Main Results

- Need identified by fire managers for seasonal forecasts of wildland fire season in March.
- CFSv2 needs post-processing to remove biases for developing outlooks of Canadian Fire Weather Indices.
- The seasonal forecasts will need to be combined with additional statistical methods to improve skill.

Seasonal Climatology of T and P shows need for corrections

- Forecast spring temperatures throughout Alaska are too cool and precipitation is too large. These two critical variables need to be corrected for use in calculating the Fire Weather Indices.
- Other Predictive Service Areas (PSAs) in Boreal Alaska display similar biases.
- Quantile Mapping was applied to the raw forecast output using PSA-based observational values for temperature and precipitation at the ‘truth’. QM adjusts the cumulative distribution function of model to match that of observations.

Seasonal forecasts do not capture seasonal T & P anomalies

- Better observational data would help with post-processing of the seasonal forecasts. Ideally a gridded observational product needed.
- Identifying large-scale circulation patterns with predictive skill or synoptic patterns associated with fire weather will be needed to improve forecasts.
- Forecast models tend to have difficulty capturing late season extremes in BUI (Figure 6, left).
- Model advances will be critical to increase forecast skill, particularly at high latitudes, where model veracity lags in lower latitudes.
- Co-production is challenging and requires time to make progress.

Summary & Thoughts

Methods & Data

- Observed climate information:
  - Met stations aggregated over Predictive Service Areas (PSAs)
  - CFSv2 seasonal forecasts (an NMME model)
- Apply the Canadian Forest Fire Weather Index System (CFFWIS) to evaluate fuel vulnerability in observations and forecast data
- Evaluate skill of seasonal forecasts
- Develop outlooks for wildland fire season

Seasonal Wildfire Acreage

- Large acres year are getting much larger while there is little change in typical season.
- Fire managers need information in March to allocate resources.
- Knowledge of lightning for ignition is also needed.

References

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Acknowledgements

Figure 1. Seasonal cycle of smoothed observed 1994-2017 (black) air temperature, raw CFSv2 1982-2017 forecast air temperature (blue), and corrected CFSv2 1982-2017 forecast temperature (red). Right: Same as left panel except for precipitation.

Figure 2. Top right: Identifies PSAs in Alaska and meteorological stations (black dots). Bottom left: Flow diagram of how the Canadian fire weather indices (FWI) are calculated (Lawson and Armitage 2008) in left panel. Bottom right: Categories of fire danger for spruce based on the fire weather indices. http://cfwindex.org/5435/download/Fire%20Indices.png

Figure 3. Left: Time series of acres burned in Alaska from 1950-2018. B-Spline regression is used to model the 33, 66 and 90th percentiles to set the categories. Right: Categories of fire danger for spruce based on the fire weather indices.

Figure 4. Top left: Seasonal 3IA temperature anomalies for observations (red) and corrected forecast (grey) for Tanana Valley West PSA. Bottom left: Similar to top panel but for precipitation. Top right: Table with monthly and seasonal correlations between observations and model for the period 1994-2017 (with 2011 missing).

Figure 5. Buildup Index for Tanana Valley West based on observations showing the seasonal features that are important for fire in terms of climate drivers.

Figure 6. Buildup Index for Tanana Valley West based on ensemble seasonal forecast from CFSv2 for 2004 (left) and 2015 (right), both high acreage burned years.

Table with monthly and seasonal correlations between observations and model for the period 1994-2017 (with 2011 missing).