A learning tool for agricultural professionals and producers in the Columbia River basin.

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Introduction

- ❑ Weather and variability in weather are primary factors affecting risk to agricultural production. Climate change and associated changes in growing conditions are additional sources of risk.
- ❑ Producers have long relied on historical context (past experiences) for dealing with risk and decision making under uncertainty.
- ❑ Communicating weather forecasts as well as climate change through an analog approach, which focuses on historical context, could be of utility to the ag professional and ag producer communities.

Objective

Our primary objective is to leverage the availability of high-resolution weather forecasts and climate projections with other spatially-explicit information (e.g., soil type, crop mix, irrigation extent and yield statistics) to create a learning tool that helps ag professionals and producers in the Columbia River basin to better relate to weather forecasts and future climate projections. The learning tool will allow users to view associated risks and impacts through the lens of their own experiences, as well as those of other professionals and producers.

Methods

We are extending methods outlined in Ramı´rez-Villegas et al. (2011) to develop weather pattern analogs, climate analogs and growing-condition analogs for locations in the Columbia River basin. A statistical metric called the similarity index is used to characterizes how similar a forecasted weather pattern is to past years' patterns or how similar a future growing-condition of a reference location is to historical growing-conditions in other locations. Locations or time frames that are most similar are considered to be the closest analogs.

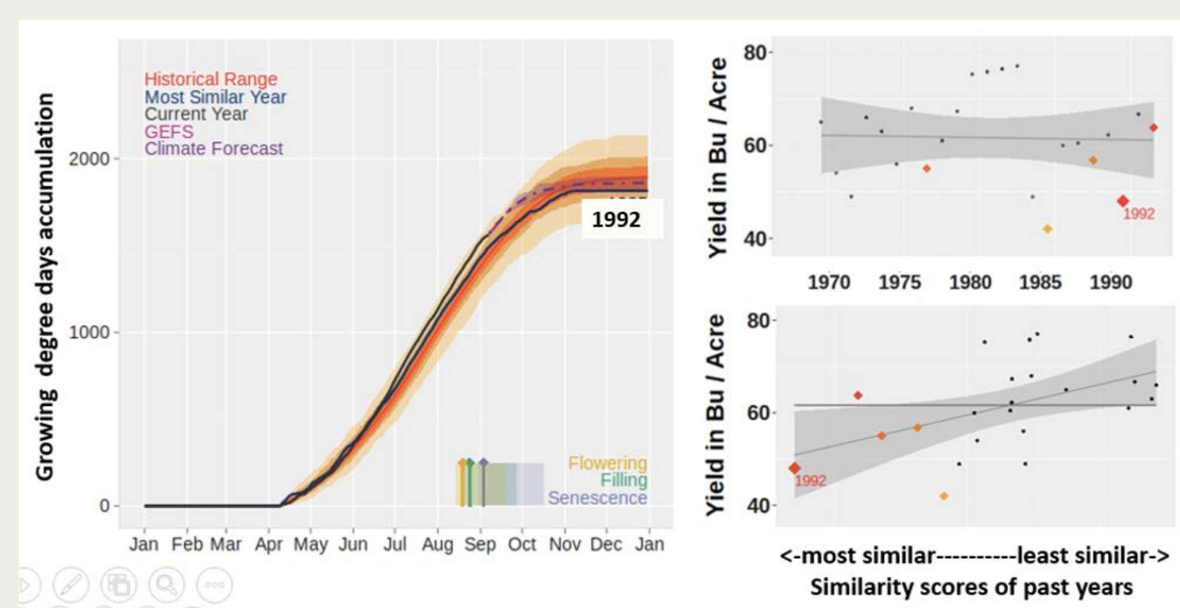
Domain Description

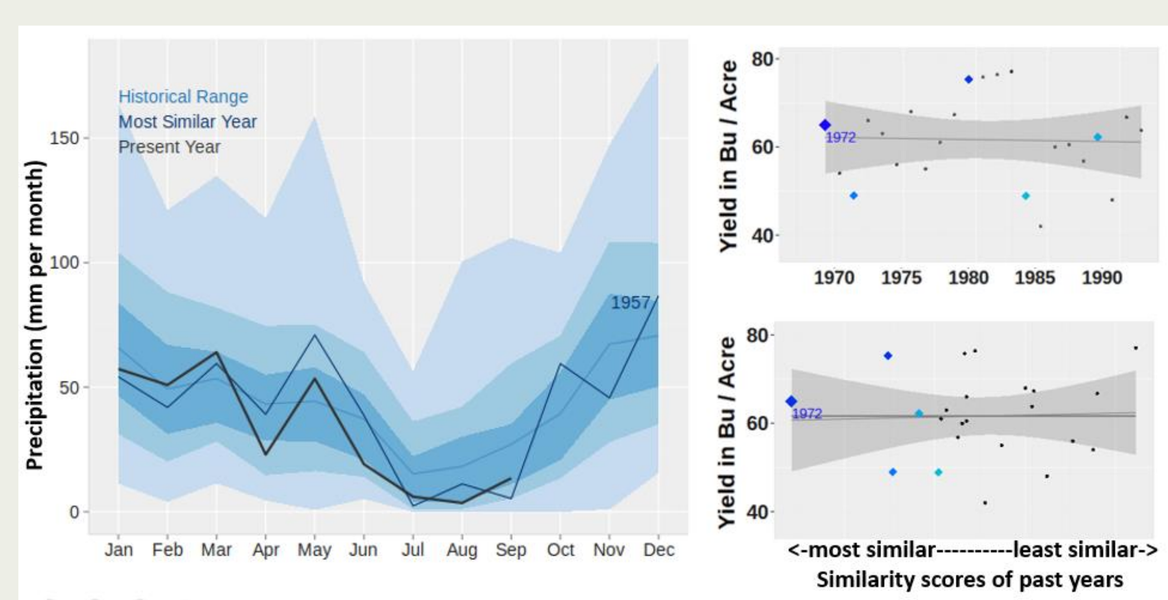
- ❑ The Columbia River Basin in the Pacific Northwest has a drainage area of about 670,000 square kilometers covering all or parts of seven states in the US as well as British Columbia.
- ❑ Irrigated agriculture is an important part of the economy. Crops of high economic value like tree fruits, wine grapes and hops are grown in the region.

Example visualizations of weather forecasts under a historical context

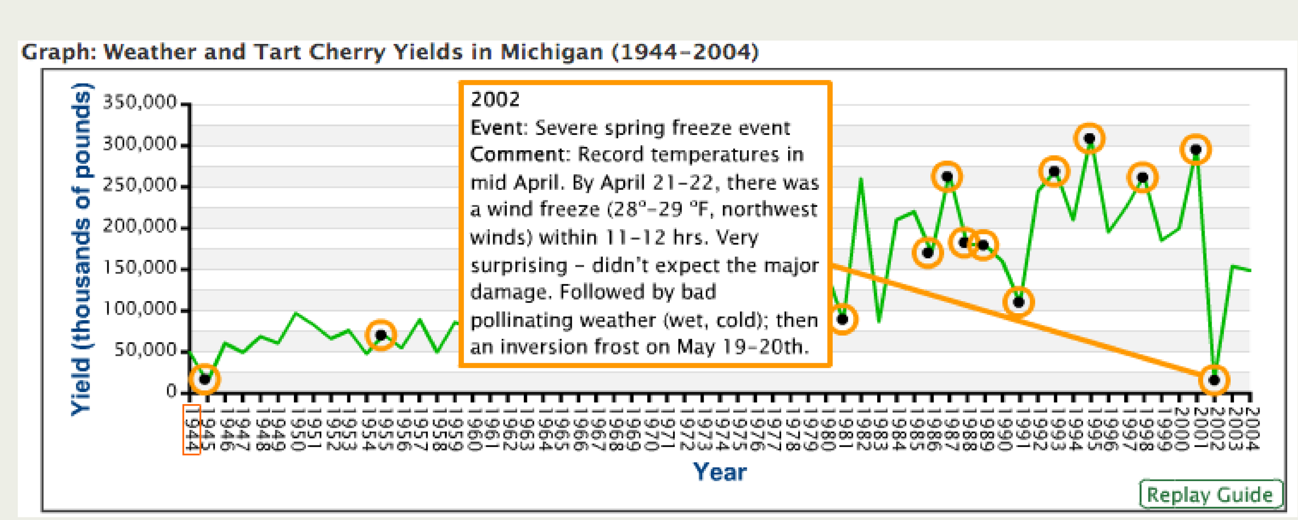
When the user selects a location of interest, several data sources specific to the location are loaded. This currently includes historical climate data, short term and seasonal weather forecasts from multiple sources, the list of crops grown in the area and USDA NASS county level annual crop yield statistics. Upon selecting a crop, cultivar and planting date, crop specific visuals related to growing degree day and precipitation accumulation are presented under a historical context.

Producers often related to incidents and experiences in specific years in the past. Analog years are identified to help facilitate this. The growing degree day accumulation plot below (for a specific location and crop) shows that yields have been below average in past years that are most similar in growing degree day accumulation patterns as compared to this year's forecast.





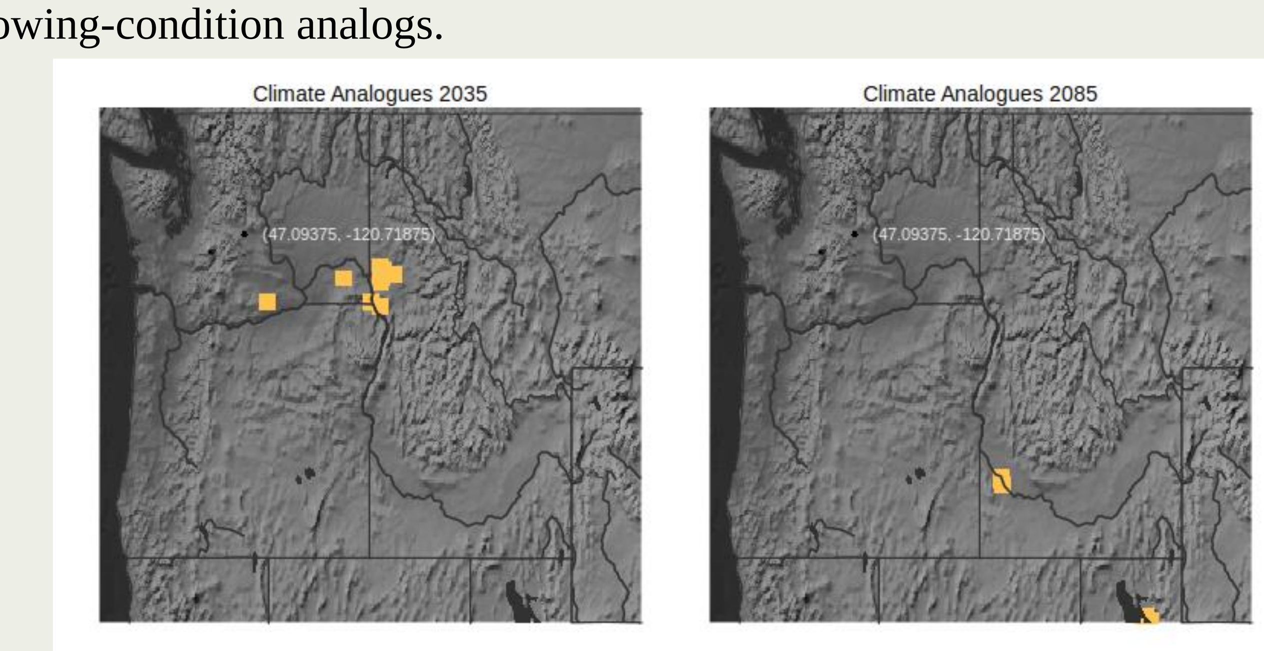
Through interactions with growers, we hope to capture growers' recollections of past weather events and make this information available alongside visuals. This would be similar to the example below which was created as part of the Pileus project in Michigan.

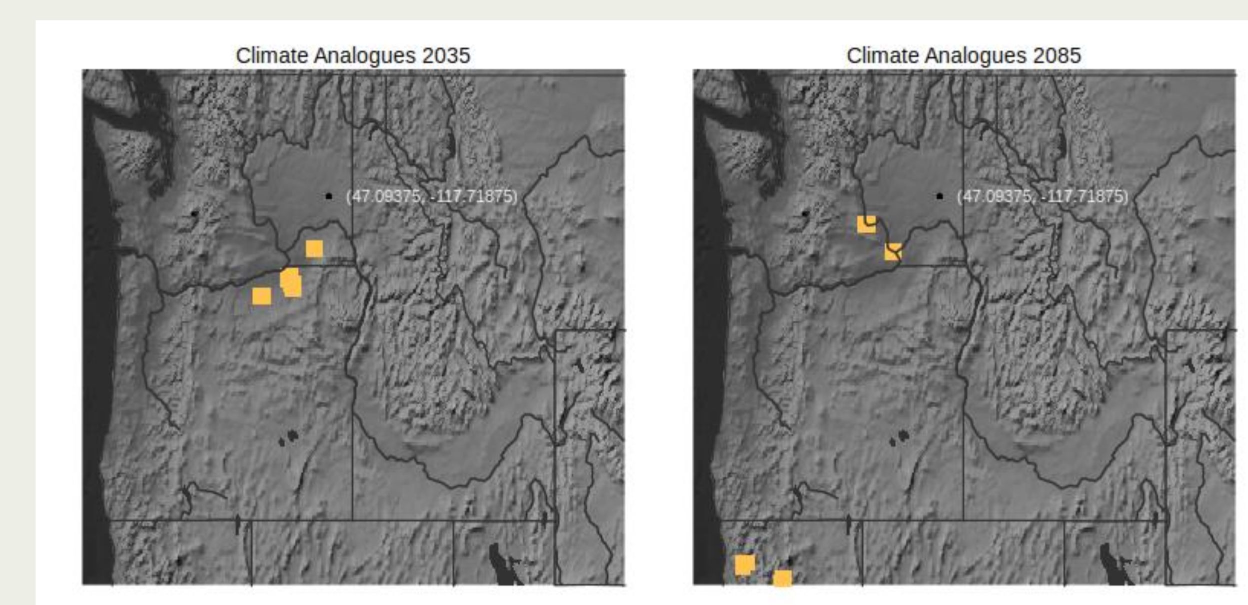


Source:Pileus project: Climate science for decision makers
http://pileus.msu.edu/growersrecdemo/index_hai1.htm

Example visualizations of future climate projections under a historical context

The learning tool allows users to explore future climate projections as climate analogs. The examples below shows climate analogs for two locations in WA. The future climate conditions in one of the locations is expected to get similar to locations further south east whereas the other location is expected to get similar to locations further south west. By including non-climate factors - such as soil types - in the analog description, we can extend the concept of climate analogs to growing-condition analogs.





Crop cultivar selection and managements practices have been advocated as successful adaptation strategies to address the impacts of climate change [Moniruzzaman, 2015; Leclère et al. 2013]. Best practices related to these choices are location-specific and have been adapted for local conditions and continuously improved by producers over the years, creating a rich body of location-specific agronomic knowledge. Within the vast network of ag professionals and producers, growing-condition analogs can be used to identify key connections that benefit from the mutual exchange of location-specific best practices appropriate for future predicted growing conditions.

Conclusions

The concept of analogs are explored as an alternate approach for ag professionals and producers to visualize weather forecasts and climate projections through a historical lens. The expectation is to create a learning tool that will allow professionals and producers to view weather and climate related risks through the lens of their own experiences, as well as those of other professionals and producers.