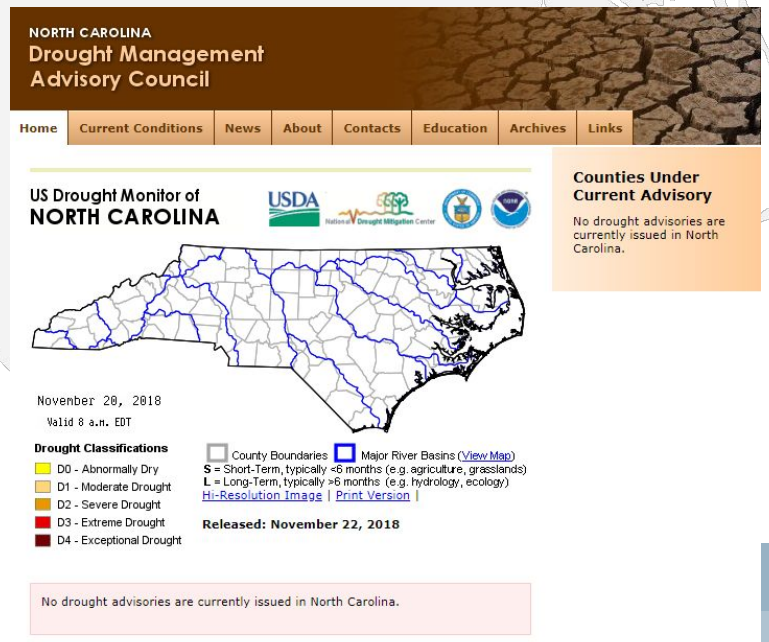
3. Drought Monitoring Processes
   - US Drought Monitor
   - North Carolina drought monitoring

4. Impacts and Additional Information Needs

Drought Monitoring Processes & Resources

- US Drought Monitor process
- NC drought monitoring process

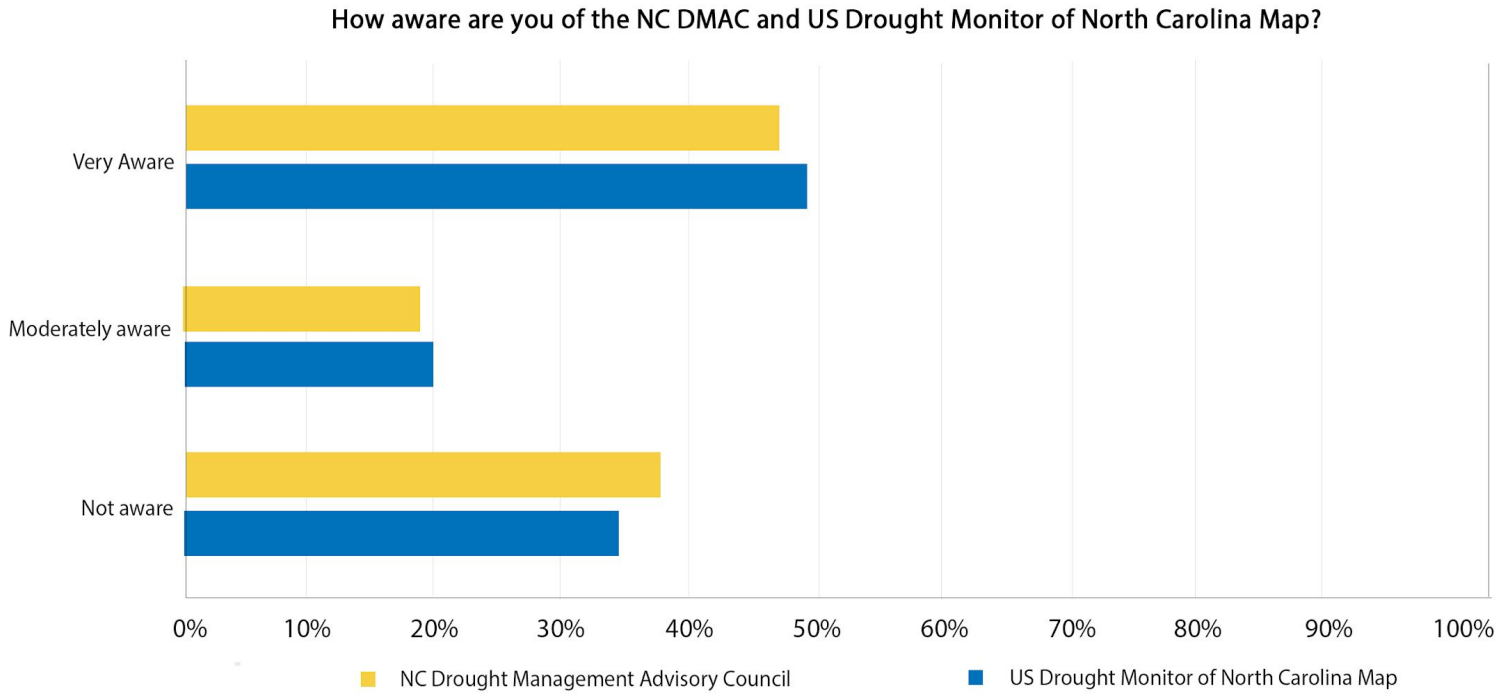




droughtmonitor.unl.edu

www.ncdrought.org

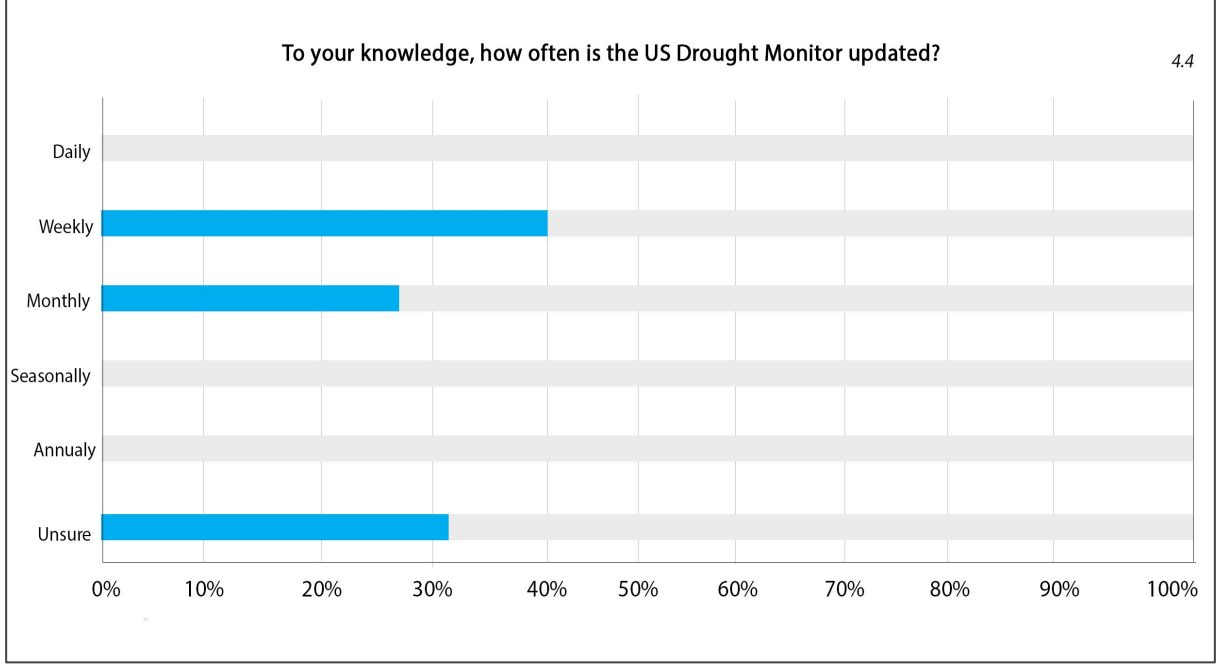
NC Drought Monitoring Process

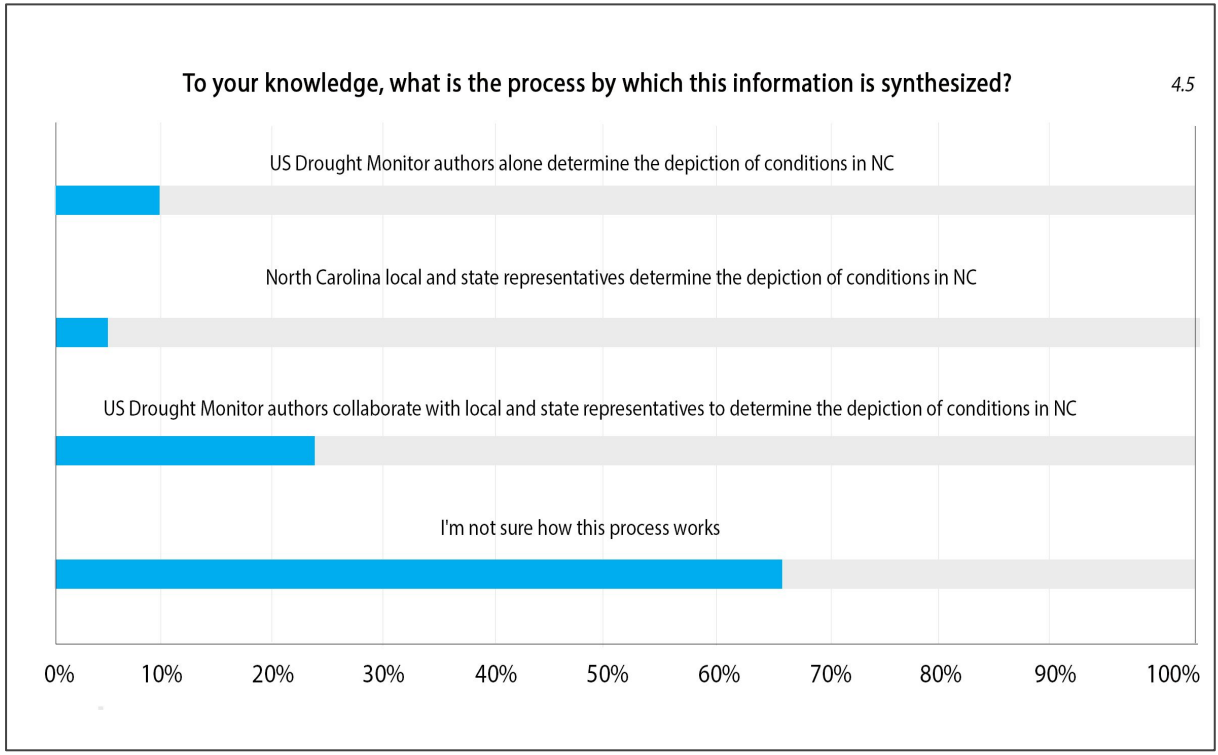


US Drought Monitor Process

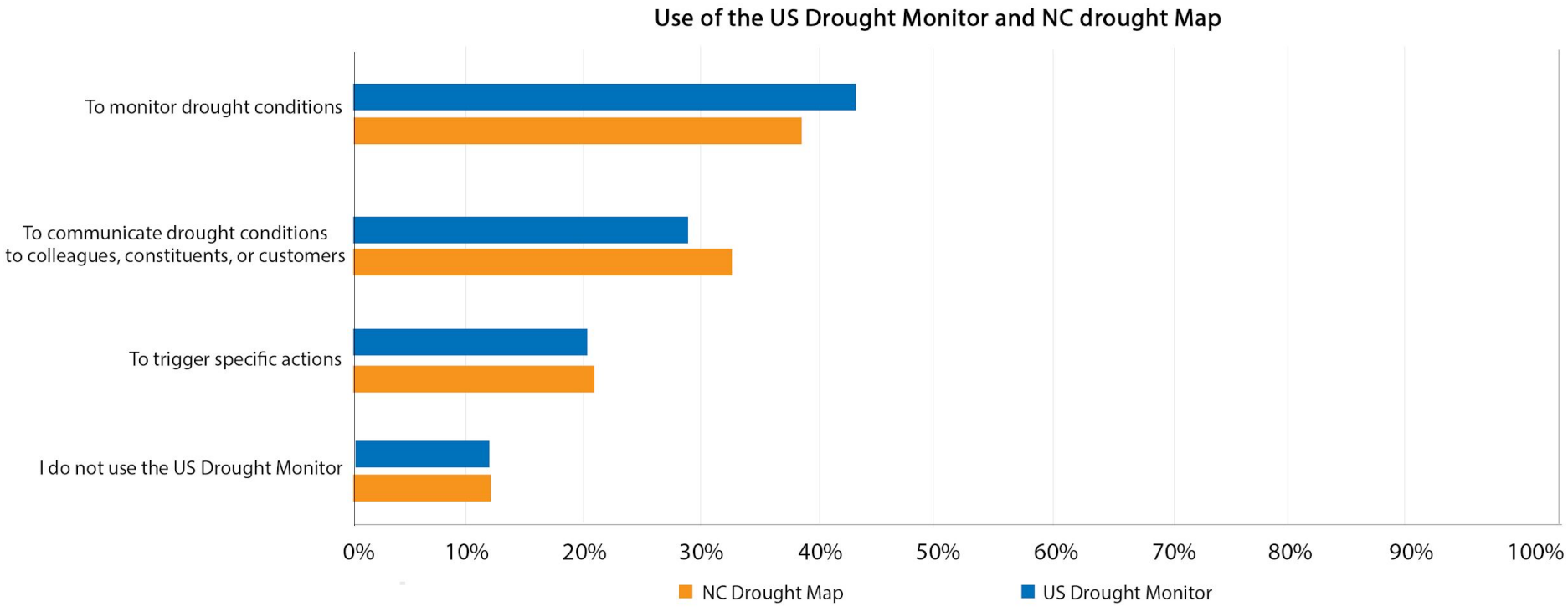
Takeaway:

- A high percentage of respondents is unsure how the USDM process works





Use of Drought Maps

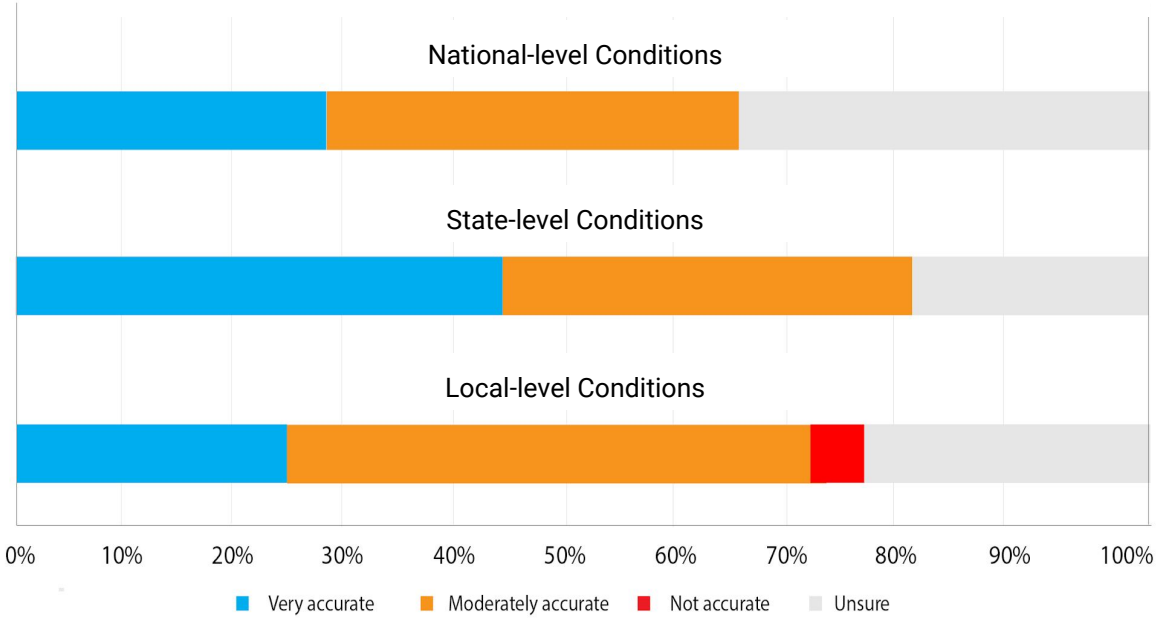


Perceived Accuracy of Drought Maps

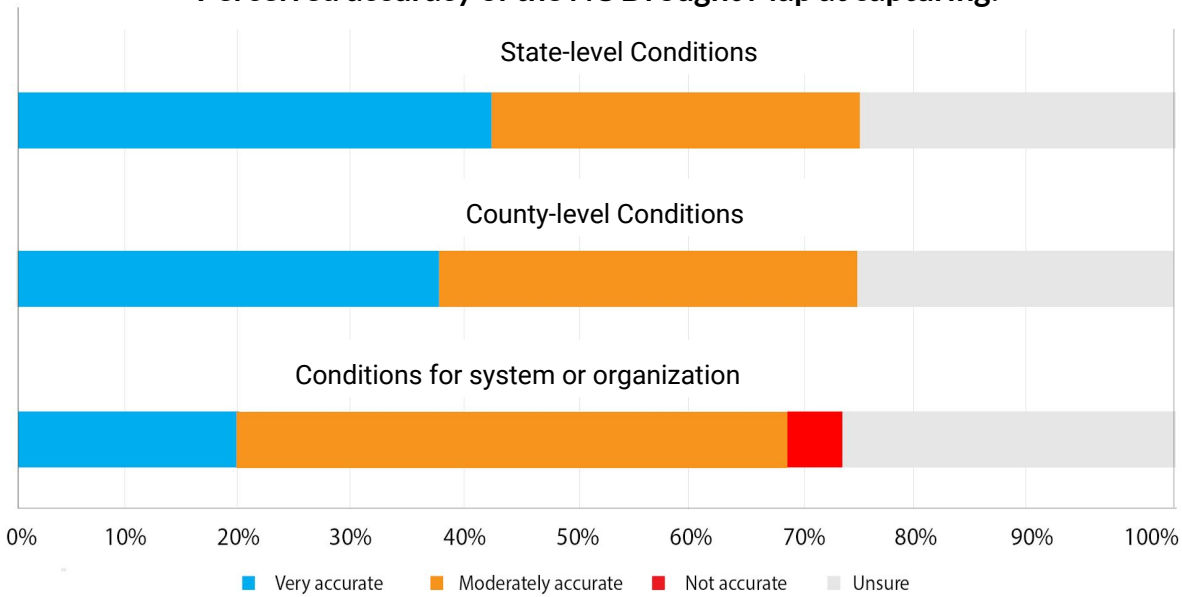
Takeaway:

- A high percentage of respondents consider the USDM and NC maps as only moderately accurate or are unsure about their accuracy

Perceived accuracy of the US Drought Monitor at capturing:



Perceived accuracy of the NC Drought Map at capturing:



Prototypes to Consider

"About NC DMAC" resources

- Purpose, history, membership, process, relevance
- How are NC Drought Map and USDM used in NC?

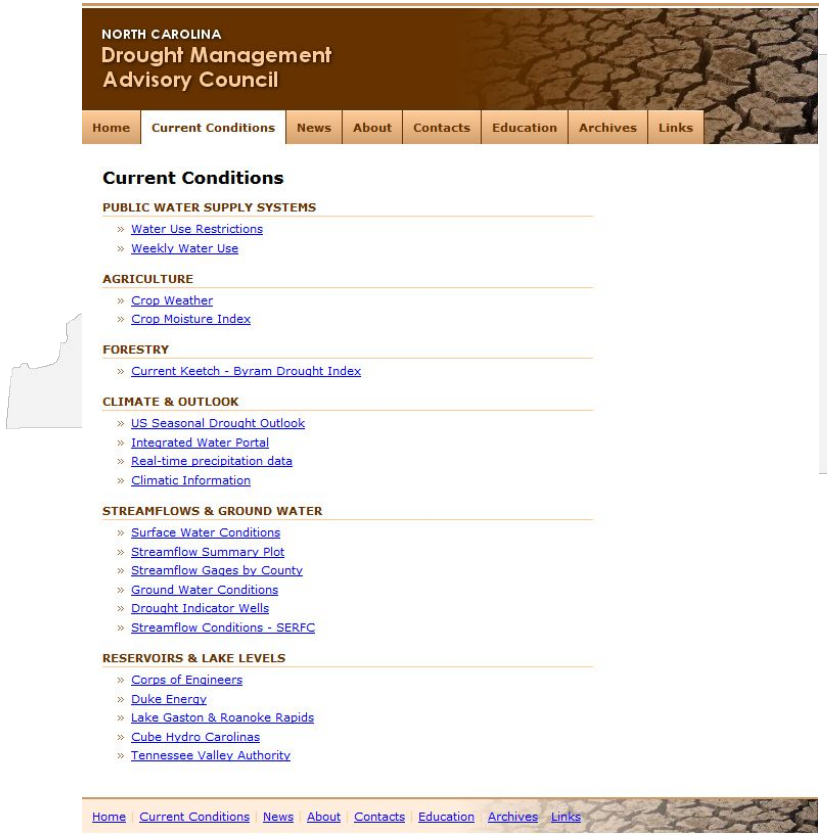
Summarized DMAC discussion

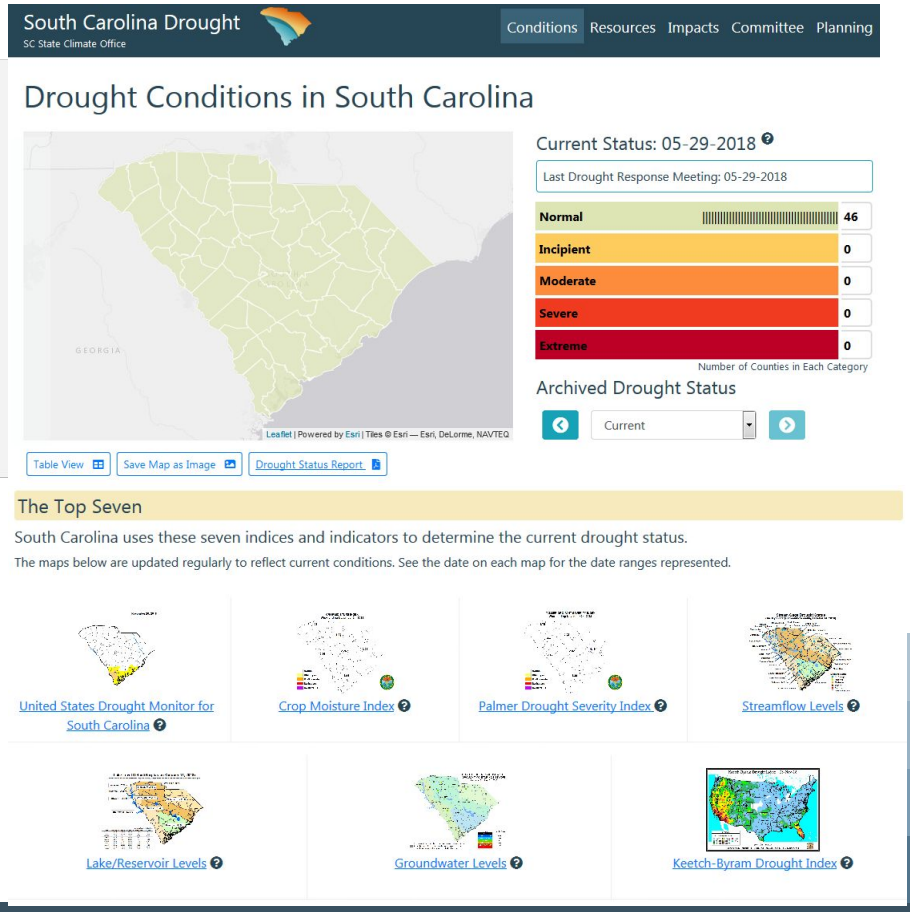
- Highlight suggestions to US Drought Monitor authors
- Explain changes (or lack thereof) made across the state

Drought Monitoring - Discussion

- Will ideas improve awareness and perceptions of accuracy?
  - Where should these “live”?
  - What existing communication processes can these be integrated into?
- Are there other ways to improve awareness and perceptions of accuracy?

"Landing Page" Examples





Example Resources to Consider

Drought monitoring explanation video (from CoCoRaHS)

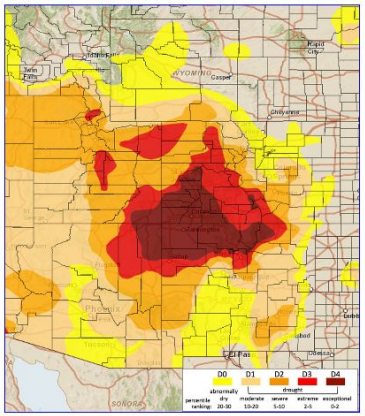
Brief explanation of conditions and how map designations were determined (from CO Climate Center)

Assessing Drought in the United States

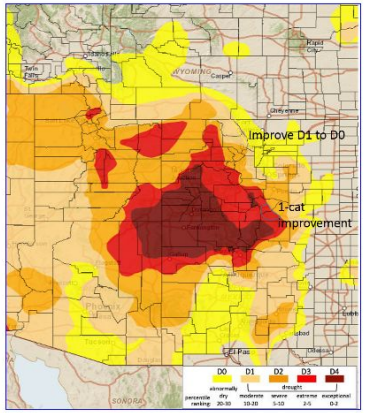
NIDIS

NIDIS Intermountain West
Drought Early Warning System
November 13, 2018

COLORADO CLIMATE CENTER



Current U.S. Drought Monitor Depiction



Recommended Changes

Summary: November 13, 2018

It was a drier week through much of the Intermountain West region, particularly the UCRB, Arizona and western New Mexico. A nice upslope event brought some widespread snowfall to the Front Range from southern Wyoming down to central New Mexico. Precipitation amounts were mainly in the 0.25 to 0.50" range, however Boulder, Huerfano and Las Animas counties saw areas of up to and over an inch. North central New Mexico, particularly Taos County also saw over an inch of precipitation.

The higher elevations in Colorado, Wyoming and New Mexico have seen a good start to the snowpack season, while Utah has already fallen behind. It is early in the season and conditions can still go either way. The next week looks favorable for Wyoming and north central Colorado, however the 8-14 day outlook is showing favorable conditions for Colorado, Utah, New Mexico and Arizona.

Recommendations:

UCRB: Status quo. While snow fell in the higher elevations in Colorado, it wasn't enough to start making up deficits.

Front Range of CO: Recommending pushing the D1 along the Larimer/Jackson and Boulder/Grand county lines west thanks to decent snowfalls over the past 2 weeks.

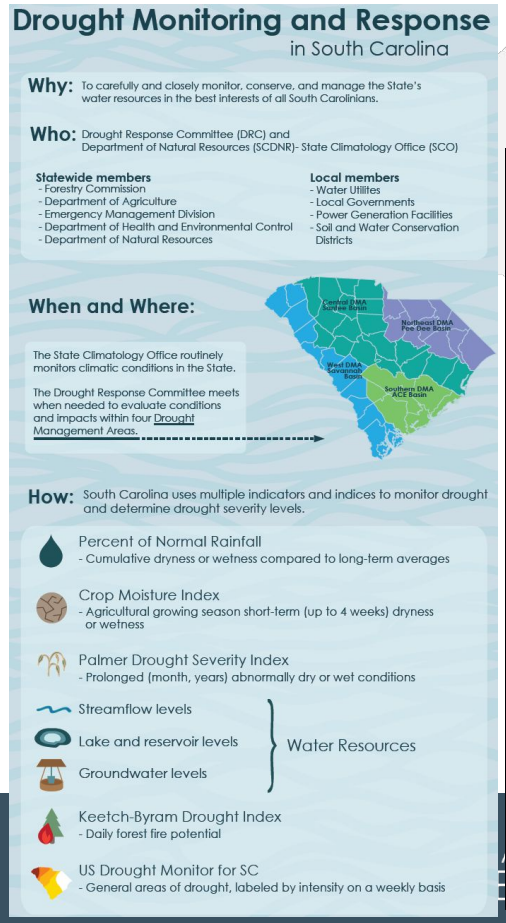
We looked at improving Boulder County to D nada, however that would leave a very small odd pocket as the surrounding area is not quite ready to be improved. We will leave this up to the Drought Monitor Author this week.

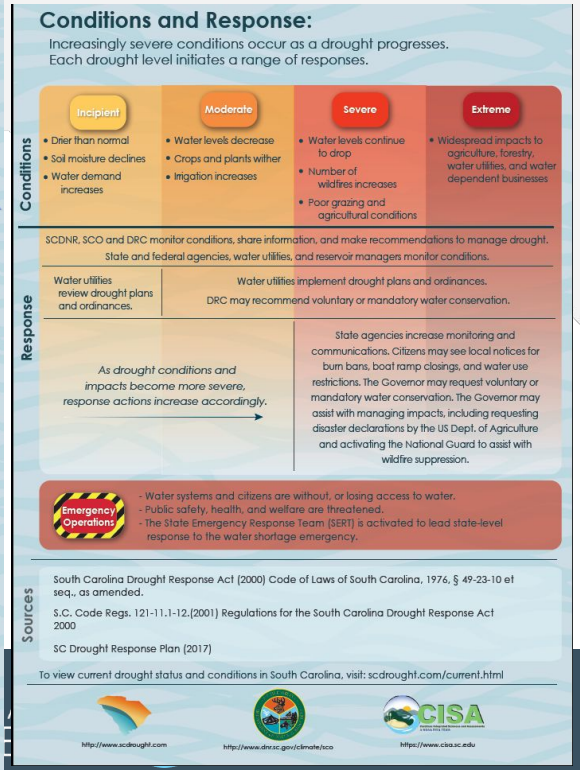
Recommending a 1-category improvement from D3 to D2 in southern Huerfano and northern Las Animas counties. Last week saw the second decent precipitation event in the last 2-3 weeks, with at least 0.50" and up to 1.50" of precipitation and now up to 2" above normal over the past 30-days.

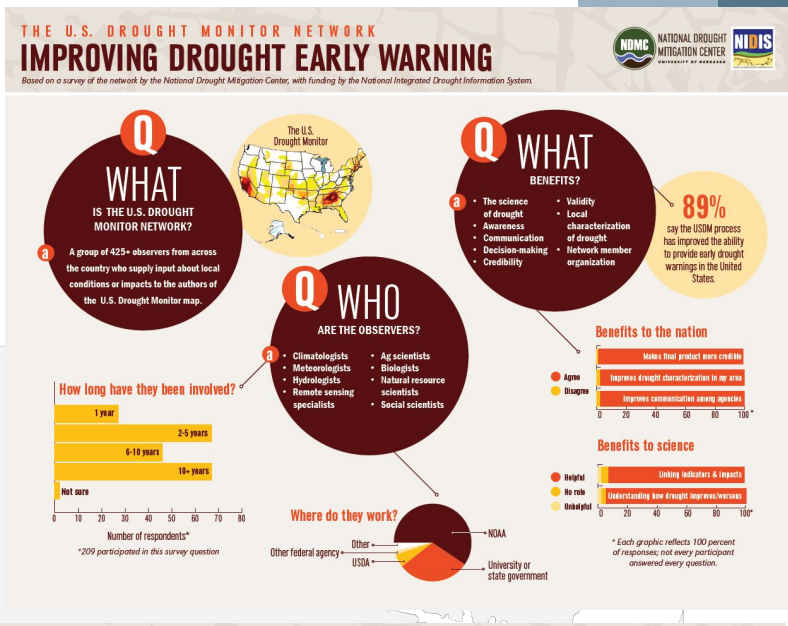
Eastern CO: Status quo.

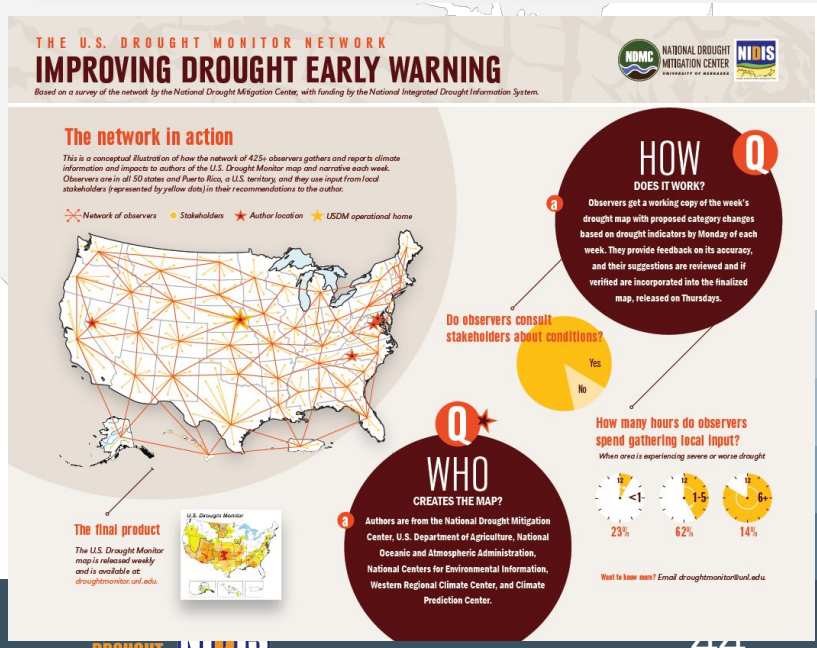
Visit the U.S. Drought Monitor

Drought Monitoring Processes & Resources - Existing Examples



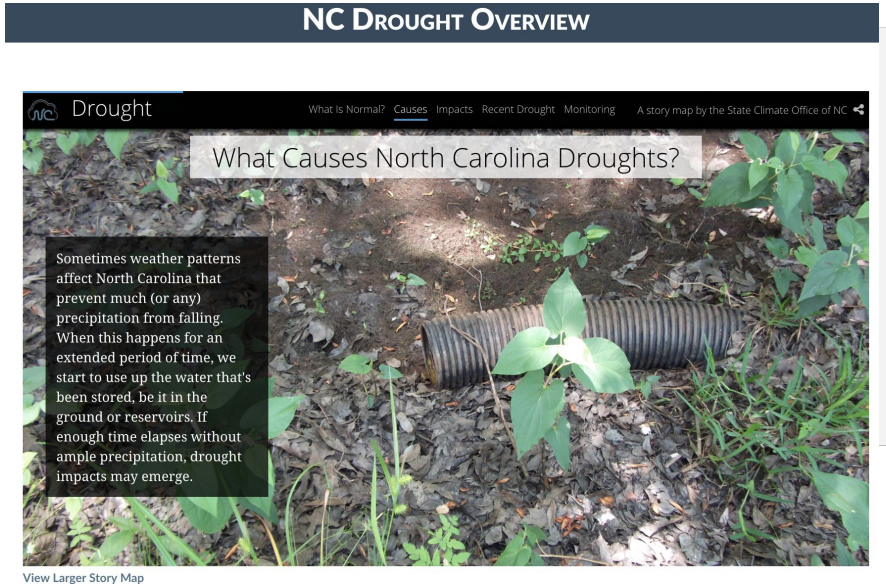






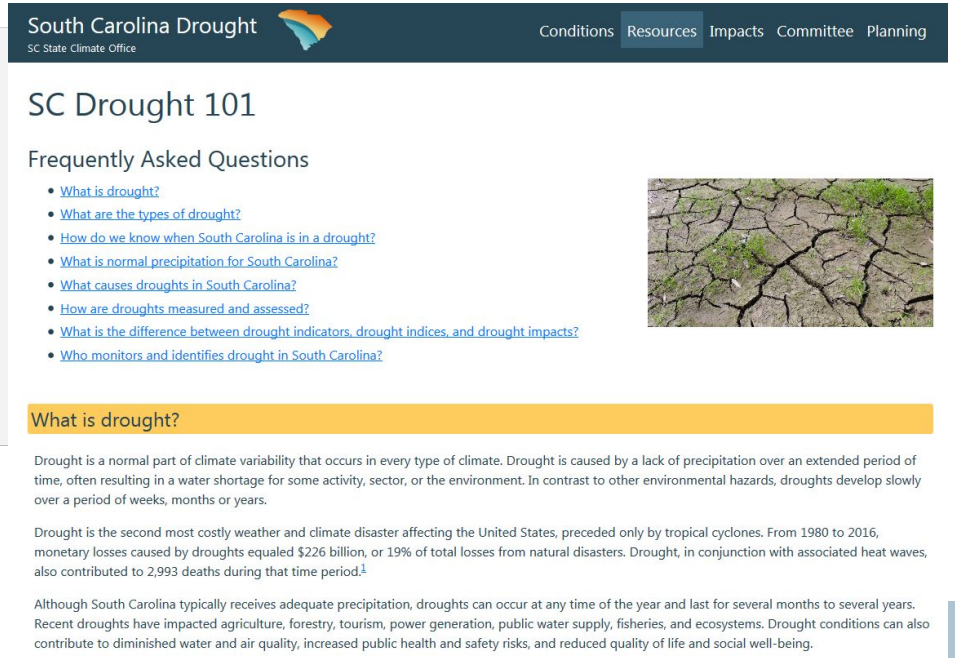
Other Resources - "About Drought"

SCONC's "About Drought" Story Map



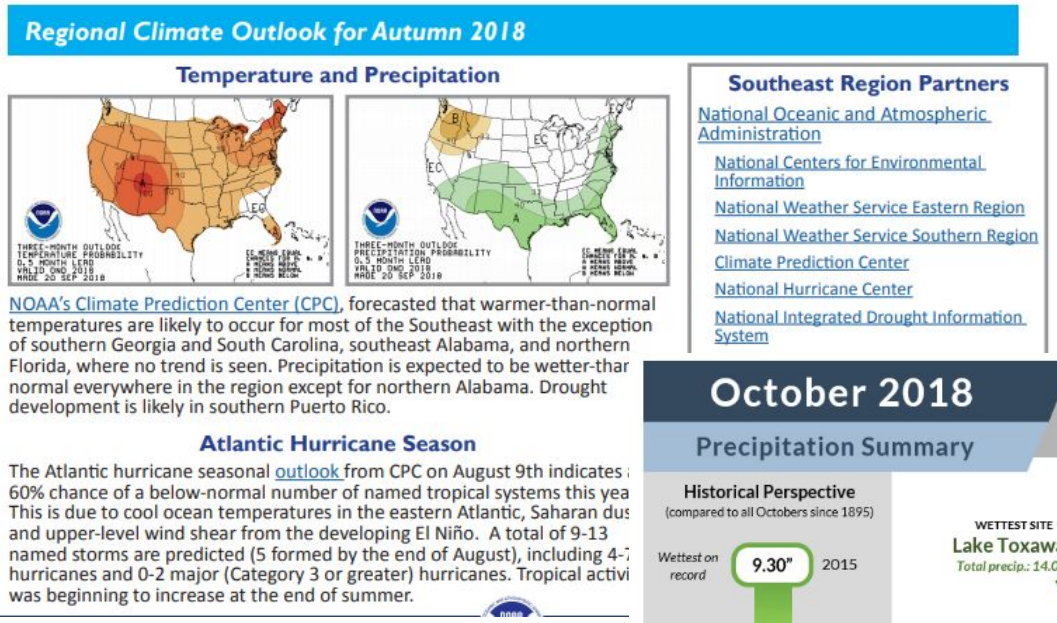
http://climate.ncsu.edu/drought/about

Drought 101 from SC State Climate Office



http://www.scdrought.com/drought101.html

Other Resources - Climate Summaries

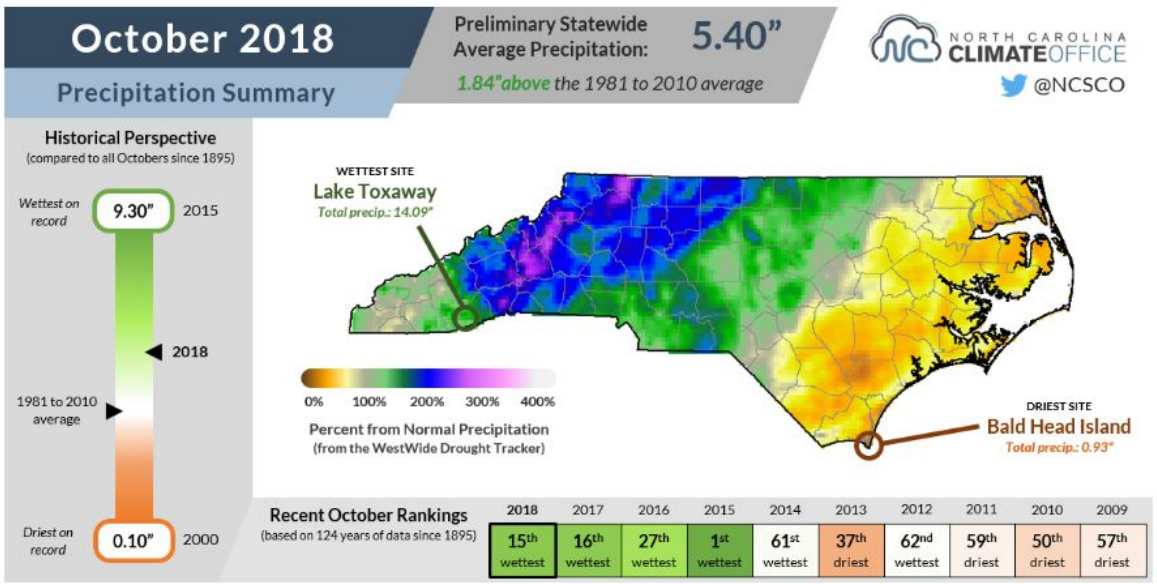


SCO Climate Blog including Monthly Summaries

http://climate.ncsu.edu/climateblog

SERCC Seasonal Summaries and Outlooks

http://sercc.com/seasonalsummary



Prioritizing Prototypes
(before the webinar)

1. "About NC DMAC" resources
2. Updates on NC Drought Conditions
3. A single page or graphic showing reservoir levels from all systems in NC
4. Resources that relate anticipated short- and long-range conditions to drought conditions and sector-specific effects in NC

Open Discussion

Which ideas should be our top priorities?

What other information do you need, including for weather, climate, drought, or impact monitoring?

Next Steps

Post-webinar survey

Upcoming In-Person Feedback Sessions

- March - WRRI Annual Meeting
- NC DMAC Meeting -- possibly a follow-up?

Thank you!

https://climate.ncsu.edu/nighthawk