Rapid Response to Assess the Risk of Arbovirus Outbreaks Triggered by Climate Events

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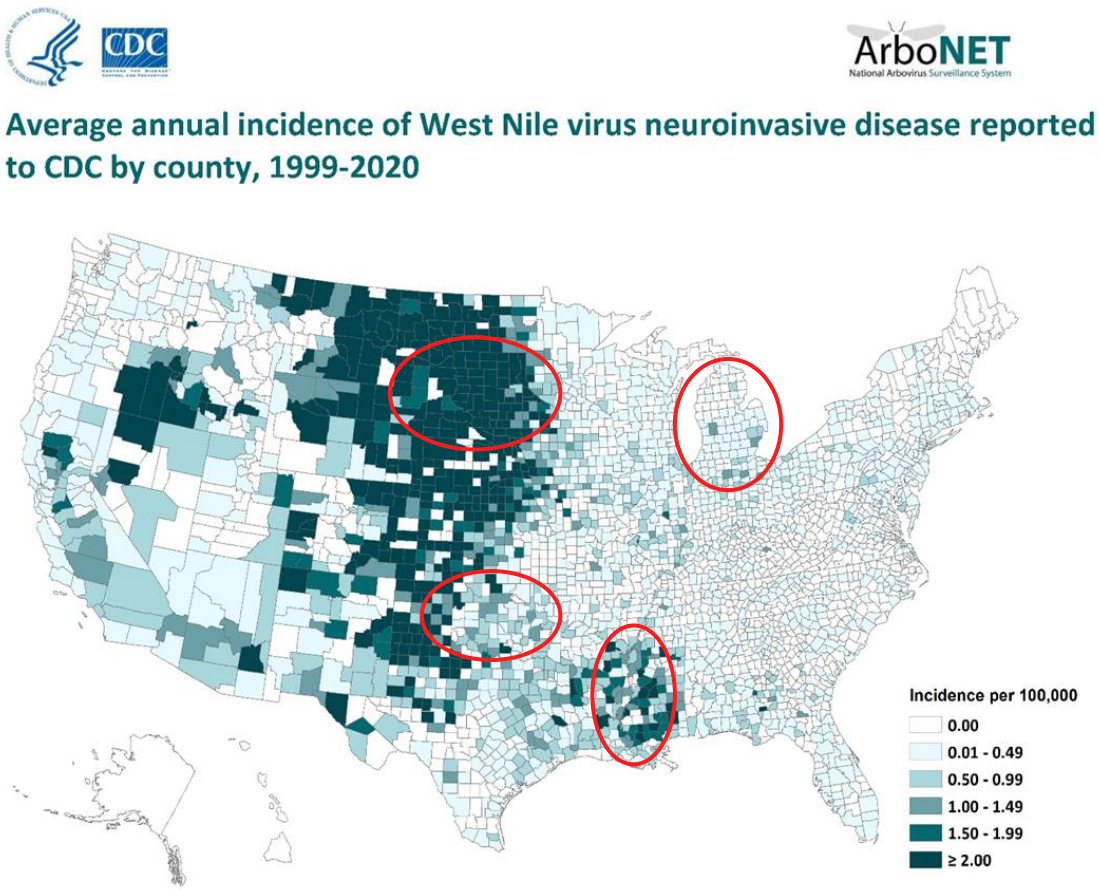
Project Objectives

- The Arbovirus Monitoring and Prediction (ArboMAP) system was originally developed to forecast West Nile virus risk in South Dakota using NASA environmental monitoring datasets.
- The aim of the current project is to extend ArboMAP to multiple states and test its effectiveness there
  - Different biogeographic setting
  - Different vector and host species
  - Different institutional environment for public health and mosquito control
- Focus on Louisiana, but also working with Oklahoma and Michigan



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The ArboMAP forecasting approach has been validated

- Accurate seasonal predictions can be made six weeks prior to peak transmission
- Predictions have skill (substantial improvements over naïve models)
- Incorporating NASA datasets improves predictions based on human and mosquito surveillance

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Integrated Forecasts Based on Public Health Surveillance and Meteorological Data Predict West Nile Virus in a High-Risk Region of North America

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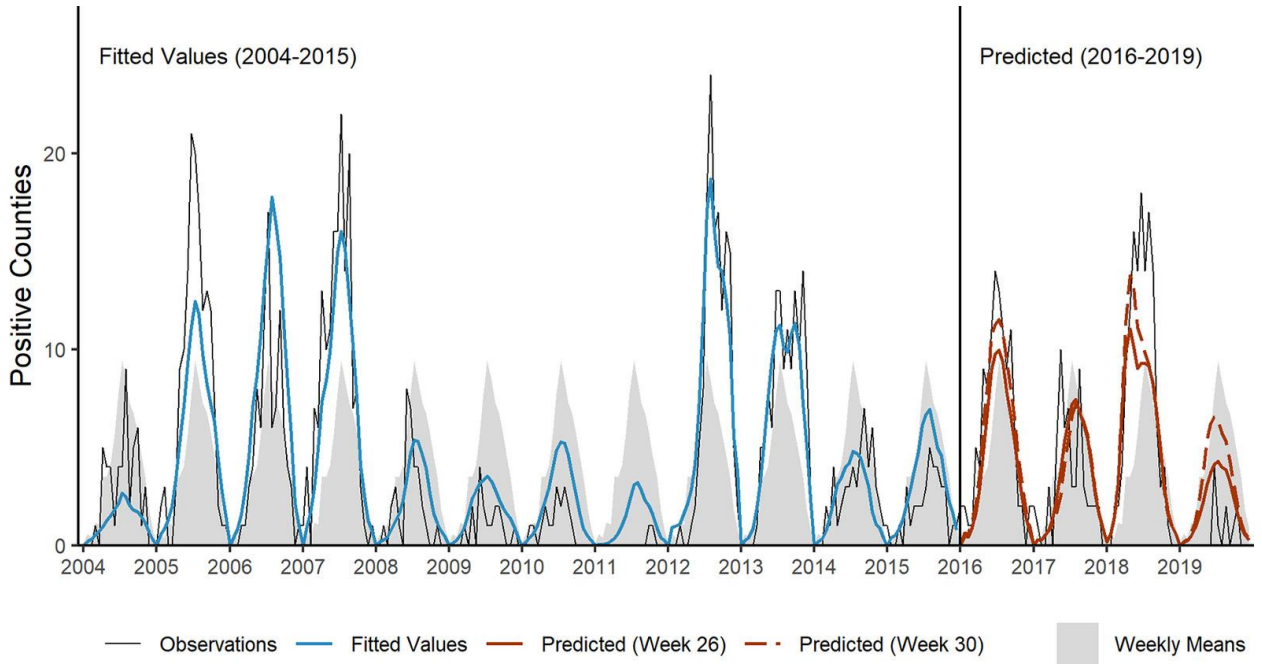

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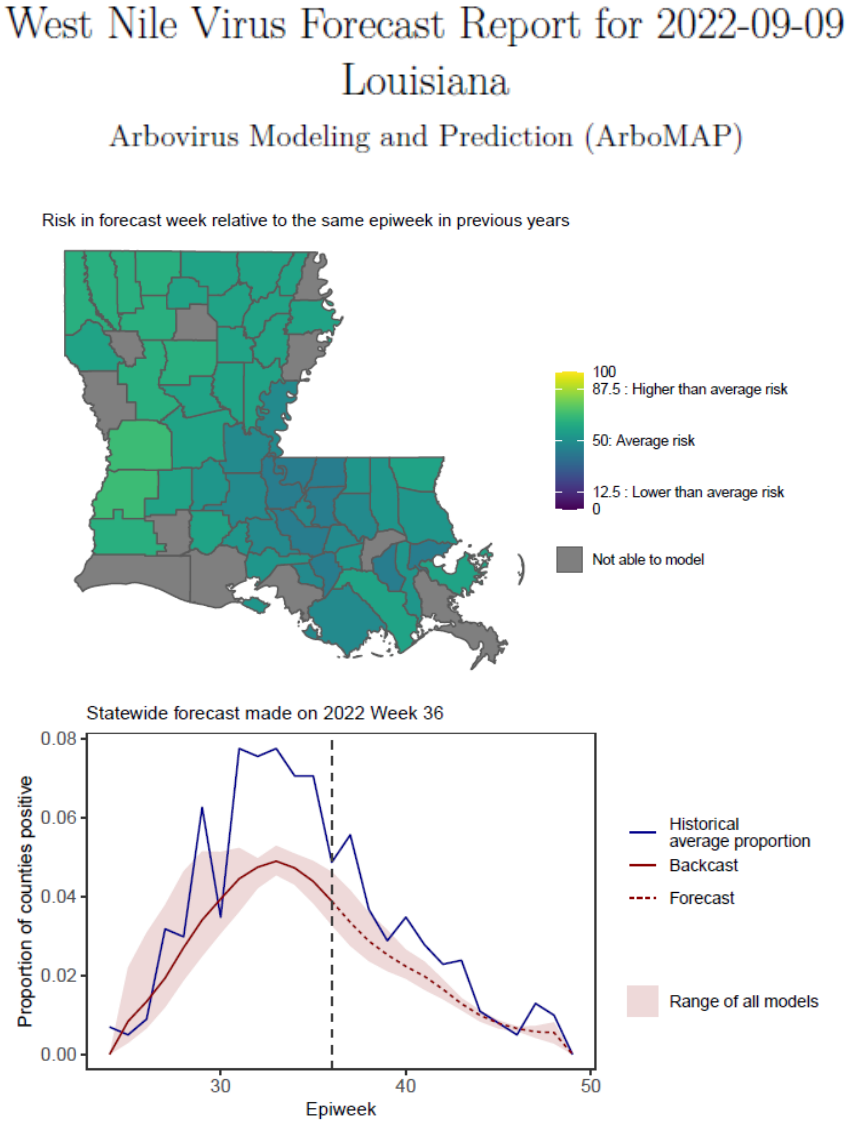
ArboMAP is being actively used by state departments of health

State	Institution	Key Contacts
South Dakota	South Dakota Department of Health	Anita Bharadwaja (Vector Biologist)
Louisiana	Louisiana Department of Health	Sean Simonson (Epidemiologist)
Oklahoma	Southern Nazarene University/OKCC Health Dept.	Caio Franca (Associate Professor)/ Phil Maytubby (Director)
Michigan	Michigan Department of Health & Human Services	Kimberly Signs (Epidemiologist)

Final workshop held with LADOH on August 23, 2022 for system handoff and evaluation



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The ArboMAP software system has been improved and is publicly available

- Implemented as an RStudio application with a GUI
- Automatically runs forecasting models and generates a detailed report
- Substantial upgrades in V. 4
  - Multistate user engagement workshop in November 2021
  - Two follow-up workshops in April 2022

https://github.com/EcoGRAPH/ArboMAP

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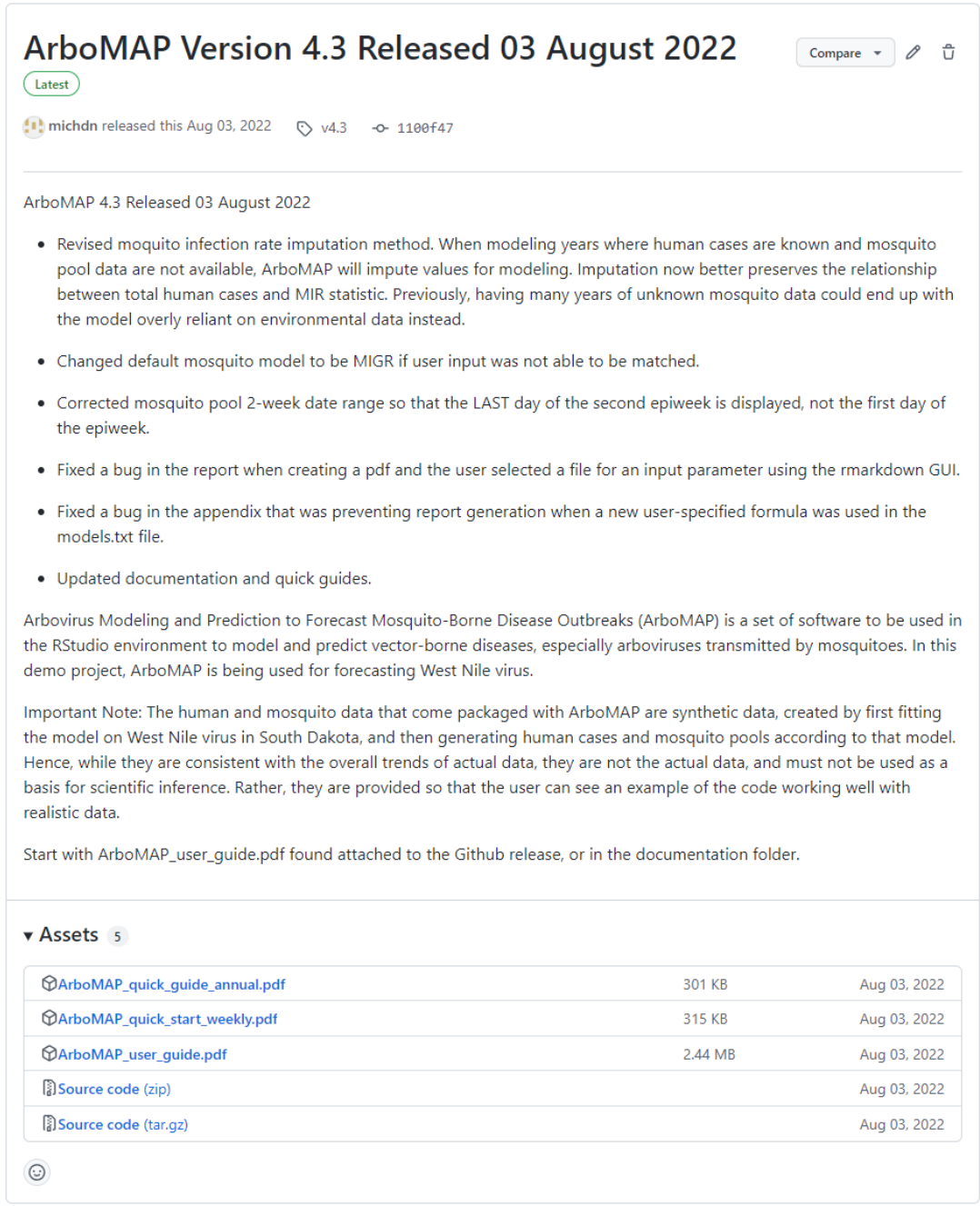


ArboMAP Version 4.3 Released 03 August 2022

Compare

Latest

michdn released this Aug 03, 2022 v4.3 1100f47

ArboMAP 4.3 Released 03 August 2022

- Revised moquito infection rate imputation method. When modeling years where human cases are known and mosquito pool data are not available, ArboMAP will impute values for modeling. Imputation now better preserves the relationship between total human cases and MIR statistic. Previously, having many years of unknown mosquito data could end up with the model overly reliant on environmental data instead.
- Changed default mosquito model to be MIGR if user input was not able to be matched.
- Corrected mosquito pool 2-week date range so that the LAST day of the second epiweek is displayed, not the first day of the epiweek.
- Fixed a bug in the report when creating a pdf and the user selected a file for an input parameter using the rmarkdown GUI.
- Fixed a bug in the appendix that was preventing report generation when a new user-specified formula was used in the models.txt file.
- Updated documentation and quick guides.

Arbovirus Modeling and Prediction to Forecast Mosquito-Borne Disease Outbreaks (ArboMAP) is a set of software to be used in the RStudio environment to model and predict vector-borne diseases, especially arboviruses transmitted by mosquitoes. In this demo project, ArboMAP is being used for forecasting West Nile virus.

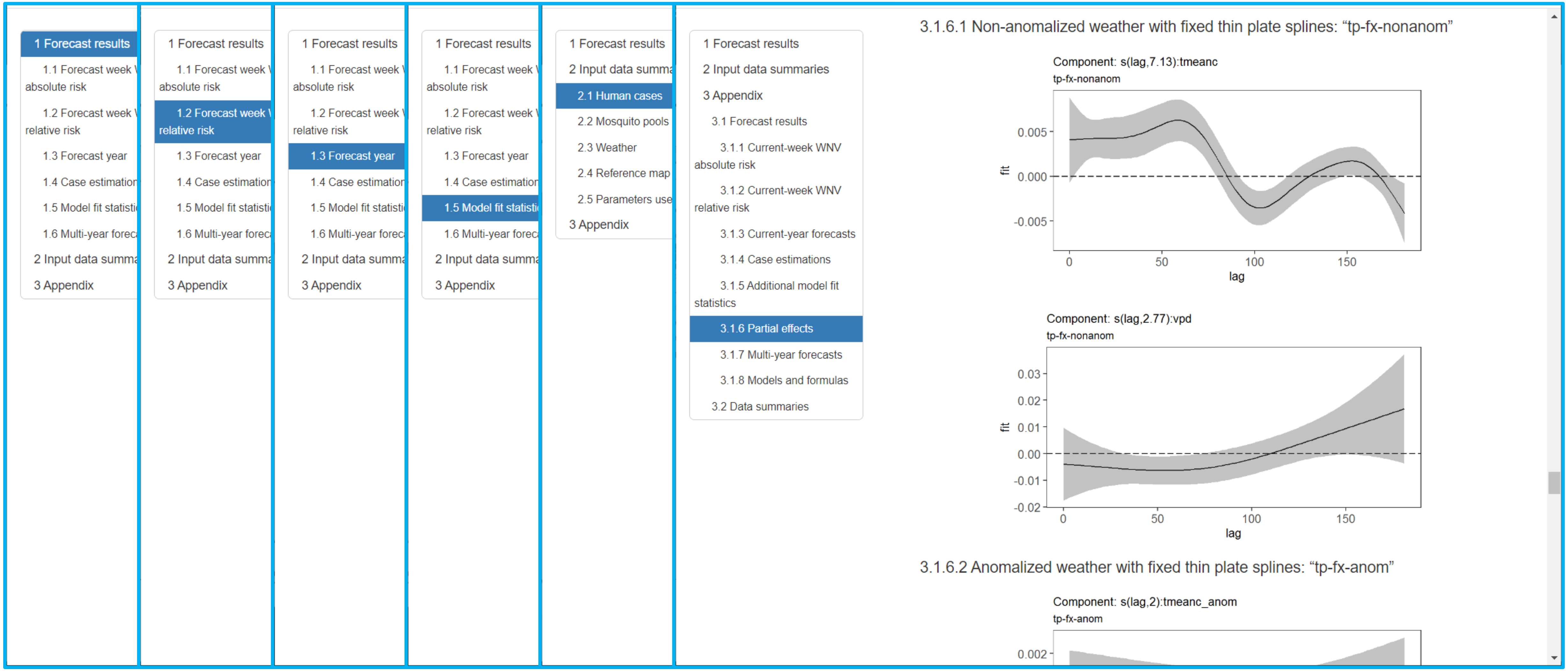
Important Note: The human and mosquito data that come packaged with ArboMAP are synthetic data, created by first fitting the model on West Nile virus in South Dakota, and then generating human cases and mosquito pools according to that model. Hence, while they are consistent with the overall trends of actual data, they are not the actual data, and must not be used as a basis for scientific inference. Rather, they are provided so that the user can see an example of the code working well with realistic data.

Start with ArboMAP_user_guide.pdf found attached to the Github release, or in the documentation folder.

▾ Assets 5

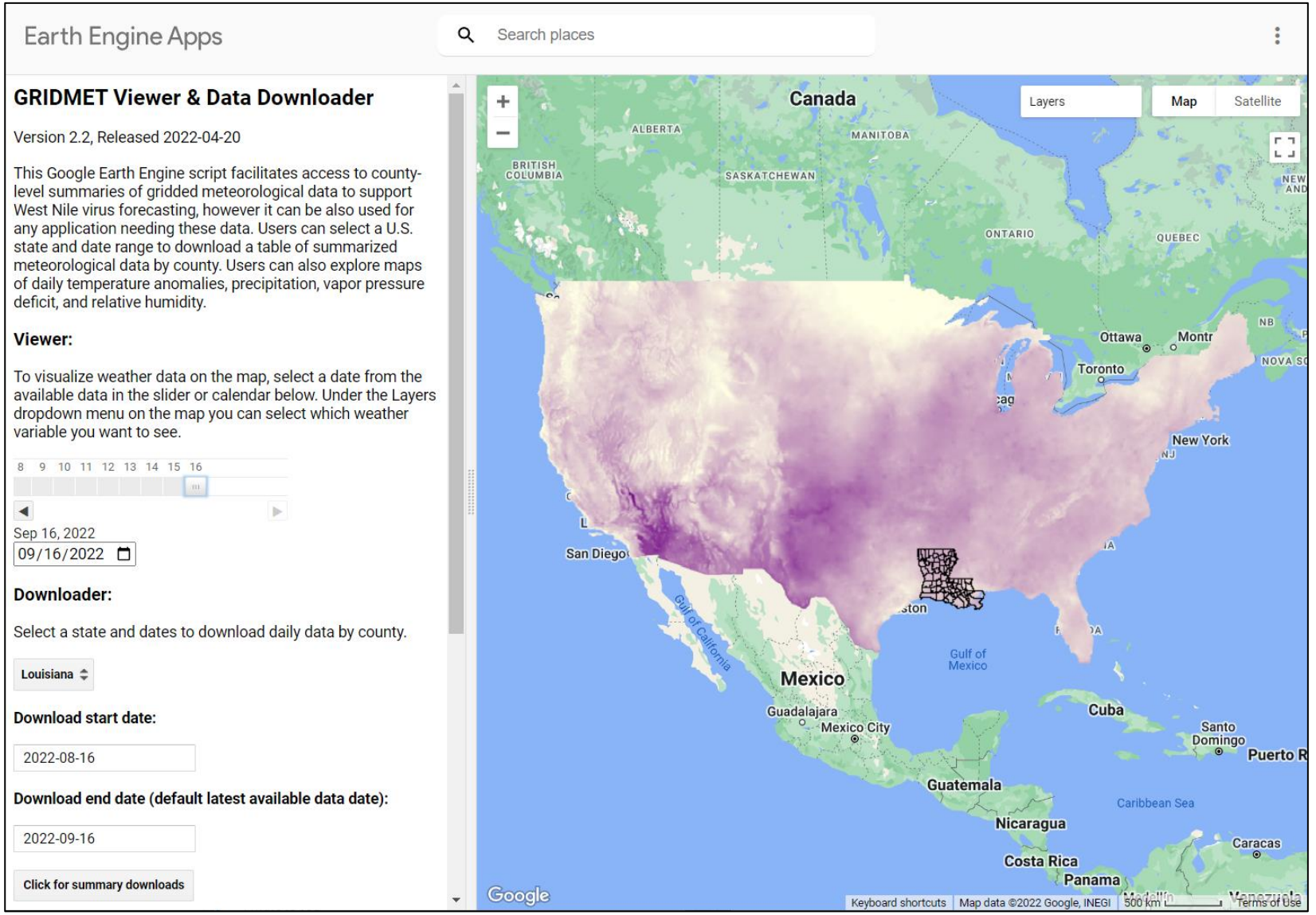
ArboMAP_quick_guide_annual.pdf	301 KB	Aug 03, 2022
ArboMAP_quick_start_weekly.pdf	315 KB	Aug 03, 2022
ArboMAP_user_guide.pdf	2.44 MB	Aug 03, 2022
Source code (zip)		Aug 03, 2022
Source code (tar.gz)		Aug 03, 2022

Reports include text, charts, and maps that were designed based on user input.



We also developed a Google Earth Engine application to facilitate access to gridded meteorological data (derived from NLDAS)

Automatically generates county-level tabular summaries that are read in by ArboMAP



https://dawneko.users.earthengine.app/view/arbomap-gridmet

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Some final items of business…

- Current NCE expires on December 31, 2022
- All funds will be expended before that date
- Target ARL: 8
  - Finalized application system tested, proven operational, and shown to operate as expected within user's environment
  - Application qualified and approved by user for use in decision making activity
  - User documentation and training completed
- Final ARL: 8
  - Achieved for Louisiana in summer 2022
- **Thanks to everybody for all of your suggestions and support!**