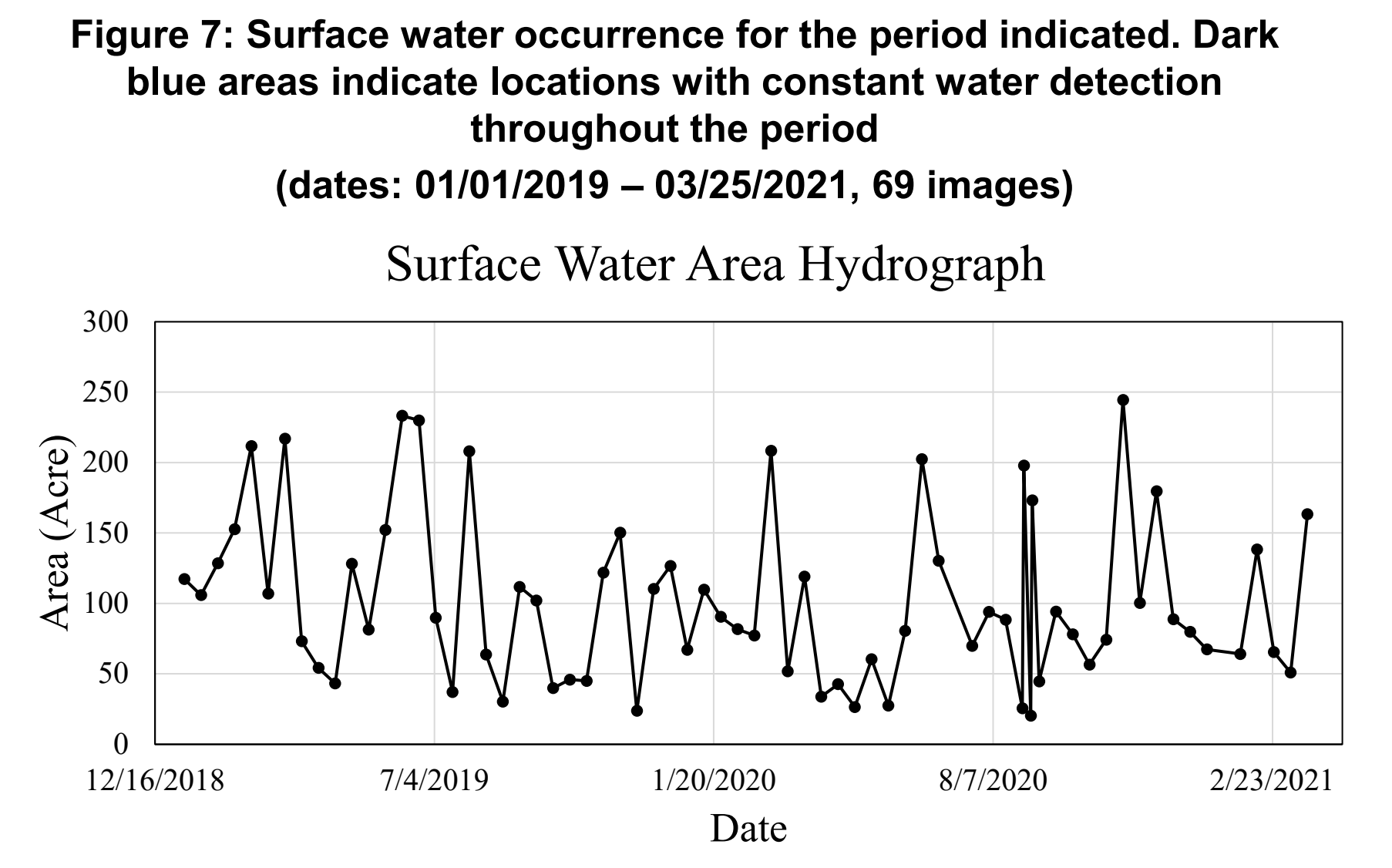
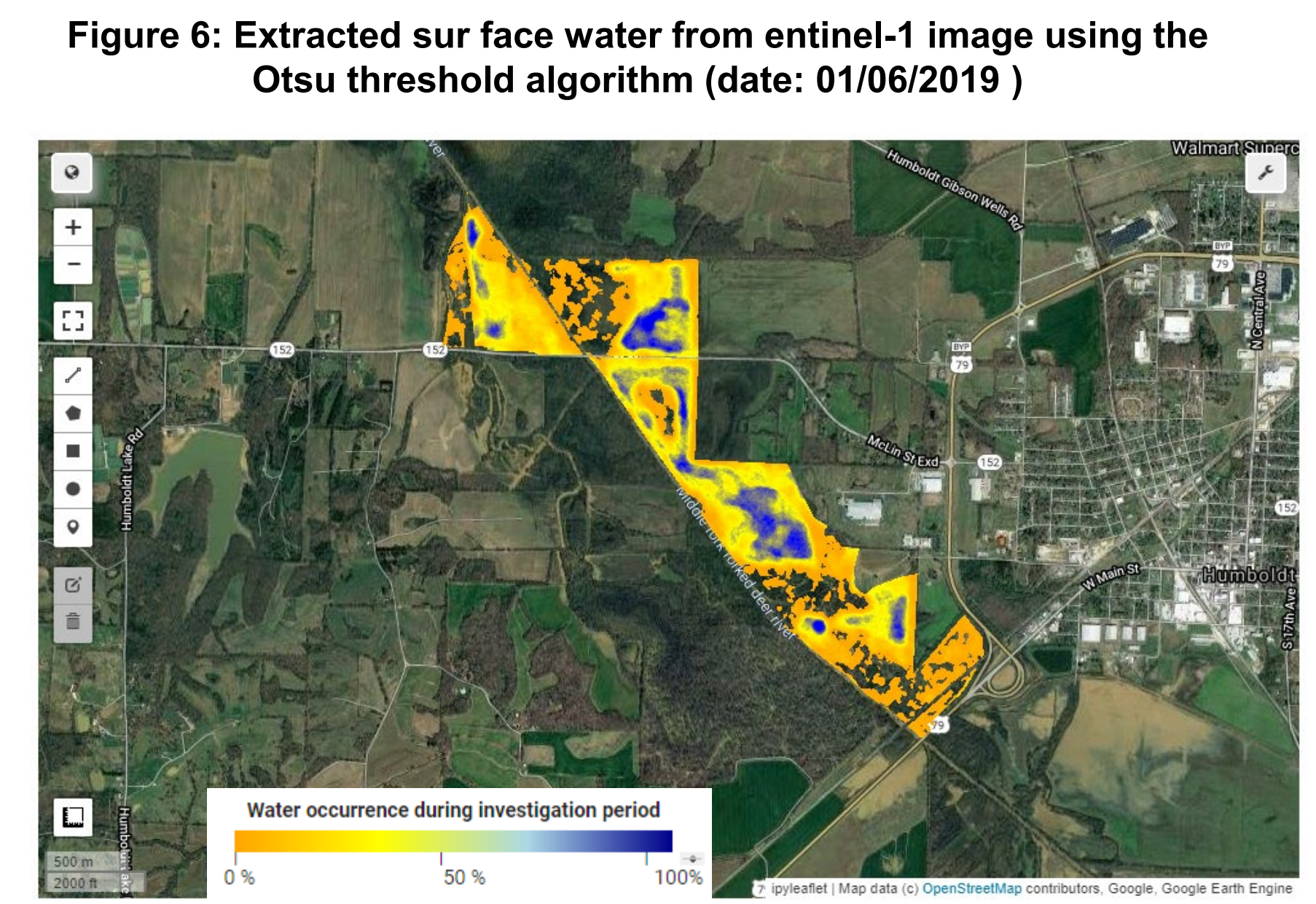
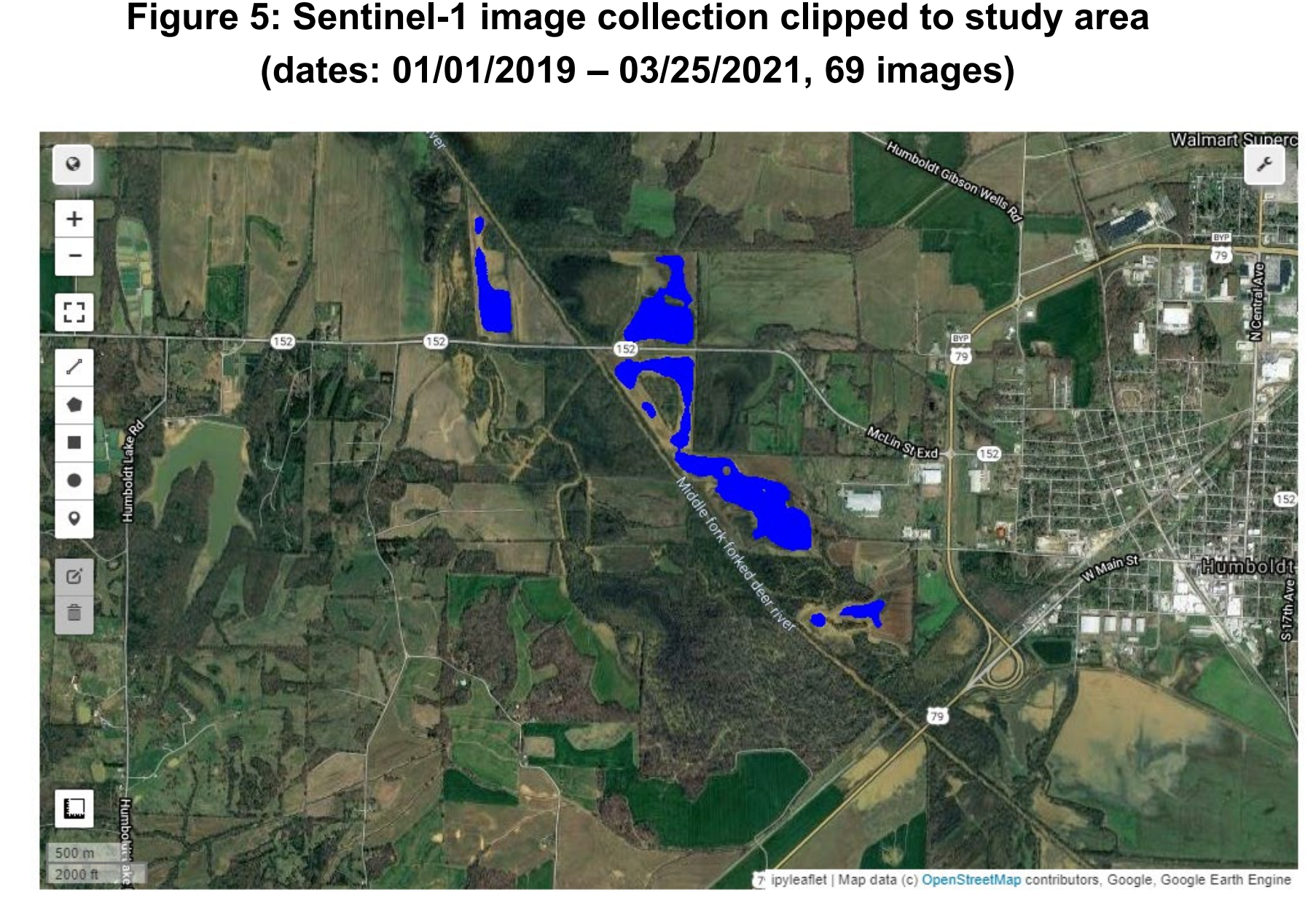
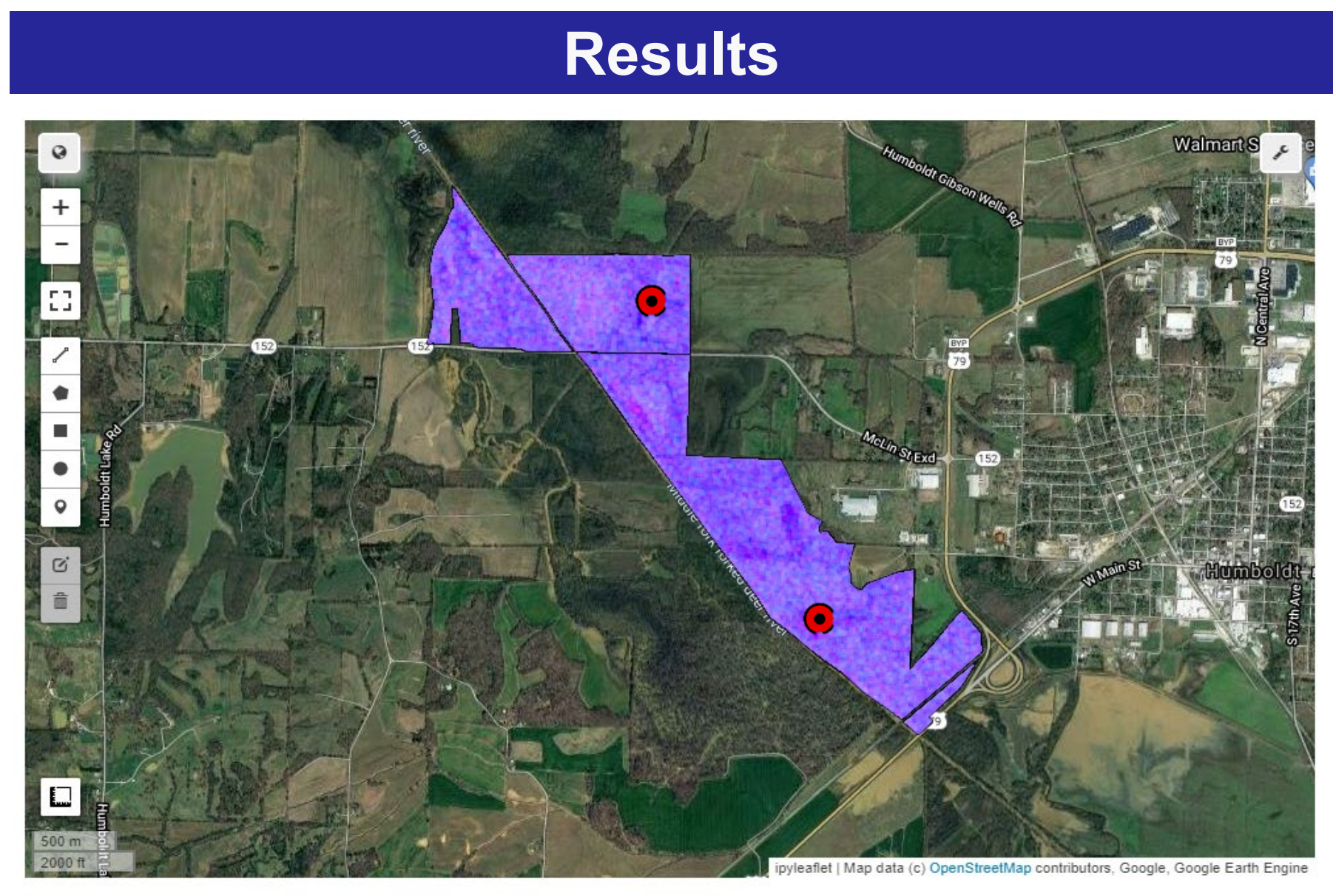
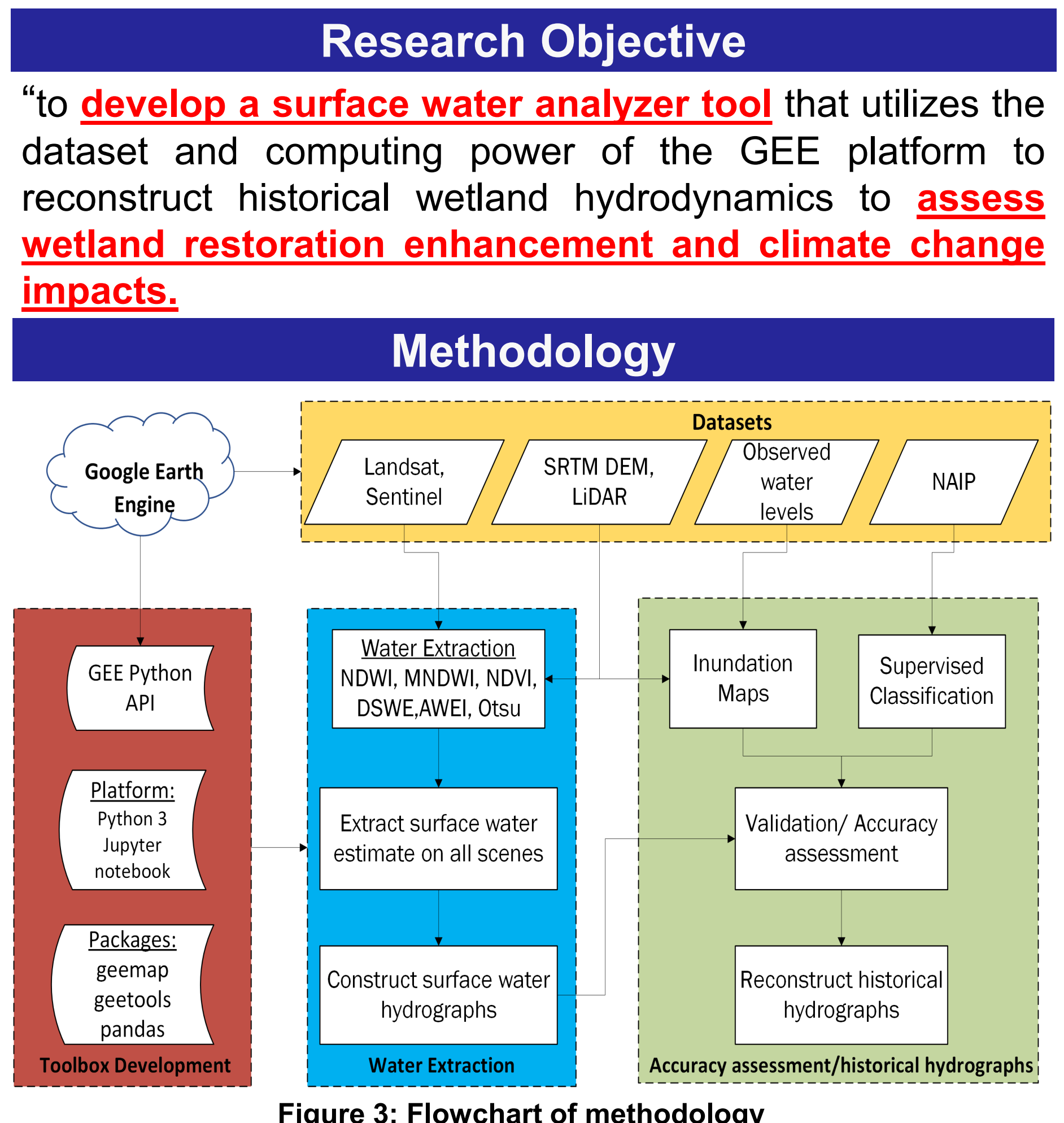


### Summary

Wetlands are vital in the sustainability of ecosystems by performing functions such as cleaning of polluted waters, providing habitat for flora and fauna, assisting with downstream flood peaks, and recharging groundwater aquifers which warrant the need for the protection and restoration of degraded wetlands. The water levels in wetlands are strongly linked to the physiochemical and biological characteristics of wetlands. Therefore water level measurement and prediction are vital for wetland management, restoration, and protection. However, wetland water level monitoring is inadequate due to the low budgets given for wetland research and also researchers measure the water level only during a study period which is not adequate for long-term analysis. Remote sensing techniques provide a viable option to provide data to augment the inadequate data required by wetland managers, researchers, and decision-makers. The Wetland Reserve Program (WRP) by the Natural Resources Conservation Service (NRCS) evaluates the performance of restoration practices implemented on the easements in West Tennessee and Kentucky. **This study aims to provide baseline hydrological parameters such as water depth and hydroperiod before the restoration period which can be used in a comparative analysis to ascertain wetland enhancements utilizing the earth observation dataset and cloud-based computing platform of Google Earth Engine (GEE).**



### Conclusions

1. The Python-GEE surface water toolbox has been developed to automate analysis and extraction of surface water.
2. The tool has been successfully applied to the study to extract time series of surface water dynamics.
3. Different water extraction methods/algorithms has been implemented for user preference.
4. One important aspect is the implementation of the DSWE (efficient in wetland surface water detection) which provides seamless integration of the DSWE dataset without downloading the dataset from USGS and to extend the DSWE model to Non-US locations.

### Future Studies

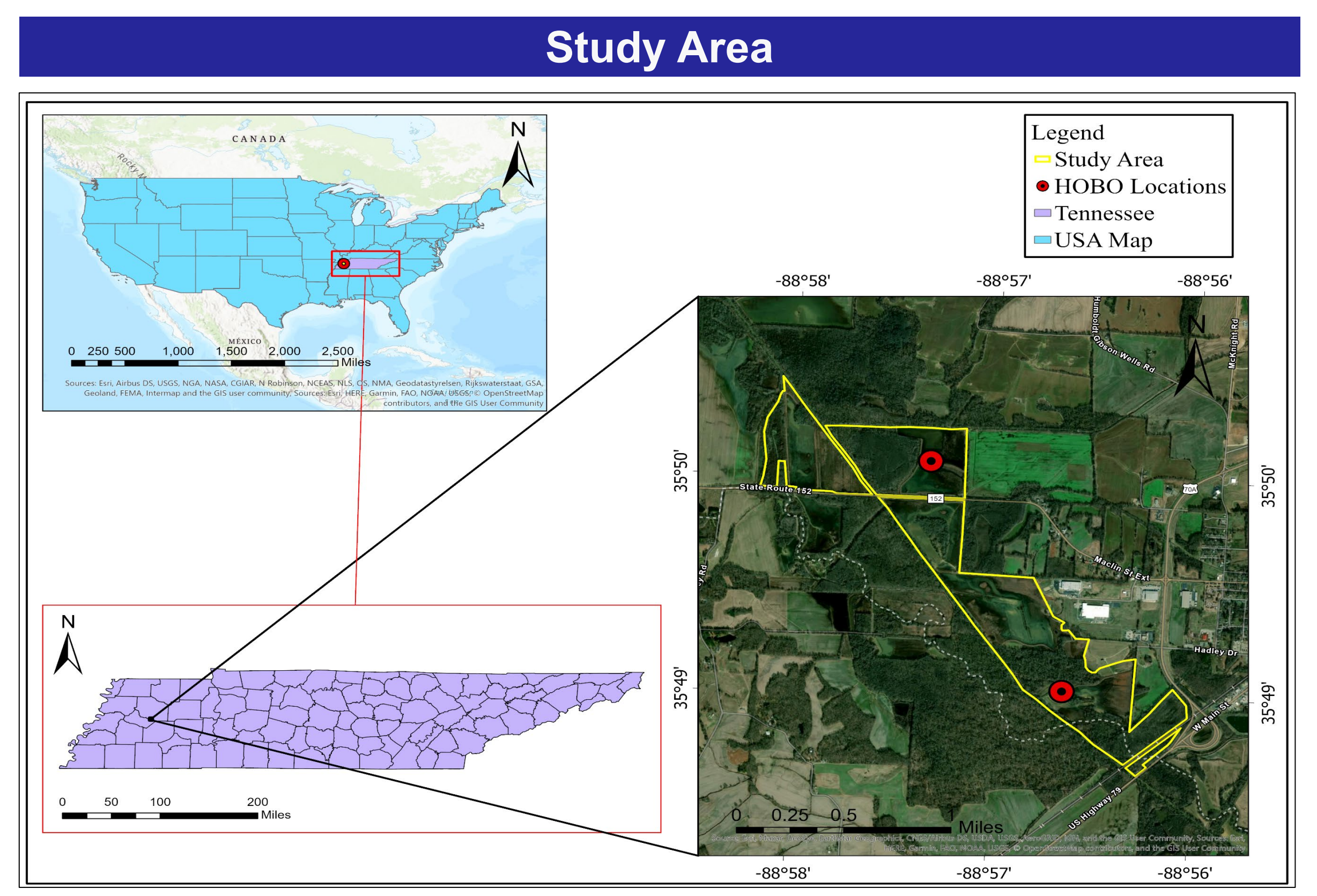
- Accuracy assessment by comparing it with inundation maps from observed water levels and supervised classification of the high-resolution satellite imagery.
- Verification of the DSWE algorithm implemented
- Data gap filling using machine learning and regression models
- Statistically evaluation of observed and estimated hydrographs.
- Application of the tool to all 38 wetlands under the WRP.

### References

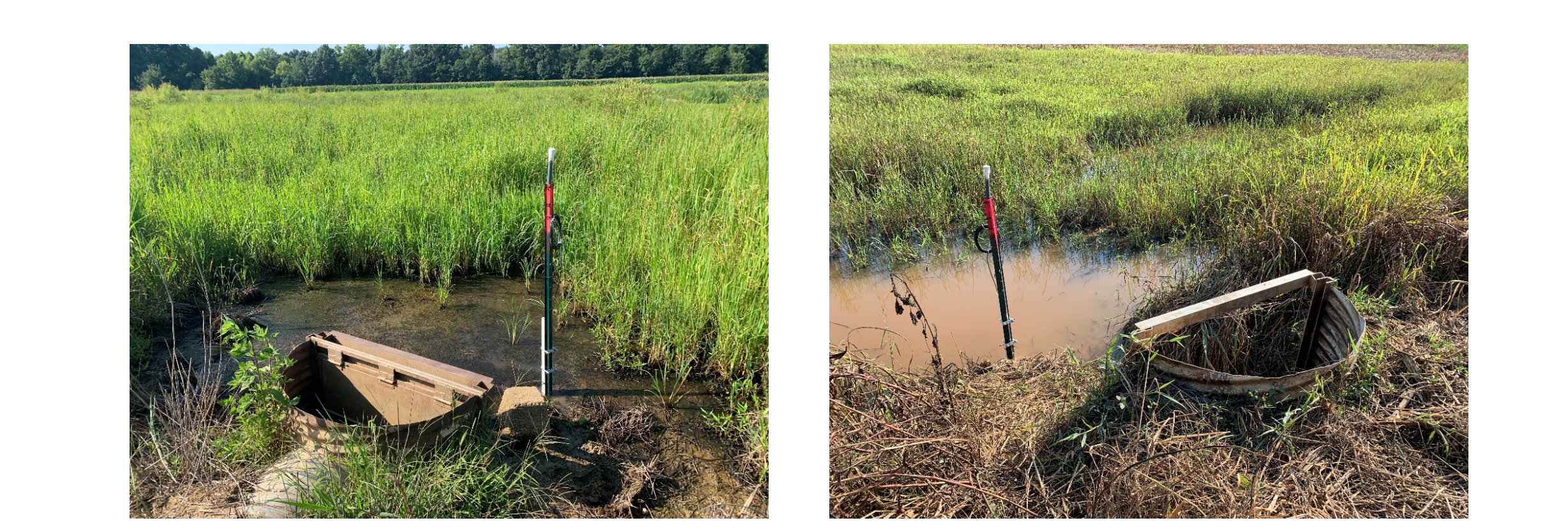
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- One of the wetlands under the Wetland Reserve Program (WRP) by the Natural Resources Conservation Service (NRCS).
- The site is located south of Gibson County, Tennessee (see Figure 1)
- Two HOB0 MX2001 water level loggers have been installed at water control structures to monitor water level (see Figure 2)



### Performance Assessment Metrics:

- Confusion matrices
- Omission and Commission error metrics

$$NSE = 1 - \frac{\sum_{i=1}^n (O_i - P_i)^2}{\sum_{i=1}^n (O_i - \bar{O})^2} \quad RMSE = \sqrt{\sum_{i=1}^n (O_i - P_i)^2}$$

$$R^2 = \left[ \frac{\sum_{i=1}^n (O_i - \bar{O})(P_i - \bar{P})}{\sqrt{\sum_{i=1}^n (O_i - \bar{O})^2} \sqrt{\sum_{i=1}^n (P_i - \bar{P})^2}} \right]^2$$

NSE = Nash-Sutcliffe efficiency; RMSE = Root mean square error  
 R<sup>2</sup> = Coefficient of determination; O<sub>i</sub> = observed data; P<sub>i</sub> = predicted data (Moriassi et al. (2007))

### Results

Figure 4: GUI of the surface water analyzer toolbox