Delaware View 2018 - 2019

Delaware View History and Successes

This is Delaware's first year as a full member to America View. Our work has focused on two main initiatives. The first initiative is research-based to estimate seasonal evapotranspiration (ET, sum of evaporation from the soil and transpiration water loss from plants) using a satellite-based energy balance model. In Delaware, ET may account for approximately two-thirds of the annual average water budget and these estimates are valuable to agricultural planners and water resource managers. The second initiative is centered on enhancing K-12 geography curriculum to meet the Delaware geographic education standards, introduce geospatial techniques, and providing relevant and exciting exercises to students.

Our research-based efforts began with a model called Surface Energy Balance Algorithm for Land (SEBAL) to compute ET, and we have transitioned to the Mapping Evapotranspiration at high Resolution with Internalized Calibration (METRIC) model because of its enhancements (Figure 1, 2), such as the internal calibration of the model using locally available weather data. The other advantage of METRIC are the tools and functions available in R. To date, two graduate students and three undergraduate students have been trained on using the satellite-based tools to estimate ET. Not only is this an area of active and worthwhile research with the extensive expansion of irrigation in Delaware, it has provided these students with geospatial skills training and expertise in remote sensing.

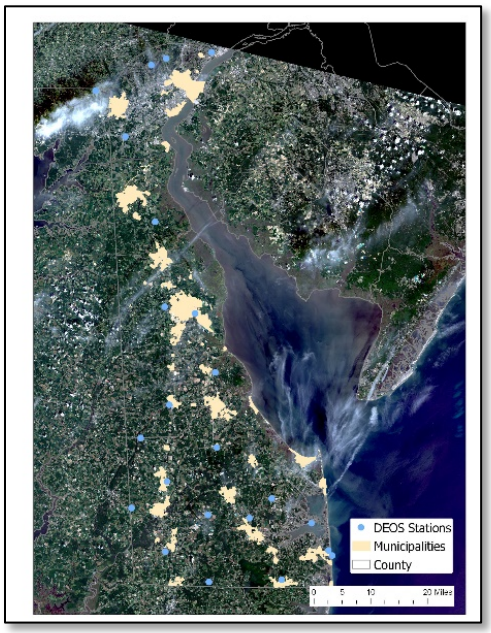

Figure 1. Input data for SEBAL model (Landsat 8 OLI dataset, DEOS weather observations).

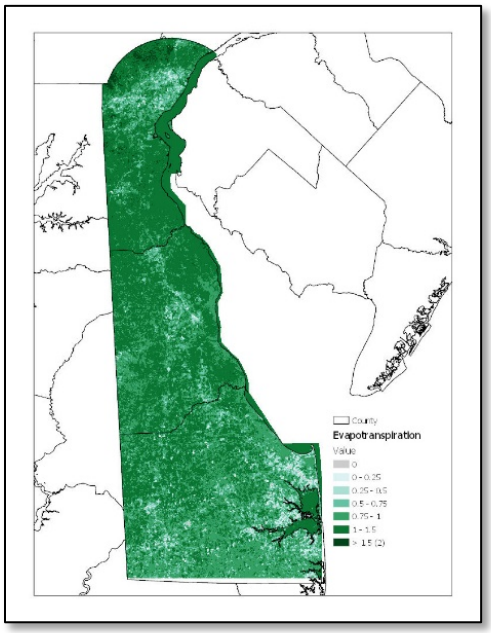

Figure 2. METRIC estimated instantaneous ET on 24 August 2016 2016.

Figure 3. Remote sensing workshop story map.

Delaware View's education and outreach efforts have brought together the University of Delaware and Geography K-12 Education Coordinator to introduce students to remote sensing data and GIS tools for geographic problem solving through teacher workshops (Figure 3) and enhancing the 9th grade *Geography in the Modern World* core curriculum with geospatial data and analysis tools accessible through ESRI ArcGIS Online web applications with accessible data and tools, along with story maps.

DelawareView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state. AmericaView is funded by USGS grant agreement G18AP00077.

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DELAWARE VIEW 2018 - 2019 ACTIVITIES

Delaware View's efforts for this grant period focused on education and outreach. The first task extended its previous year's work to further enhance the geography high school core curriculum by creating ArcGIS Online web mapping applications to support geospatial data and/or analysis tools for four lessons that include:

- *Firefly Music Festival lesson* (Basics of Spatial Analysis Unit, Special Event Planning and Complementarity)
- *What makes a place unique lesson* (Unique Nature of Places Unit, Elements of Place)
- *How has Delaware changed lesson* (Unique Nature of Places Unit, Cities and Culture) (Figure 4)
- *Saving the Everglades lesson* (Environmental Interdependence Unit, Impacts of Ecological Cycle Modification - Florida Everglades)

All four lessons have an associated web mapping applications with necessary geospatial data to support the lesson. For example, *What makes a place unique* lesson contains population density, race, and landuse data layers in a simple, visually easy to understand legend and color scheme to identify the dynamics of the socioeconomic characteristics across Delaware.

Two workshops were offered to introduce remote sensing to the four lessons outlined above. Six teachers attended with four joining virtually. Given the low turnout for the two workshops, we have begun to focus on individual teacher training, and attend workshops and conferences K-12 teachers participate in to allow for one-on-one conservations of their needs.

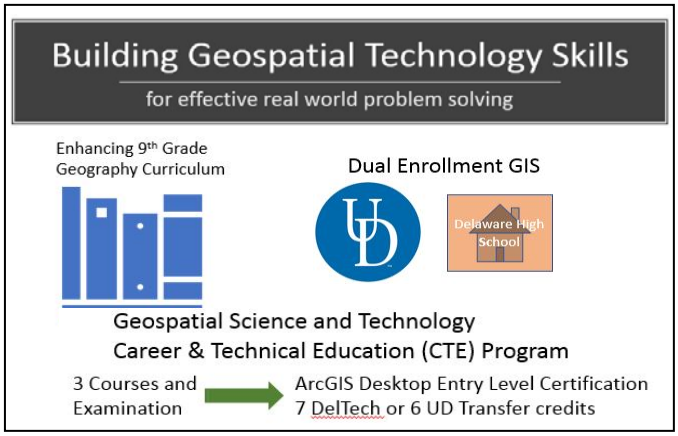

Figure 5. Delaware View Education and Outreach activities

Figure 4. 2012 (top) and 2017 (bottom image) aerial photography of Middletown Delaware provides excellent example for change analysis with fast paced development in last 10 years.

Our second task for this grant period concentrated on creating a broader, more coordinated instructional program in geospatial technologies that would allow high school students to gain technical expertise in GIS and spatial analysis (Figure 5) beyond the high school curriculum. Delaware View, Geography K-12 Program Coordinator, and Delaware Technical Community College (DelTech) submitted an application to develop a GIS Career and Technical Education (CTE) Pathway with the support and guidance from Delaware Department of Education (DeDOE) in August 2018. DeDOE raised the application to state level and submitted it again in 2019. Delaware View and K-12 Coordinator were also successful in exploring opportunities with a local high school. We are set to offer a Geospatial Activity Block starting this fall to expose high school students to geospatial technologies. These efforts meet USGS Objective 3 and 4 providing education training.

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