



The Use of Social Science and Expanding the IDSS Footprint at the Climate Prediction Center

Jon Gottschalck

Chief, Operational Prediction Branch
NOAA / NWS / Climate Prediction Center

Climate Prediction Applications Science Workshop

May 24-26, 2022



Outline

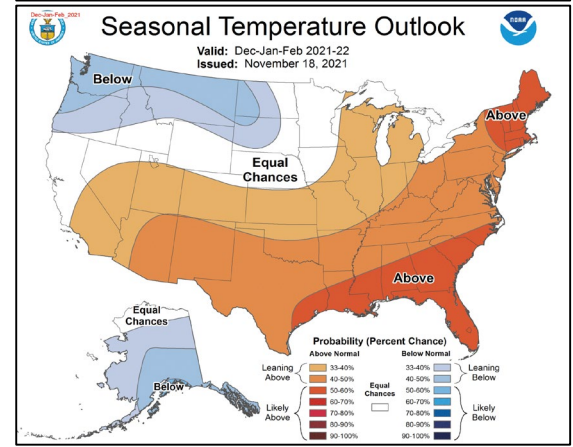
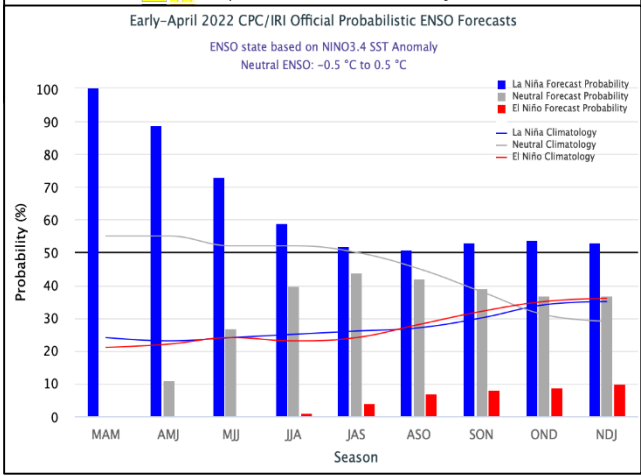
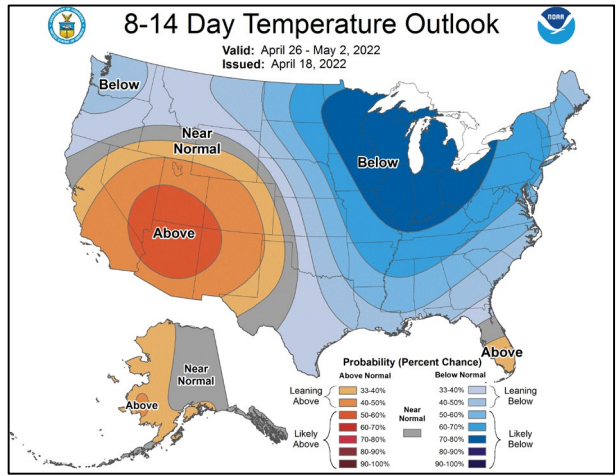
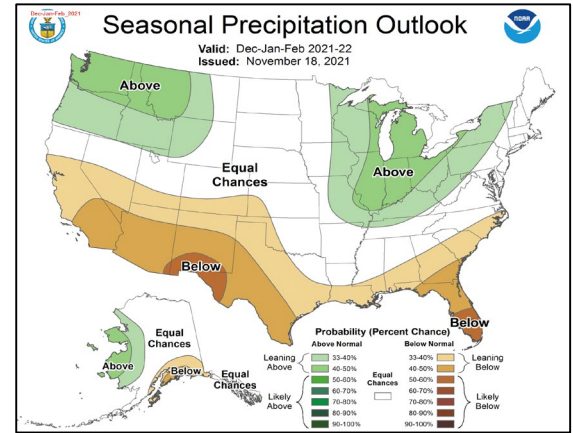
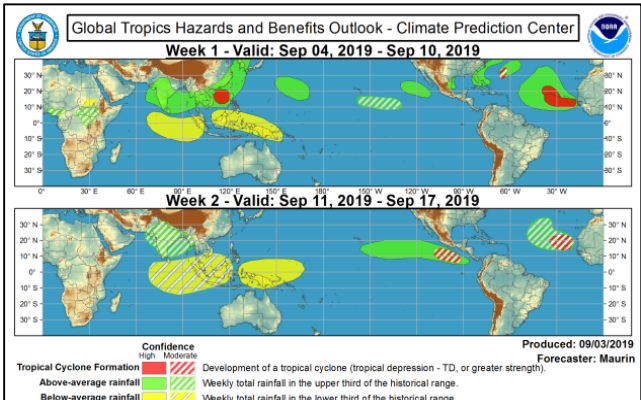
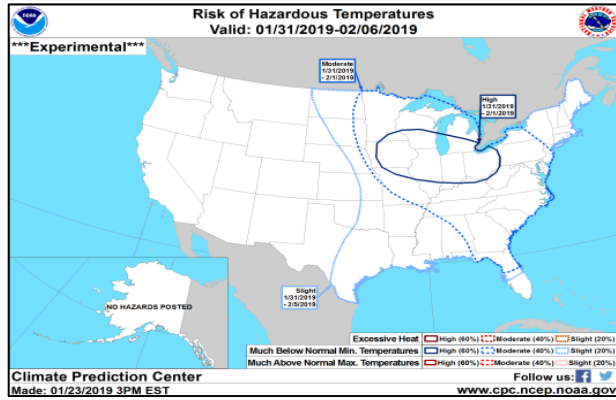


- ✓ Reformatting CPC temperature and precipitation outlook maps
- ✓ Social science CPC drought and U.S. Hazards outlooks project
- ✓ Outreach and IDSS at CPC

CPC Mission

Deliver real-time products and information that predict and describe climate variations on timescales from weeks out to a year thereby promoting effective management of climate risk and a climate-resilient society

Both domestic and international presence

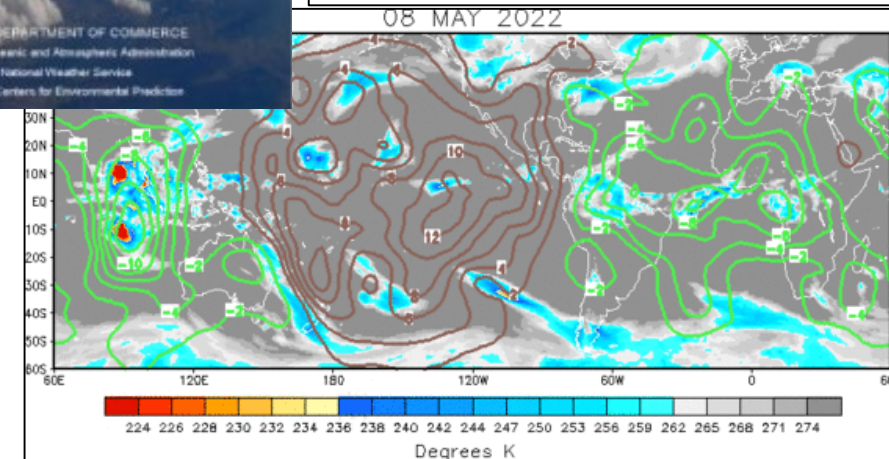
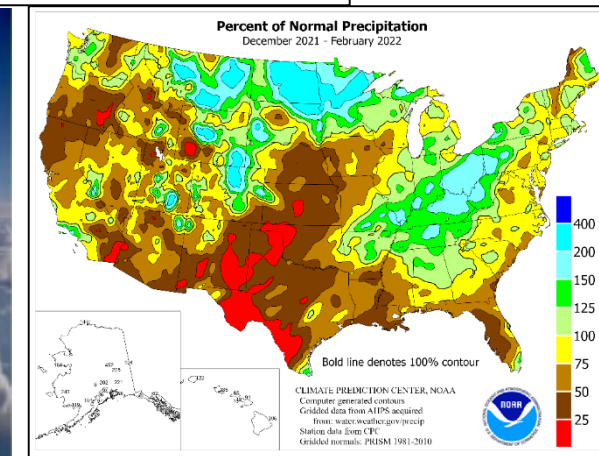
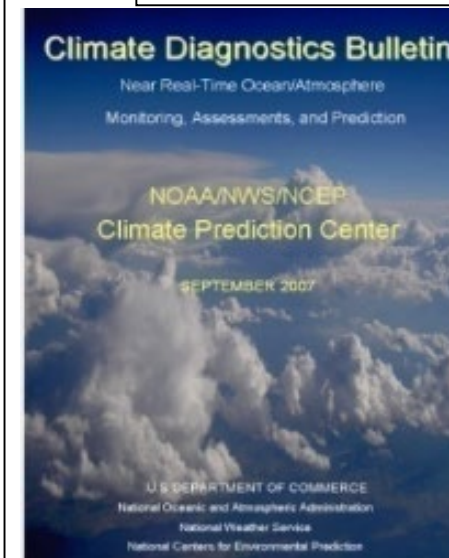
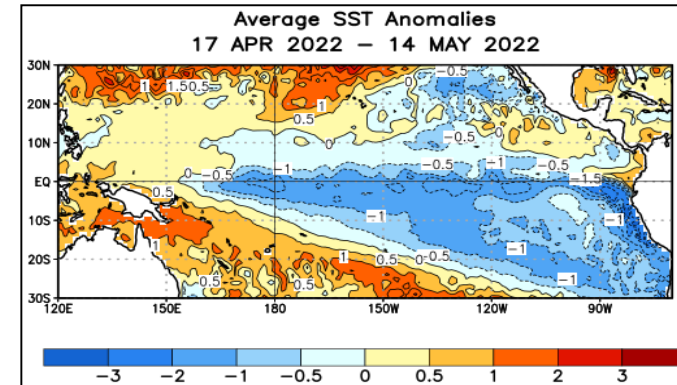




Monitoring and Diagnostic Products



- U.S. Drought Monitor
 - ✓ Co-produced with USDA, NCEI, and WRCC
- CMORPH Satellite Precipitation
- Gauge Based Precipitation
- Surface Temperature
- GODAS Ocean Analysis
- Atmospheric Reanalysis:
 - ✓ R1, R2, NARR, and COR_e
- Modes of Climate Variability:
 - ✓ ENSO, MJO, NAO, AO, PNA, stratosphere
- Climate Diagnostics Bulletin:
 - ✓ Synthesis of current climate conditions and forecasts
- Monthly Attribution Briefing
 - ✓ Review of observations, predictions for recent season
- Assessment of predictability of major climate anomalies
- Briefings, training for NWS field and partners, stakeholders





Project Background



Title: “Identifying Users, Diagnosing Understandability Challenges, and Developing Prototype Solutions for NOAA Climate Prediction Center’s Temperature and Precipitation Outlooks”

UMD-CICS Staff: Melissa Kenney, Michael Gerst, Allison Baer, Felix Wolfinger

CPC Staff: Jon Gottschalck, Scott Handel, David DeWitt and Matt Rosencrans

- Information on stakeholders, their level of understanding of the T/P outlooks and specifics about their decision making is important to CPC
- Initial project utilizing the social science discipline / experts to continue to increase our knowledge in these areas

Objective: Provide guidance and recommendations for initial steps to improve product understandability and aid usage in the decision making process



Scoping and Identifying End-User Audiences

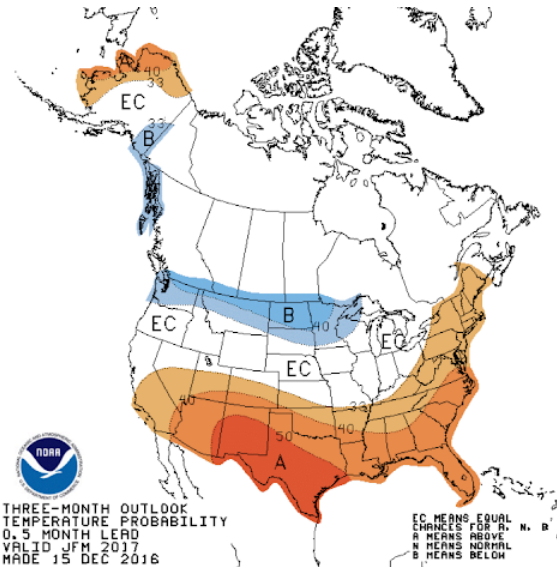


- Identified the objectives and intended user audiences through interviews with experts identified by CPC
- The results of this scoping were used to inform the structure of interactions with users later in the study
- Developed a database of stakeholders/users/experts in four core priority sectors: [agriculture](#), [energy](#), [water resource management](#) and [emergency management](#)
- Developed and deployed an online survey to measure how well users understood the content of the visualization of CPC extended-range, Week 3-4, monthly and seasonal outlooks
- Surveys were recruited using the stakeholder / expert database previously developed
- The survey results were complemented through interviews with decision-makers in each of the target sectors to understand the role of climate outlooks in their decision-making and changes that would make the products more useful for this purpose

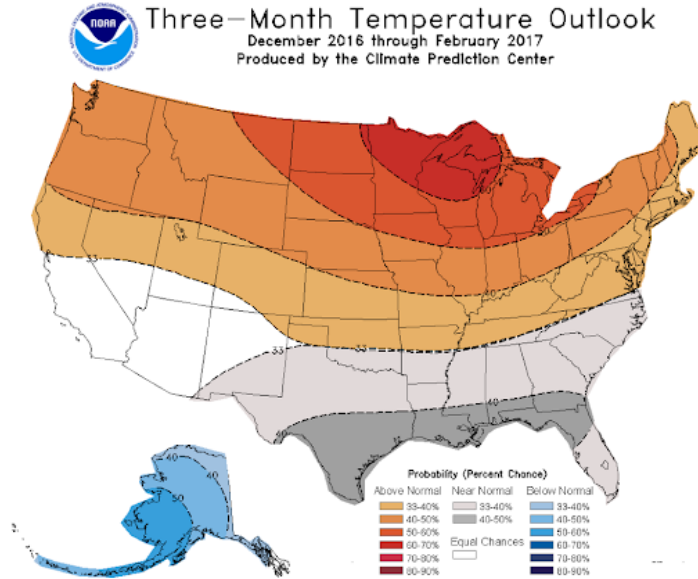




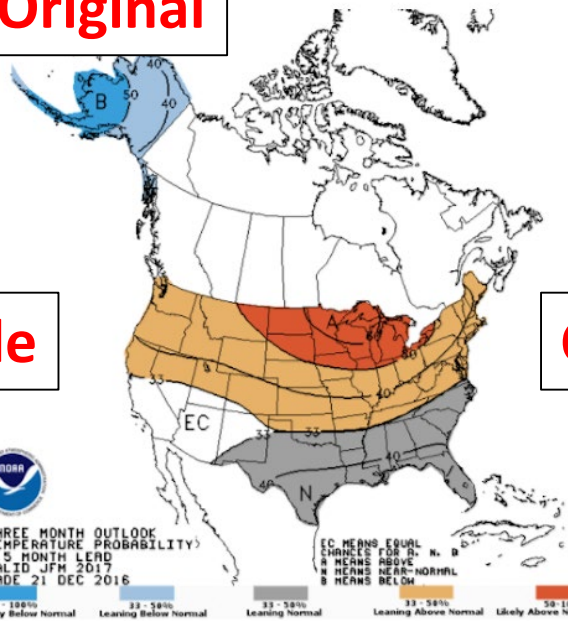
Control vs Treatment Results



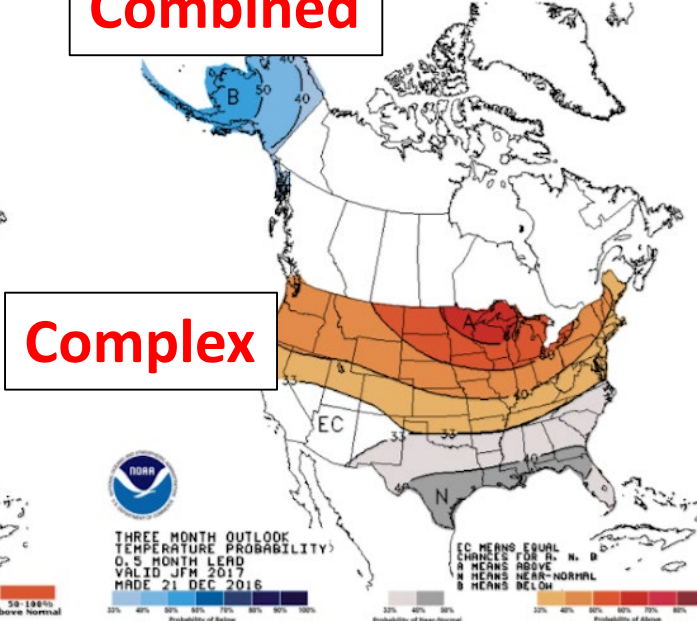
Original



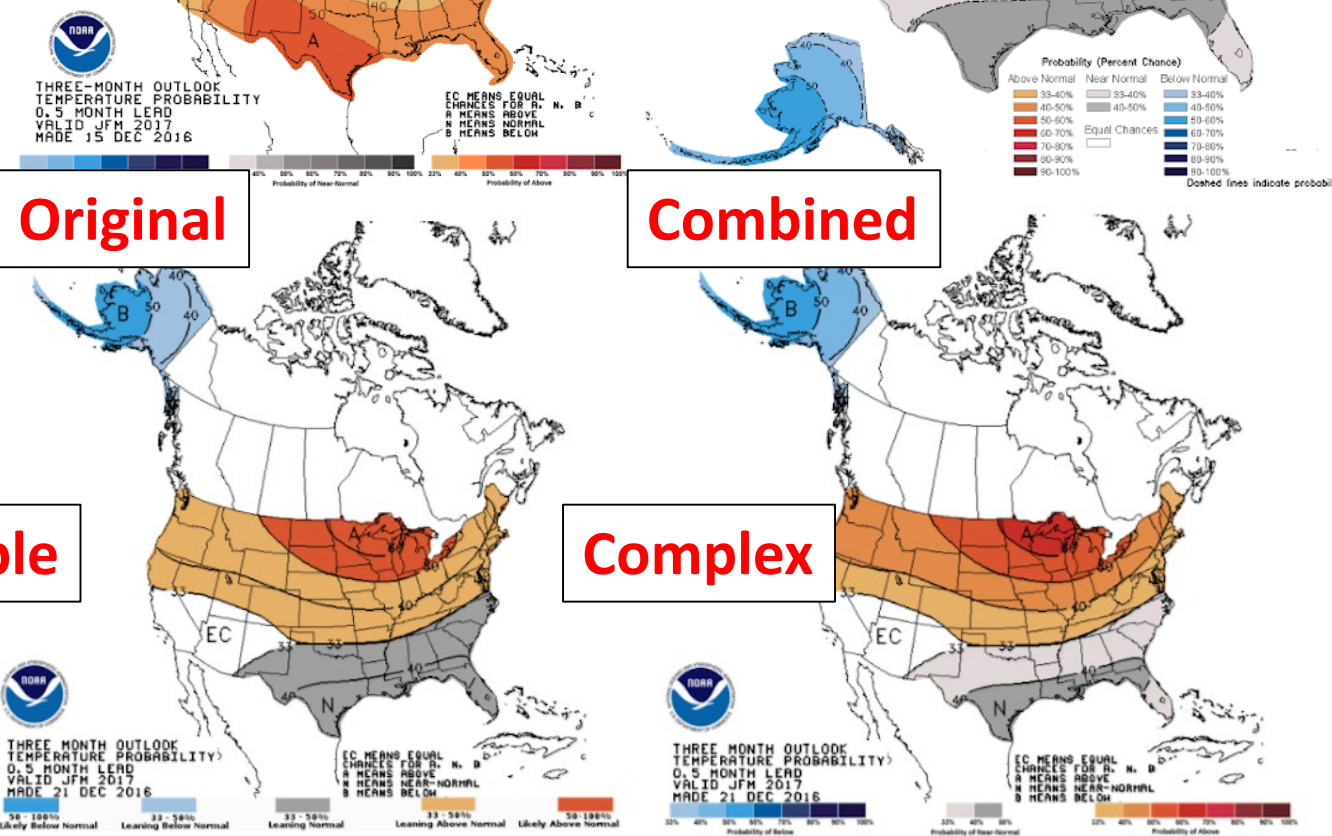
Combined



Simple

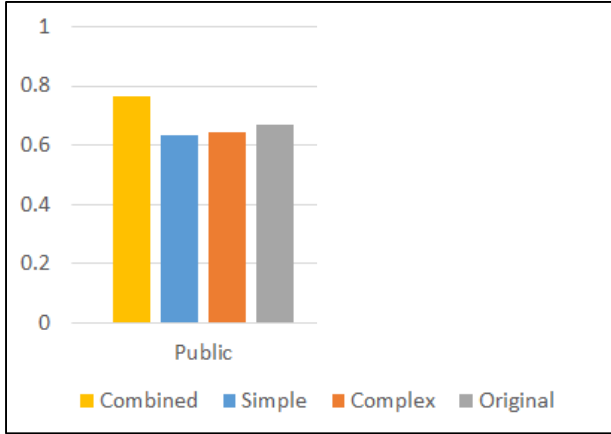


Complex

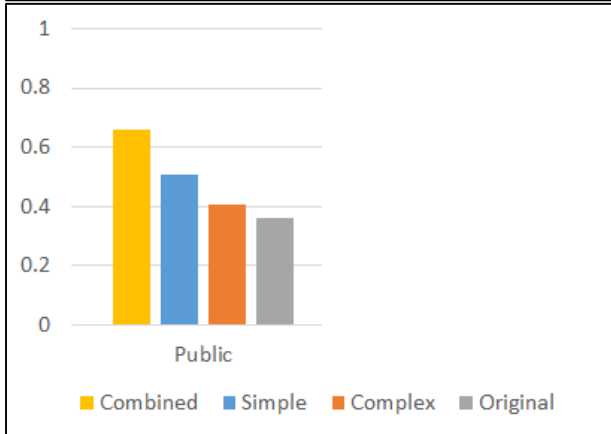




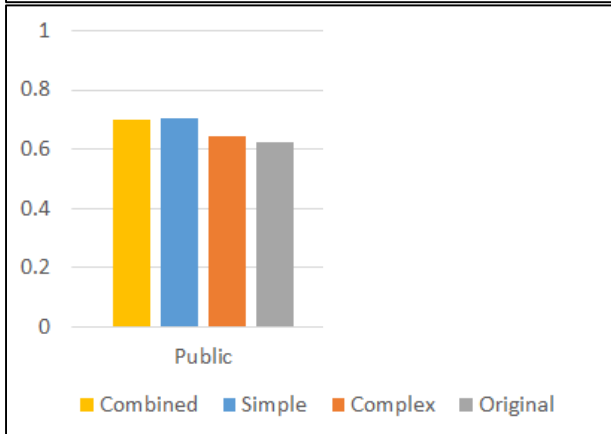
Control vs Treatment Results



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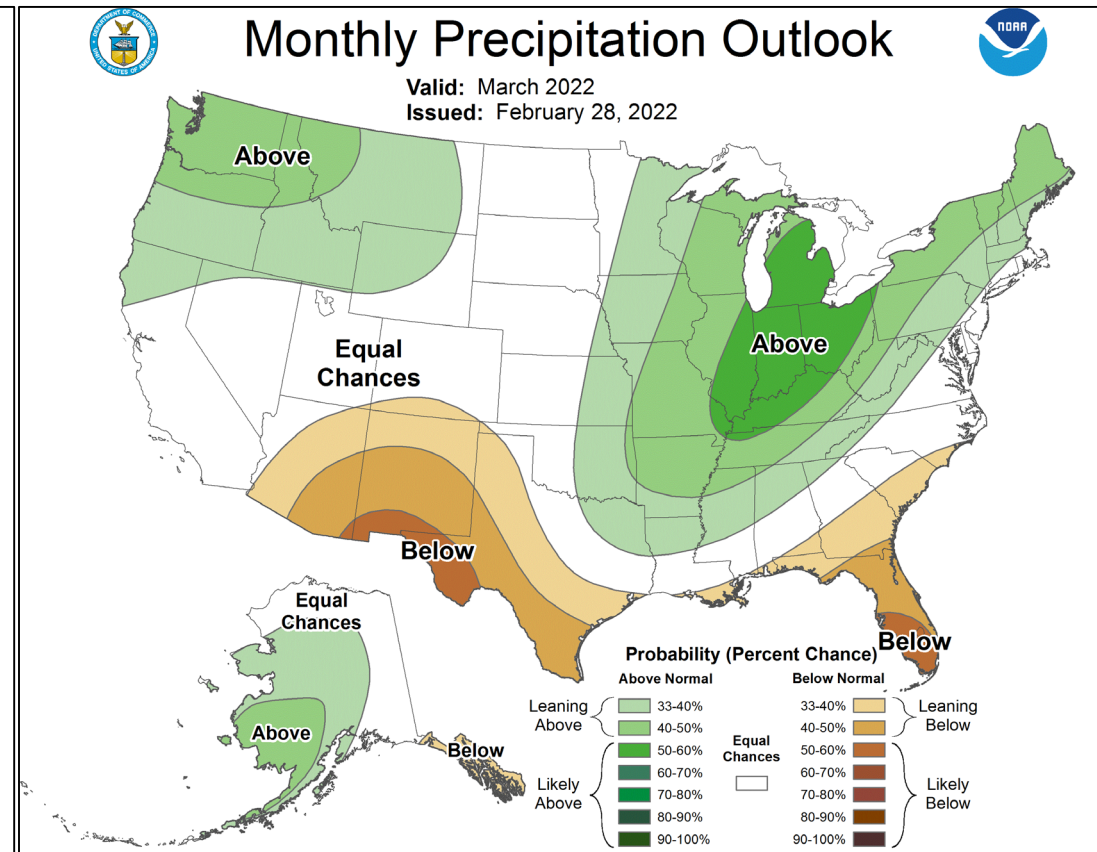
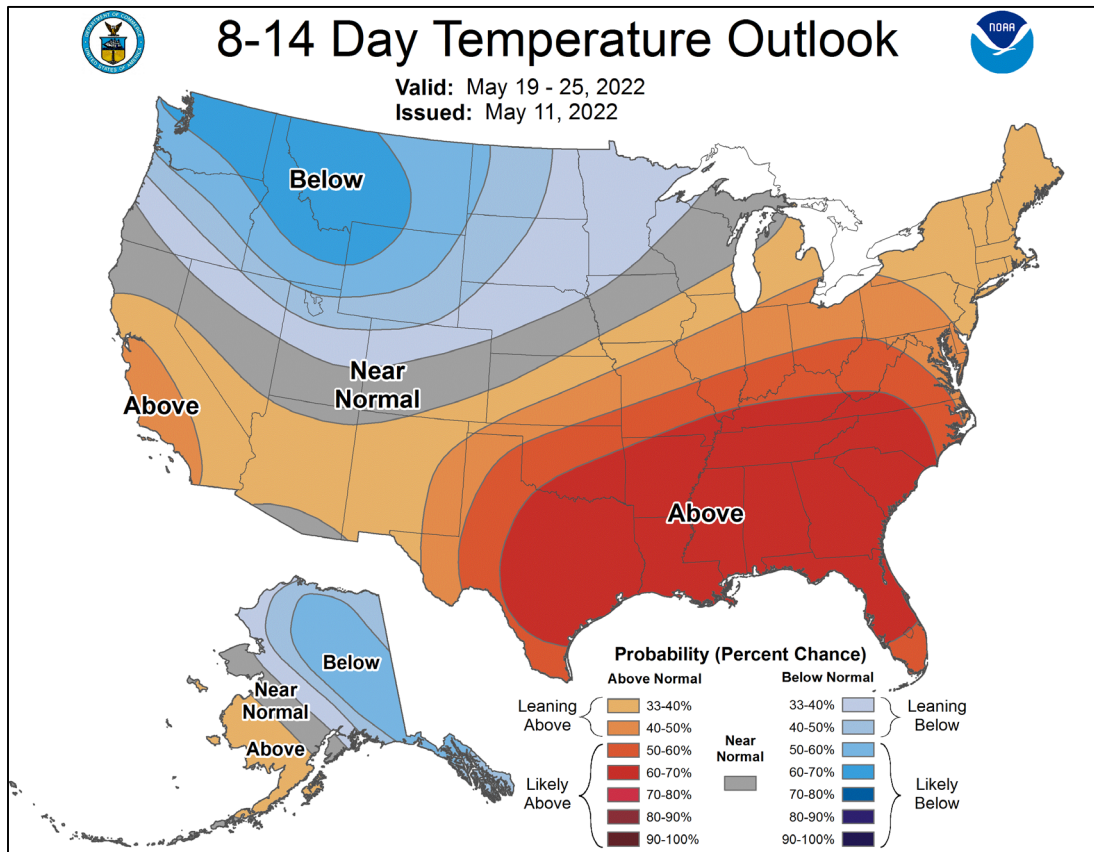
Fraction to correctly interpret near normal gray shading



Fraction to correctly interpret a state specific equal chances outlook



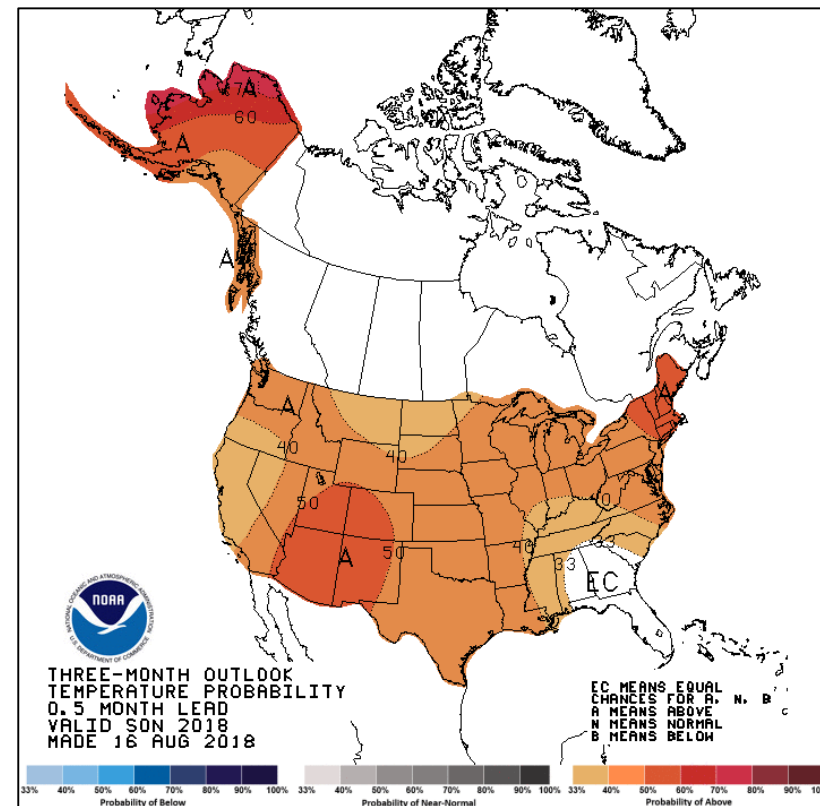
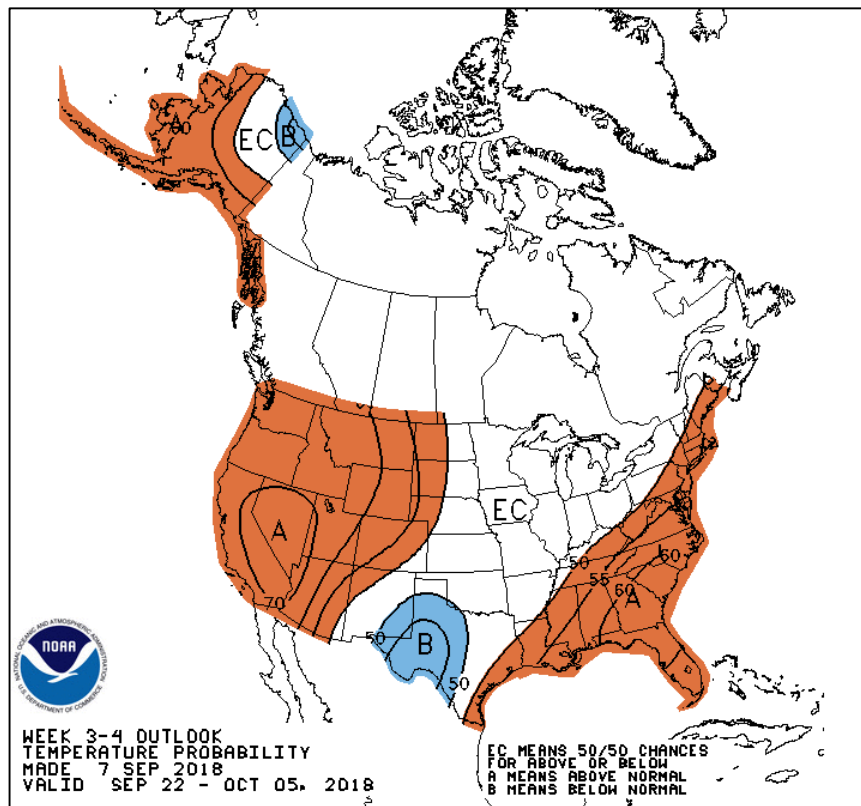
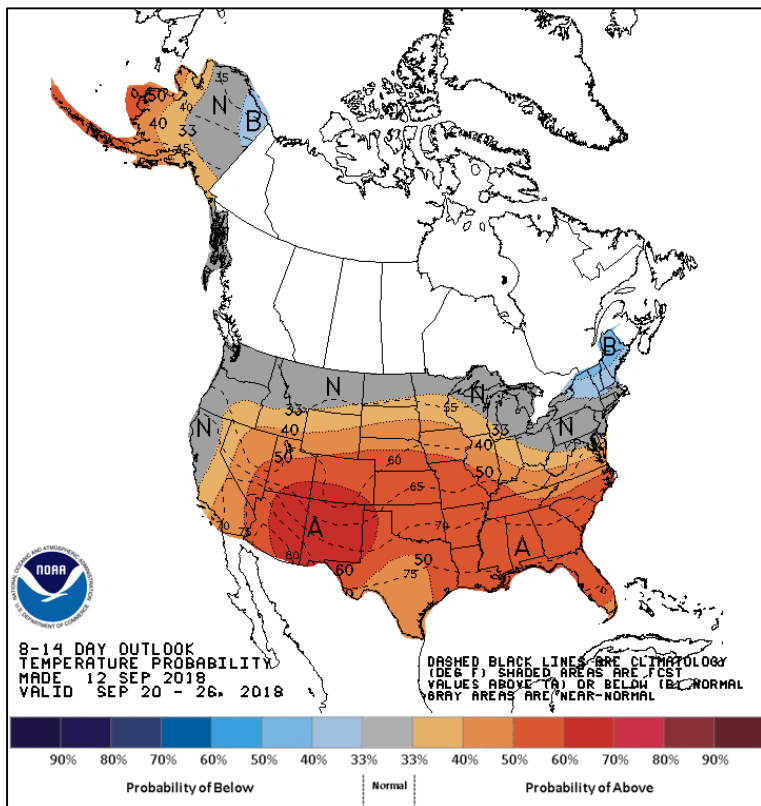
Recommendation #1



Operational implementation occurred on September 16, 2021 for the Week-2, monthly, seasonal outlooks and January 7, 2022 for the Week 3-4 outlooks.

Control vs Treatment Results

The inconsistency in presentation across products causes confusion and interpretation challenges amongst even well-equipped users. We recommend that the climate outlooks be consistently presented across the suite of products.





Recommendation #2 – Outlook Consistency



- ✓ FY22 STI portfolio funded project to do the tasks to properly convert current two class Week 3-4 T/P outlooks to utilize a 3-class system similar to other CPC outlooks
- ✓ FY22 STI NWS milestone and project to meet this goal initiated with project scope, requirements and deliverables outlined. Project plan and associated timeline currently being prepared.
- ✓ Extensive work and evaluation is required to complete this project:
 - Observations need to be characterized into 3 classes (below-, near- or above-normal)
 - Forecast guidance products and statistical/hybrid forecast tools retrospective data need to be prepared and forecast skill re-evaluated for a 3-class system
 - Realtime forecasts need to be characterized as 3 classes (below-, near- and above-normal)
 - Verification of forecast tools using independent data to assess representative 3-class forecast skill



Overview of Drought/Hazards Outlook Project



- NIDIS has funded a follow-up CPC social science project focusing on the drought and Week 2 U.S. Hazards Outlooks

Physical science projects: (Led by PI Hailan Wang of CPC)

- ✓ “Development of CPC Probabilistic Drought Outlooks”
- ✓ “A Process-oriented Investigation of Subseasonal Drought Forecasting using Dynamical Subseasonal Forecasts and Noah-MP Land Surface Model”
- ✓ “Converting CPC Deterministic Monthly / Seasonal Drought Outlooks to an Objective Format”

Social science project:

- ✓ Diagnose Understandability, Interpretation and Use Challenges and Develop Prototype Improved Solutions for the CPC’s Drought and U.S. Hazards Outlooks



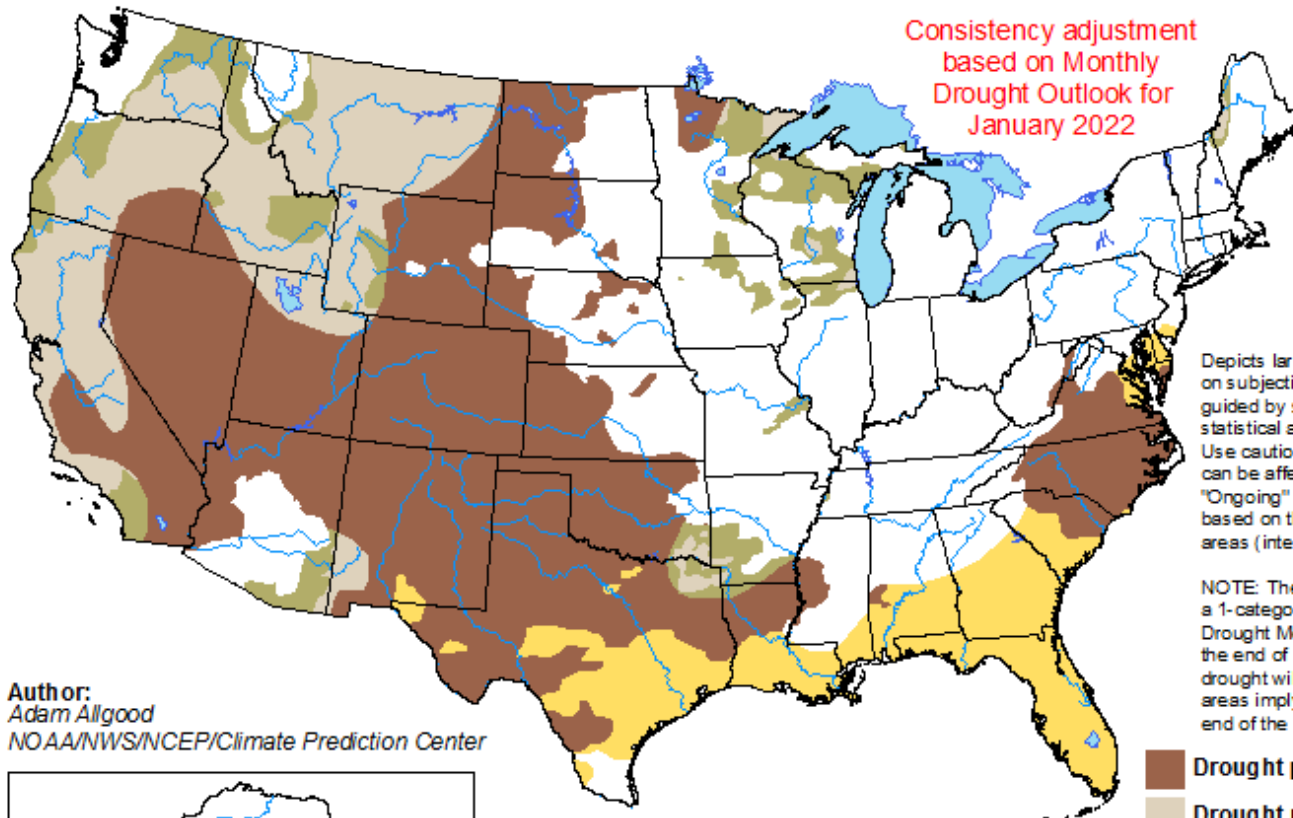
Seasonal / Monthly Drought Outlook



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

Valid for January 1 - March 31, 2022
Released December 31, 2021

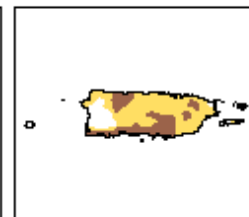
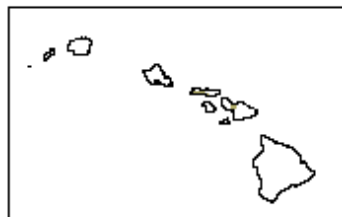
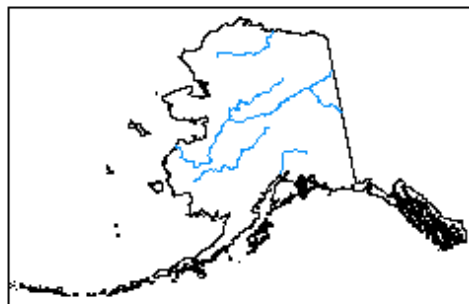
Consistency adjustment
based on Monthly
Drought Outlook for
January 2022



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

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

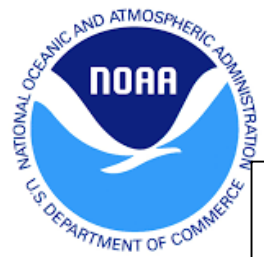
Author:
Adam Allgood
NOAA/NWS/NCEP/Climate Prediction Center



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



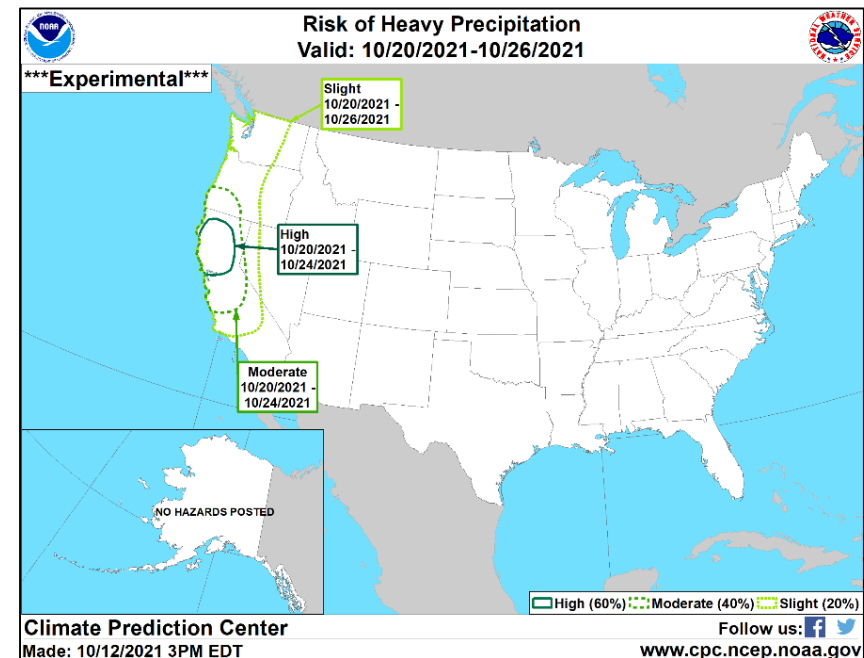
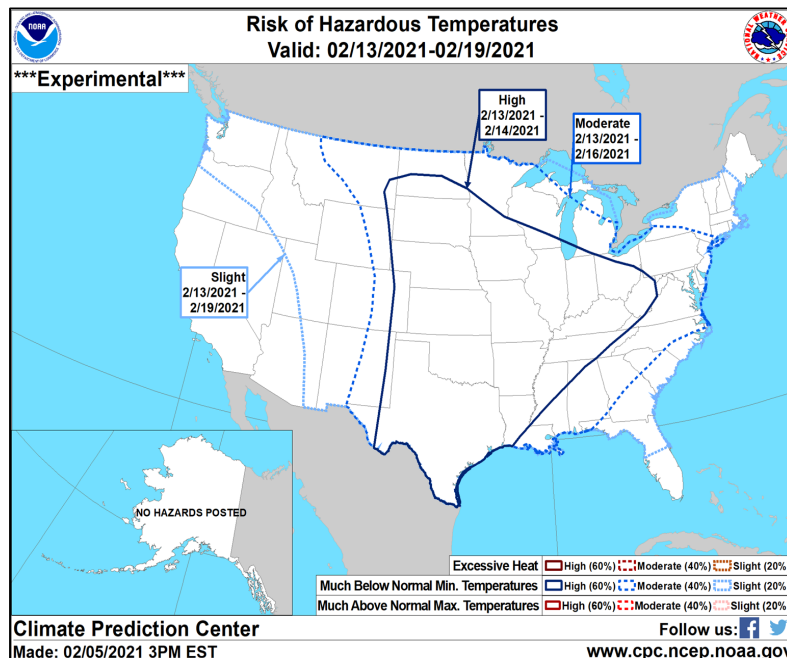
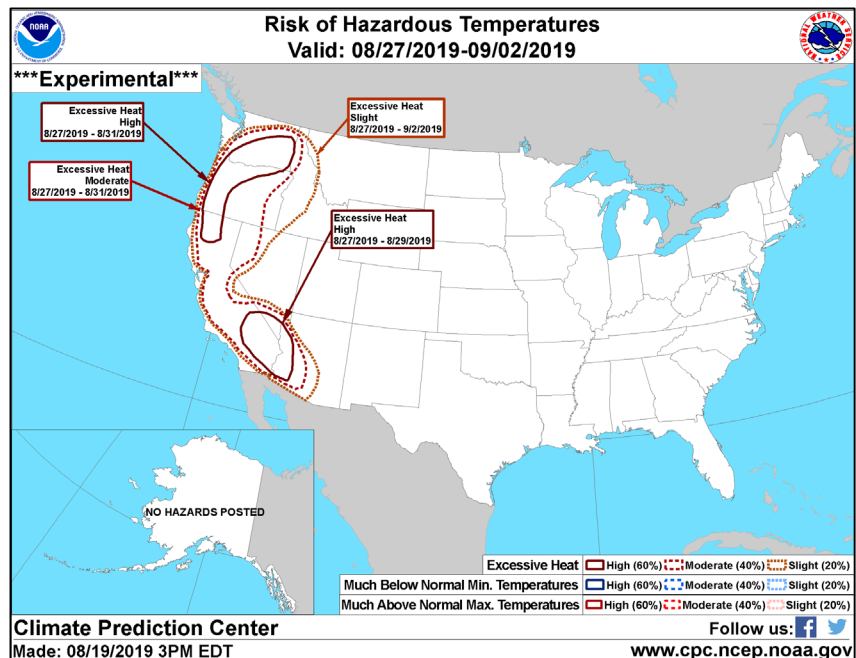
<http://go.usa.gov/3eZ73>



Week 2 U.S. Hazards Outlook



- Targets the Days 8-14 period, probabilistic in nature
- Highlights areas for *slight, moderate or high risk* for hazardous conditions related to temperature, precipitation and winds
- Hazardous conditions are defined based on thresholds or exceeding percentiles or both





Status of Drought/Hazards Outlook Project



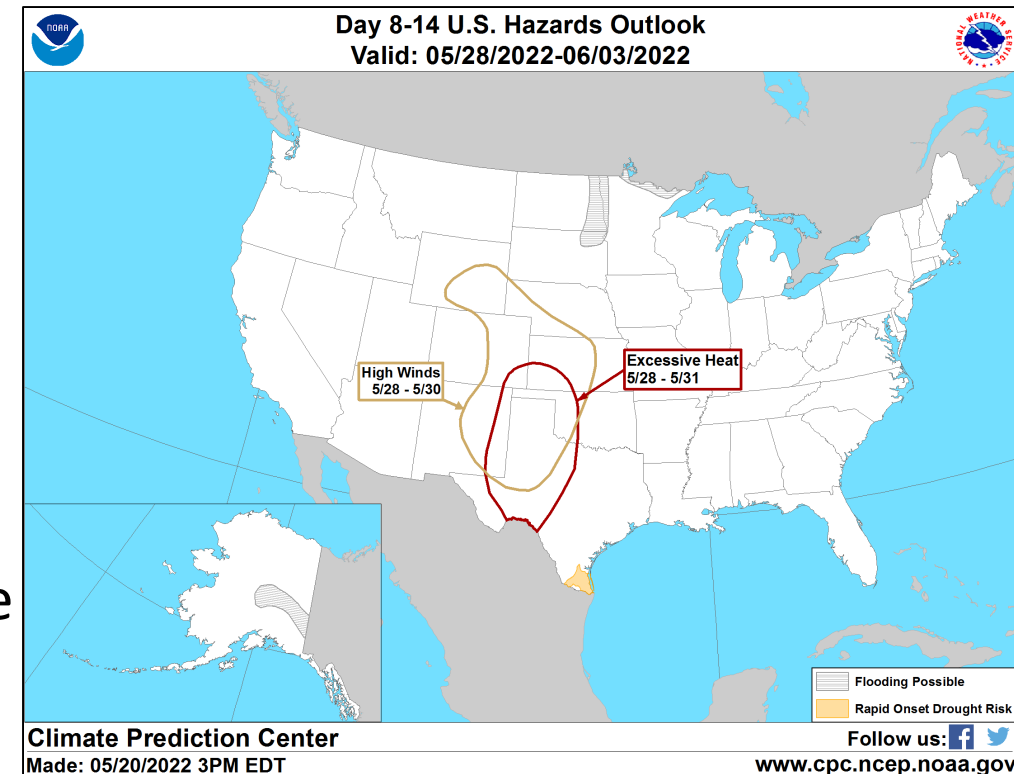
Stage 1: Diagnosis of graphics using taxonomy of visual communication problems by identifying the major understandability challenges for the current deterministic DO and hazards graphics

Stage 2: Engagement with drought and hazard outlook producers, core partners, stakeholders facilitated by CPC and NIDIS

Stage 3: Redesign of visualizations through collaboration on the experimental redesign of CPC outlooks

Stage 4: Test redesign effectiveness for intended end-users through use of control vs. treatment testing

Stage 5: Synthesizing results and developing best practice recommendations for CPC





Current collaboration, outreach and IDSS activities



- ✓ CPC conducts routine conference calls with discussion and questions as part of its operational product release schedule.

- ✓ Opportunities to coordinate with the NWS field span all CPC operational products and services:
 - For the monthly and seasonal temperature, precipitation and drought outlooks, call open to the NWS regions and other partners two times per month: (1) the Tuesday before the 3rd Thursday of the month from 1:00 – 2:30 PM ET and (2) 2nd to the last day of the month for monthly update outlooks (time varies)

 - For the Week 3-4 temperature and precipitation outlooks, call each Friday from 11:15 AM ET – 12 PM ET

 - Tropical discussion to inform the Global Tropics Hazards (GTH) Outlook each Monday from 2:30 – 3:00 PM ET

 - Review and reasoning behind the latest GTH outlook every Tuesday from 2:30 – 2:50 PM ET

 - For the 6-10 day and 8-14 day temperature and precipitation outlooks and the Week 2 U.S. Hazards Outlook, daily call 1:00 – 1:30 PM ET to review and discuss the soon to be released outlooks

 - Monthly ENSO talking points the Wednesday prior to ENSO Diagnostic Discussion at 3 PM ET



Current collaboration, outreach and IDSS activities



CPC Outreach Week-2 Hazards Outlook Inbox x



Brad Pugh - NOAA Federal

Thu, Feb 4, 2:39 PM



to Ray, Doug, CRH, Kevin, Christopher, ER.Roc, Ellen, Andy, Melissa, James, Dennis, kevin.r.grode, Andrea, WR, Scott, Victor, NWS, Jon, SR-SRH, Chad ▾

Hazard: High and moderate risks of much below normal minimum temperatures

Link: <https://www.cpc.ncep.noaa.gov/products/predictions/threats/threats.php>

Location: High risk - Great Plains and Midwest

Moderate risk - Northern Rockies, Great Plains, Midwest and parts of the East

Timing: High risk, Feb 12-13

Moderate risk, Feb 12-15

Details and Impacts:

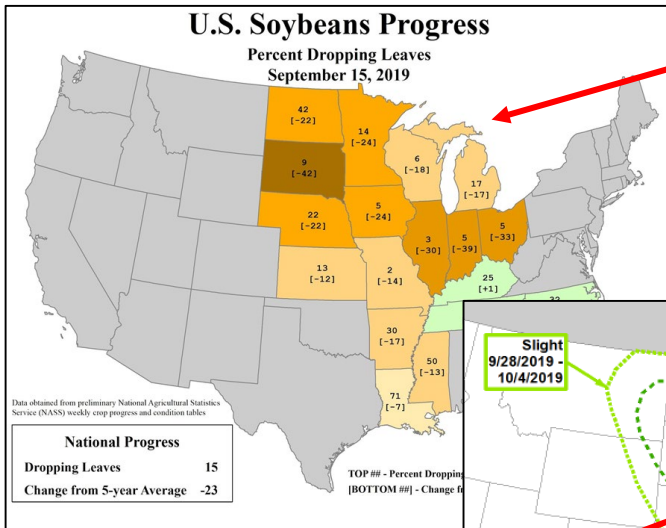
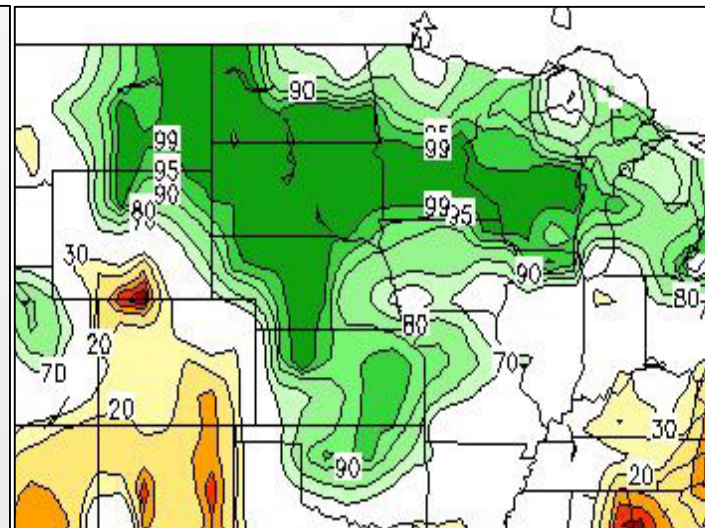
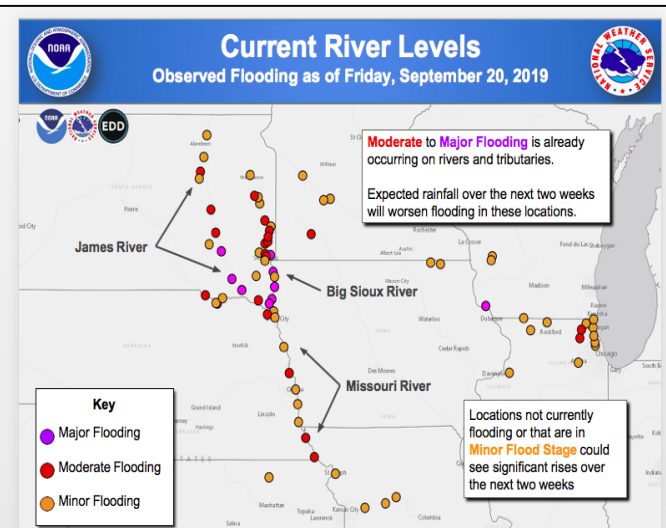
- The upcoming Arctic Air outbreak is likely to peak during the mid to late part of next week across the northern/central Great Plains and Midwest with subzero lows as far south as northern Kansas and Missouri.
- A frost or freeze is becoming more likely for the lower Rio Grande Valley.
- Late next week, there is an increasing chance of surface low development near the Gulf Coast which poses a winter weather risk for parts of the Southeast.



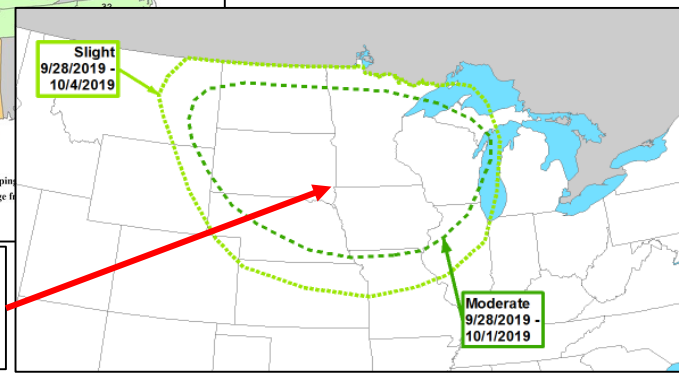
Current collaboration, outreach and IDSS activities



- ✓ Extended period (~ 6 months) update calls with NWS CR, U.S. Army Corp of Engineers, USDA, etc. for ongoing and future flooding concerns
- ✓ Report on latest longer range monthly and seasonal outlooks as well as additional forecast information and context outside of released products and services



Crop harvesting impacts due to previous flooding



Antecedent conditions: Many rivers near or above flood stage and saturated soils over much of the region

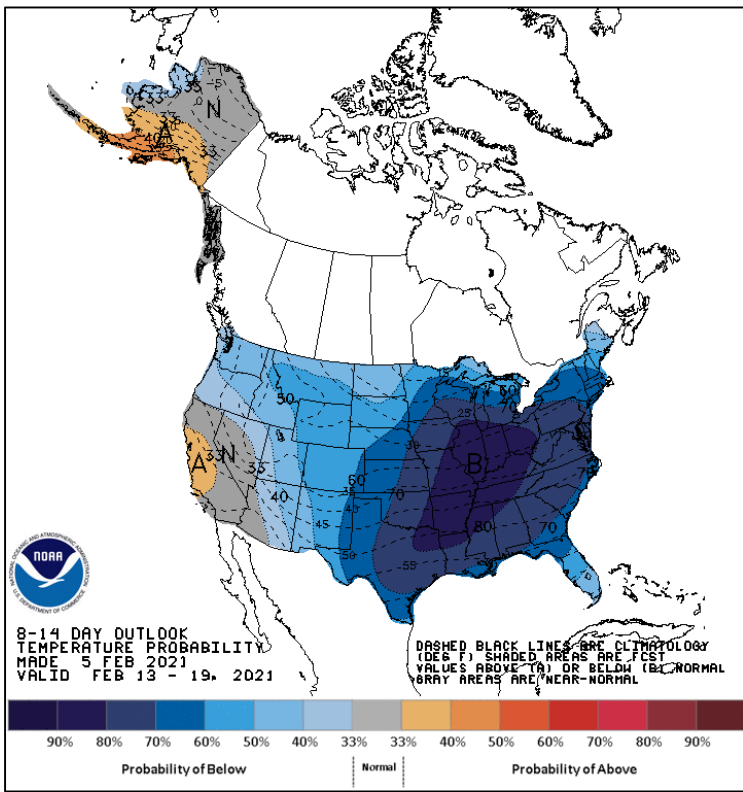
CPC updates for Week 2 provided also



Current collaboration, outreach and IDSS activities



✓ Arctic air outbreaks and messaging of potential impacts using Week 2 temperature outlooks



NWS Climate Prediction Center @NWSCPC

A high risk for much below-normal temperatures exists on Feb 13-14 for much of the Great Plains, Mississippi Valley, and Ohio Valley. Record lows appear possible in the highlighted area, while a freeze could occur as far south as the Rio Grande. cpc.ncep.noaa.gov/products/predi...

Risk of Hazardous Temperatures
Valid: 02/13/2021-02/19/2021

Experimental

High 2/13/2021 - 2/14/2021
Moderate 2/13/2021 - 2/14/2021
Slight 2/13/2021 - 2/19/2021

NO HAZARDS POSTED

Excessive Heat: High (60%), Moderate (40%), Slight (20%)
Much Below Normal Min. Temperatures: High (60%), Moderate (40%), Slight (20%)
Much Above Normal Max. Temperatures: High (60%), Moderate (40%), Slight (20%)

Climate Prediction Center
Made: 02/05/2021 3PM EST
www.cpc.ncep.noaa.gov

3:04 PM · Feb 5, 2021 · Twitter Web App

Regional DSS Coordination and Tempo

Based on CPC guidance the Regional Operation Center collaborates the potential of an extreme cold wave with field offices during daily briefings well in advance of the event.

This sets in motion a consistent IDSS and operations tempo.

NWS Central Region Field Office Service Level Display



Planned Climate IDSS and Outreach Services in FY22



- ✓ Started taking steps to introduce CPC “Key Messages” similar to other NCEP centers
- ✓ Working with NWS HQ AFS IDSS and Climate Services Branch and standard templates, etc.

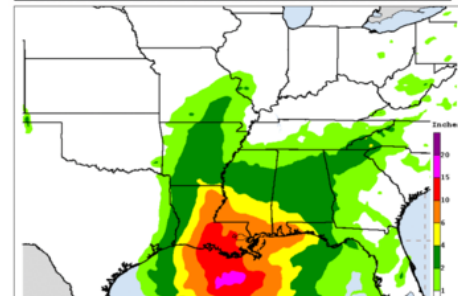
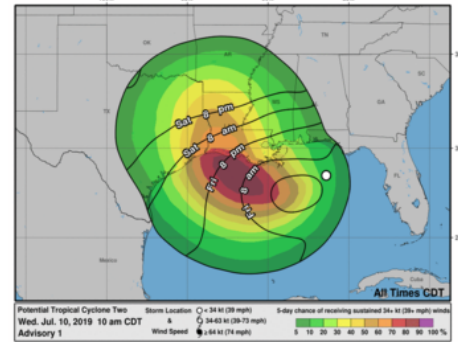
NHC



Key Messages for Potential Tropical Cyclone Two Advisory 1: 10:00 AM CDT Wed Jul 10, 2019

1. A tropical depression is expected to form later today or Thursday. Conditions appear favorable for this system to strengthen to a hurricane as it approaches the central Gulf Coast by the weekend.
2. Dangerous storm surge is possible in portions of southeast Louisiana, and a Storm Surge Watch has been issued for this area. The risk for dangerous storm surge impacts also exists farther west along the Louisiana coast into the Upper Texas coast, and additional storm surge watches may be needed later today or tonight. Residents in these areas should monitor the progress of this system and listen to any advice given by local officials.
3. A Tropical Storm Watch has been issued for portions of the Louisiana coast and additional Tropical Storm or Hurricane Watches could be needed later today or tonight for the remainder of the Louisiana coast and the Upper Texas Coast.
4. The system has the potential to produce very heavy rainfall along and inland of the central Gulf Coast through early next week. For more information, see products from your local National Weather Service office and the NOAA Weather Prediction Center.

Most Likely Arrival Time of Tropical-Storm-Force Winds



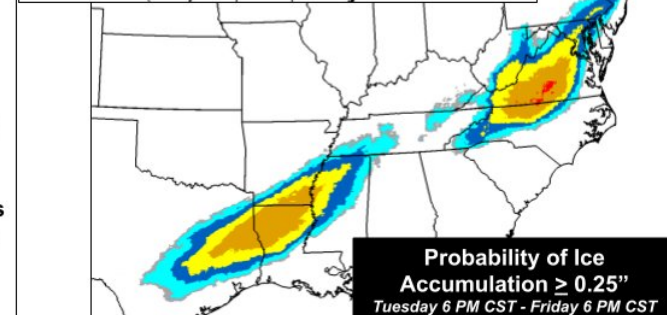
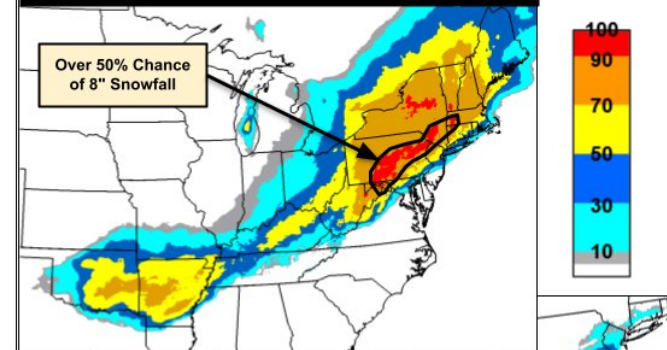
WPC

Next Major Winter Storm to Affect South-Central Plains To Mid-Atlantic Later Today into Friday

Key Messages

- The next major winter storm develops over the southern Plains today, spreads across the Mid-South and lower MS Valley through Wednesday before shifting northeast, overlapping some areas impacted by the February 14-15 storm.
- A large swath of 4” of snow is forecast across OK and AR, into the OH Valley, northern Mid-Atlantic and Northeast.
- A swath of freezing rain is forecast from the TX Hill Country to southwest TN with heavy icing of over 0.25” to possibly 0.5” centered from eastern TX to northern LA.
- There will be significant travel disruption in both the snow and ice areas with concern for further/extended power outages for areas already experience power outages.
- Record cold air over the southern Plains to the western Gulf Coast precedes this event and is expected to continue through Saturday morning.

Probability of Snow Accumulation ≥ 4” Tuesday 6 PM CST - Friday 6 PM CST





Summary



- ✓ CPC is actively engaging with social science experts to improve CPC product and services, first targeting the temperature and precipitation outlooks and the associated operational implementation in 2021-2022.
- ✓ A similar project utilizing social science principles is underway to improve the CPC drought and Week 2 U.S. Hazard Outlooks.
- ✓ CPC is actively working with NWS partners and collaborators to expand its IDSS footprint within emerging regional and national frameworks with the understanding of the nature of climate IDSS and its unique challenges.
- ✓ CPC very much wishes to actively collaborate with the NWS CR on their expanding S2S IDSS services and to take part in FY23 framework planning.



Thank you for your time and attention
Jon.Gottschalck@noaa.gov