



# WEST VIRGINIAVIEW 2021 - 2022

**AmericaView**<sup>SM</sup>  
Empowering Earth Observation Education  
[americaview.org](http://americaview.org)

## WEST VIRGINIAVIEW 2021 - 2022 ACTIVITIES

Our **first HIA** this year focused on continuing to develop **free, online course materials** relating to remote sensing, GIS, and geospatial data science. Key activities this year include:

- Updating our website and hosted courses including *Methods in Open Science*, *GIScience*, *Open-Source GIScience*, *Digital Cartography*, *Client-Side Web GIS*, *Remote Sensing*, *Open-Source Spatial Analytics (R)*, and *Geospatial Deep Learning*
- Adding new modules to our *Open-Source Spatial Analytics (R)* course relating to tidymodels, shiny apps, and raster analysis with terra.
- Adding a new course relating to open data science using Python.
- Adding new lab exercises to our *GIScience* course.

Our **second HIA** focused on working with KentuckyView and OhioView as part of the **ORIGIN project**, which is associated with water quality predictive modeling.



New course webpage.



R packages that are covered in our course content.

```
class Course:
    def __init__(self, subject, number, name):
        self.subject = subject
        self.number = number
        self.name = name
    def printCourse(self):
        print("course is " + self.subject + " " + str(self.number) + ": " + self.name)

x = Course("Geography", 550, "GIScience")
x.printCourse()
type(x)

x.number = 350
x.printCourse()
```

Python code example.

```
names(pre) <- c("Blue", "Green", "Red", "NIR", "SWIR1", "SWIR2")
names(post) <- c("Blue", "Green", "Red", "NIR", "SWIR1", "SWIR2")

pre_nbr <- (pre$NIR - pre$SWIR2)/((pre$NIR + pre$SWIR2)+.0001)

post_nbr <- (post$NIR - post$SWIR2)/((post$NIR + post$SWIR2)+.0001)

dnbr <- pre_nbr - post_nbr

tm_shape(dnbr)+
tm_raster(style= "equal", n=7, palette=get_brewer_pal("YlOrRd", n = 7, plot=FALSE))+
tm_layout(legend.outside = TRUE)
```

R code using terra package to calculate difference normalized burn ratio.

West VirginiaView 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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## BENEFITS TO WEST VIRGINIA

- Provide educational materials for students and geospatial professionals
- Foster remote sensing education, outreach, and research in the state
- Provide access to LiDAR data via a web app
- Fund software purchases
- Provide summer funding for graduate students



Article

### Forest Type Differentiation Using GLAD Phenology Metrics, Land Surface Parameters, and Machine Learning

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**Abstract:** This study investigates the mapping of forest community types for the entire state of West Virginia, United States, using Global Land Analysis and Discovery (GLAD) Phenology Metrics, Analysis Ready Data (ARD) derived from Landsat time series data, and digital terrain variables derived from a digital terrain model (DTM). Both classifications and probabilistic predictions were made using random forest (RF) machine learning (ML) and training data derived from ground plots provided by the West Virginia Natural Heritage Program (WVNH). The primary goal of this study was to explore the use of globally consistent ARD for operational forest type mapping over a large spatial extent. Mean overall accuracy calculated from 50 model replicates for differentiating seven forest community types using only variables selected from the 180 GLAD Phenology Metrics used in the study resulted in an overall accuracy (OA) of 54.3% (map-level image classification efficiency (MICE) = 0.433). Accuracy increased to a mean OA of 64.8% (MICE = 0.496) when the Oak/Hickory and Oak/Pine classes were combined into an Oak Dominant class. Once selected terrain variables were added to the model, the mean OA for differentiating the seven forest types increased to 65.2% (MICE = 0.570), while the accuracy for differentiating six classes increased to 76.2% (MICE = 0.660). Our results highlight the benefits of combining spectral data and terrain variables and also the enhancement of the product's usefulness when probabilistic predictions are provided alongside a hard classification. The GLAD Phenology Metrics did not provide an accuracy comparable to those obtained using harmonic regression coefficients; however, they generally outperformed models trained using only summer or fall seasonal medians and performed comparably to those trained using spring medians. We suggest further exploration of the GLAD Phenology Metrics as input for other spatial predictive mapping and modeling tasks.



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**Keywords:** forest type mapping; forests; phenology; machine learning; digital terrain analysis; Landsat

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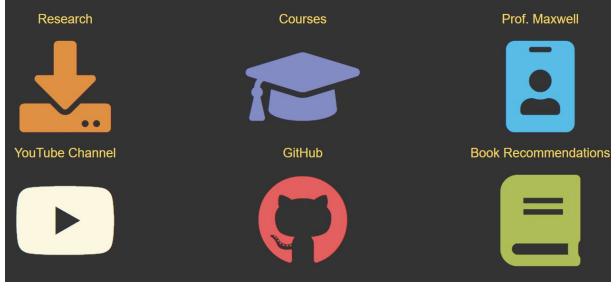


#### About WV View

West Virginia View is a consortium of public, private, and non-profit remote sensing organizations. We are a member of AmericaView. Aaron Maxwell, Assistant Professor in the Department of Geology and Geography at West Virginia University, serves as the principle investigator.

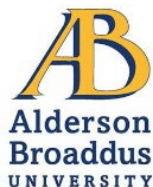
The West Virginia View consortium has the following objectives:

- Support remote sensing education, research, and outreach in West Virginia.
- Share remote sensing data and resources.
- Support students pursuing remote sensing or geospatial research.
- Develop free and open courses and training materials associated with a wide range of geospatial topics and technologies.
- Share research results and associated publications, data, and code.
- Help develop the geospatial workforce in the state of West Virginia and beyond.
- Contribute to reaching the goals and objectives of AmericaView.



West VirginiaView webpage.

## WEST VIRGINIAVIEW CONSORTIUM MEMBERSHIP



Federal consortium members identified above do not receive funding from AmericaView.

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