

Project Nighthawk Feedback Session

NC Fire Environment Committee Meeting

Corey Davis and Kirsten Lackstrom

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”*

Code Name: *Project Nighthawk*



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

Informed Consent

More information at <http://climate.ncsu.edu/nighthawk>

INNOVATING APPROACHES TO DROUGHT COMMUNICATIONS WITH NORTH CAROLINA DECISION MAKERS

Background | Why Nighthawk? | Objectives | Timeline | Our Partners | Funding Source | Contact Us | **For Participants**

Any questions?

Project Nighthawk Phases



Fall 2018

Summer 2019

Phase 1

Identify

Refine priorities for new products with project partners and target audiences

Phase 2

Develop

Develop tailored information and communication prototypes

Phase 3

Evaluate & Refine

Assess prototypes with stakeholder assessment and engagement, refine and enhance information and communication deliverables

Phase 4

Implement & Integrate

Integrate and implement communication strategies

Phase 5

Evaluate

Evaluate project activities and outcomes

Water Resources Sector

Initial Project Survey

Sectoral Webinar

WRI Annual Conference

Agriculture/Forestry Sectors

Initial Project Survey

Sectoral Webinar

Extension Conference (TBD)

DMAC In-Person Meeting

Agriculture/Forestry and Water Resources Sectors

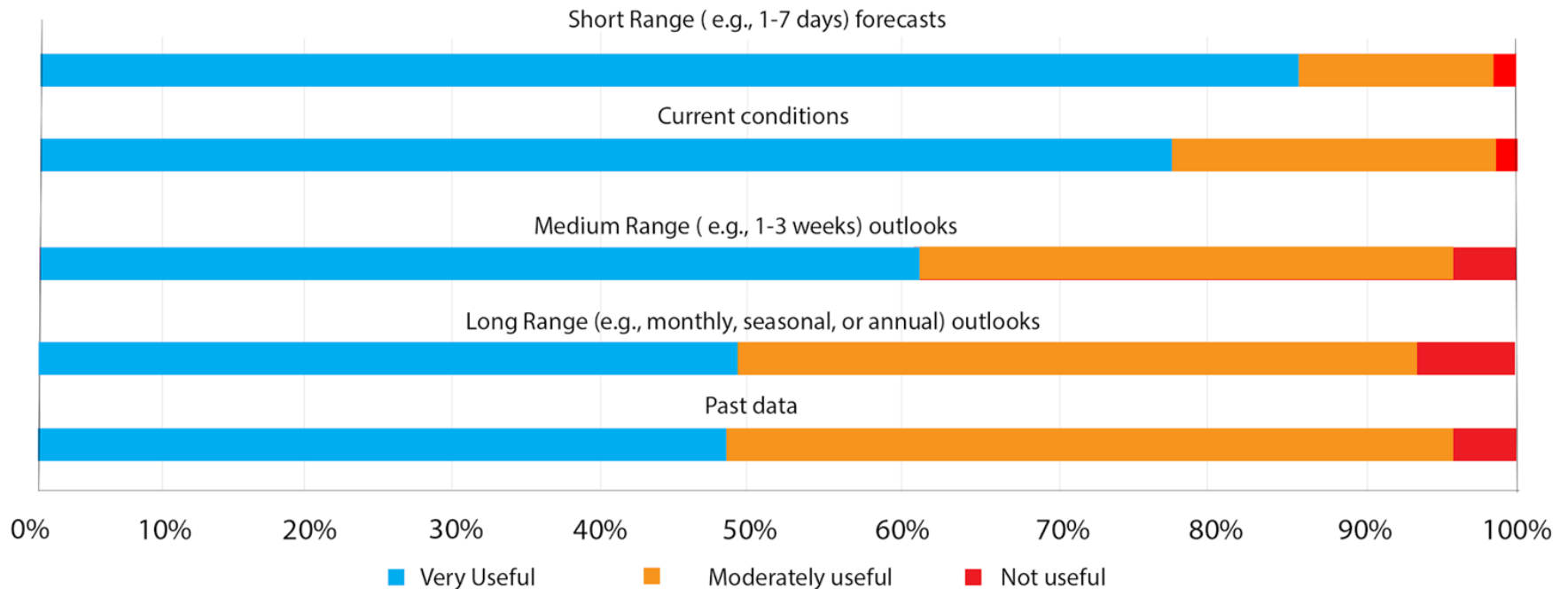
Combined Follow-Up Webinar

Final Project Survey

Key Project Tasks

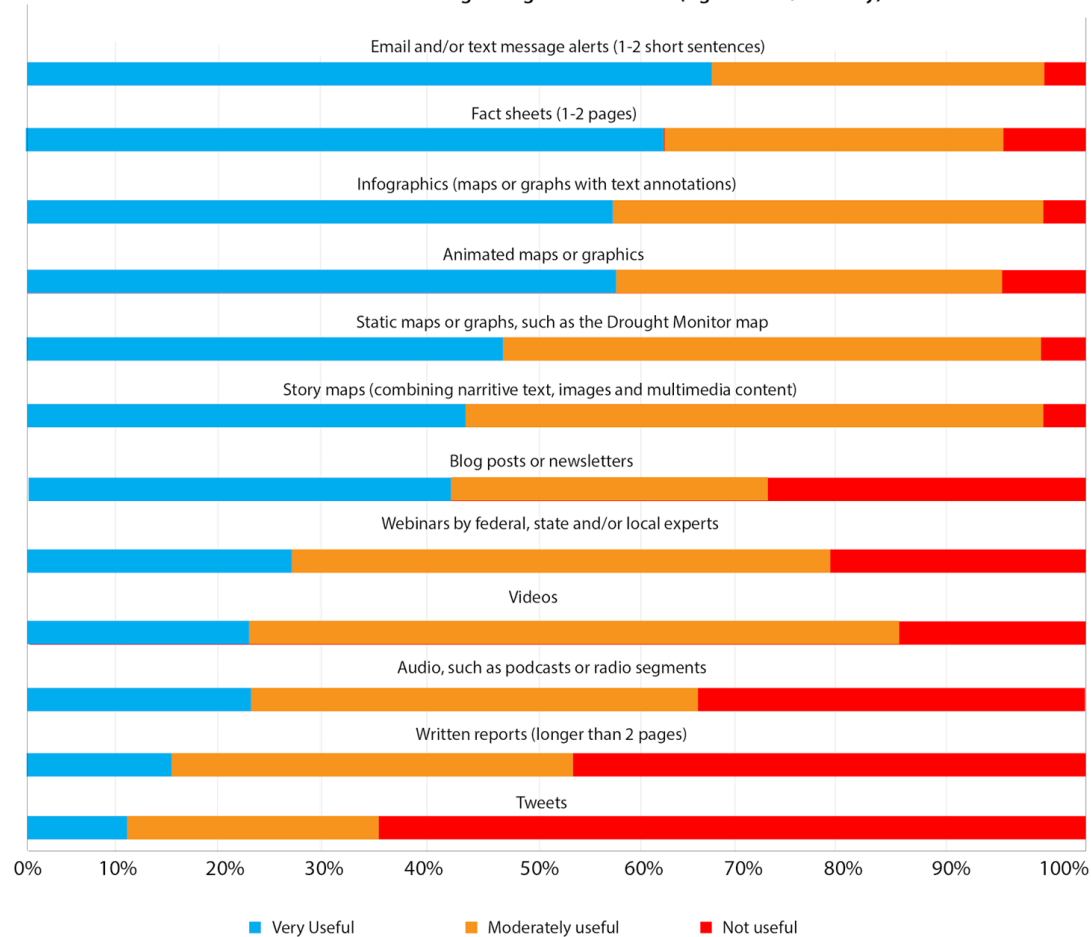
Selected Survey Results (Ag/Forestry)

Importance of weather and climate informaton



Selected Survey Results (Ag/Forestry)

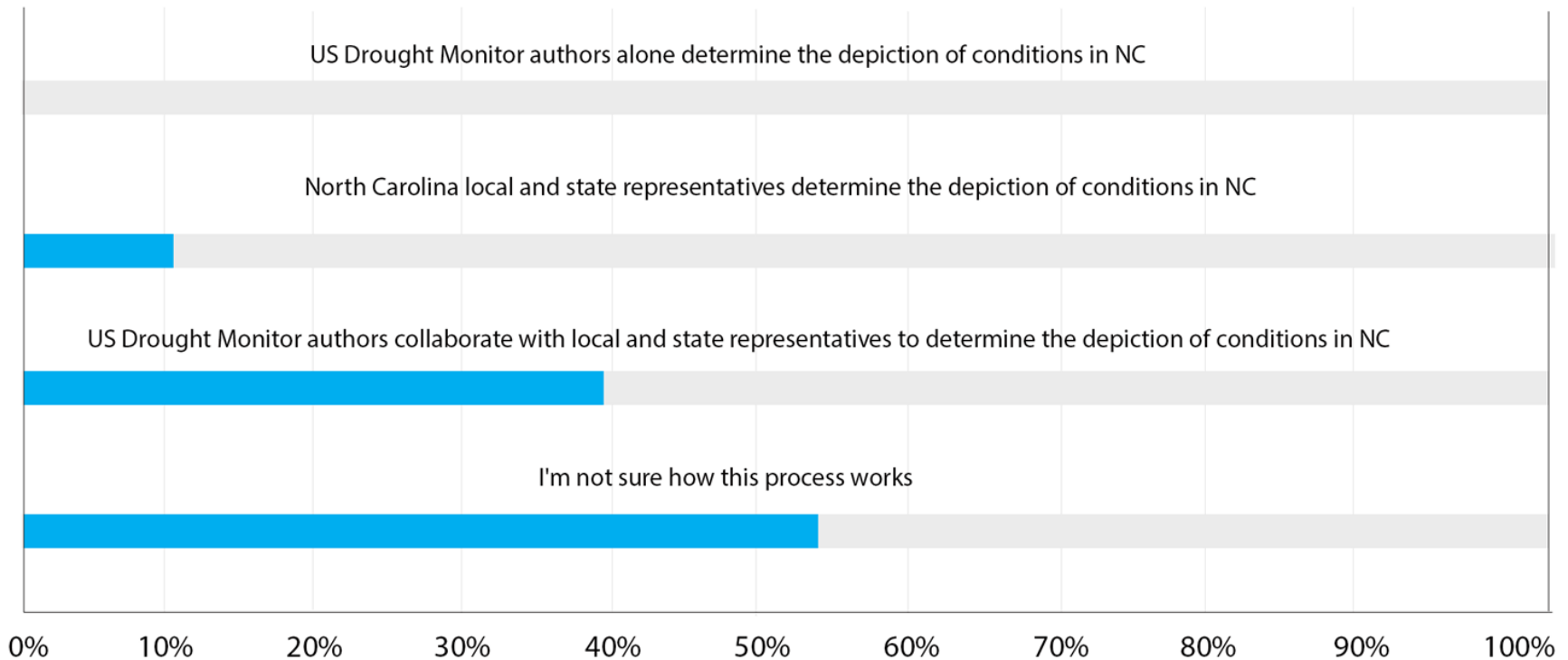
Preferences for receiving drought Information (Agriculture/Forestry)



Selected Survey Results (Ag/Forestry)

To your knowledge, what is the process by which this information is synthesized?

4.5



Main Takeaways So Far

- Current conditions and short-range forecasts are generally the most useful
- Users prefer information in a variety of formats
 - Including email alerts, factsheets, & infographics
 - Content both pushed to them and web-accessible
- The NC drought monitoring process needs more transparency
 - Explaining the reasoning behind map changes

Your Drought Information Needs

- Where do you go for drought information?
 - FWIP? ncdrought.org?
Other sites?
- Where do you go for weather forecasts and outlooks?
 - Are current NOAA/NWS products sufficient?

Fire Weather Intelligence Portal

A product of the State Climate Office of North Carolina

**NORTH CAROLINA
Drought Management
Advisory Council**

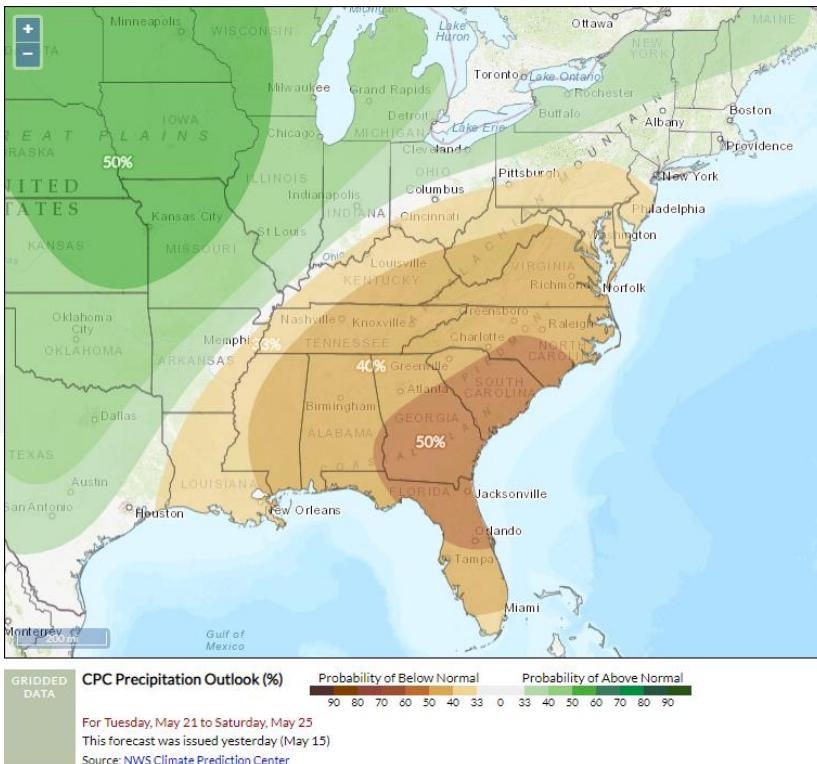
**NATIONAL
INTEGRATED
DROUGHT
INFORMATION
SYSTEM**



Drought.gov
U.S. Drought Portal



Your Drought Information Needs



- How does this information fit in your decision-making?
- Do you have access to the information you need or are interested in?
- What are your other drought info. needs?

Your Drought Information Needs

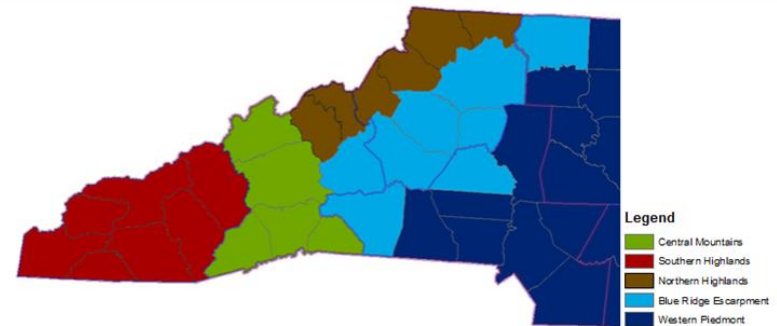
- Who are you sharing drought information with?
 - Are you sharing info. directly from the FWIP?
 - How do you share this info.? (email, etc.)

SUMMARY

Fire Danger will be slightly elevated today with low RH and moderate wind. Rain moving in this evening through Saturday should lower fire danger considerably. Sunday through the remainder of the period will see dry weather and lower RH which will slowly increase fire danger through the region.

- Minimum RH will be around 30% for today, climbing to 40-50% for tomorrow and climbing further to the 60-80% range for Friday-Saturday. For the remainder of the period, expect 35-45%.
- Winds will generally be S/SW under 10 MPH for today and tomorrow, with gusts to 20 on the ridge tops. For Friday, they should be from the S at 10-15. For the remainder of the period, expect W winds, 10-15 MPH for Saturday and Sunday, dropping back to 5-10 for Monday and Tuesday.
- High temperatures will be in the 70s-80 for today and tomorrow, dropping back to the 50s-low 60s for Friday and Saturday, before returning to the 70s for the remainder of the period. Lows will be in the upper 40s to mid-50s except mid-30s to mid-40s for Friday and Saturday nights.
- ERCs bounced up and down but remained below average last week. They are predicted to hold steady through the weekend, then climb above average later in the period except Western Piedmont which should be around average. 100 HR FMs will be dropping to slightly below normal during the period for the Central Mountains and Blue Ridge, but well below average for the remainder of the FDRAs.
- 1000 HR FMs have recovered further this past week with all stations above the 20% threshold.
- There is little or no potential for a significant fire.
- Greenup has accelerated this week, with D-12 ahead of last year. Potential frost in the mountains may slow this over the weekend.

FIRE DANGER RATING AREAS (FDRAS) FOR REGION 3



Prototypes in Development

- Short-range outlooks
- Weekly drought overviews
- “About the DMAC” resources



Short-Range Outlooks

Goal: Give weather outlooks, including expected impacts, for the next 1 to 4 weeks in an easily readable format

Possible Approach:

- A one-page fact sheet outlining weekly forecasts and possible impacts

Short-Range Outlook Example

Short-Range Outlooks for North Carolina

Week 1: May 21 to 27

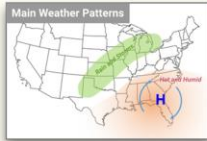
Forecast Confidence
5 out of 5

The high pressure system controlling our weather will be slow to move out, so all signs point to a hot, dry week.



Summer Heat Builds: High pressure over the Southeast US will become a stagnant summer air mass, with high temperatures reaching the mid-90s by the middle of the week. While humidity will be high, rain chances will be limited.

Fuel For Fire: The heat will quickly dry out vegetation and soils, and fire danger will ramp up especially across already-dry parts of the southern Coastal Plain. The lightning threat should be low but fires could start from man-made ignition sources.



Forecast guidance from the National Weather Service

Week 2: May 28 to June 3

Forecast Confidence: 4 out of 5

A few models show an eastward shift in the position of the ridge and storm track later in the week, which could increase our rain chances.



Warm Weather Continues: A building ridge in the jet stream over the eastern US will keep us locked into a warmer pattern, with temperatures likely 2 to 5 degrees above normal. Normal highs for this time of year are in the low to mid 80s.



Limited Rain Chances: High pressure overhead will continue to bring us mostly dry weather. The best chances for showers may come along the coast if an afternoon sea breeze develops, but as always, these are likely to be highly localized.



Forecast guidance from the NWS Climate Prediction Center

Weeks 3 and 4: June 4 to 17

Forecast Confidence



Exactly if and when this pattern change takes place is still uncertain.

Relief from the Heat?

The high-pressure system controlling our weather since early May could finally shift off to our northwest in the first half of June. This would likely bring our temperatures closer to normal.

Rain May Return

If that stubborn high finally moves, it could open the door to a feed of Atlantic moisture from the southeast, fueling showers and thunderstorms mainly in eastern North Carolina.



Forecast guidance from the NWS Climate Prediction Center

Short-Range Outlooks for North Carolina

Week 1:
May 21 to 27

Forecast Confidence:
5 out of 5

The high pressure system controlling our weather will be slow to move out, so all signs point to a hot, dry week.

Main Weather Patterns



Fuel for Fires

The heat will quickly dry out vegetation and soils, and fire danger will ramp up especially across already-dry parts of the southern Coastal Plain. The lightning threat should be low but fires could start from man-made ignition sources.

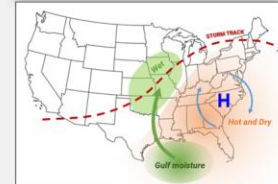


Summer Heat Builds

High pressure over the Southeast US will become a stagnant summer air mass, with high temperatures reaching the mid-90s by the middle of the week. While humidity will be high, rain chances will be limited.



Week 2:
May 28 to June 3



Limited Rain Chances

High pressure overhead will continue to bring us mostly dry weather. The best chances for showers may come along the coast if an afternoon sea breeze develops, but as always, these are likely to be highly localized.

Warm Weather Continues

A building ridge in the jet stream over the eastern US will keep us locked into a warmer pattern, with temperatures likely 2 to 5 degrees above normal. Normal highs for this time of year are in the low to mid 80s.



Forecast Confidence:

4 out of 5

A few models show an eastward shift in the position of the ridge and storm track later in the week, which could increase our rain chances.

Weeks 3 and 4:
June 4 to 17

Forecast Confidence:
2 out of 5

Exactly if and when this pattern change takes place is still uncertain.

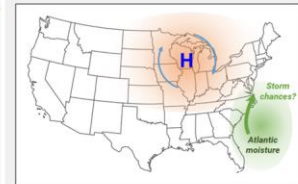
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Weekly Drought Overviews

Goal: Provide insights into NC's weekly drought discussions for release alongside each week's map

Components:

- Blog post summaries
- Email alerts/notifications
- Infographics

Blog Post Example

Moderate Drought Expands Across the Piedmont

Posted on November 9, 2017 by Corey Davis

Another dry week in central and eastern North Carolina has led to expansion of Abnormally Dry and Moderate Drought conditions on the US Drought Monitor.

The multi-agency [North Carolina Drought Management Advisory Council](#) (NC DMAAC) reviewed recent conditions on Tuesday afternoon and provided input to the US Drought Monitor author, including recommendations for the following changes on this week's map:

- Moderate Drought (D1) conditions were added to parts of Rockingham, Guilford, Randolph, and Stanly counties in the central Piedmont, including the cities of Greensboro, Asheboro, and Reidsville
- Moderate Drought was also expanded to cover northern Wake County in the Falls Lake area
- Abnormally Dry (D0) conditions were introduced into Lenoir County, including the city of Kinston

These changes were based on a number of objective indicators that show the increase in dryness across the state:

U.S. Drought Monitor North Carolina November 7, 2017 (Released Thursday, Nov. 8, 2017) Valid 7 a.m. EST



This week's US Drought Monitor map for North Carolina

A Lack of Rainfall

Precipitation was largely limited to the Mountains over the past 7 days. A shower over Rockingham County brought about half an inch of rain to Reidsville, but it was still yet another below-normal week. Elsewhere in the Piedmont and Coastal Plain, most locations received no rain at all.



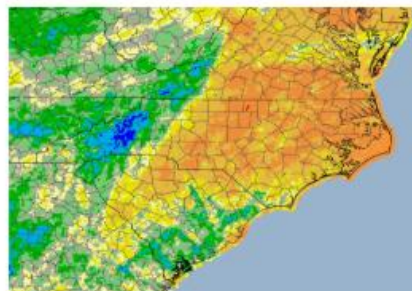
Nov 7, 2017

7-day cumulative precipitation

Total precipitation from November 1-7, 2017; from the [Integrated Water Portal](#)

A Sharp Precipitation Divide

Wet in the west and dry in the east has been the recent trend across North Carolina. Over the past 60 days, much of the Mountains has received above-normal rainfall - including from the remnants of Hurricane Irma - while parts of the Piedmont and Coastal Plain have seen just 25 to 50% of their normal precipitation.



Nov 7, 2017

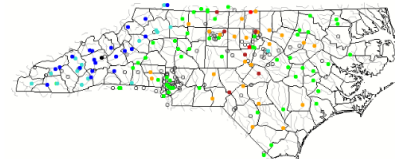
Percent of normal precipitation for the 60 days ending on November 7, 2017; from the [Integrated Water Portal](#)

Struggling Streams

The lack of recent rainfall has caused streamflows to decline, especially in the northern and central Piedmont. Monitoring sites along the Cape Fear River at Lillington, Pittsboro, and Gibsonville have all had their 28-day average streamflows drop into the much below normal range.

28-Day Average Streamflow Levels

Tuesday, November 07, 2017



USGS

Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		

Average streamflow conditions over the past 28 days; from [USGS WaterWatch](#)

Lakes Levels Lowering

Reservoirs across the Piedmont are also feeling the effects of the recent dry weather. Falls Lake, Jordan Lake, and Kerr Lake have all fallen more than two feet below their target levels, according to the US Army Corps of Engineers. That decline began in the late summer but has accelerated recently due to the lack of rainfall, especially in the upper Cape Fear River basin.



Falls Lake levels (pink) compared to targets (blue line) since late July; from [www.LakeLevels.info](#)

With harvesting being finished and the end of the growing season expected soon - possibly as soon as this Saturday morning, when low temperatures are expected to drop [below freezing](#) across much of the state - the agricultural impacts of the recent dry spell have been limited.

Extension agents in the northern Piedmont have [noted](#) that rain is needed to germinate the recently planted small grains and grasses, but otherwise, the dry weather has helped farmers get into the fields to harvest.

Impacts to water resources have been much more pronounced, especially to surface water conditions such as streamflows and reservoir levels.

Although the upcoming [short-range](#) and [long-range](#) forecasts don't offer much hope of a wet pattern emerging, the approaching winter season should at least limit evaporation and overall water demand. In addition, the worst of the dryness has emerged only in the past two months, so it hasn't become a significant long-term event.

Infographic Examples

North Carolina Drought Update For the week ending March 28, 2017

This Week's Drought Monitor of North Carolina Map

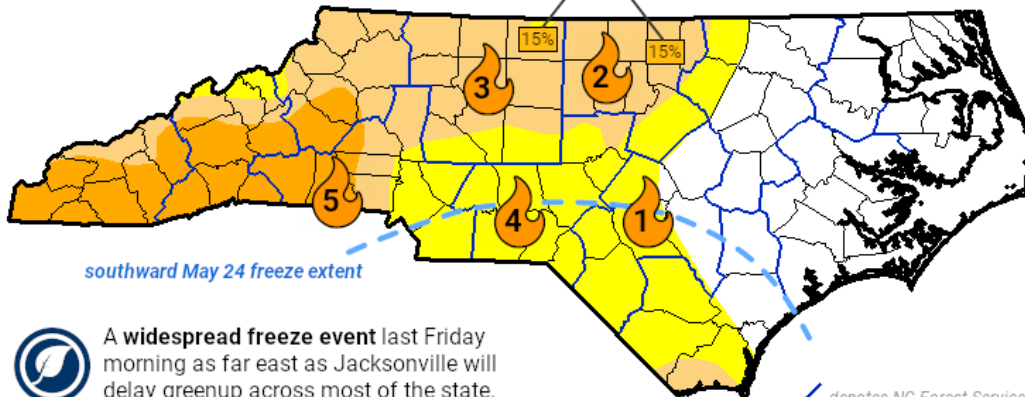
From the US Drought Monitor, authored by Eric Luebehusen (USDA) with input from the North Carolina Drought Management Advisory Council



Last Tuesday, **10 wildfires** were reported in Region 2 with an additional **5 fires** in District 12 (see 🔥 icons). All were small acreage burns.



The **1000-hour fuel moisture** values have dropped to 15% in parts of the northern Piedmont.



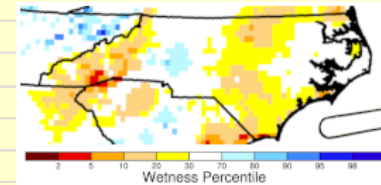
A **widespread freeze event** last Friday morning as far east as Jacksonville will delay greenup across most of the state.

denotes NC Forest Service district boundaries

Forestry/Fire Summary

Notes about this week's drought map

- Up to **3 inches of rain** last week in the Mountains led to improvement from **Severe** to **Moderate Drought** in several counties
- **Less than a half-inch** of rain fell in eastern NC, with **Moderate Drought** expanding into Brunswick Co.
- **Soil moisture levels** (right) are lowest in the Mountains and northern Piedmont



Surface soil moisture drought indicator from NASA GRACE on March 27, 2017

Drought Monitor Intensity:

- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)

This infographic is a product of



<http://climate.ncsu.edu/nighthawk>

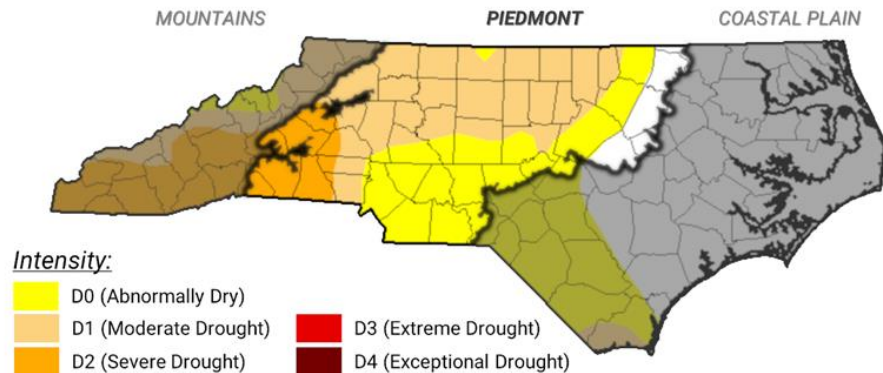


Infographic Examples

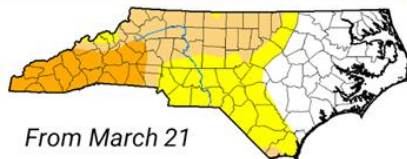
North Carolina Drought Update For the week ending March 28, 2017

This Week's Drought Monitor of North Carolina Map

From the US Drought Monitor, authored by Eric Luebehusen (USDA) with input from the North Carolina Drought Management Advisory Council



Last Week's Drought Map



This infographic is a product of



PROJECT
NIGHTHAWK



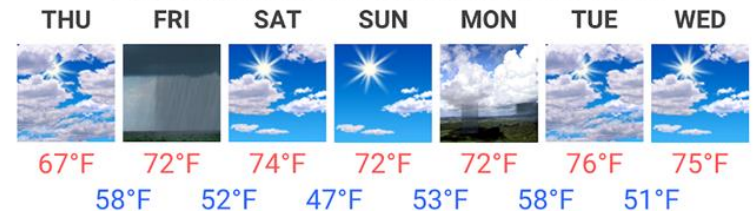
<http://climate.ncsu.edu/nighthawk>

Piedmont Summary

- The northern Piedmont remains in **Moderate Drought** as streamflows and soil moisture levels continue to decline
- After a week with little to no rainfall, the southeastern Piedmont is still **Abnormally Dry**, but is being monitored for further degradation
- Reservoirs across the region remain at or near normal levels

Weather Outlook for the Week of Thu., Mar. 30

Forecast guidance from the National Weather Service



Friday: A cold front will bring a chance of rain, mainly in the northern counties. **Monday:** Pop-up showers and thunderstorms are possible in the afternoon.

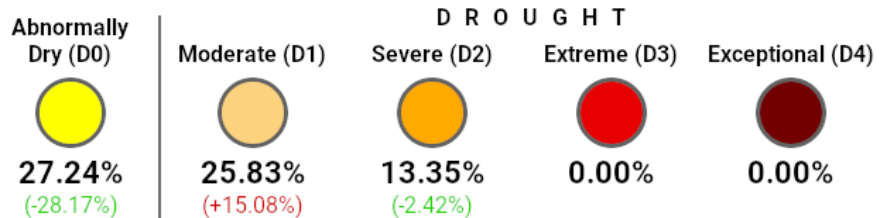
Infographic Examples

North Carolina Drought Update For the month of March 2017

Drought Monitor of NC Map, Released Mar. 28, 2017

From the US Drought Monitor, authored by Eric Luebehusen (USDA) with input from the North Carolina Drought Management Advisory Council

Current Coverage and Changes Since Feb. 28



Mountains improve, but drought persists

Severe Drought was upgraded to Moderate Drought in parts of the Mountains that received up to **3 inches of rain** last week, including northern Haywood and Swain counties.

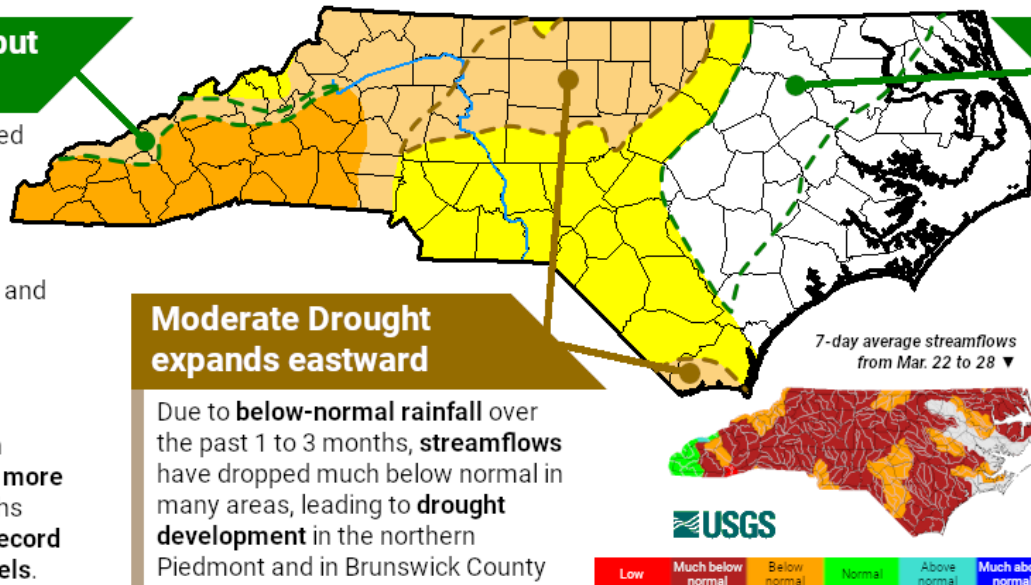
However, Severe Drought remains in the southern Mountains, which have seen **precipitation deficits of 4 or more inches** over the past 3 months and continue to have **near-record low monthly streamflow levels**.

Moderate Drought expands eastward

Due to **below-normal rainfall** over the past 1 to 3 months, **streamflows** have dropped much below normal in many areas, leading to **drought development** in the northern Piedmont and in Brunswick County

Northern coast no longer Abnormally Dry

A **wet start to March** replenished **soil moisture** and **groundwater** levels, especially north and east of Rocky Mount



This infographic is a product of



<http://climate.ncsu.edu/nighthawk>



“About the DMAC” Resources

Goal: Provide background information about the NC DMAC and its history, membership, and weekly drought monitoring process

Possible Approaches:

- Infographics
- Story maps
- Updated content for ncdrought.org

"About the DMAC" Resources

North Carolina Drought Management Advisory Council History

A main purpose of the DMAC is to provide consistent and accurate information on drought conditions to the state to the U.S. Drought Monitor, the Environmental Management Commission, the Secretary of the Department of Environment and Natural Resources, the Environmental Review Commission, and the public.

1998-2003 Drought
Severe drought heavily impacted the forestry and agriculture industries. More than 200 municipalities were under some sort of water conservation efforts.



2007-2008 Drought
North Carolina experienced one of the worst droughts in its modern history. At its peak in December 2007, the U.S. Drought Monitor classified 60% of the state in Exceptional Drought. Visible impacts could be seen across NC, such as low levels in Falls Lake (pictured below, image from Southeast Regional Climate Center).



Who serves on the NC DMAC?



- 1992** Formation of NC Drought Monitoring Council
The Drought Monitoring Council, an inter-agency coordination, is created in 1992.
- 1999** Creation of the US Drought Monitor
The US Drought Monitor was created in 1999; the Drought Monitoring Council began offering USDM authors local and state-level input.
- 2002** Drought Monitoring Council is Recognized
The NC General Assembly gives the Drought Monitoring Council an official statutory base and changes its name to the Drought Management Advisory Council (DMAC) to reflect its broad extends beyond monitor. The Chair of the Council is Department of Environment designated by the Department.
- 2003** A New Role
A new statute charged the official state drought advisory technical data to address throughout NC.
- 2004** Annual Reports
The General Assembly by Council to submit an annual the Secretary, the Governor Environmental Review Commission includes a review of the recommendations to improve drought monitoring.
- 2008** New Participants
The NC legislature passed improving drought preparation which included defining membership. Various groups send a representative to the drought monitoring.

Monitoring Drought with Technical Information

North Carolina droughts are complex phenomena that influence and are influenced by a variety of factors, both natural and human. Members of the NC DMAC meet regularly to assess conditions across the state and determine drought designations for each county. Drought advisories made by the NC DMAC are based on technical data obtained from sources throughout the state and are tailored to local conditions. Descriptions of some of these types of information are included below.

Droughts, at their core, are caused by an imbalance between the supply of water and the demand for that water. North Carolina's supply of water originates as precipitation. Comparing how much precipitation fell over the past week, month, season, or even year to the average over that same time period provides an indication of the supply side of the water supply-demand balance.

The NC DMAC uses information from gauges across North Carolina that regularly measure the levels of surface water and groundwater supplies as guidance for hydrological drought and drought impacts. Precipitation that runs off the surface eventually makes it way to surface water supplies (streams, rivers, and lakes) to be used by plants, animals, people, and industry. Humans have also constructed dams, creating man-made lakes for purposes like adequate water supply and flood control. These dams are maintained by various entities, such as federal, state, or local governments, utilities, or even private landowners.



Reports of agricultural conditions and crop progress from across North Carolina are provided by Cooperative Extension agents and agronomists. These reports provide information about drought impacts to agriculture.



Forest fires are part of North Carolina's climate, but these can become more frequent or severe during times of drought. Reports of forest fire incidence and acreage provide information about drought impacts to forested lands.

Reports of conditions from citizen scientists as part of the CoCoRaHS Condition Monitoring program provide a baseline understanding of moisture conditions that aren't specific to any one sector. Among the unique types of impacts that these reports include are impacts to backyards and wildlife.



Public water supplies are typically managed to be resilient to drought, impacted. Often, utilities and municipalities will institute voluntary or measures to mitigate a drought's impacts. Keeping tabs on these yield a drought is having in different parts of the state. The quality of water well when water levels decline. Monitoring water quality provides info drought.

The Context

The NC DMAC examines technical data as well as the context for that information when making drought designations. This context includes timing, location, and recent history.



Expected drought impacts may change based on the current season. For example, drought conditions in the spring might impact the germination of seeds whereas drought in the fall may impact wild fire likelihood and intensity.



Convergence of Evidence

The NC DMAC uses a convergence of evidence approach: each piece of information from the NC DMAC and drought designations are based on what they have by having multiple technical experts examining the same information, no single piece, ensuring that the drought designations correctly reflect on-site conditions.



Precipitation that enters the soil provides moisture for plants roots. If that water continues to filter into the soil, it eventually reaches underground aquifers, becoming groundwater. Groundwater wells provide drinking water for many North Carolina residents, and some groundwater flows into rivers and lakes, becoming surface water.

Monitoring Drought with Technical Information (continued)



Drought Designations

The drought designations used by the NC DMAC match the US Drought Monitor. These designations follow a 5-point scale that ranges from Abnormally Dry to Exceptional Drought. The NC DMAC may recommend a drought designation that is different from that of the U.S. Drought Monitor if the U.S. Drought Monitor does not accurately reflect localized conditions because of differences in scale or because the U.S. Drought Monitor does not consider one or more of the indicators of drought that the NC DMAC uses.



What's my designation?



Abnormally Dry
The lowest designation, D0, indicates areas that might be going into or coming out of drought. Examples of impacts include slowing growth of crops (going into drought) or lingering water deficits (coming out of drought).



Moderate Drought
The least severe drought designation is Moderate Drought, or D1. Some examples of impacts include damage to crops, declining stream, reservoir, or well levels, and voluntary water-use restrictions requested.



Severe Drought
When a Severe Drought designation is issued, examples of drought impacts include crop or pasture losses, widespread water shortages and water use restrictions.

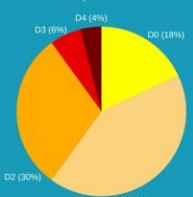


Extreme Drought
As conditions worsen into an Extreme Drought, types of impacts include major crop and pasture losses as well as widespread water shortages or water use restrictions.



Exceptional Drought
The most severe drought designation is an Exceptional Drought, D4. Places with this drought designation may experience exceptional and widespread crop and pasture losses. Shortages of water in reservoirs, streams, and wells that water emergencies are also possible in an Exceptional Drought.

Droughts don't follow political boundaries, so it's possible (and even common) for a county to have several levels of drought within its bounds. In these instances, the drought designation of the county will be the highest drought designation that applies to at least twenty-five percent (25%) of the land area of the county.



Let's say that the pie chart above is the breakdown, by percentage, of each of the drought levels for your county. Even though a larger percentage of the county is in Moderate Drought (D1, 42%), the county's drought designation would be Severe Drought (D2, 30%). This is because D2 is the highest drought designation that applies to at least 25% of the county.

Project Nighthawk Next Steps

Phase 4

Implement & Integrate

Integrate
and
implement
communication
strategies

- Revise prototypes based on Phase 3 feedback
- Begin testing Weekly Drought Updates and Short-Range Outlooks
 - Seeking representatives to receive these and share feedback
 - How can these supplement Cabe's regional fire danger assessments?

Project Nighthawk Next Steps

Phase 5

Evaluate

Evaluate project activities and outcomes

- This summer and fall, we'll evaluate what we've done
- Seeking additional feedback opportunities for ag, forestry, and water resources sectors
 - Could you recommend any conferences or events to attend?

Agriculture/Forestry and Water Resources Sectors

Combined Follow-Up Webinar

Final Project Survey



Questions or Suggestions?

<https://climate.ncsu.edu/nighthawk>