Improving the Understandability and Usability of NOAA CPC Drought & Week 2 U.S. Hazards Outlooks

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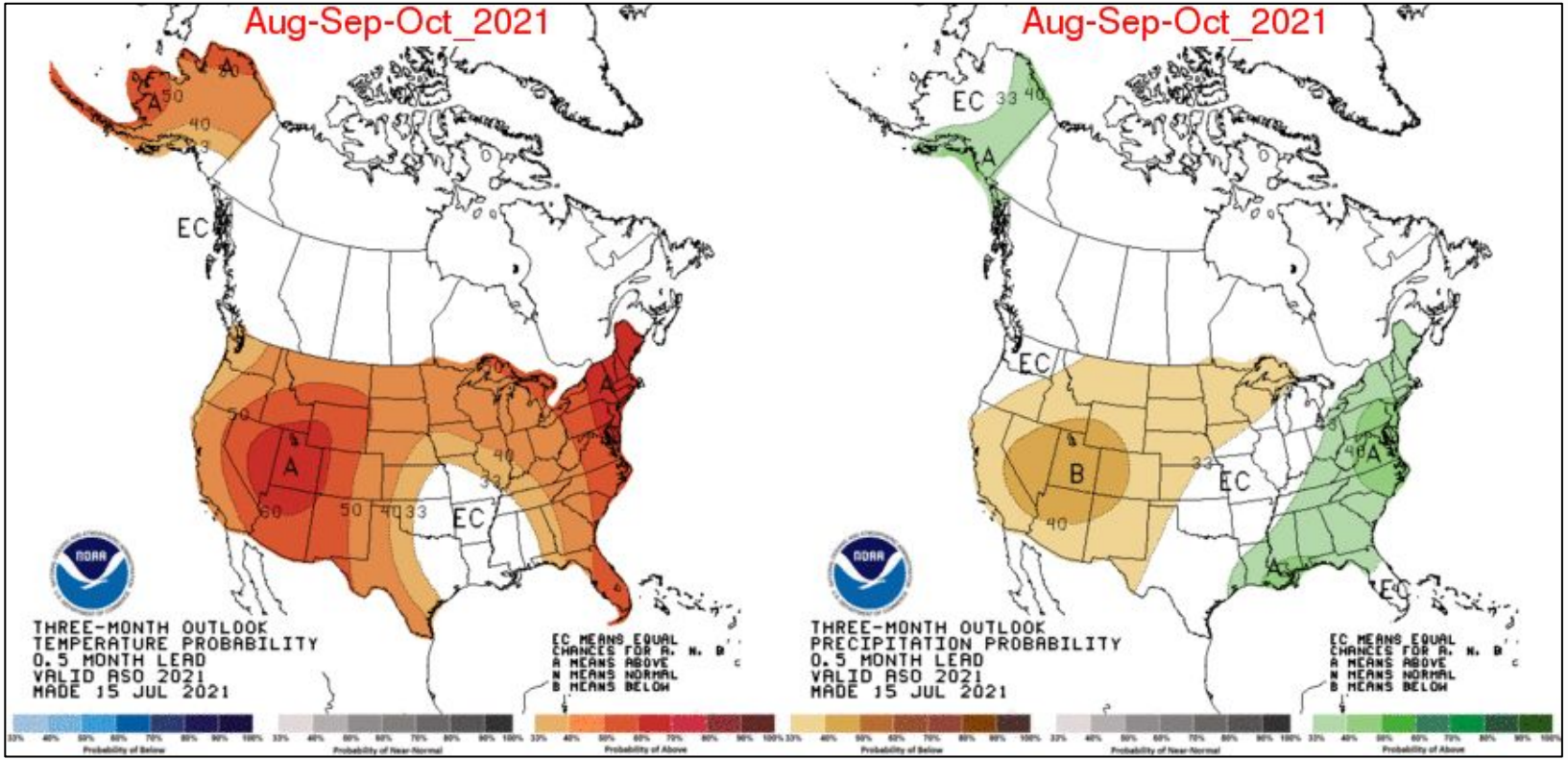
Project Goal

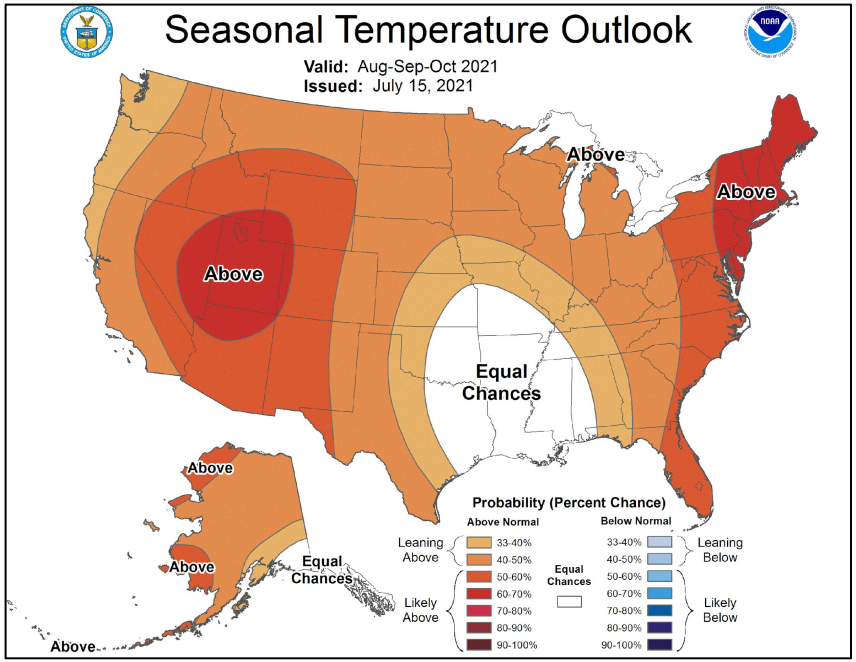
Provide NOAA **actionable information** to improve the understandability and usability of forecast products based on

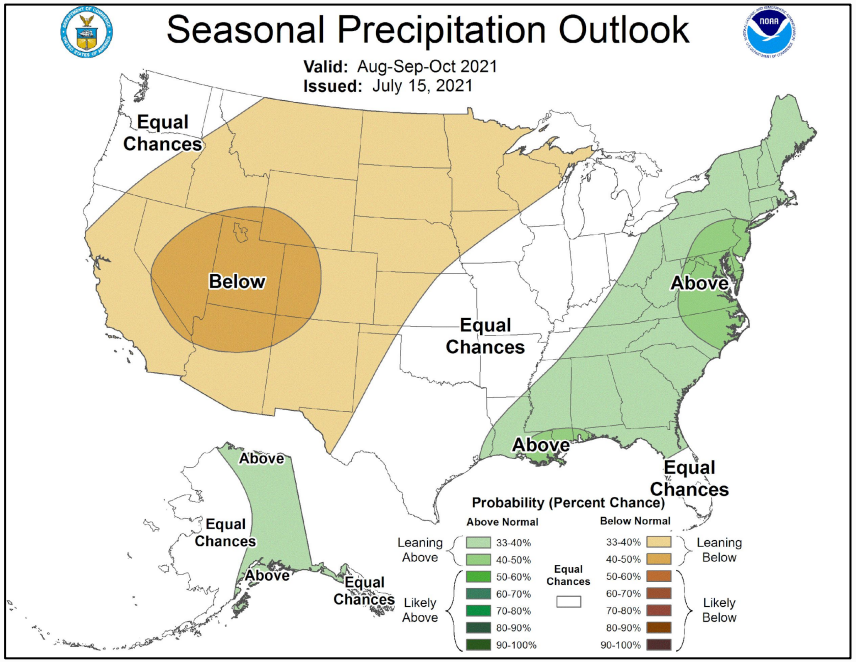
- Social science methods of diagnosing visualization problems
- Evaluating trade-offs of different design modifications
- Testing of existing and modified graphics

Navigating Usability and Understandability Challenges



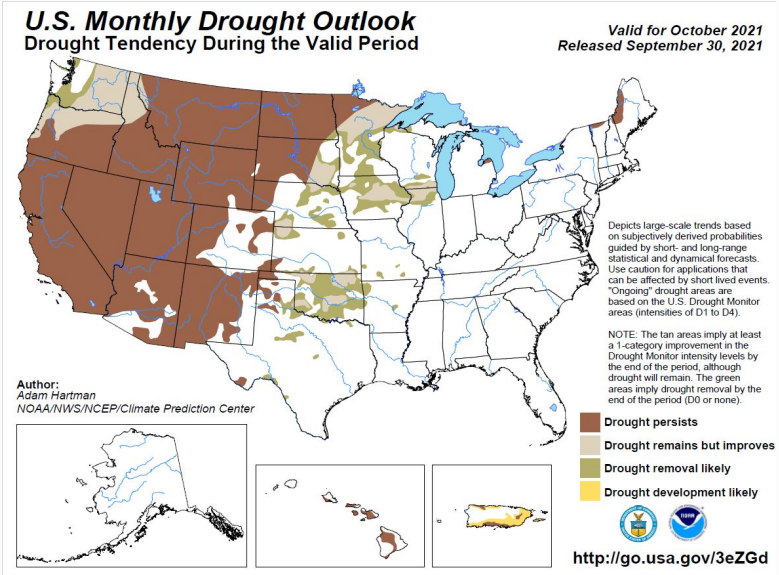
Building on Previous Work and Successful Operationalization

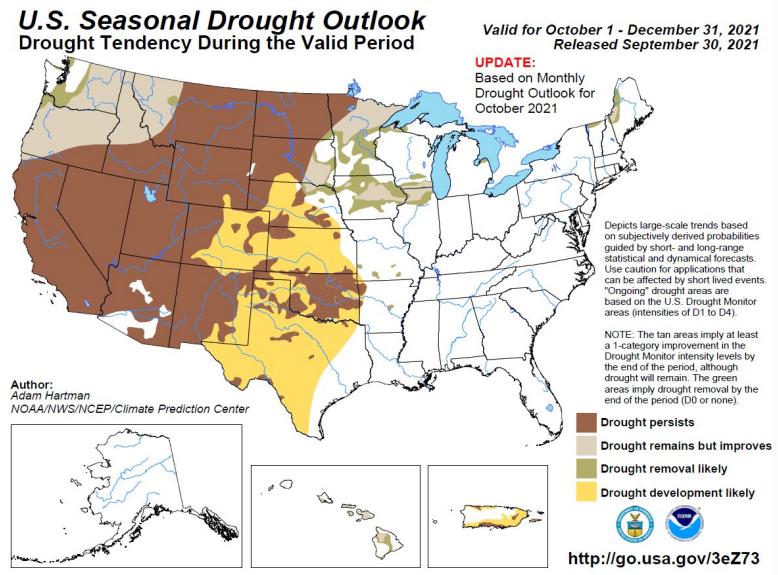




Products Evaluated

Week 2 U.S. Hazards Outlook
Monthly & Seasonal Drought Outlooks



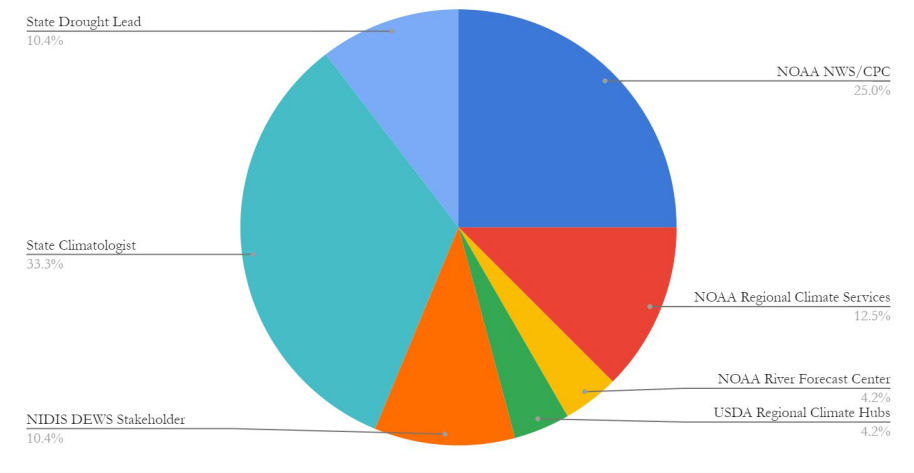


Methods Overview

Engagement with Outlook Producers and Core Partners

Focus Groups

- 9 focus groups, 48 individuals
  - NOAA CPC outlook producers (n=8)
  - Outlook translators from NOAA and other federal agencies (n=14)
  - Key stakeholders and end users (n=26)



Focus Group Goals

Focus groups were designed to understand

- Primary goals of the outlooks
- How information is shared with stakeholders
- The most useful elements (keep)
- Recommendations for improvement (change)

Results: The Role of Translators

- Translators are seen as the **primary audience**
- Contextualize information for end users & decision makers
  - Regionally or sectorally relevant information
  - Integrate outlooks into synthesized products

Results: Translating to Decision Making

How the outlooks are used is highly **context-dependent**

- Location
  - region, watershed, jurisdiction
- User type
  - natural resource, emergency, and water resources managers, media, elected officials
- Timing of decisions
  - shorter term preparedness, emergency response, long-term planning

Results: Significance of the Outlooks

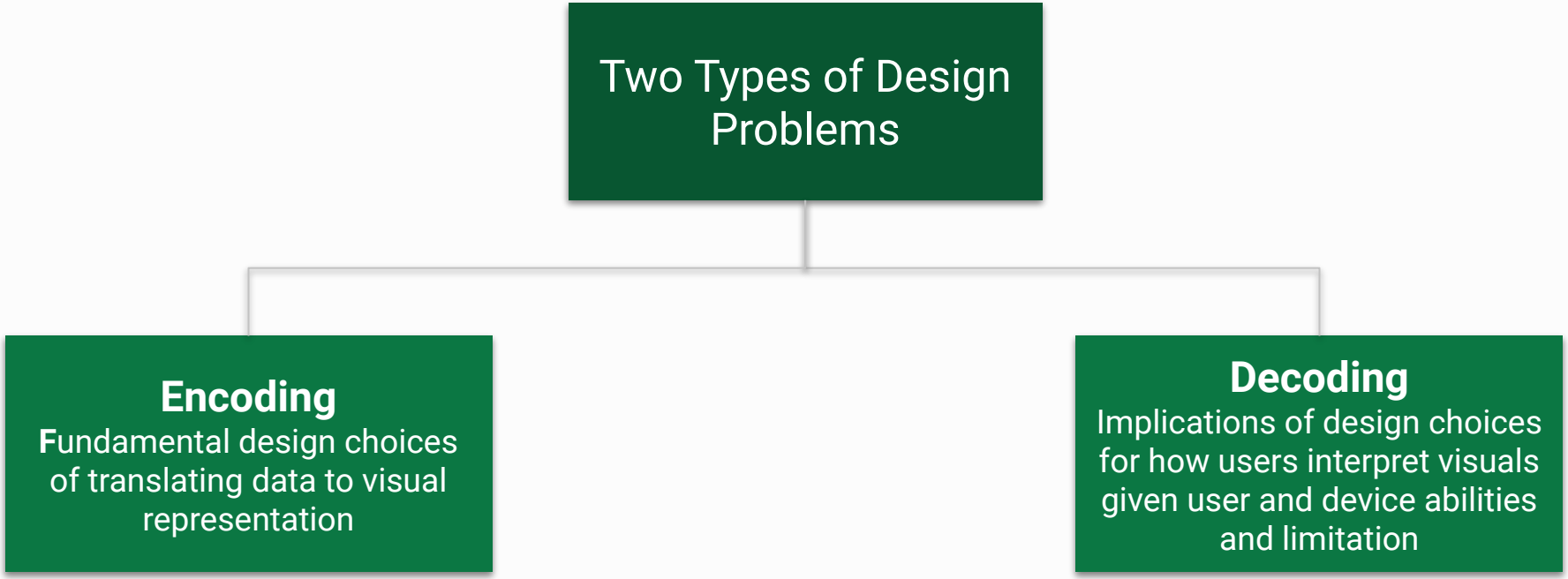
As federal products, the outlooks are seen as a **trusted source of information** which

- Provide early warning for events which might lead to significant impacts
- Provide “cover” for decision makers
- Provide needed information in a format users don’t have the capacity to develop themselves

Diagnosis of Understandability Challenges

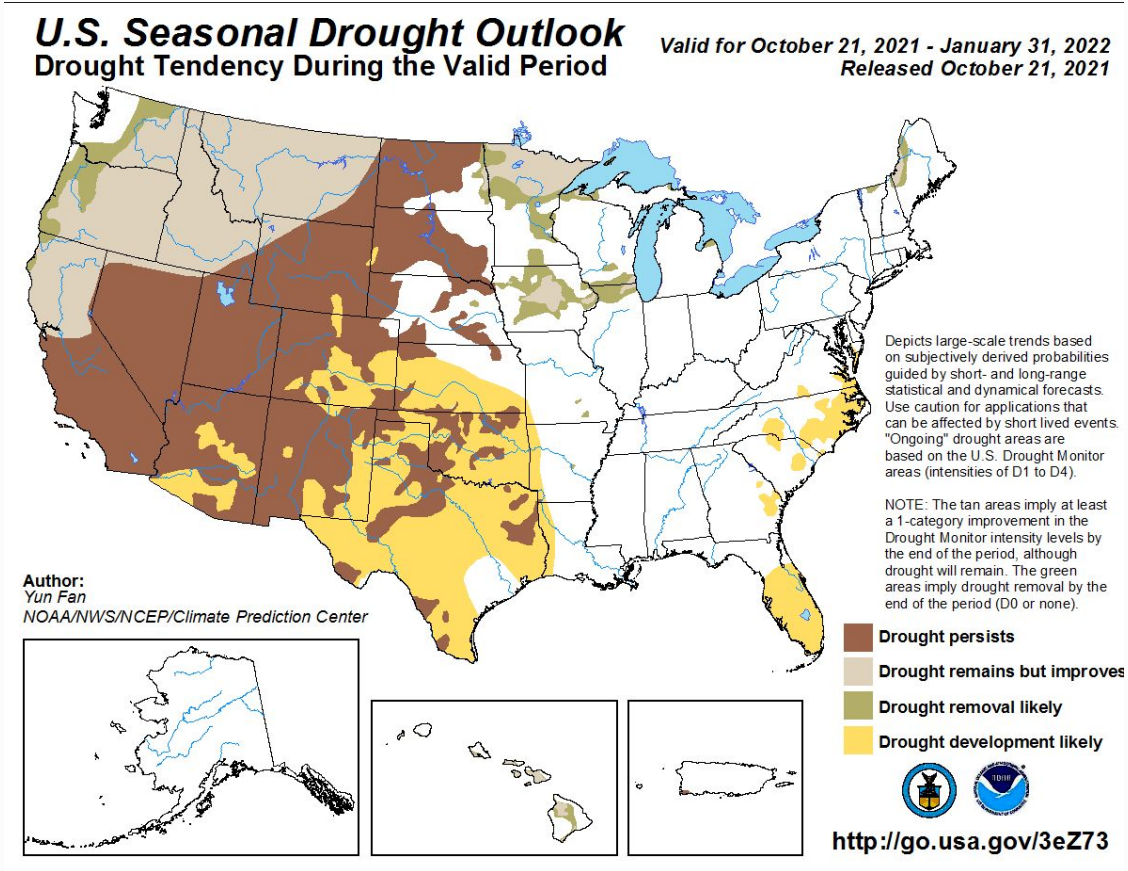
"...intuitions about good design practices may not always match best practice informed by cognitive principles, and viewer preferences may not always be predictive of ease of comprehension." Harold et al., 2016

Design Problems



Dasgupta et al. 2015. “Bridging Theory with Practice: An Exploratory Study of Visualization Use and Design for Climate Model Comparison.” *IEEE Transactions on Visualization and Computer Graphics*, 21 (9).

Diagnosing Usability and Understandability Issues



Communication gaps:

- Meaning of “tan”
- Whitespace
- Ordering of legend entries
- Boundaries
- Scale differences
- Drought category

Colormap:

- Reconsider changes in hue

Graphic Redesign and Experimental Testing

Focusing on deterministic and probabilistic monthly and seasonal drought outlooks

Approach to Control vs. Treatment Testing

Focus groups and Diagnostic

Translators
Context
Confusing colors
Legend categories

Literature review

Color choice
Visuals and heuristics
Reducing cognitive load
Gestalt

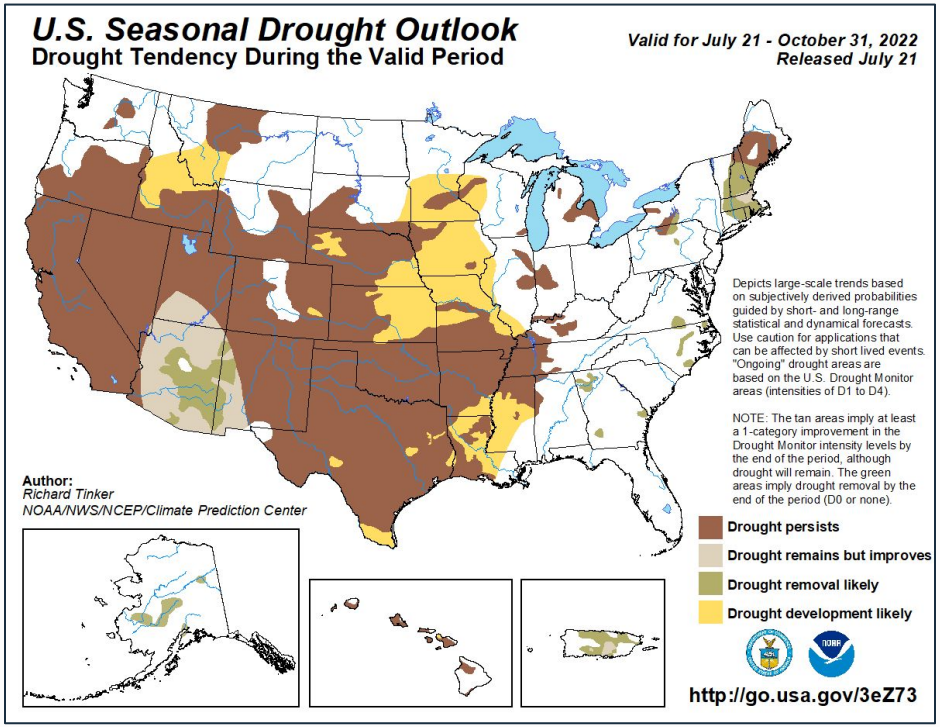
CPC priorities

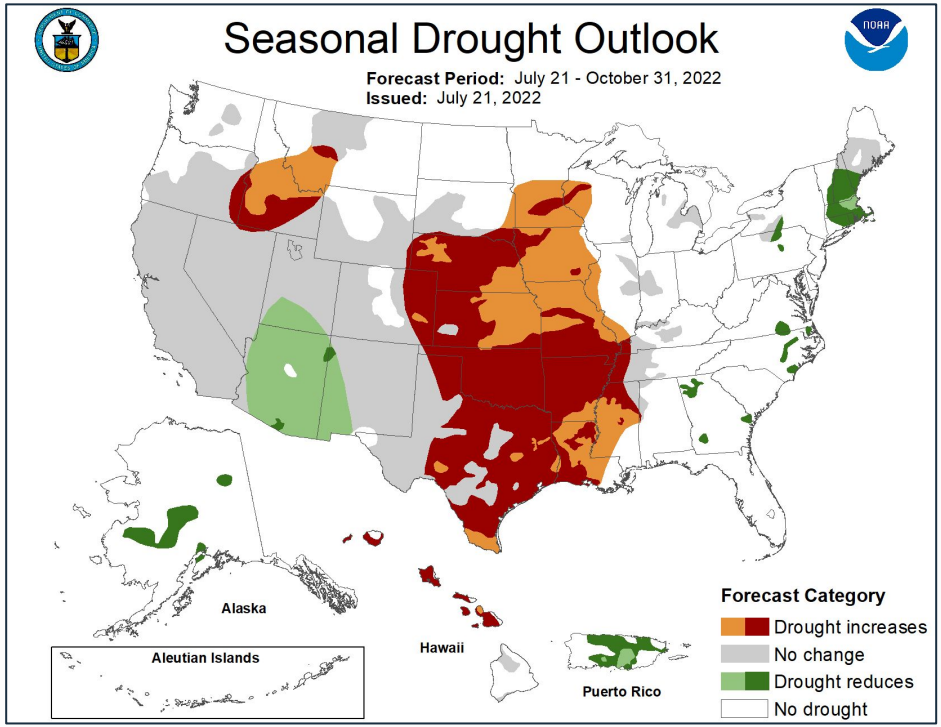
Color scheme
Drought categories
Product consistency
Usability + Understanding

Final testing

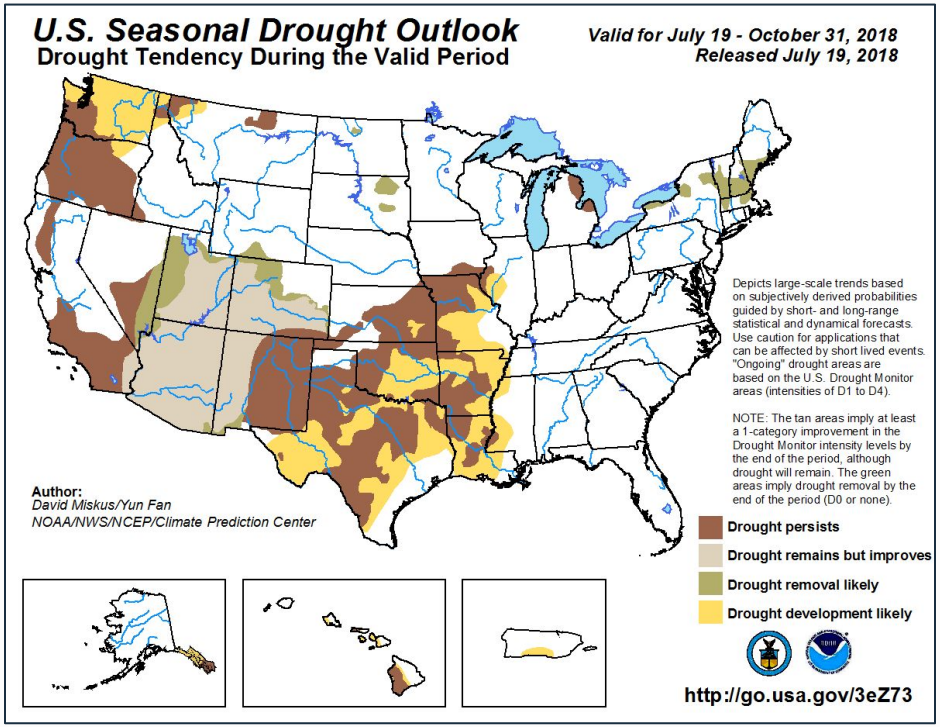
Identifying trade-offs
Product consistency
Color scales
Category scales
Category labels

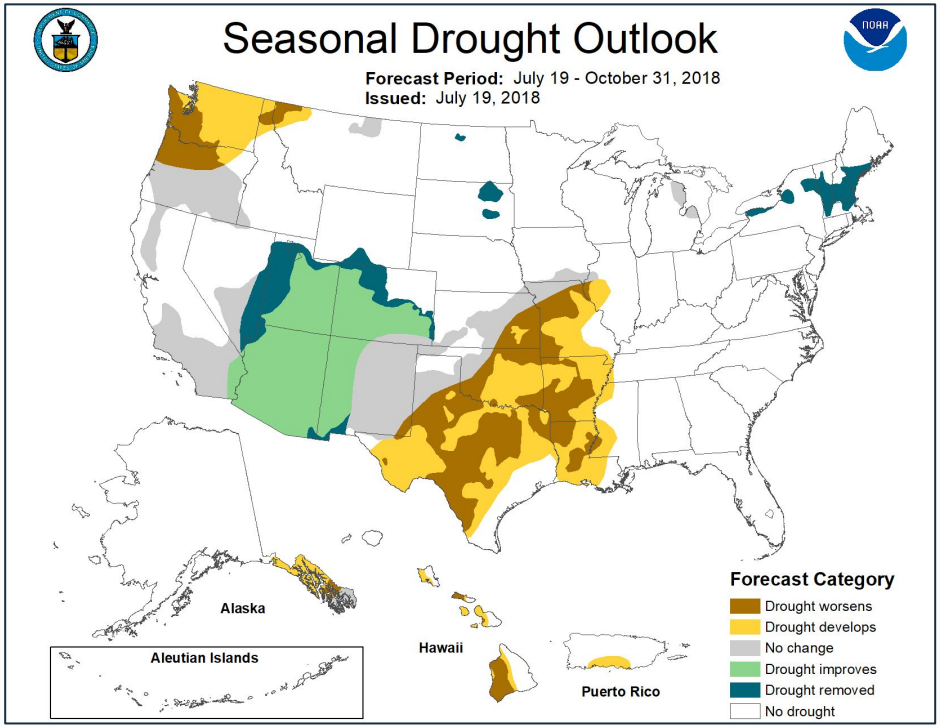
2022 Original vs. Redesigned Drought Outlook



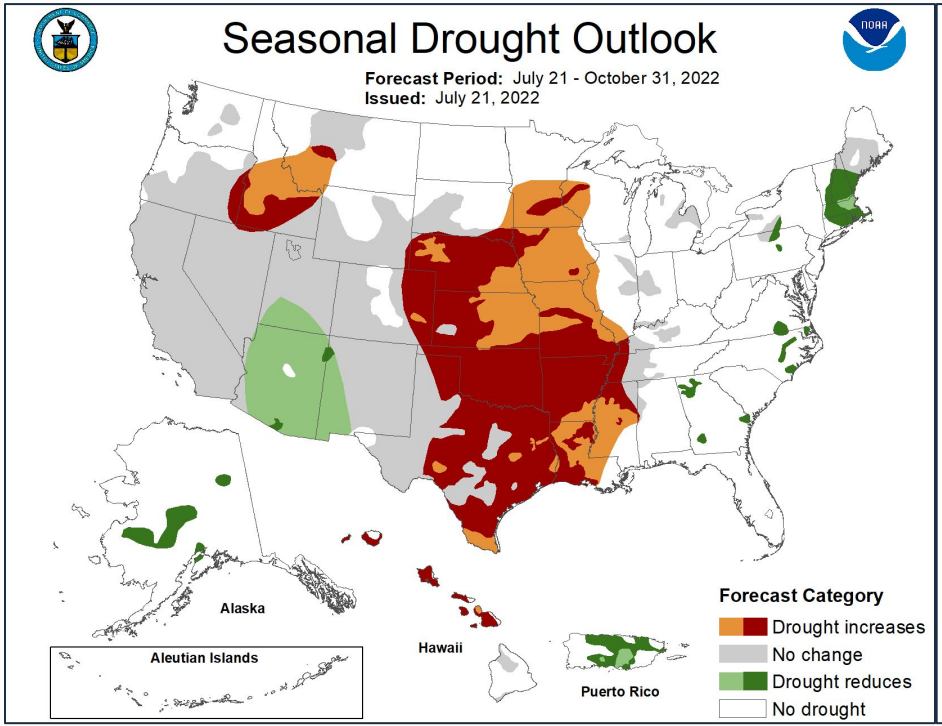


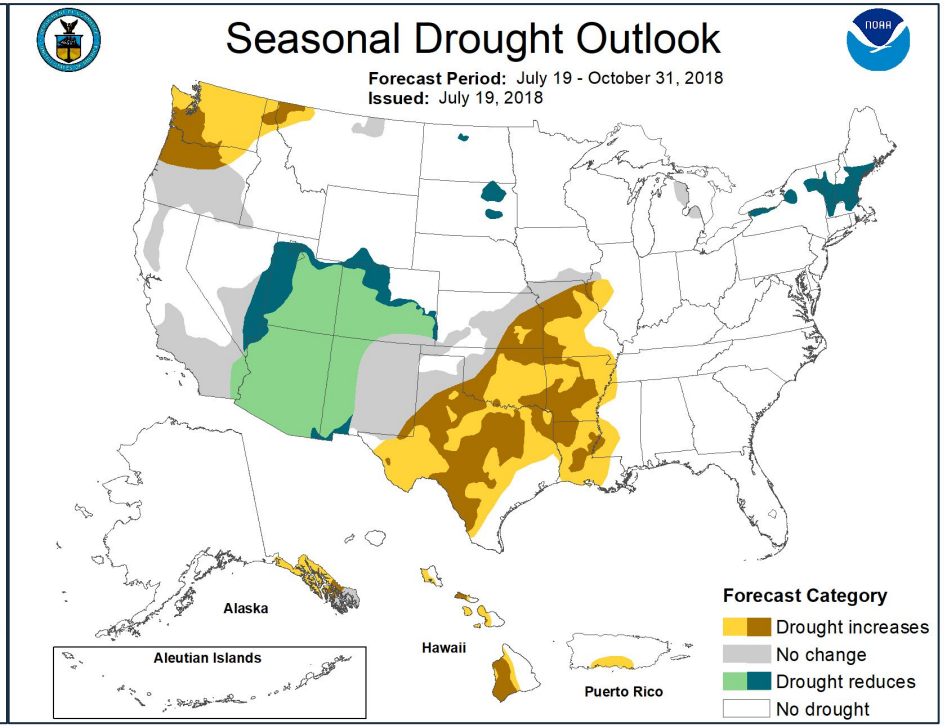
2018 Original vs. Redesigned Drought Outlook



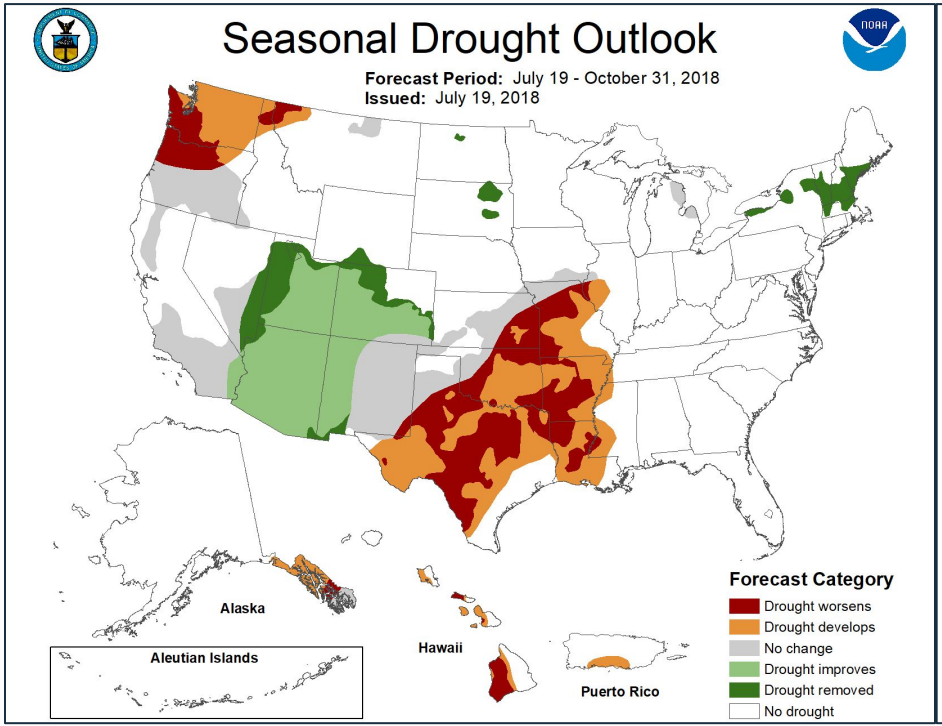


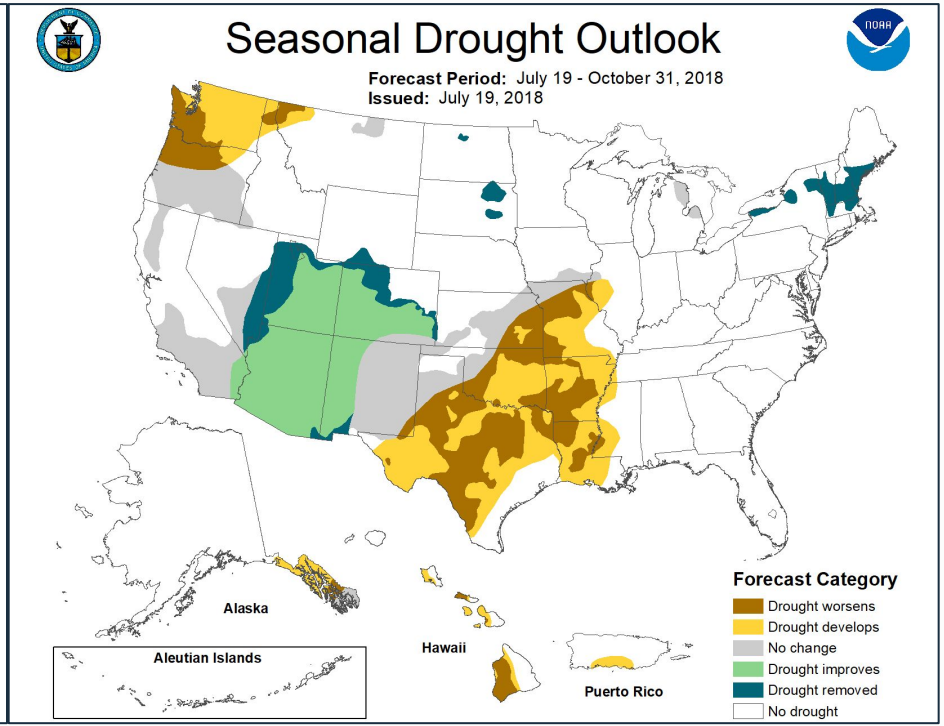
Redesigned Drought Outlooks - Collapsed Categories





Redesigned Drought Outlooks - Extended Categories



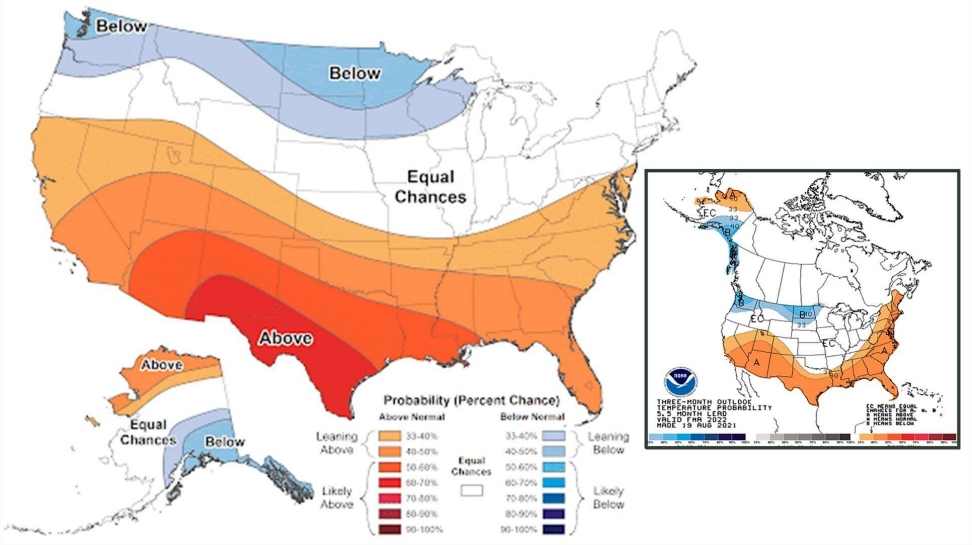


Next Steps

- Testing redesign effectiveness for intended end-users
- Synthesizing results and developing best practice recommendations
- Additional focus groups or re-engaging with translators on recommended new version

Overcoming Obstacles

- Shift towards operationalization of social science research to improve usability of federal products
- Collaborating with social scientists from the beginning of product design transforms the products and ultimately improves lives and livelihoods



Thank You

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