"Improving Impact-Based Seasonal Outlooks for South Central Texas"

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August 2017

Outline

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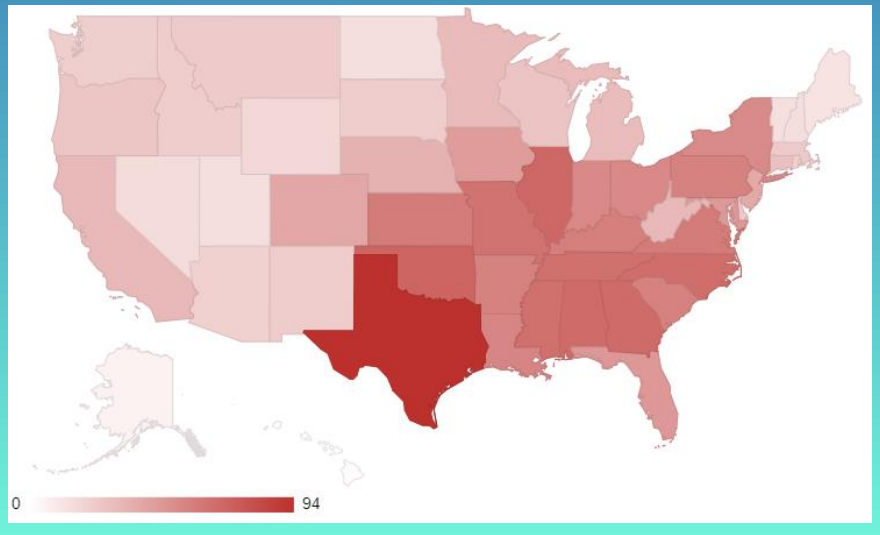
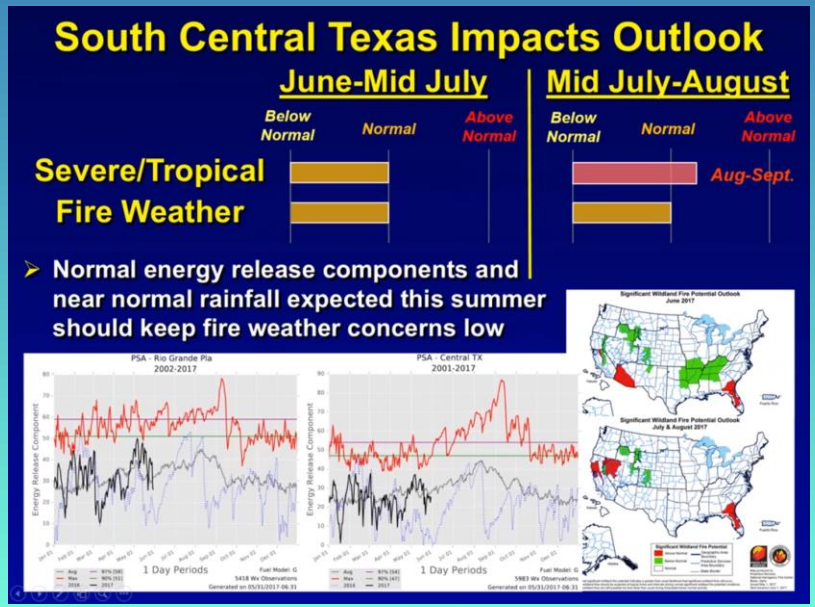
Motivations

- As of July 7, 2017, Texas leads the U.S. in CPI-Adjusted Billion-Dollar Weather and Climate Disasters (bottom left)
  - Record drought and subsequent flooding, most catastrophic wildfires and costliest hailstorm in state history since 2010
- Beginning fall 2015, EWX produced quarterly seasonal outlooks for stakeholders to inform potential for upcoming season to be above normal, near normal, or below normal (bottom right)





Objectives

- Modeled after CPC nonparametric tercile-based approach in seasonal forecasts
- Verification Indices for:
  - Severe Weather
  - River and Flash Flooding
  - Fire Weather
  - Winter Weather
- Subjective vs. Objective forecasting
  - Thought severe weather would be toughest to predict
  - Other events easier to predict
    - Event based vs. Antecedent conditions based
- Comparison of Subjective, Objective Hindcasts
  - Modified Heidke Skill Score
  - Ranked Probability Score
  - Verification based on rank rather than a CDF curve

Background

- Separation into winter (DJF), spring (MAM), summer (JJA), fall (SON)
- One report day considered to be 12Z to 12Z the next day
  - Fire dataset did not have time listed, report day simply by date

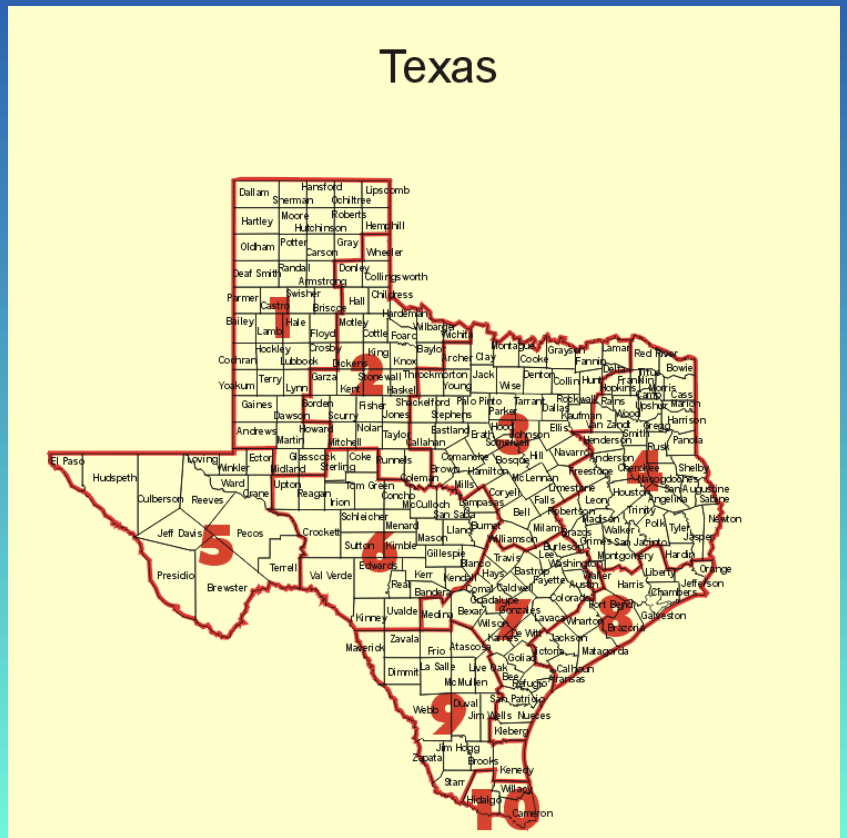
Common Indicators

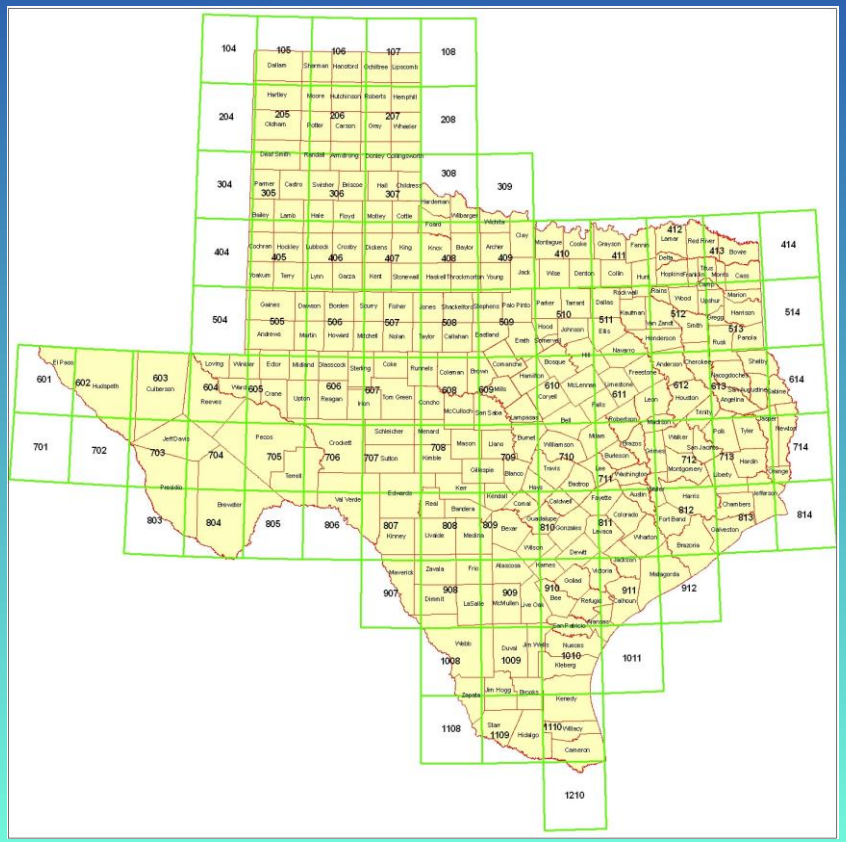
- Total number of reports
- Days with a report
- Fatalities, injuries blend
  - Fatalities used for rank; injuries used as tiebreakers

Year	Fatalities	Injuries	Blend	Rank
1989	1	32	1	2
1990	1	0	1	3
1991	0	1	0.01	4
1992	4	0	4	1
1993	0	0	0	5

Total CWA Rainfall

- How to quantify rainfall throughout 4 Climate Divisions (left)?
  - Our solution: LCRA quadrangles (right)
- Statistically significant difference in spring; due to climatology of rainfall between Corpus Christi CWA and San Angelo CWA





Severe Weather

- Climatology: 1981-2010
  - Dataset obtained from NCEI Storm Events Database
- Indicators:
  - Occurrence
    - Number of reports
    - Number of days with a report
    - Total rainfall
    - Total tornado path length
  - Severity
    - Maximum tornado width
    - Maximum reported hail diameter
    - Maximum reported non-tornadic wind magnitude
  - Impacts
    - Fatalities, Injuries blend

River and Flash Flooding

- Climatology: 1981-2010
  - 1981-1995 compiled using Storm Events Publications, office archived E-5 reports
  - 1996-2010 compiled using Storm Events Database
- Indicators:
  - Occurrence
    - Number of reports
    - Number of days with a report
    - Total CWA rainfall
  - Severity
    - Maximum 1 day rainfall
    - Maximum 2 day rainfall
  - Impacts
    - Fatalities, Injuries blend
    - Number of times selected river gages went above moderate flood stage

Fire Weather

- Climatology: 2000-2014
  - Dataset obtained from Texas State Fire Marshal's Office
  - Dataset goes back to 1982, no reported acres burned 1982-1999
- Indicators:
  - Occurrence
    - Number of fire reports
    - Number of days with a fire report
    - Total CWA rainfall
  - Severity
    - Total acres burned
    - Keetch-Bynum Drought Index (summer, fall); number of dry frontal passages (winter, spring)
    - Average maximum temperature
  - Impacts
    - Fatalities, Injuries blend

Winter Weather

- Climatology: 1981-2010
  - 1981-1996 compiled using Storm Events Publications
  - 1996-2010 compiled using Storm Events Database
- Indicators:
  - Occurrence
    - Number of reports
    - Number of days with a report
  - Severity
    - Maximum 1 day snowfall
    - Maximum 2 day snowfall
    - Number of days below freezing
  - Impacts
    - Fatalities, Injuries blend

Predictors

- ONI to test for ENSO impacts
- CPC seasonal outlooks
- Previous 1 month, 3 month rainfall
  - River and flash flooding, fire weather
- Previous 1 month, 3 month temperatures

Predictive Correlations

- Pearson's Rank-Order Correlation
  - Individual predictors vs. climatology rank
- Multiple Linear Regression
  - Aggregate all predictors and test vs. climatology rank or actual values
  - Ran at a 95% significance level

Summary

- Summarize your project and results.

Next Steps

- James Bruce Morehead Award at OU
  - Expand to individual states, Southern Plains
  - Integration into experimental developments of seasonal severe weather forecasts made by the SPC and CPC
  - Meeting with WFO DTW to discuss application of winter weather process to regions with more experience
- Use PRISM gridded data to eliminate assumptions made in using climate divisions
- Add downriver streamflow as an indicator to river flooding
- Expansion to WFOs across the U.S. in 2021

Acknowledgements

This project would not be were it is today without:

- Larry Hopper and Mark Lenz, NWS WFO EWX, for their guidance throughout.
- The rest of the EWX staff for their generosity and helpfulness to whatever random question I threw at them
- John Nielsen-Gammon, Texas A&M University, for offering incredible feedback on all aspects of the project
- Scott Breit and Mike Dunivan, Texas A&M Forestry Service, for giving feedback on drought and fire weather.
- Matthew Rosencrans, CPC, for aiding in the gathering of archived seasonal outlooks.
- Carolyn Pursley, Texas State Fire Marshal's Office, for providing the fire impacts dataset.
- Michael Churma, NWS Office of Science and Technology Integration, and Jenna Meyers, NWS Climate Services Branch, for aiding in data retrieval from LCAT.
- Brian Tomiuk, University of Michigan, and Justin Stipe, University of South Florida, for giving me ideas and helping me fix problems in writing Python scripts for the project.

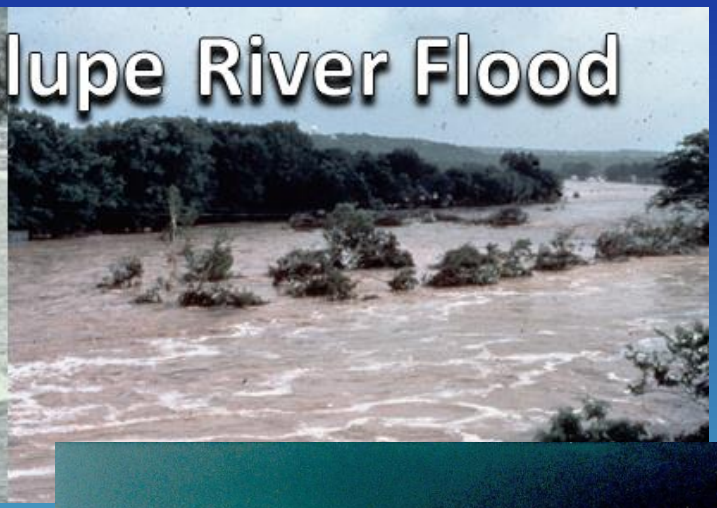
and many others who I bounced ideas off of the past several months.

Works Cited

- NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2017). https://www.ncdc.noaa.gov/billions/

Pictures


Balch Springs
Christian Academy
SEAGOVILLE ROAD BAPTIST


The 1987 Guadalupe River Flood