Ag Climate Visualization Tool

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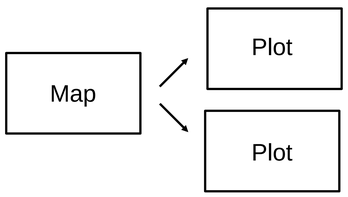
Motivation

- The Center for Sustaining Agriculture & Natural Resources (CSANR) [1] provides assistance to agricultural producers in planning for climate change on crops and livestock
- Forecasts of edible vegetation on grazing lands and heat stress demonstrate hazards to cattle [2], for which CSANR is developing an informational, web-based tool to educate cattle producers
- The senior design team has been tasked with creation of an AgViz Tool [3] that renders forecasts actionable by presenting visualizations qualitatively and quantitatively

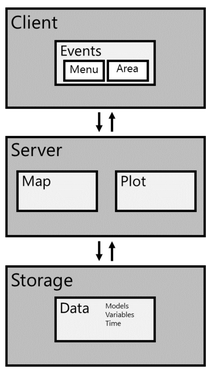
AgViz Tool

The main view is a geographic map that displays forecasted change in environmental variables by color. Once a user selects a region of interest, the tool generates plots for a variable over time for multiple climate scenarios. The forecasts are provided by the US Forest Service [2].



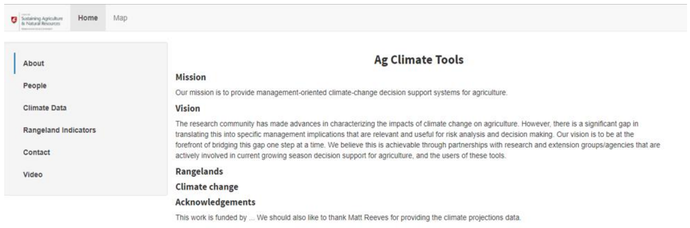
Design

- The Client subsystem is responsible for displaying an interactive map, plots, and user input menu.
- The Server subsystem processes data and outputs maps and plots to the Client for display to the user.
- The Storage subsystem is a collection of files that encode data values for climate indicators mapped to coordinates in the United States over 10 decades.

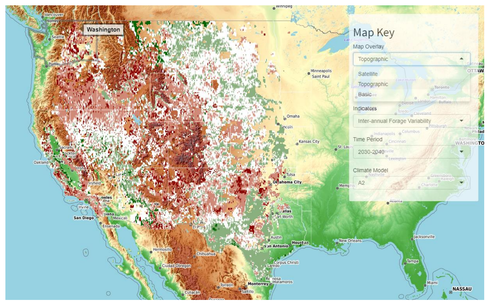


Homepage

The AgViz Tool has a web interface that introduces the mission and vision of CSANR



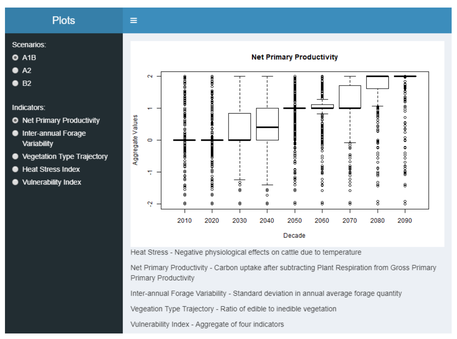
Spatiotemporal Map



The interface provides a drop-down menu for selection of climate model, map overlay, map boundary, time period, and climate indicator.

Graphical Analysis

If the cursor selects a bounded area by clicking, a window appears containing a plot of data aggregated from the bounded area. The plot displays a mean value and standard deviation of one climate indicator forecast over 10 decades.



Usability Testing

CSANR recruited a group of researchers and agricultural professionals to participate in testing a series of use cases. A protocol was developed that standardizes three tasks. Participants were evaluated for task success. All testing was conducted remotely without direct observation.

Conclusions

The senior design team developed a data visualization tool that displays forecasts of environmental variables important for operational planning in cattle production. The team employed the R language with packages, RShiny and Leaflet.

Future Work

- Incorporate feedback from usability testing.
- Enhance performance of plotting.

References & Glossary

[1] CSANR. (2018). Center for Sustaining Agriculture and Natural Resources [Online]. Available: http://csanr.wsu.edu
[2] M. C. Reeves, K. E. Bagne, J. Tanaka, "Potential Climate Change Impacts on Four Biophysical Indicators of Cattle Production from Western US Rangelands," Rangeland Ecology & Management , vol. 70, pp.529-539.
[3] AgVizTool. (2018). Available: http://agclimatetools.cahnrs.wsu.edu

Leaflet - Open-source JavaScript library for interactive maps
RShiny - An open-source R package for building web applications using R

Acknowledgements

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