

# 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

Phase 2

Phase 3

Phase 4

Phase 5

*Identify*

*Develop*

*Evaluate & Refine*

*Implement & Integrate*

*Evaluate*

Refine priorities for new products with project partners and target audiences

Develop tailored information and communication prototypes

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

Integrate and implement communication strategies

Evaluate project activities and outcomes

Water Resources Sector

Initial Project Survey

Sectoral Webinar

WRRJ Annual Conference

Agriculture/Forestry Sectors

Initial Project Survey

Sectoral Webinar

Extension Conference (TBD)

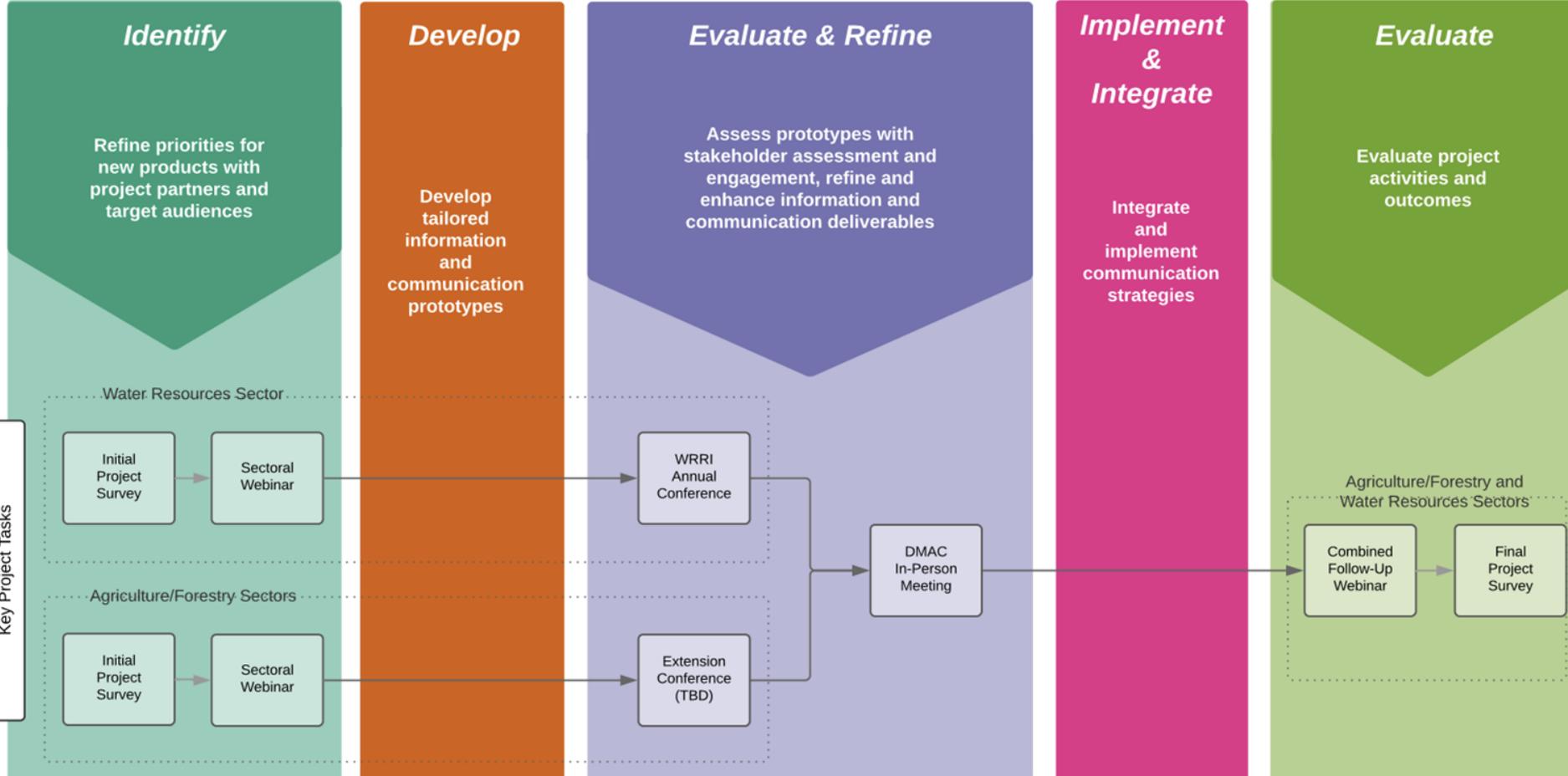
DMAC In-Person Meeting

Agriculture/Forestry and Water Resources Sectors

Combined Follow-Up Webinar

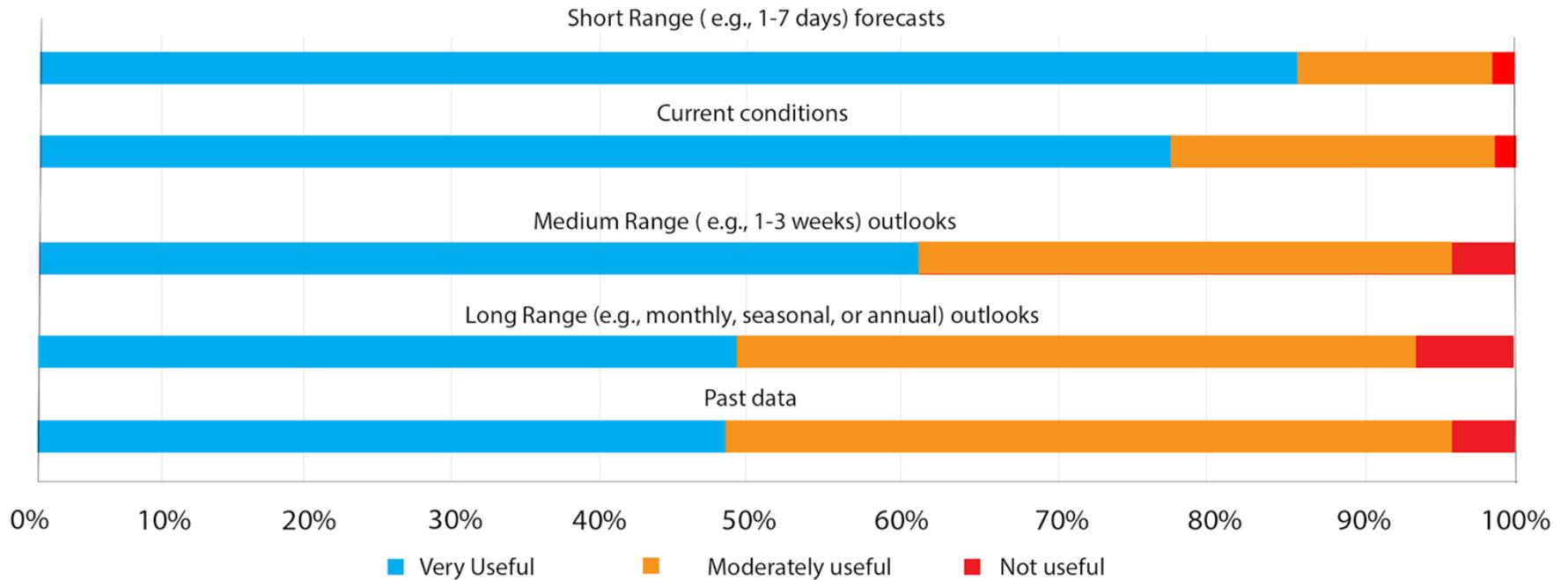
Final Project Survey

Key Project Tasks



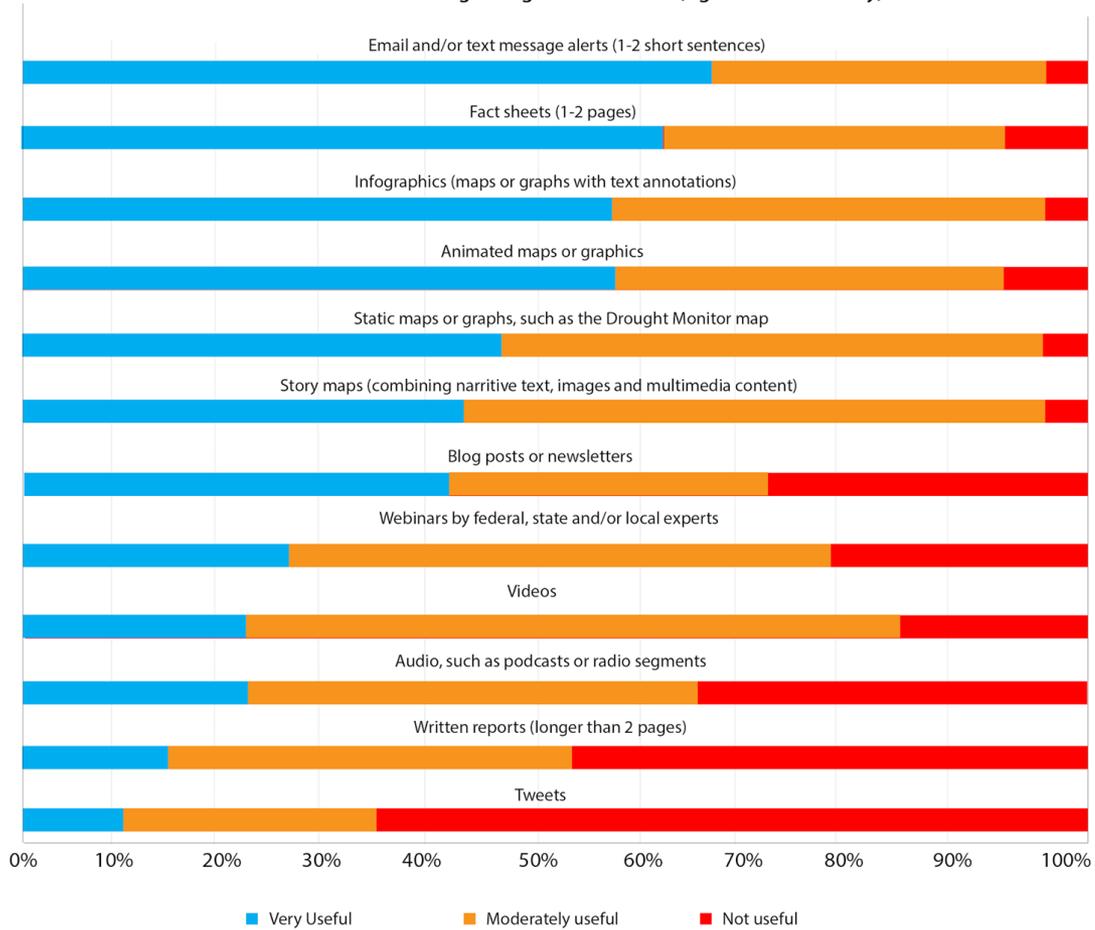
# Selected Survey Results (Ag/Forestry)

## Importance of weather and climate informaton



# Selected Survey Results (Ag/Forestry)

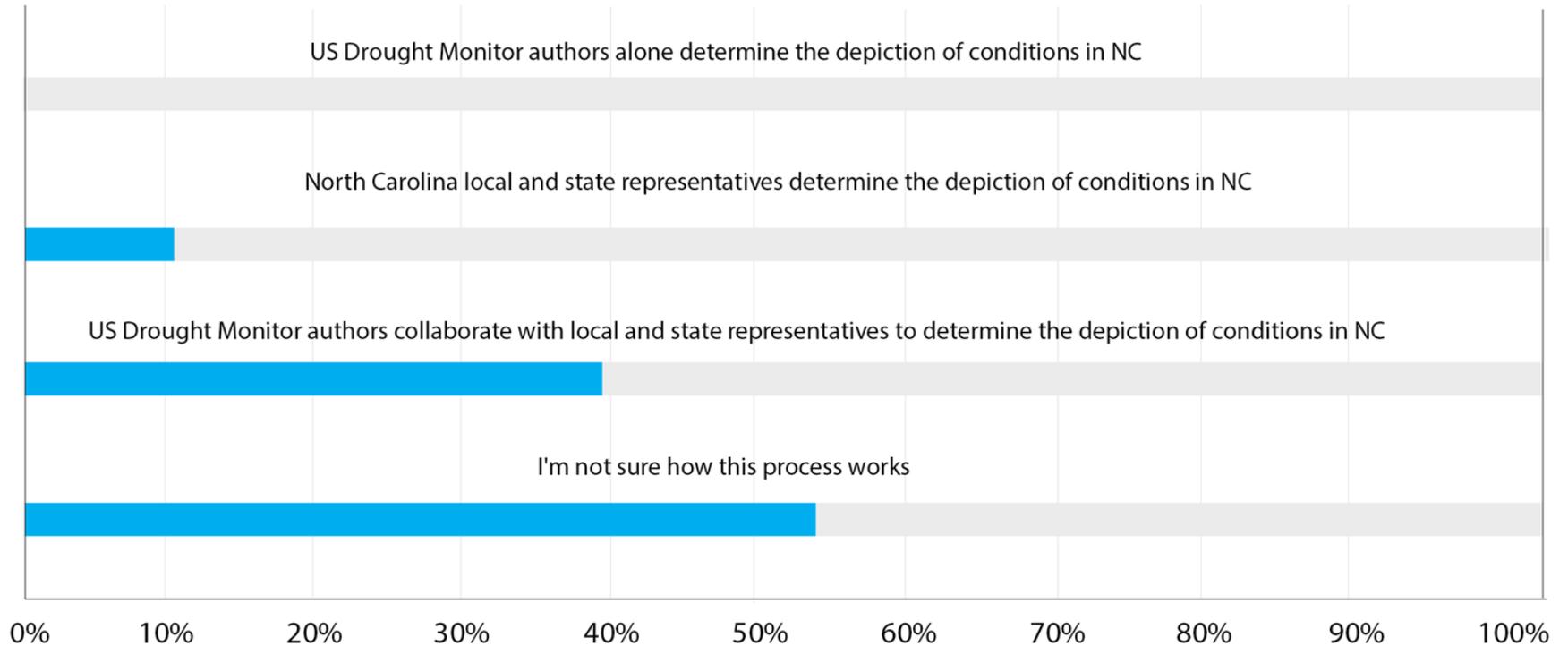
Preferences for receiving drought Information (Agriculture/Forestry)



# 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](http://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**

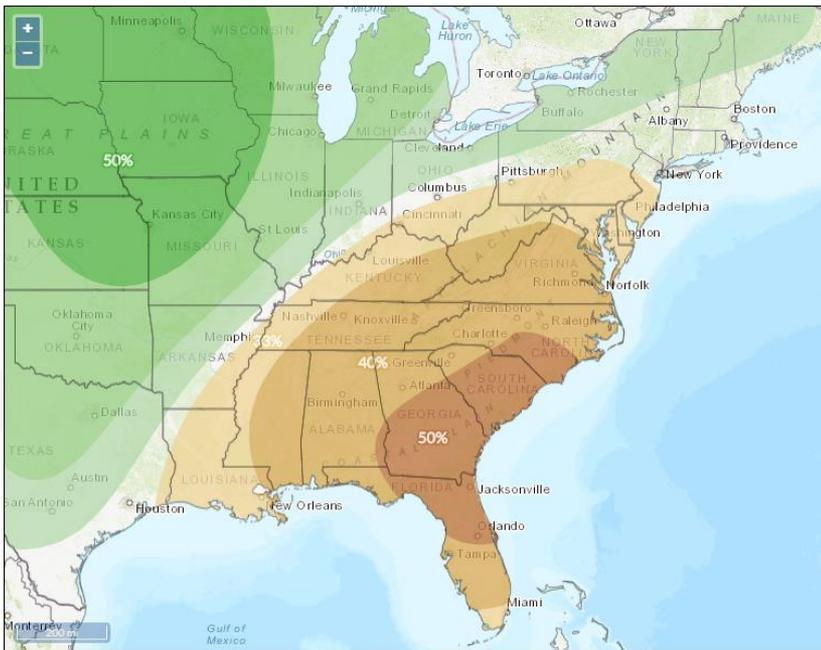
**NATIONAL  
INTEGRATED  
DROUGHT  
INFORMATION  
SYSTEM**



**Drought.gov**  
U.S. Drought Portal



# Your Drought Information Needs



GRIDDED DATA CPC Precipitation Outlook (%) Probability of Below Normal Probability of Above Normal  
 For Tuesday, May 21 to Saturday, May 25  
 This forecast was issued yesterday (May 15)  
 Source: [NWS Climate Prediction Center](#)

- 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

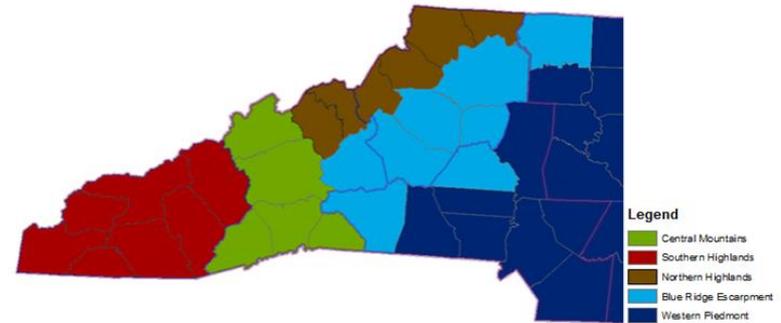
- Who are you sharing drought information with?
  - Are you sharing info. directly from the FWIP?
  - How do you share this info.? (email, etc.)

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.

Main Weather Patterns



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

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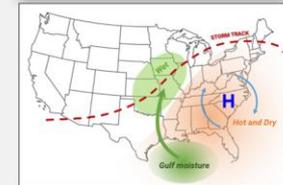
**Fuel for Fires**

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**

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**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**

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**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

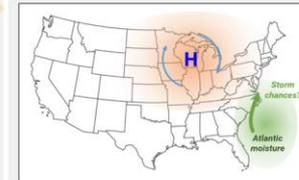
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# Weekly Drought Overviews

**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 DMAC) 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. 9, 2017 7 a.m. EST)



**Legend:**  
 D0 Abnormally Dry D1 Moderate Drought D2 Severe Drought  
 D3 Extreme Drought D4 Exceptional Drought

This week's US Drought Monitor map for North Carolina

### A Lack of Rainfall

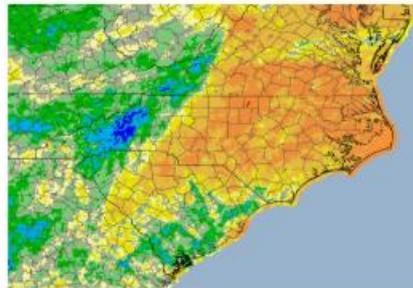
Precipitation was largely limited to the Mountains over the past 7 days. A shower over Rockingham County brought about half an inch of rain to Reidsville, but it was still yet another below-normal week. Elsewhere in the Piedmont and Coastal Plain, most locations received no rain at all.



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.

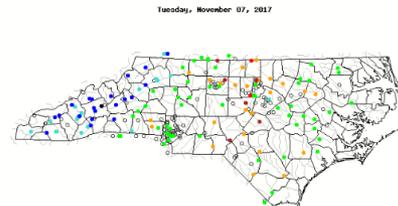


Percent of normal precipitation for the 60 days ending on November 7, 2017; from the [Integrated Water Portal](#)

### 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



USGS

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

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

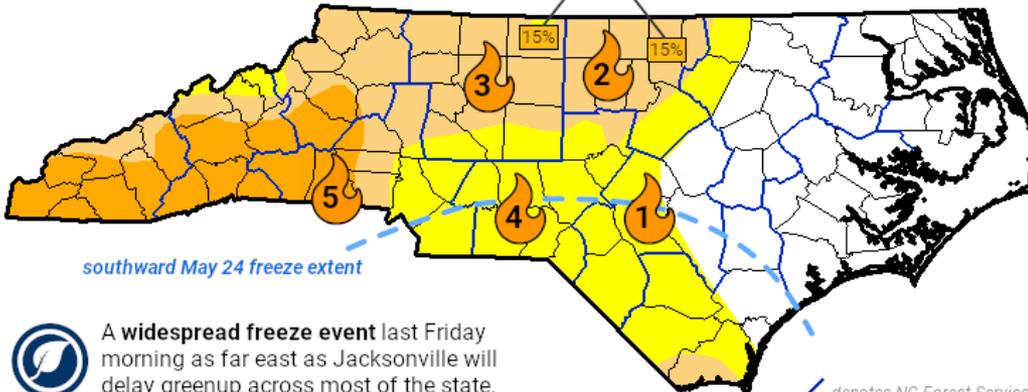
From the US Drought Monitor, authored by Eric Luebehusen (USDA) with input from the North Carolina Drought Management Advisory Council



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.



southward May 24 freeze extent

denotes NC Forest Service district boundaries

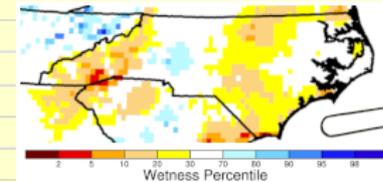


A **widespread freeze event** last Friday morning as far east as Jacksonville will delay greenup across most of the state.

## 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>

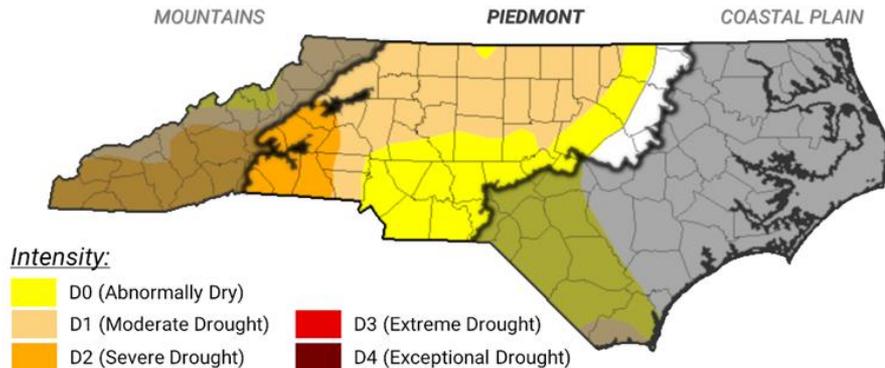


# Infographic Examples

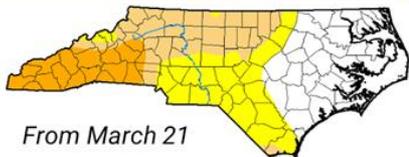
## North Carolina Drought Update For the week ending March 28, 2017

### 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

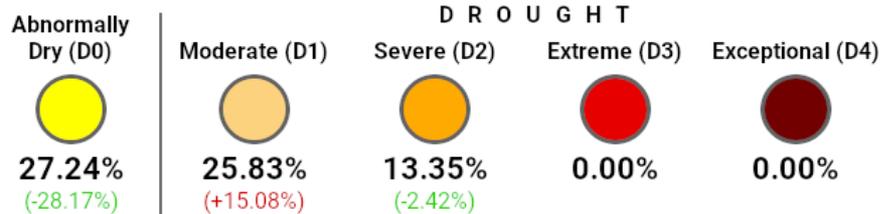
## North Carolina Drought Update

For the month of March 2017

## Current Coverage and Changes Since Feb. 28

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

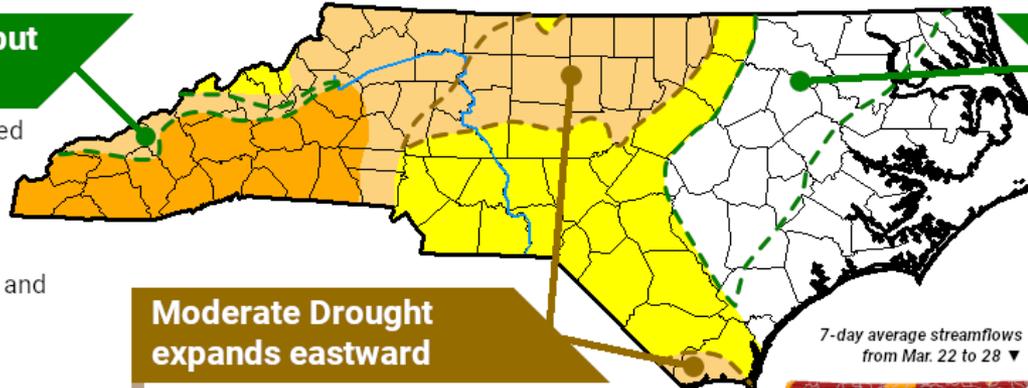
From the US Drought Monitor, authored by Eric Luebehusen (USDA) with input from the North Carolina Drought Management Advisory Council



### 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**.

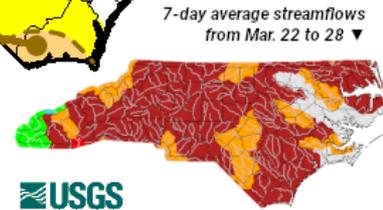


### Northern coast no longer Abnormally Dry

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

### 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



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](http://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 in 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 US 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).



- 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 Reorganized. 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 Depart
- 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 Govern Environmental Review. Co includes a review of the Ci recommendations to imp
- 2008** New Participants. The NC legislature passed improving drought prepar which included defining ti membership. Various gres send a representative to s due to their expertise in a drought monitoring.

### Who serves on the NC DMAC?



## 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.

## 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.



## 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.

What type of drought (or non-conditions have we experience recent past? If we've experience several years of water-than-in conditions, it might take longer to enter into a drought because soil moisture and groundwater levels are higher.



Precipitation falling within the the Cape Fear highlighted in green the bounds. For this reason, some basins can experience very differ and impacts.

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.

Temperatures — and whether they are warmer or cooler than normal — give an indicator atmosphere's demand for water through evapotranspiration (the combination of evaporation and transpiration). We expect to be quite a bit of evapotranspiration in warmer months, but a stretch of unusual weather can lead to more-than-typical am of water leaving the surface for the atmosphere. If that water doesn't return as precipitation water supply-demand balance might shift drought.

## 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-

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.

## What's my designation?

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.



# 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

Agriculture/Forestry and Water Resources Sectors

Combined Follow-Up Webinar

Final Project Survey

- 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?



# Questions or Suggestions?

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