

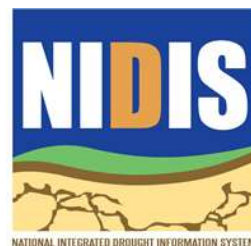
So Why Does The Drought Map Look Like That?

Exploring The Linkages Between Transparency and The Usability of Drought Information



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PRESENTED AT:



1. INTRODUCTION

Motivation & Objectives

This collaborative project between the State Climate Office of North Carolina (SCONC) and NOAA's Carolinas Integrated Sciences and Assessments (CISA) program focused on improving the usability and communication of drought-relevant information for North Carolina decision makers working in the agriculture, forestry, and water resources sectors.

The project's motivation stemmed from needs articulated by the North Carolina Drought Management Advisory Council (DMAC) and constituents such as N.C. Cooperative Extension agents, fire managers, and public water supply system managers. These needs included a better understanding of how drought is monitored, the climatic and environmental conditions that can cause or worsen drought conditions, and drought impacts on various sectors and regions of the state.

The project objectives were to:

- Develop tailored, sector-specific information for drought-relevant decisions
- Deliver information in accessible and actionable formats
- Improve the transparency of the drought monitoring process through enhanced engagement and communications with decision makers

This poster explores how efforts to build transparency and better understanding of drought monitoring and designation processes can shape how decision makers apply, share, and value the information produced by monitoring groups and scientific agencies.

The North Carolina Drought Monitoring Process

The North Carolina Drought Management Advisory Council (NC DMAC) monitors drought and issues drought advisories for the state of North Carolina. Originally formed in 1992, subsequent state legislation in 2003 and 2008 formalized the DMAC's membership, functions, and responsibilities.

Technical experts from various agencies and organizations serve on a volunteer basis.

State agencies

Cooperative Extension Service	Forest Service
Department of Agriculture and Consumer Services	State Climate Office
Department of Commerce	Utilities Commission
Department of Environmental Quality	Wildlife Resources Commission
Department of Public Safety	

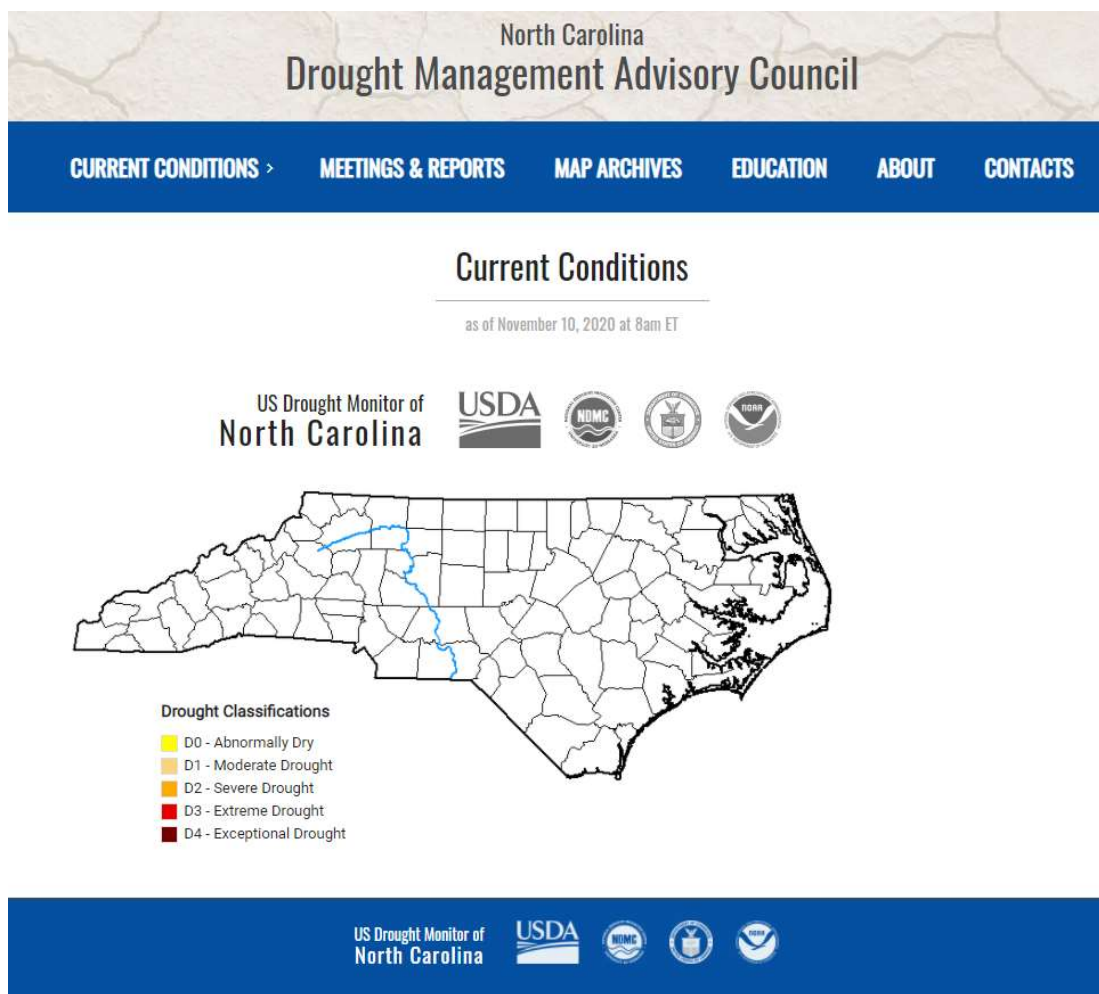
Federal agencies

Federal Emergency Management Agency	US Army Corps of Engineers
National Weather Service	US Department of Agriculture
Tennessee Valley Authority	US Geological Survey

Reservoir managers/energy producers

Cube Hydro	Duke Energy
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The DMAC meets regularly via teleconference and provide recommendations to the US Drought Monitor (USDM), following the "convergence of evidence" approach used by the USDM authors (Svoboda et al., 2002 (<https://journals.ametsoc.org/bams/article/83/8/1181/57818/THE-DROUGHT-MONITOR>)). The final product is the weekly US Drought Monitor of North Carolina Map.



(<https://www.ncdrought.org/>)

Figure 1. The NC DMAC website. Click here (<https://www.ncdrought.org/> (<https://www.ncdrought.org/>)), or on the image (above), to visit the website.

2. APPROACH

An Iterative Process

The project was designed as an iterative process and involved decision makers throughout the various stages of product development, evaluation, and refinement.

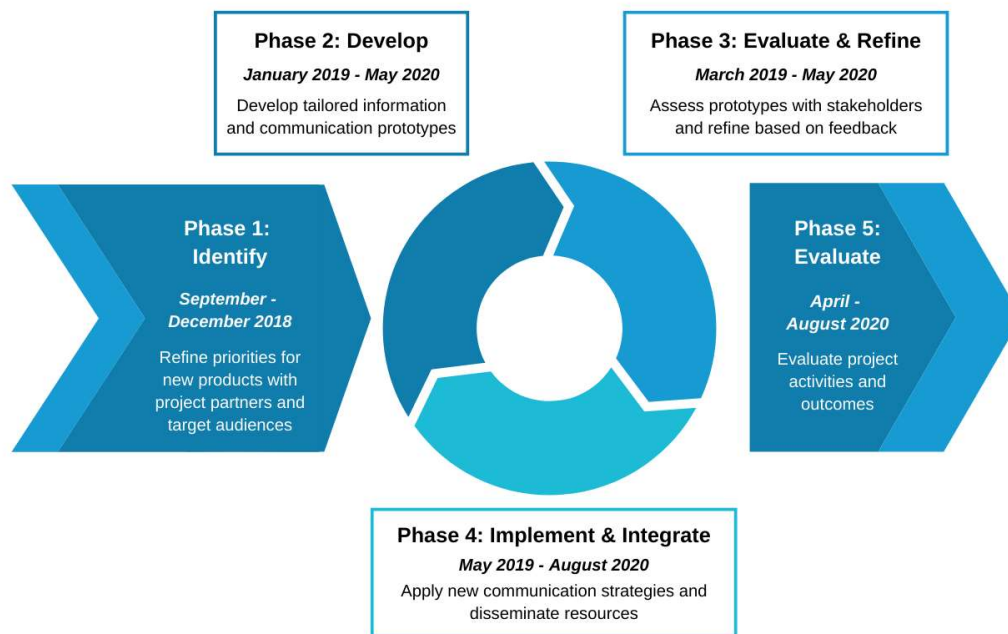


Figure 2. The project's five phases.

- **Phase 1.** We engaged with partners and our target sectors to conduct a needs assessment, identify priorities for new information resources, and explore strategies to disseminate new resources.
- **Phase 2.** We created prototypes to share drought information based on priorities identified in Phase 1.
- **Phase 3.** We systematically evaluated and refined the prototypes through a combination of surveys, in-person and virtual feedback sessions, and eye tracking studies with extension agents, water resource managers, and other stakeholders. Products were assessed in terms of their content, design, understandability, ease of access, and shareability.
- **Phase 4.** We began to disseminate new products through partner organization's communications processes, a listserv for project participants, and a project website.
- **Phase 5.** We evaluated project outcomes in terms of product use and the engagement process through a qualitative analysis of all feedback received during the project. Overall, we conducted and/or attended over 17 engagements with decision makers and other project stakeholders.

3. NEEDS ASSESSMENT RESULTS AND EXAMPLE PRODUCTS

Needs Assessment Methods

- In October 2018 we sent online surveys to 499 extension agents (agriculture, forestry), water resource managers, and NC DMAC members to collect information about decision makers' uses of and needs for drought information. We received 140 completed, or partially completed, surveys (28.1% response rate).
- In November and December 2018 we conducted two follow-up webinars to share survey results and refine ideas for new resources and tools to develop. Attendees (31 total) included NC DMAC members, information providers (e.g., National Weather Service offices), and key sector representatives (i.e., agriculture, forestry, water resources).

Needs Assessment Results

- We identified a need for a better understanding of the NC drought monitoring process and how drought designations are determined. Survey respondents were almost evenly split between those who were aware of the NC Drought Map and monitoring process and those who were unaware of the process. Over half of respondents indicated they consider the NC and USDM maps only moderately accurate or are unsure of their accuracy.
- The drought maps and indicators currently available are retrospective (i.e., show past conditions) and are not always presented at a meaningful scale for decision making.
- Participants indicated needs for products that are easily understandable and accessible to the various audiences with whom they interact and communicate. Preferred products were those written in clear and concise language, presented in user-friendly formats, and shareable through existing channels such as social media and websites.

Priorities & Products

Through this process we identified the following project priorities to address the needs articulated by the survey and webinar participants. These priorities were the basis for new products and resources.

Click on each image to link to the example resource in a new window.

Visit the project website (https://climate.ncsu.edu/drought_comm) to see additional products and examples.

Priority 1. Narratives to accompany the NC Drought Map and synthesize the weekly drought status in North Carolina.

North Carolina Drought Update

For the assessment period ending October 29, 2019

This Week's Drought Monitor of North Carolina Map

From the US Drought Monitor, authored by David Senechal (Western Regional Climate Center) with input from the North Carolina Drought Management Advisory Council (<https://climate.ncsu.edu/nighthawk>)



Changes in the Past Month

What a difference a month makes! In early October, Severe Drought expanded into western North Carolina after a record-dry September. Several wet weeks since then have helped erode the drought and bring us closer to normal, but some areas are still suffering from lingering dryness.

NC Drought Map on October 8



Statewide Coverage By Category

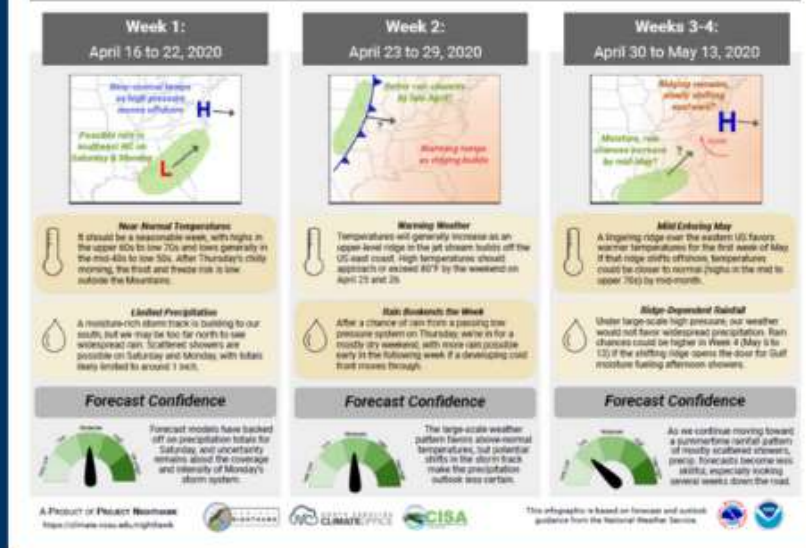


Weekly Drought Update infographics

(https://climate.ncsu.edu/documents/nighthawk/DroughtUpdates/DroughtUpdate_2019-10-29.pdf)

Priority 2. Resources that relate anticipated short and long-range conditions to drought and local- and and sector-specific effects.

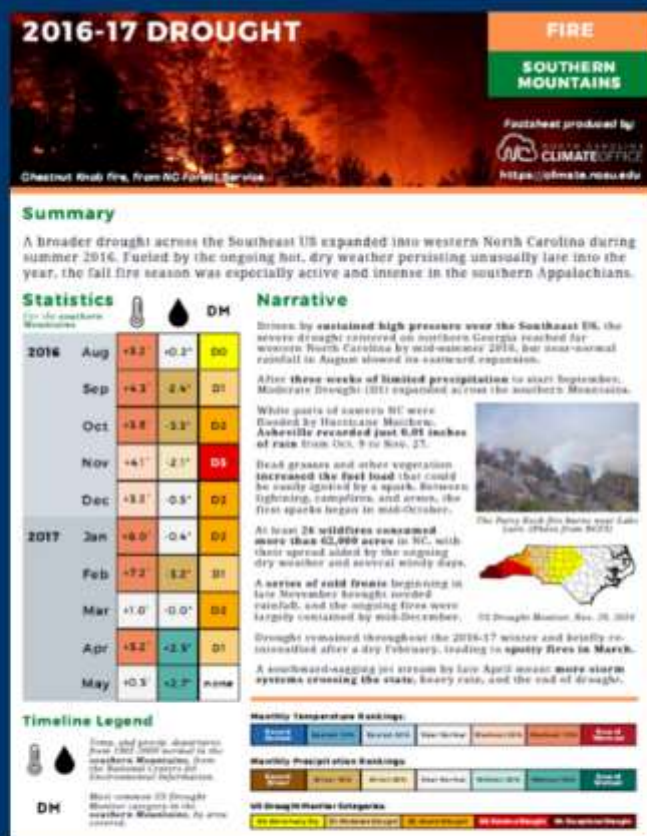
Short-Range Outlook for North Carolina



Short-Range Outlook infographics

(https://climate.ncsu.edu/documents/nighthawk/SROutlooks/SROutlook_April2020.pdf)

Priority 3. Contextualized and sector-specific information to support use and understanding of drought information.



Historical drought factsheets

(https://climate.ncsu.edu/documents/nighthawk/Factsheets/Factsheet_Fire_2016-17_SMtns.pdf)

Priority 4. Resources that describe the NC DMAC, its weekly drought monitoring process, and how this relates to the US Drought Monitor.



(<https://www.ncdrought.org/about>)

4. KEY FINDINGS FROM PRODUCT EVALUATIONS

Creating Usable and Useful Products

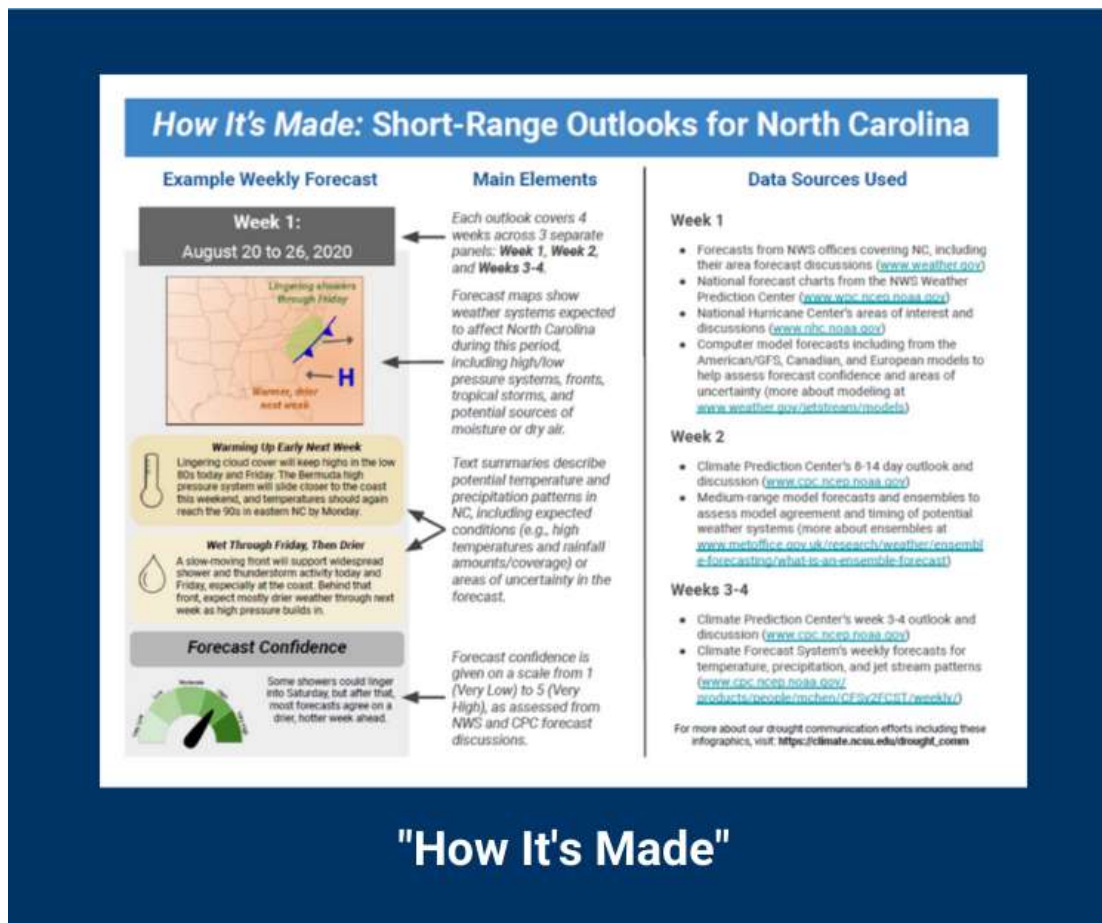
User engagements conducted in Phase 3 focused on obtaining feedback on specific product design elements and content.

As an example, the slide deck (below) highlights different iterations of the Weekly Drought Update infographics.

As we worked through the product evaluation and refinement process, we refined our understanding of how users interacted with the information and how to adapt the prototypes so they would be most useful for the intended audiences.

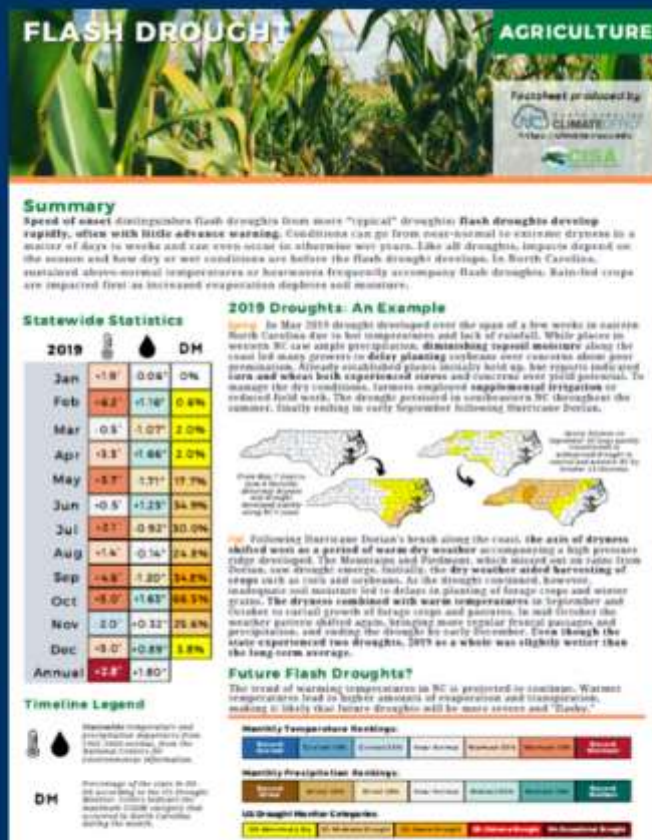
- **Standardized formats**, a streamlined design, and balanced text and visual elements help users to consume the presented information on a week-to-week basis.
- **Avoiding jargon** and less technical language makes them useful for explaining drought status to the media, public audiences, and higher-level decision makers.
- **Presenting forecast confidence** in a clear and understandable manner is of utmost importance. The “forecast confidence scale” in the Short Range Outlook infographics went through several iterations.
- **Some users appreciated the amount of detail** included in the products, but others indicated they included too much text. Resources explaining “how the infographics are made” provide additional information for those seeking more details.
- **A “one-size-fits-all” approach may be ineffectual** for audiences requesting sector-specific information. We therefore created templates, such as those for the Historical Drought Factsheets, that could be adapted for different user groups.

Click here (https://climate.ncsu.edu/documents/nighthawk/SROOutlooks/SROOutlook_About.pdf) to access the "How It's Made" infographic for the Short Range Outlook product.



(https://climate.ncsu.edu/documents/nighthawk/SROOutlooks/SROOutlook_About.pdf)

Click here (https://climate.ncsu.edu/documents/nighthawk/Factsheets/Factsheet_Flash_Drought.pdf) to access the Flash Drought factsheet developed for the agriculture sector.



Flash drought factsheet

(https://climate.ncsu.edu/documents/nighthawk/Factsheets/Factsheet_Flash_Drought.pdf)

5. KEY FINDINGS FROM THE FINAL PROJECT EVALUATION

Creating Used and Trusted Products

At end of the project (Phase 5) we undertook a more holistic evaluation to assess the use of the new products, as well as the effectiveness of the engagement process. We used NVivo, a qualitative analysis software program, to analyze and code focus group discussions, meeting notes, and open-ended survey responses (Saldaña, 2013) and developed our coding categories from literature on climate information use and usability, knowledge, exchange, and co-production processes (McNie, 2007; Wall et al., 2017).

Use of New Products

Although North Carolina experienced little drought during the project period, participants indicated using the products to:

- communicate drought status to their colleagues and constituents
- educate others about drought and drought monitoring processes
- maintain situational awareness about changing or static conditions
- justify decisions such as those related to prescribed burning

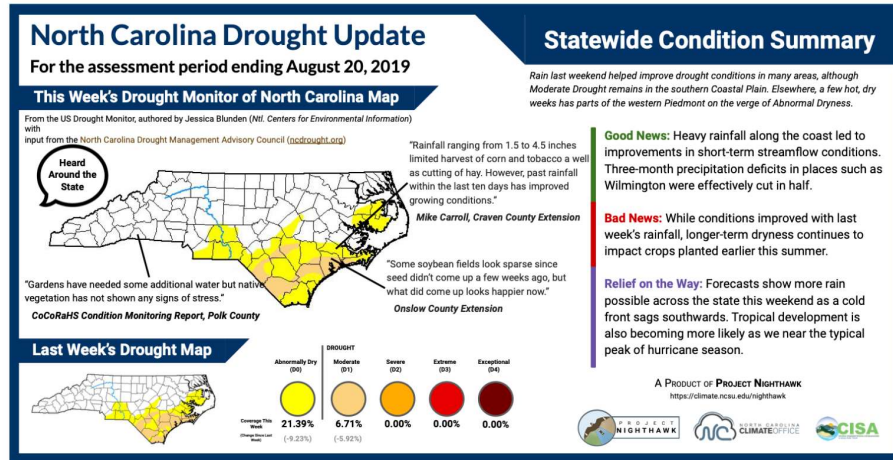
Supporting the Use of Drought Information through Enhanced Transparency – What Worked?

- **Communicating the process** and reasoning behind the drought status designations shown on the USDM and North Carolina Drought Maps
- **Drawing from reputable and trusted sources** (such as the SCONC, National Weather Service) and explaining the connections between the new products and the original data sources
- **Contextualizing climate and drought information** in meaningful ways for the end users, for example, focusing on impacts rather than difficult-to-understand indices
- **Explaining drought status at multiple scales** (state, regional, and local) and how conditions at one level may affect another
- **Designing products that can be disseminated** through sector's preferred and existing mechanisms such as Facebook (extension agents) or Twitter (water utilities)
- **Providing information and status reports**, even when there is "no drought"
- **Leveraging existing networks, partnerships, and activities** to refine and provide information, such as through workshops and training with extension agents

Featured Product: Weekly Drought Update

Slide 1 of 8

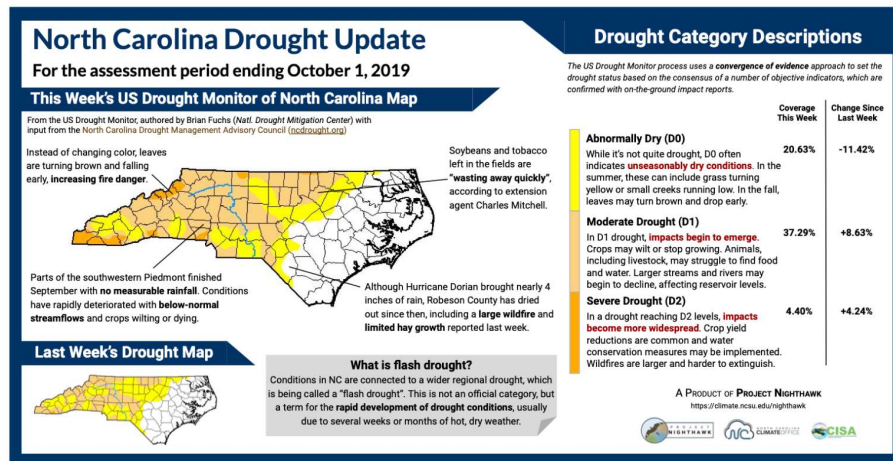
The infographic format was designed to meet users' requests for concise and easy-to-understand content that explained the reasoning behind drought designations.



Featured Product: Weekly Drought Update

Slide 2 of 8

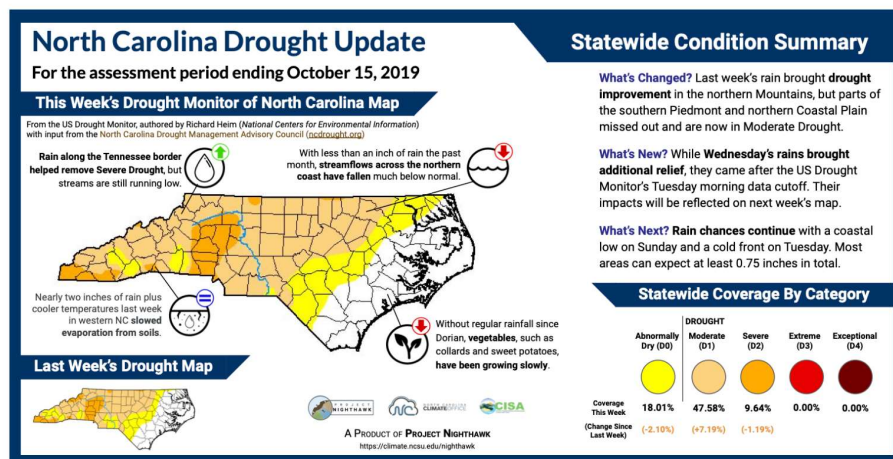
During the emergence of flash drought in fall 2019, we used the infographic to educate users about what to expect and look for during different drought severity levels.



Featured Product: Weekly Drought Update

Slide 3 of 8

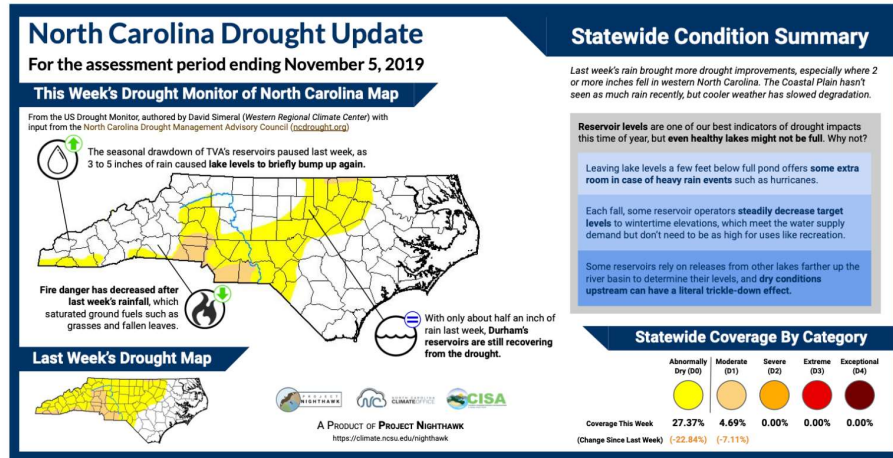
Based on user feedback, we settled on a standardized set of icons with accompanying text to depict worsening, stable, or improving conditions.



Featured Product: Weekly Drought Update

Slide 4 of 8

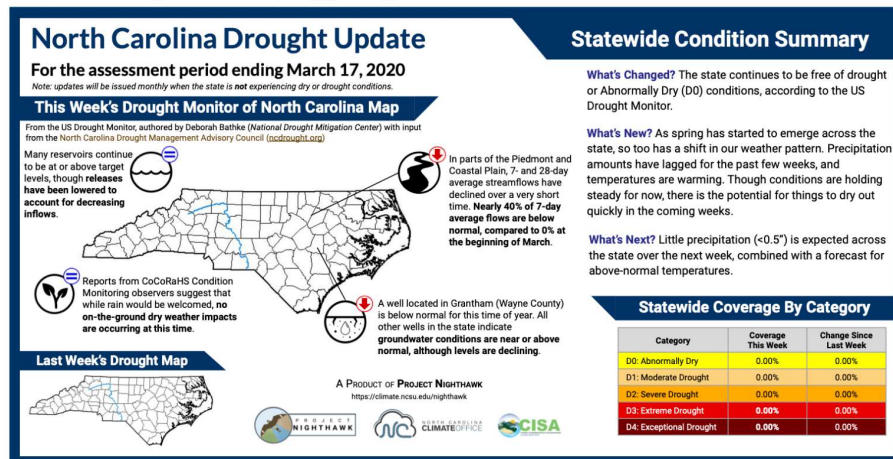
Water utility representatives recommended that we use the infographic format to explain how reservoir levels and operations respond to drought during different times of the year.



Featured Product: Weekly Drought Update

Slide 5 of 8

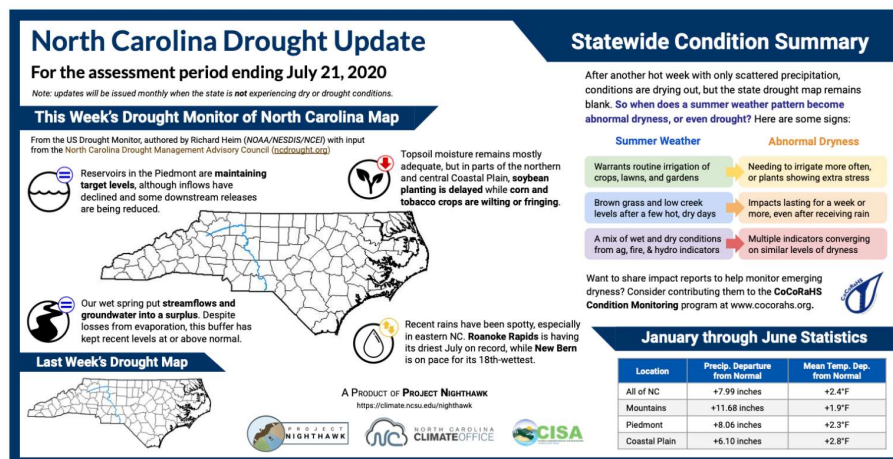
Agriculture stakeholders monitor conditions closely, even when there is no drought. Although the winter was drought-free, weekly explanations helped to show how a lack of precipitation and warming temperatures might affect the spring growing season.



Featured Product: Weekly Drought Update

Slide 6 of 8

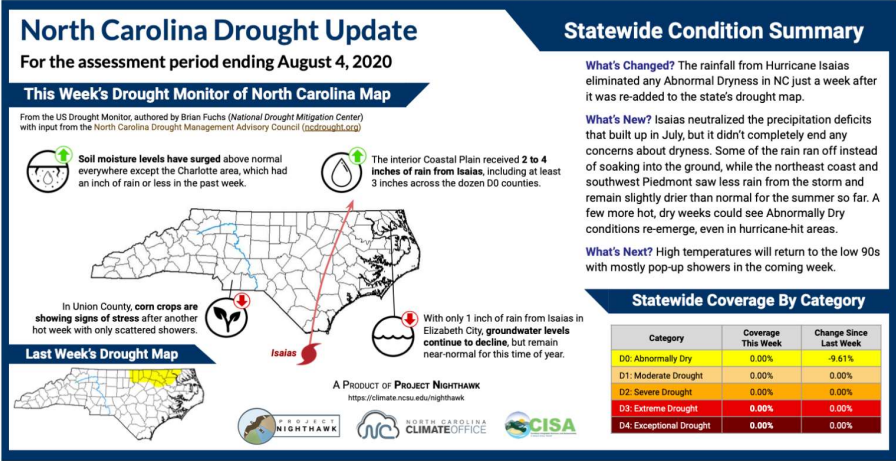
Confusion about the difference between North Carolina's normal summer variability and "abnormal dryness" motivated this mid-summer infographic.



Featured Product: Weekly Drought Update

Slide 7 of 8

This infographic shows the effects of Hurricane Isaias. North Carolina relies on "drought-busting" tropical storms, such as Isaias, to alleviate precipitation deficits and dry conditions.



AUTHOR INFORMATION

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ABSTRACT

During recent droughts in North Carolina, various audiences have articulated needs for information that explains current or anticipated impacts, droughts' geographic extent and timing, and how the State monitors drought. This is despite there being a regular process in place to evaluate statewide conditions and seemingly abundant information available through federal, state, and local agency websites; media outlets; and other channels. This presentation provides findings from a research project designed to improve the availability, understandability, and usability of drought communications products for North Carolina audiences, focusing on the US Drought Monitor map of North Carolina as an example. The North Carolina Drought Management Advisory Council (DMAC) technical committee has met weekly to assess drought conditions since the 1990s and has recommended the state's drought designations to the US Drought Monitor since 2000. The DMAC recommendations typically align with the weekly USDM map. Through surveys, focus groups, usability studies, and other engagement methods, we collected information from groups such as extension agents and water utility staff about 1) their communications preferences - resources that are concise, easily readable, and readily shareable through email, listservs, and social media - and 2) infographic prototypes created to address those preferences. User feedback on the prototypes informed iterative refinements to their content and design and provided information about their potential use for communications and management decisions. Ultimately, understanding the monitoring process and how drought designations are made was a key factor affecting the extent to which extension and other communication professionals apply, share, and value the information produced by monitoring groups and scientific agencies. This research suggests that addressing transparency questions can support efforts to communicate complex problems, such as drought.

REFERENCES

Project Website

Additional information and project materials are available on the project website (https://climate.ncsu.edu/drought_comm). (https://climate.ncsu.edu/drought_comm)

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