AlabamaView 2019 - 2020

AlabamaView 2019 - 2020 Activities

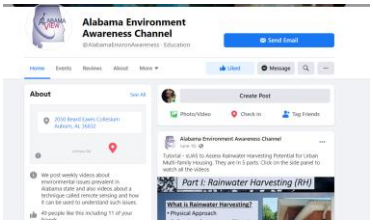
Mother Earth as Art Symposium at the Jule Collins Smith Museum of Fine Arts

In the weeks leading up to the 50th anniversary of Earth Day, the Department of Geosciences, in collaboration with the Jules Collins Smith Museum (JCSM) of Fine Art, hosted the "Mother Earth as Art" exhibition. The exhibit featured real satellite images of Earth taken from USGS and NASA. These images were then color enhanced and framed as pieces of artwork and displayed in the museum gallery. Co-I Mitra, three graduate students, and two undergraduate students worked on this project. The exhibit was geared toward raising awareness about the beauty of our planet and human induced landcover changes and climate change effects. The gallery was made up of three sub-sections of images: Our Beautiful Earth, Human Footprint on our Beautiful Earth, and Future of our Beautiful Earth. The Mother Earth as Art exhibition was originally intended to be viewed in person at the JCSM of Fine Art, however due to the ongoing threat of COVID-19 was moved online. Here is the link to the online display of art: http://jcsm.auburn.edu/exhibitions/mother-earth-as-art/. A video was created to show the opening of the display and the process involved: https://www.youtube.com/watch?v=gDQYSKuqNzw&ab_channel=AlabamaEnvironmentAwarenessChannel. Board Chair and original "Earth as Art" online curator, Brent Yantis, MLA, University of Louisiana at Lafayette was invited and gave a talk to the visitors explaining the importance and usage of using art with science especially in the field of remote sensing.

Mother Earth as Art exhibition on Earth Day 2020.

Facebook page creation and promotion

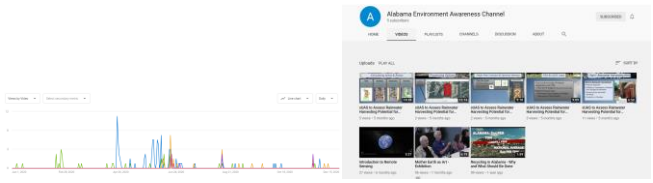
A facebook page was created to promote the work, activities, and videos created for Alabamaview. All the videos are promoted through this page: https://www.facebook.com/AlabamaEnvironAwareness/?view_public_for=100846665005207 to reach out to many. The page is also shared with Alabama citizens so they know about Alabama environment and how remote sensing can be used to assess and evaluate various aspects of Alabama's environment.



Facebook page

Youtube videos

In the last year, we have worked on four videos – Landfills in Alabama, Remote sensing indices, Solar power potential in Alabama, and Mother Earth as Art exhibition. Among these four two are published, one is at the last stages of completion and the last needs to add animations. Three graduate students and two undergraduate students have worked on these videos. Below is the figure showing the reach and views of our youtube channel.



Youtube Channel reach and view – stats

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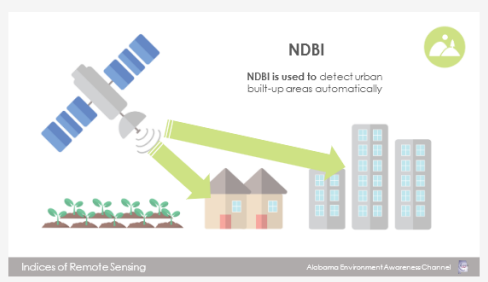
Benefits to Alabama

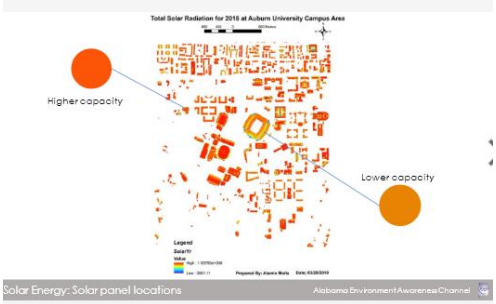
The videos are created to raise awareness among Alabama citizens about the environment and how RS can be used to access, evaluate, and communicate such information. Research using Auburn library resources, google scholar and google search were conducted to find topics and relevant information. Scripts were created and needed RS analysis were conducted. Required logos and graphs were created using Adobe illustrator and PowerPoint. After the audio was recorded for the script, the video was stitched together using Premiere Pro.

RS Indices videos provides an overview of different types of available measures which help in determining the health of vegetation, the growth of a city, the conversion of wetland to forest land etc. These indices can be used by Alabama resource managers to understand the growth and type of vegetations, analyze the growth of the city and predict future expansion, understand the available wetlands, and water resources and plan proper management practices for sustainable future.

Alabama has a huge potential for solar power generation, but Alabama's available policies and programs are not favorable to utilize this potentiality of solar power. This video created – Solar power potential in Alabama - can help the Alabama resource managers to understand and then use it to promote solar power generation to the citizens and the policy makers.



RS indices youtube clip



Solar power potential youtube clip

AlabamaView Consortium Membership

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

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AlaskaView 2019 - 2020

AlaskaView 2019 - 2020 Activities

AlaskaView developed an open access online introductory course on **Remote Sensing of Wildfires (RSW)** geared toward high school and college freshmen students. The course was launched on **edX.org** (a global nonprofit online education and learning platform) on September 28, 2020. Course About Page.

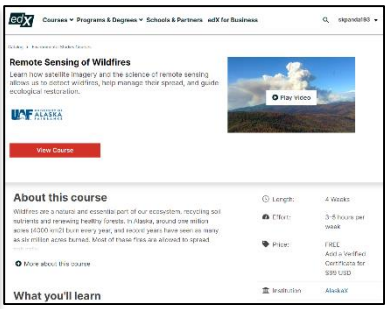
Goal: Introduce remote sensing science and applications to high school and college freshmen students through wildfire application—a problem that is worsening with climate warming and best addressed using remote sensing.

RSW: Four modules (consisting of video lectures, illustrations, interactive exercises, and quizzes)

1. An overview of wildfires in Alaska
2. An introduction to remote sensing of Earth
3. Remote sensing applications on wildfires
4. Remote sensing resources

Map showing RSW learners.

RWS course instructors surveying wildfire burn severity and shooting footage for the course.



RSW course about page

This activity meets the objective 4 of the USGS/NLI "*developing online educational materials that are immediately actionable by teachers or students with a minimal implementation curve*".

Student support: Two graduate students received summer salary support and contributed to the course development as co-instructors. Also, we offered four AV fellowships (2x$1000; 2x$500) to support and promote geospatial research at University of Alaska Fairbanks. Below are the student project titles:

- Mapping coastal change and community-based observations in western Alaska
- Estimation of turbidity using remotely sensed images for evaluation of fish behavior following forest fire
- Remote sensing the post-glacial high-water mark in southeast Alaska
- Prehistoric archeological site prediction in Alaska's Mt Hayes and Gulkana area

AlaskaView Consortium Membership

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BENEFITS TO ALASKAVIEW

As a result of activities and support of AmericaView the State of Alaska have benefited as follows:

Enrollment in RSW: The RWS online course has been benefitting Alaskans and global students alike. The RSW learners include Alaskan K-12 students, university students, state and tribal agencies workforce.

Total enrollment 963 (as of 12/18/2020) from 87 countries. Female: 37.5%; Male: 62.3%.

Learners age statistics: 30% are below 25; 54% are between 26 and 40; 16% are over 41.

Learners education level: 12.5% high school diploma or less; 42.5% college degree; 43.5% advanced degree.

In 2019, the participants of ***Alaska Summer Research Academy*** (**ASRA**) [middle school] and ***Upward Bound College Bound*** (**UBCB**) [high school] program benefitted from two remote sensing application workshops focused on wildfires and coastal erosion. Along with introduction to remote sensing students also received hands on training on QGIS, Google My Maps, and GEE operations.

We offered four fellowships to support and promote geospatial research at University of Alaska Fairbanks.

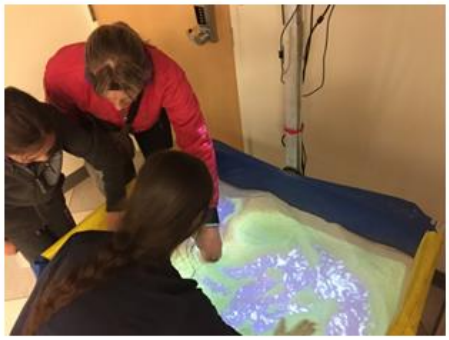
Public Outreach: AKView participated in the 2019 Annual Science Potpourri event organized by University of Alaska Fairbanks' College of Natural Science and Mathematics. Exhibit included: Augmented Reality Sandbox, 3D printers, Landsat board games, NASA posters, USGS Landsat Science booklets.

Consortium Development: Collaborated with UAF eCamups, edX.org, NSF Alaska EPSCoR program, and U.S. Fish and Wildlife Service.

Middle-school student participants of 2019 Alaska Summer Research Academy working on a forest fire burn scar and burn severity mapping from pre- and post-fire Landsat images.

High-school student participants of 2019 Upward Bound College Bound program working on a lab on coastline erosion along Alaska's northern coastline.

Below pictures were taken during 2019 Science Potpourri event held at University of Alaska Fairbanks campus on 13th April 2019.



These activities meet the objectives 2 and 4 of NLRSEORA 2018 grant: "establishing strategic partnerships to develop and deploy remote sensing applications through collaborations involving university research teams and K-12 schools" and "developing materials for an educational and training workshop".

AlaskaView Principal Investigator:

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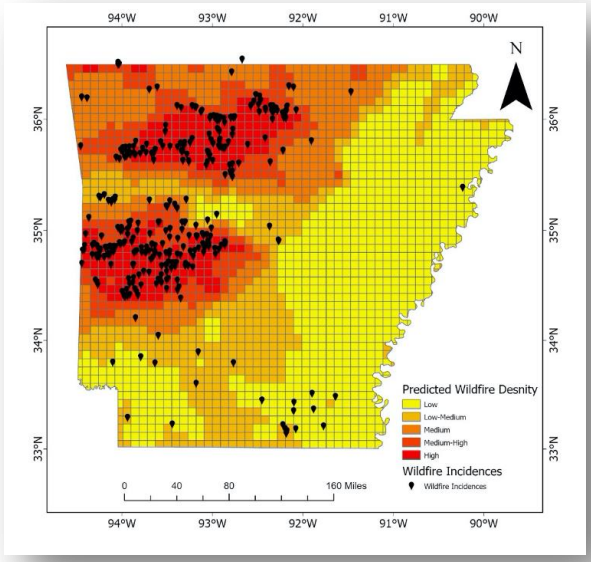
ARKANSASVIEW 2019 - 2020

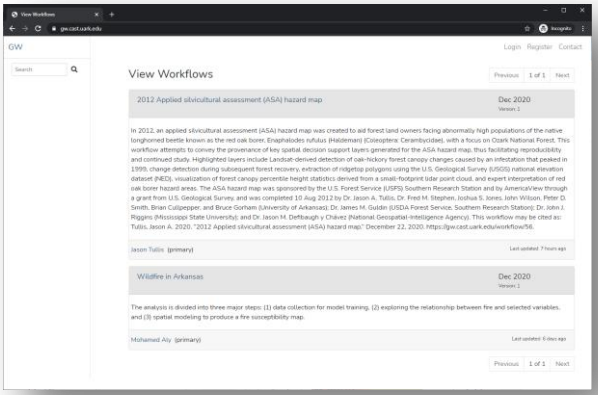
ARKANSASVIEW 2019 - 2020 ACTIVITIES

In 2019-2020, ArkansasView sponsored two graduate student interns, published a geoprocessing and workflows (GW or "Gigawatt") tool, and organized a national AmericaView GitLab group with an introductory primer for new users. The "keep it simple" approach of GW allows registered users to capture streamlined workflow titles, descriptions, steps, and sources. Users can now explore, query, and reproduce the first two remote sensing workflows or "recipes" published by ArkansasView using widely available data and geoprocessing tools. The *2012 Applied Silvicultural Assessment (ASA) Hazard Map* (Dr. Jason Tullis) demonstrates the detailed reconstruction of historical forest entomology maps supported by the U.S. Forest Service and AmericaView, and *Wildfire in Arkansas* (Dr. Mohamed Aly) provides a new wildfire susceptibility map for our state. The idea of an AmericaView GitLab has been shared with UtahView, OregonView, and IowaView, with detailed demonstrations underway. While related to the simpler GW tool, the GitLab initiative can itself has generated national interest and can become a valuable independent resource for our consortium.



This wildfire susceptibility map of Arkansas, developed from random forest regression, represents the first of two first workflows published through the new GW tool and via https://www.arkansasview.org.

A workshop on how to get started with the AmericaView GitLab group was held with UtahView on 21 Oct 2020, and a national version of the presentation materials can be found at https://www.arkansasview.org together with a prominent link to this GitLab group. Ongoing demonstrations have been planned for early 2021.



The streamlined geoprocessing and workflows (GW or "Gigawatt") tool launched by ArkansasView in Dec 2020. Anyone can access the detailed steps for published workflows, and registered users can publish new workflows.

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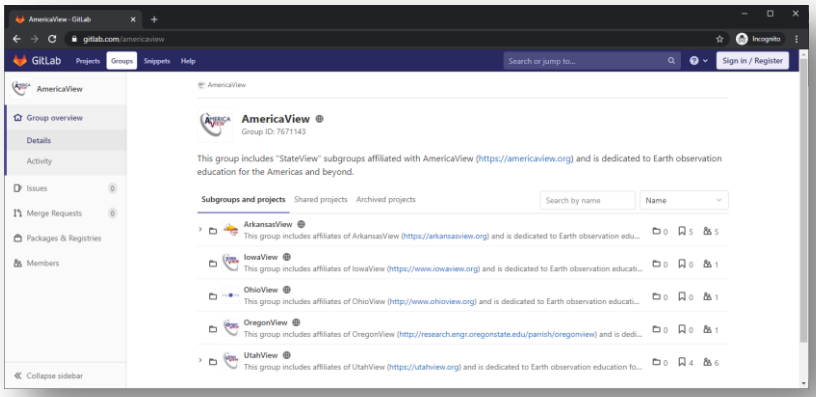
Benefits to Arkansas

- Development of the streamlined geoprocessing and workflows (GW or "Gigawatt") tool was conducted by the Center for Advanced Spatial Technologies (CAST) and involved database and overall concept design (Dr. Jason Tullis), web development (Dr. Chris Angel and Hayley Hames), information technology (IT) guidance (John Wilson), and testing (Vance Green). The web development was conducted using GitLab and the data is stored in MySQL. The tool can be continually augmented as registered users join, new workflows are added, and geospatial reproducibility and replicability (R&R) lessons are learned.
- ArkansasView intern Abdullah Al Saim contributed to the wildfire susceptibility workflow, led by Dr. Mohamed Aly. The dynamic of wildfire in Arkansas is very complex, thus the obtained results from the wildfire study can be useful for fire prevention and preparedness to reduce the economic loss and to save lives in the state. Results show that the Ouachita National Forest and the Ozark Forest are the most susceptible areas to wildfires in Arkansas.
- ArkansasView intern Mahud Afroz contributed to the reconstructed 2012 applied silvicultural assessment (ASA) workflow, led by Dr. Jason Tullis. This effort underscores the value of historical investments in remote sensing, and provides a demonstration of one way to curate that work so that future efforts (e.g., those related to ongoing forest entomology in the Ozark National Forest and beyond) need not start from scratch.
- ArkansasView staff and graduate student interns received training related to the AmericaView GitLab group for source control interchange, and a quick primer is now available for a national audience. This effort places Arkansas as a pioneering leader in R&R related to remote sensing workflows, and provides public demonstrations of how to benefit from source control. Git repositories by their nature can be migrated between platforms and so there is no requirement for long-term commitment to GitLab. The draft site includes five 'StateView' subgroups affiliated with AmericaView and is dedicated to Earth observation education for the Americas and beyond.



AmericaView GitLab group, currently featuring five StateView subgroups: ArkansasView, IowaView, OhioView, OregonView, and UtahView. Some of these are still under development in preparation for future StateView-specific workshops. This GitLab site is not intended to only include content funded by AmericaView but rather content shared by individual AmericaView participants interested in interchanging both public and private source control (code, project files, etc. that can benefit from high quality version control).

ArkansasView Consortium Membership

CAST Center for Advanced Spatial Technologies
COMMUNITIES . . . Unlimited
ARKANSAS GIS OFFICE
U of A DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System
UNIVERSITY OF ARKANSAS J. WILLIAM FULBRIGHT COLLEGE OF ARTS & SCIENCES

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ArkansasView

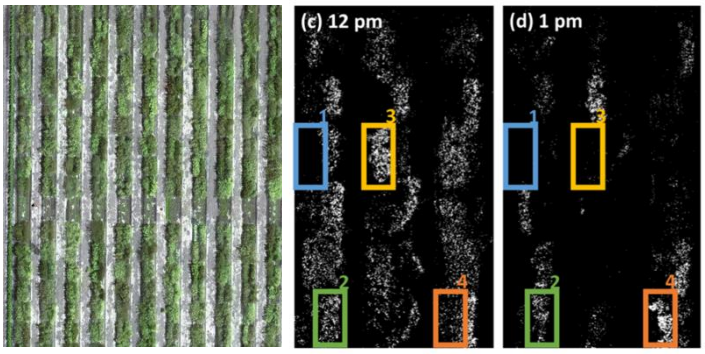
Center for Advanced Spatial Technologies (CAST)
J. William Fulbright College of Arts and Sciences
University of Arkansas, Fayetteville, AR 72701
https://arkansasview.org

CALIFORNIAVIEW 2019 - 2020

CALIFORNIAVIEW 2019-2020 ACTIVITIES

CaliforniaView's vision is to promote and advance remote sensing education within the state of California utilizing predominantly USGS Landsat data sets to solve societal problems. It has become the state's go-to remote sensing educational resource since 2012. In GY 2019, CaliforniaView has made great efforts to train and promote the applications of UAV technology in precision agriculture, in addition to the continuation of advancing remote sensing education across multiple disciplines.

Graduate student research project on high throughput phenotyping with multispectral drone imaging. CaliforniaView supported a Geography PhD student to work with a Plant Biology student on using drone to capture the lettuce flowering dynamics. Together they designed and implemented the aerial imaging mission with a DJI-MicaSense drone system. An automatic workflow was developed to map flowers. This study demonstrated the efficacy of using drones to detect temporal differences in daily floral opening events.

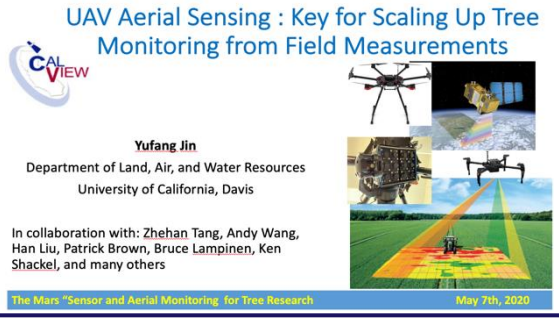


UAV imagery (RGB) and identified floral pixels at different time of the day (e.g., 12pm and 1pm) showing the variation in flower opening time for various lettuce varieties.

Interns learning how to operate the drone for aerial imaging.

Student training on UAV/drone remote sensing technology. CaliforniaView has paired five interns with graduate students in UAV-based research projects. Two Engineering student interns worked on the integration of a high precision RTK GPS unit with a thermal sensor. Three senior students gained hands-on experience on Pix4D drone image processing and visual interpretation for building training dataset. A drone lab was added to the curriculum of a remote sensing course for flight planning and image processing, and a summary lecture on UAV applications in precision agriculture was given to a graduate level course.

UAV/drone technology demonstration. CaliforniaView demonstrated drone technology for agricultural applications via the DroneCamp by partnering with UC Division of Agriculture & Natural Resources, and presented the UAV related research to the Mars Sensor and Aerial Monitoring Team and much broader audience in the NRCS Technology Showcase in Sacramento. We also supported campus-wide drone user groups, UCD Drone Club, and MapTime.



PI Jin gave a talk on UAV applications for tree crop monitoring to the international team of the MARS Corporation in May 2020 (right).

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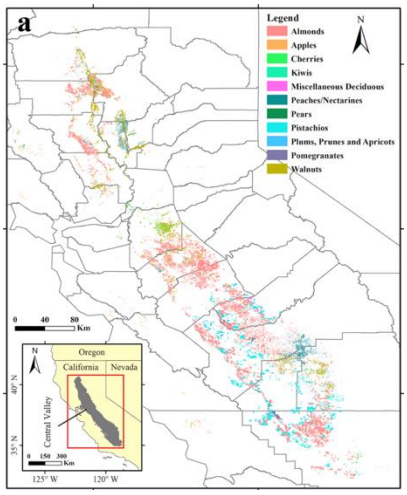
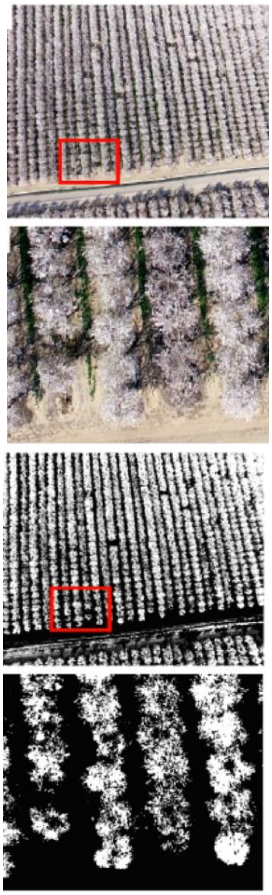
Benefits to California

California is the most diverse and productive agricultural state. There is an urgent need to minimize the inputs of water and fertilizer while maximizing the yield. CaliforniaView's activities contributed to facilitate on-farm adaptive irrigation and fertilization management strategies and inform regional scale water planning by

- Providing guidance to the specialty crop industry, such as the almond board, and large growers in California on the UAV technology for precision agriculture.
- Training students to make sure the next generation workforce is well equipped with remote sensing foundations and tools for sustainable agriculture resource management.
- Relaying the power of multi-scale remote sensing framework and workflow for upscaling drone-based sensing with high resolution satellite imagery, to support better-informed decision making across scales.
- Educating a broader audience, including the general public and state agencies, about the benefits and directions of remote sensing applications.
- Building the bridge between private companies in agriculture technology, agronomists, and growers, to help service providers meet the needs of end users.





Demonstration of bloom monitoring for early season almond yield prediction to improve N management.

CaliforniaView Consortium Membership

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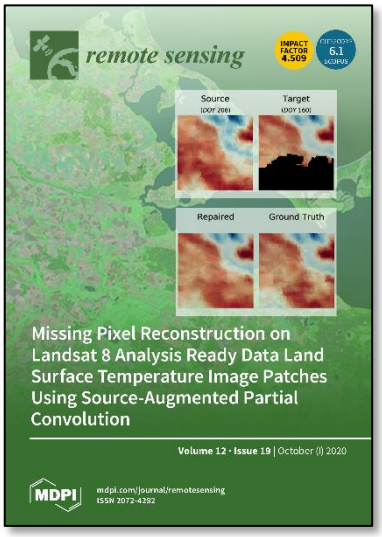
COLORADOVIEW 2019 - 2020

COLORADOVIEW 2019 - 2020 ACTIVITIES

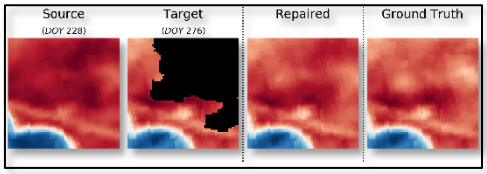
Satellite images may contain missing pixels due to poor atmospheric conditions like thick cloud cover or satellite sensor malfunctioning like the Landsat 7 scan line corrector (SLC) failure. This affects the image analysis and applications. An area of active remote sensing research is attempting to develop algorithms and models in order to reconstruct missing pixels in satellite images using another collocated complete imagery.

One of ColoradoView GY19 HIAs is to develop a deep learning algorithm for solving the issue. Unlike traditional methods, the deep learning approach is data driven, which learns the "rules" of missing pixel reconstruction from millions of training samples and requires no prior human knowledge of these "rules." Using Landsat 8 Analysis Ready Data (ARD) Land Surface Temperature product as an example, we generated the training samples, each comprises a (corrupted) target image and a collocated (complete) source image. With the improved partial convolution framework accommodating the source images, the trained model outperforms the baseline models by 7-59% in terms of nine validation metrics.

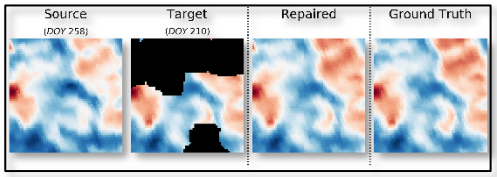
ColoradoView scientists and a student intern contributed to the work. The work is published in the *Remote Sensing* journal and selected to appear on the cover of the October (I) 2020 issue (https://www.mdpi.com/2072-4292/12/19).



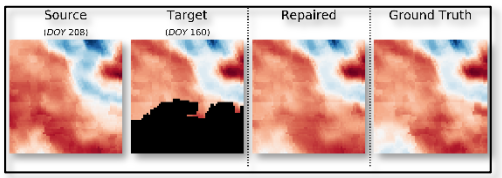
Remote Sensing selects the missing pixel reconstruction paper as the cover story for the October (I) 2020 issue.



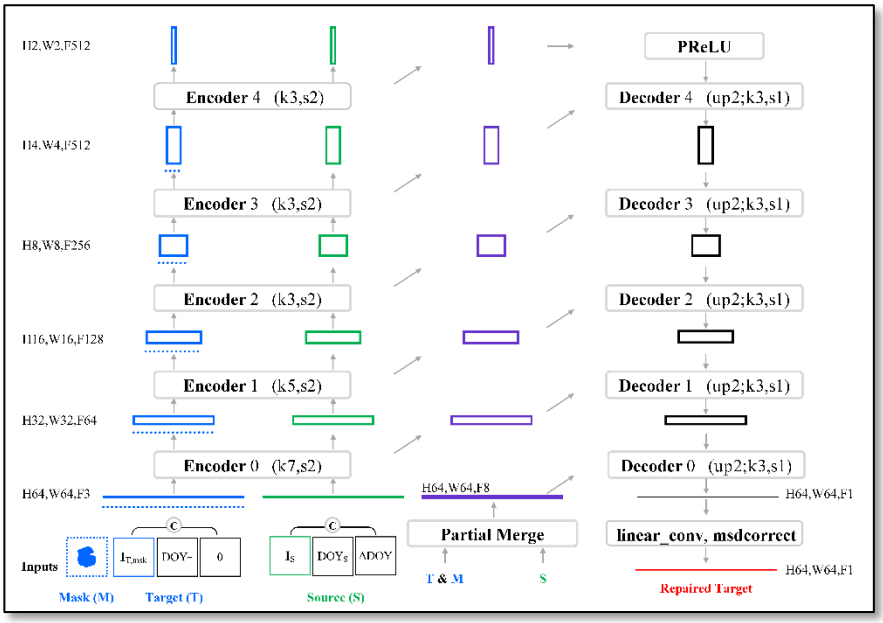
Missing pixel reconstruction result (Case 1)



Missing pixel reconstruction result (Case 2)



Missing pixel reconstruction result (Case 3)



The overall architecture of the proposed Source Augmented Partial Convolution v2 (SAPC2) model for missing pixel reconstruction.

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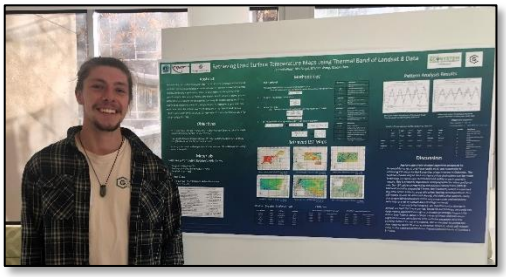
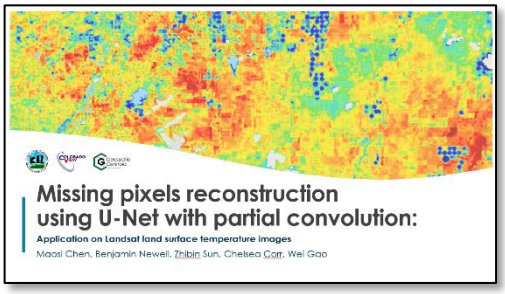
rodney.yantis@louisiana.edu

BENEFITS TO COLORADO

- Provided student interns the opportunity to engage in actual research projects, through which they learned
  - the retrieval and analysis of Remote Sensing variables using Google Earth Engine scripts;
  - state-of-the-art machine learning, especially deep learning techniques; and
  - how to write summary reports and present findings for scientific investigations.
- Developed the deep learning algorithm to fill gaps of Remote Sensing images with the help of another collocated complete image. This work could be used to recover the cloud block regions in remote sensing images for Colorado or any place on Earth.
- Promoted Remote Sensing research through poster and oral presentations at Colorado State University and international conferences.



Nick Vogel, a former ColoradoView student intern, presented the LST retrieval and pattern analysis work on GIS day (November 13, 2019) in Morgan library, Colorado State University, Fort Collins.



Benjamin Newell, a former ColoradoView student intern, presented the missing pixel reconstruction work at the AmericaView monthly meeting in July 2020.

COLORADOVIEW CONSORTIUM MEMBERSHIP

Colorado State University

USDA

Google Earth Engine

Geospatial Centroid
gis.colostate.edu

NREL

USDA UV-B Monitoring and Research Program

Department of ECOSYSTEM SCIENCE & SUSTAINABILITY
Colorado State University

Google Cloud Platform

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COLORADO VIEW

https://www.coloradoview.org/

CONNECTICUTVIEW 2019 - 2020

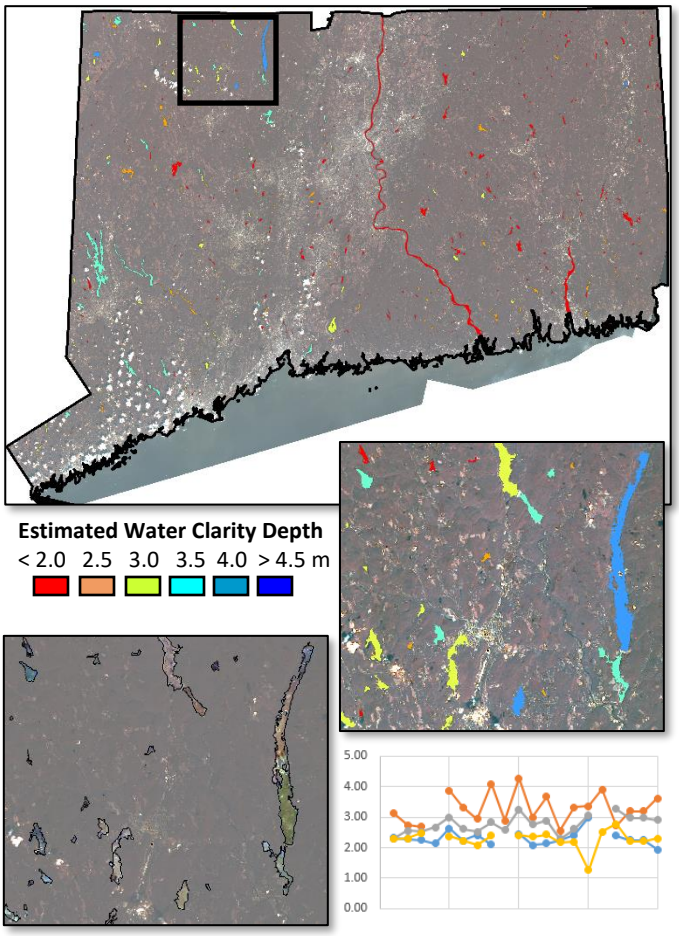
CONNECTICUTVIEW 2019 - 2020 ACTIVITIES

The goals of ConnecticutView are to further the awareness and promote the use of remote sensing technology, from space borne sensors to ground based systems, within the state of Connecticut. To meet these goals, ConnecticutView engages in various activities targeted at the education of K - 12 students, undergraduate students, and the general public. In addition, remote sensing technology is used to develop data and information that address specific issues within Connecticut.

Water Clarity Estimation: This past year, ConnecticutView has focused on the development of multi-temporal (2015 – 2019) water clarity estimates based on Landsat satellite imagery reflectance characteristics of surface waters in the state. Water clarity is a measure of how far light can penetrate through the water column of a body of water, and is indicative of poor water *quality*. The causes of poor water quality are numerous, but generally related to high population density and associated development and other anthropogenic activities adjacent to water bodies.

Connecticut is a water rich state with over 5,000 lakes, ponds and reservoirs with surface areas over five acres in size. Although Connecticut governmental agencies, non-profit organizations, and citizens monitoring groups regularly measure water clarity on select lakes, most lakes and ponds remain unmonitored resulting in the inability of these agencies and groups to identify potential problems and act on them. Analysis of satellite imagery provides the ability to systematically estimate water clarity of all sizable surface water bodies throughout the state to provide a means to track changes in water quality over time and identify potential problems that can become the focus of remediation efforts. Results of the multi-date analysis will be shared via an ESRI Story Map Journal accessible through the ConnecticutView website.

4H STEM Day UAV Demonstration: ConnecticutView shared UAV technology with a group of middle school students during the annual 4H STEM Day held at the University of Connecticut.



Example of water clarity estimate for Connecticut from September 2019. This image is part of a multi-temporal dataset of water clarity estimates for the state analyzing surface waters for the summer months of June – September over the years 2015-2019. These data will allow for the monitoring of changes in water clarity and highlight lakes and ponds that might require further investigation.

Demonstrating UAV technology at 4H STEM Day.

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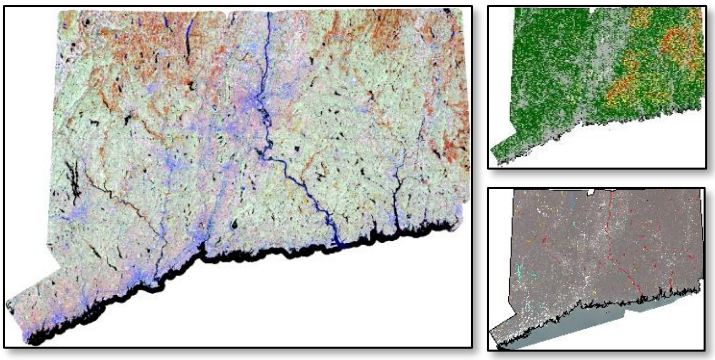
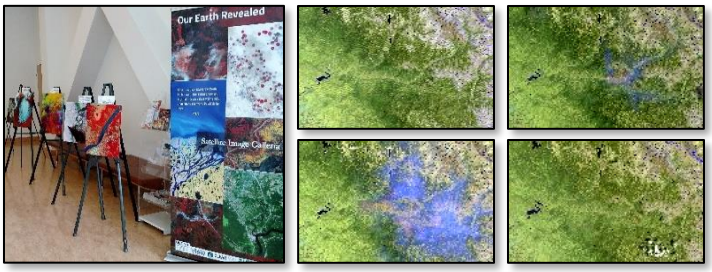
Benefits to Connecticut

While small in area, Connecticut is a diverse state. Connecticut has an abundance of forest, numerous water bodies, and the state borders the Long Island Sound, an ecologically important estuary into which a majority of Connecticut watersheds drain. Connecticut also has a high population density with its associated urban and suburban development, road networks, and golf courses. As such, remote sensing technology can serve as a valuable tool to assist in the monitoring and management of the diverse Connecticut landscape and help educate the citizens on the impacts of human activities on the earth, both locally and globally. Imagery can also serve to highlight the beauty of the planet on which we live.

- Provide remote sensing based informational and data products that address issues specific to Connecticut to improve monitoring and management of the landscape.
- Expose K-12 students to remote sensing technology and provide educational outreach programs and materials.
- Provide quality imagery through "Our Earth Revealed" satellite image exhibit to expose the public to local and global landscapes.



Landsat 8 OLI image of Connecticut captured in April 2014 (left), and derived data products showing gypsy moth defoliation from 2017 (top right), and water clarity estimates from September 2019 (lower right).



Our Earth Revealed satellite image exhibit displayed during Connecticut GIS Day, November 2019 (top). New imagery that highlights CA 2015 wildfires (top right four images), and Long Island Sound (right).

ConnecticutView Consortium Membership

ConnecticutView collaborates with various partners on a per-project basis. Current partners include:

UCONN Natural Resources and the Environment

CLEAR Center for Land Use Education & Research

UCONN University Libraries Hartford

Yale

CTIWR Institute of Water Resources

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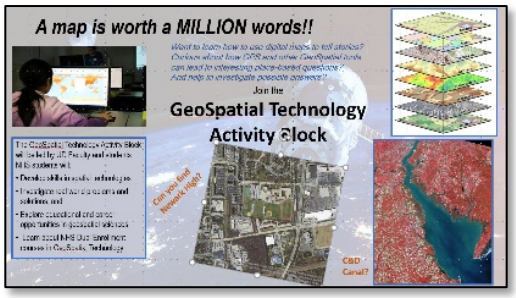
Delaware View 2019 - 2020

Delaware View 2019 - 2020 Activities

Activity One. Geospatial Activity Block

Tracy DeLiberty (Delaware View Lead Delegate) and Mary Schorse (Delaware Center for Geographic Education Associate Director) taught a Geospatial Activity Block with Newark High School (NHS). NHS is one of the most diverse high schools in the state with over 60% of its student population representing minority populations. The Activity Block included 11 students who represented both an array of grade levels (9-11) and ethnic backgrounds and participated in the weekly class which ran from November 2019 until March 2020 when the COV-19 pandemic shutdown the Delaware schools. We recruited 4 University of Delaware undergraduate students to assist with classroom delivery and provide an almost one to one teacher student ratio. During the 5+ months of instruction, we introduced students to the geospatial technologies of GIS, GPS, and remote sensing through mini lectures, demonstrations, videos, and hands on use with a GPS unit, viewing an array of imagery from GOES, Landsat, and high resolution aerial photography, and making maps in ArcGIS Online.

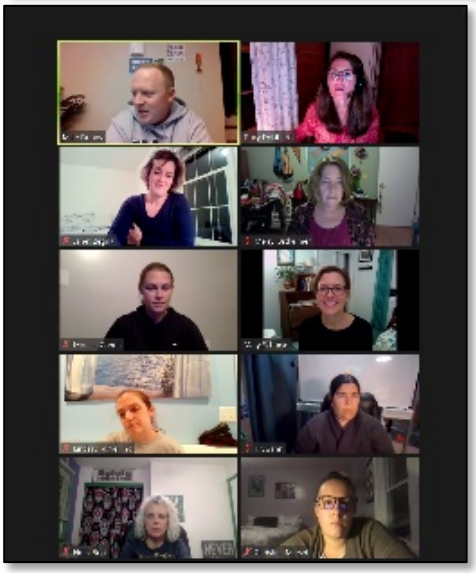


Postcard created to advertise Geospatial Activity Block to Newark High School students.

Tracy DeLiberty demonstrating how a satellite revolves around the Earth with one student assisting by holding the globe.

Thinking Geographically
Using Geospatial Data to Encourage Exploration and Ask Probing Questions about Place

Activity Two. K-12 Teachers Seminar



K-12 teachers who participated in the Thinking Geographically Seminar.

Tracy DeLiberty and Mary Schorse teamed up as seminar leaders for a geospatially-focused seminar with K-12 teachers. This geospatial seminar worked with 9 teachers to develop their understanding of how to create and access geospatial data as a tool for disciplinary instruction. Teachers become familiar with the latest geospatial technologies and learned how to identify and analyze geospatial datasets in order to ask important placed-based questions. Each teacher produced a curriculum unit at the conclusion of the seminar. A 4th grade English as a Second Language teacher wrote a unit titled *Understanding Why We Left Home* using place based interviews, maps, and imagery to identify the push/pull facts of immigration families face in the choice of moving to Delaware. As part of an AP Environmental Science course, a 10th grade teacher focused on land use change in Delaware over the last 10 years relying on high resolution imagery. A 9th grade Civics teacher created a unit which utilized voter data and election outcomes.

These activities contribute to the USGA Objective 4 Advancing Education and Training by supporting remote sensing science instruction in K-12 grades.

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Benefits to Delaware

- **12 Newark High School students** exposed to geospatial technologies and the usefulness of these technologies to examine our world's challenging problems. We focused on the problems of plastic trash by collecting GPS locations of trash on the school grounds, and through student conducted GIS analysis found how plastic trash is transported by waterways to the giant ocean gyres.
- **9 K-12 Teachers** learned to think geographically by asking placed-based questions. Each teacher wrote a curriculum unit to support their instruction. One example is 2nd grade teacher wrote two placed based surveys called *Windows to Nature* and *Backyard Walk*. This data was mapped and explored in the classroom.
- **4 University of Delaware undergraduates** participated in the Geospatial Activity Block at Newark High School. They worked 1-on-1 with students to trouble shoot technology problems, guide steps through geographical lessons, and learn the patience and persistence required for effective and compassionate teaching.
- **25+ 4th and 5th grade students at Marshall Elementary School** were introduced to GPS, GIS and remote sensing. Students looked at aerial photography and Landsat images of their school and performed several ESRI GeoInquiries.
- **1 Geography Masters student** completed degree May 2020, and employed with Sonoma Technology October 2020.

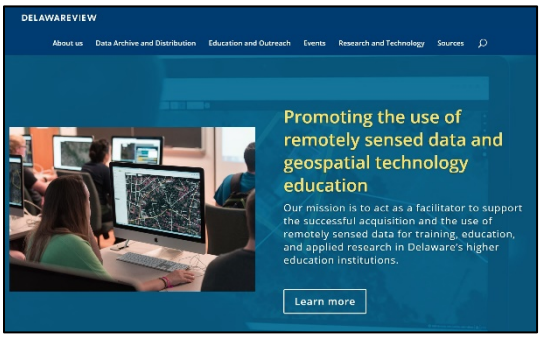
Tracy DeLiberty talking with Newark High School Instructor coordinating the Activity Block.

First virtual session of the K-12 Teachers Seminar.

Delawre View Consortium Membership

Tracy DeLiberty
Delaware View PI

Mary Schorse
Delaware Center for Geographic Education



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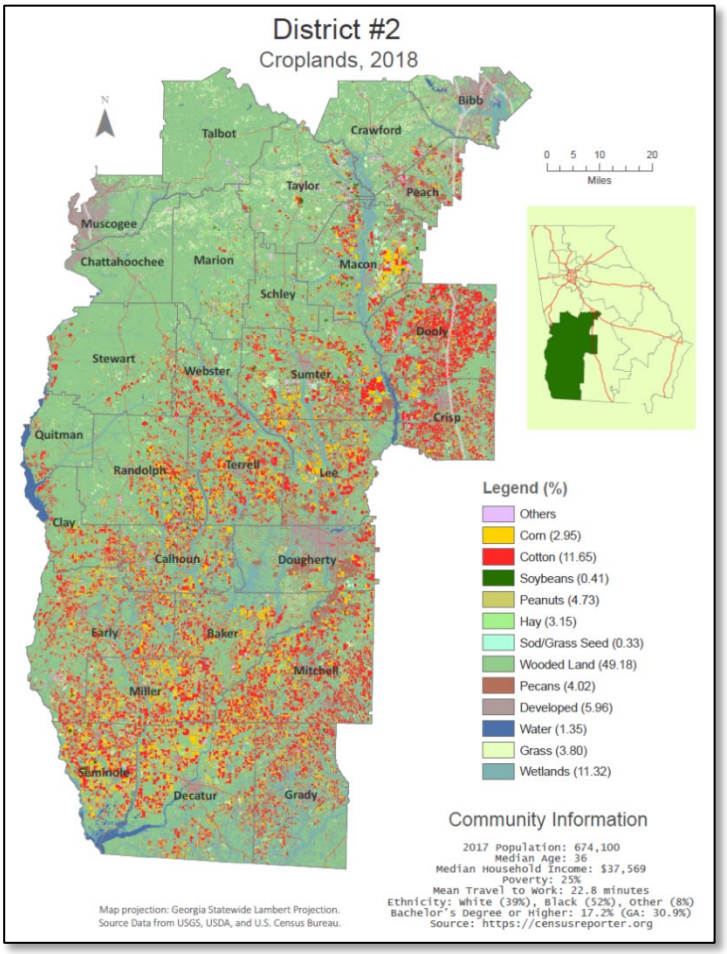
GeorgiaView 2019 - 2020

GeorgiaView 2019 - 2020 Activities

GeorgiaView's activities can be highlighted by two projects. The first project is the publication of Georgia Landcover Image Atlas Volume II: Croplands (2018) to outreach regional offices with the atlas. It focused on croplands and their products. A total of 191 maps were designed using the boundaries of 159 counties, 14 U.S. congressional districts, and 12 regional commissions. The atlas used Landsat imagery from the U.S. Geological Survey, air photos, and the Cropland Data Layer (CDL) dataset from the U.S. Department of Agriculture. The atlas was delivered to 70 local and regional offices in Georgia including the Governor's office, U.S. congressional offices, regional commissions, counties, and agricultural extensions. The atlas is freely available in the PDF eBook format at the GeorgiaView website, https://gaview.org.

The online Earth Observation Day event on October 13, 2020.



An example of cropland map showing the U.S. Congressional District #2 in Georgia.

The second project was to promote science and geospatial technology to undergraduate students in Georgia by hosting an Earth Observation Day (EOD) event. Due to the COVID-19 pandemic, GeorgiaView hosted an online EOD event on October 13, 2020 and 35 undergraduate students participated in the event. Students participated in online activities like the Landsat image mosaic game (https://americaview.org/program-areas/education/ earth-image-puzzles/).

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Benefits to Georgia

GeorgiaView has brought broad impacts to the State of Georgia by promoting geospatial technologies, educating science, and helping decision making about natural resources. The following are testimonials about Georgia atlas activities and student training.

"This publication can be very helpful for us as ANR agents to compare crop acreage by commodities." Seth McAllister, Terrell County Agriculture and Natural Resources Agent.

"Great work! I am originally from Lowndes county and am surprised to know the top crop producer is cotton, not Pecans." Megan Hunnicutt, Coastal Regional Commission.

"Not only am I honored to receive a copy of my own, but I welcome the thought that those in the Second District will have the use of this data at their fingertips in order to more efficiently produce the crops needed to feed our growing world." Representative Sanford Bishop, Jr., U.S. Congress.

Our office has used the Atlas you provided in the past and using it now as a very useful validation reference. Habte Kassa, Georgia DOT Office of Planning.

"This atlas project gave me a crash course on map making in GIS and a behind the scenes look on how these maps are created … The last and most important thing that I learned in this project is that I had fun in creating this project." Jessica Sinel, UWG undergraduate student.

Undergraduate students, Jessica Sinel and Jordan Woodall, are mapping Georgia croplands in the UWG GIS Lab. Mapping gives them the sense of placeness about where they live and the geospatial technology skills.

University of North Georgia (UNG) students, Eric Peaslee and Christopher Sorrell, pictured with M600 UAS and the True View 410 LIDAR/camera system.

GeorgiaView Consortium Membership

"Overall, the project was fun, and I learned many things. It will help me in the future and give me a copy of the work I did while I was in college. In the end, it left a very good impression on me." Jordan Woodall, UWG undergraduate student.

"Using this project to spend more time researching about remote sensing helped better prepare me for my classes. As remote sensing utilizes more UAS technology, being able to get hands on with drones and working with LiDAR programs will prepare me better for a career in GIS." Eric Peaslee, UNG undergraduate student.

"While researching information about remote sensing I found myself becoming more intrigued by the potential uses of remote sensing in environmental conservation." Christopher Sorrell, UNG undergraduate student.

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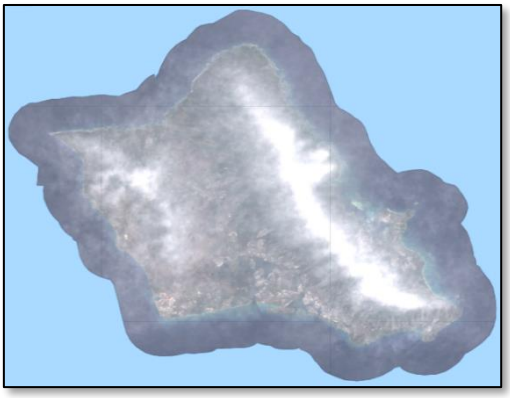
HawaiiView 2019 - 2020

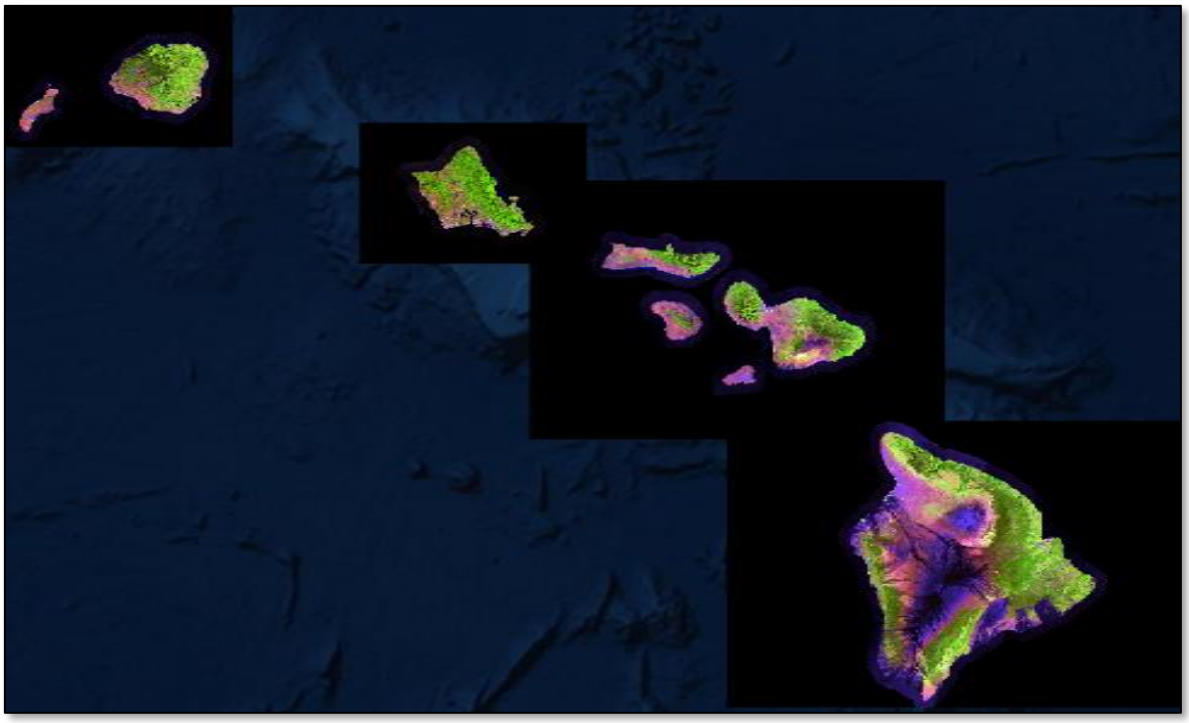
HawaiiView 2019 - 2020 Activities

In Hawaii, satellite remote sensing has been challenged by persistent cloud coverage, making it incapable of monitoring the rapid environmental changes happening in the islands. Our analysis of all Landsat-8 imagery since 2013 over Oahu showed that 98% of scenes have cloud cover of more than 20%, with the average cloud cover being 62% and only one scene of <10% cloud cover. HawaiiView overcame this significant challenge by producing the HiMACC (Hawaii Moving-average Cloud-free Composite) dataset using the Landsat-8 imagery from 2013-2020. A total of 24 cloud-free top-of-atmosphere (TOA) reflectance images over six different years (2014-2019) in five counties were created for public access (see https://bit.ly/2ILmzJo) and ready for environmental analysis.



Persistent cloud over mountain ridge in Oahu

Example of true-color cloud-free mosaic for Oahu



Example of false-color Landsat-8 cloud-free composite Imagery for the whole State: 2013-2015

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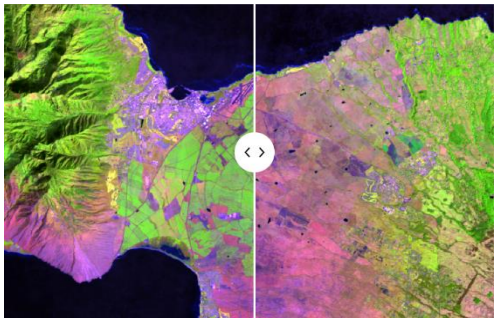
BENEFITS TO HAWAIIVIEW

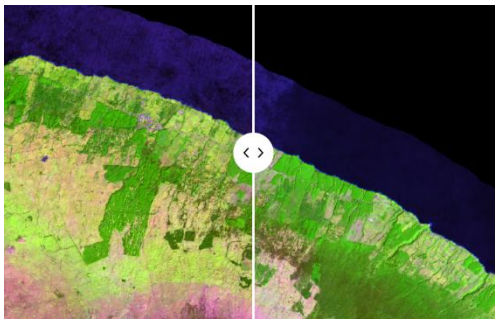
- The most recent Landsat cloud-free mosaic in Hawaii was for 2007. In this grant cycle, we made Landsat-8 cloud-free mosaics for every year between 2014 and 2019 for the whole State.

- One Master graduate student was trained and supported for processing satellite imagery.

- This unprecedented dataset significantly enhances the value of Landsat program for Hawaii by enabling the use of satellite imagery for studying environmental changes such as urban expansion, agricultural abandonment, forest restoration, volcanic eruption, and land-climate interaction (see https://bit.ly/2ILmzJo).

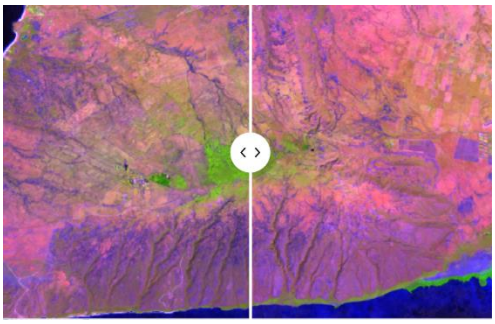


Agricultural abandonment, Central Maui

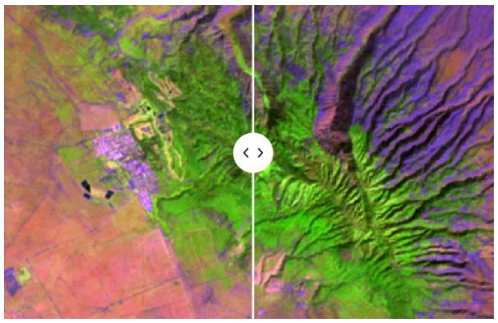


Eucalyptus tree removal, Big Island

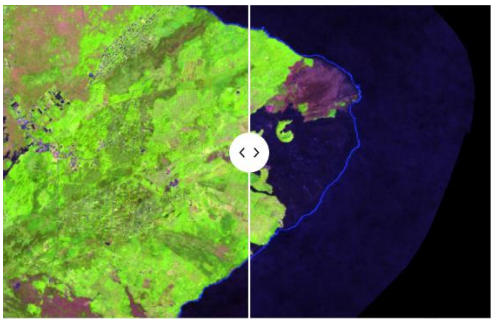
Urban expansion, West Oahu



Forest loss, Molokai



Forest restoration, Lanai



Volcanic eruption, Big Island

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IowaView 2019 - 2020

IowaView 2019 - 2020 Activities

Developing a Remotely Sensed Cover Crop Identification Tool

The planting of cover crops has been identified as an important strategy to protect Iowa soils and waterways. According to the NRCS, "Cover crops have the potential to provide multiple benefits in a cropping system. They prevent erosion, improve soil's physical and biological properties, supply nutrients, suppress weeds, improve the availability of soil water, and break pest cycles along with various other benefits."

The goals of this project were to create a publicly shareable process to determine the presence of cover crops over a season using public imagery and to produce a dataset relatively quickly. This past year, IowaView staff completed creation of a tool that allows users to input a series of Sentinel 2 images (late fall, early spring, and late spring) and receive an output of potential cover crop locations based on the collective Normalized Difference Vegetation Index (NDVI; this index shows greenness of vegetation on the landscape) value (ranging from -1 to 1, with higher values indicating greater vitality and plant health). The tool was then used to create another deliverable: a statewide map showing potential cover crops. The project website can be found here: https://www.iowaview.org/cover-crop-mapping-project/

The toolbox uses the NDVI values to compare pixels in a scene. The project chose NDVI to reveal areas of intentional growth by observing a pattern of greenness from fall through spring. During the months after harvest, it was assumed that fields would be bare in areas not specifically planted to cover crop or covered in permanent vegetation, such as forest or grass.

The tool was developed to operate as three consecutive steps. The first step produced an NDVI image for each of the three Sentinel 2 input images and created a geodatabase for each scene. This geodatabase contains four Sentinel 2 bands, a Normalized Difference Vegetation Index raster for the image, a field boundaries layer that has zonal statistics for each field, and a zonal statistics table.

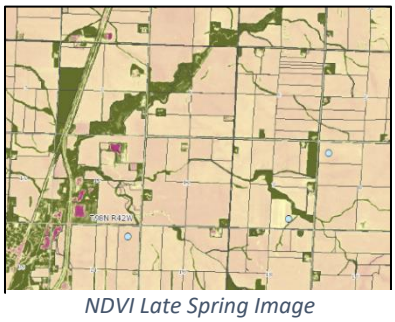
The second step examined each pixel of the NDVI images and assigned values indicating low, moderate, and high growth/greenness. Known cover crop planted field data from partner organizations was used to determine the NDVI cutoff values. Then, the values from each of the images were combined to create a composite image with 15 possible values indicating likelihood of cover crop.

The final step of the tool reclassified the composite image to three categories based on the sequence of NDVI values: No Cover Crop, Potential Cover Crop, and Cover Crop. These raster values were then summarized by field boundary to give a generalized indication of cover crop potential in the field.

Cereal Rye Cover Crop Field
Photo by Jason Johnson

NDVI Fall Image
Osceola County, Iowa - 11/21/2017

NDVI Early Spring Image
Osceola County, Iowa - 4/25/2018



NDVI Late Spring Image
Osceola County, Iowa - 5/25/2018

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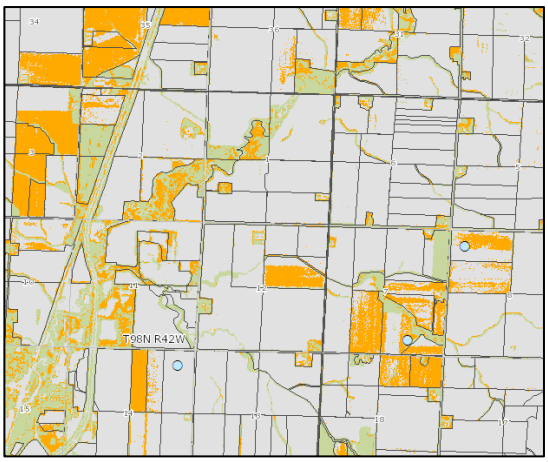
Benefits to Iowa

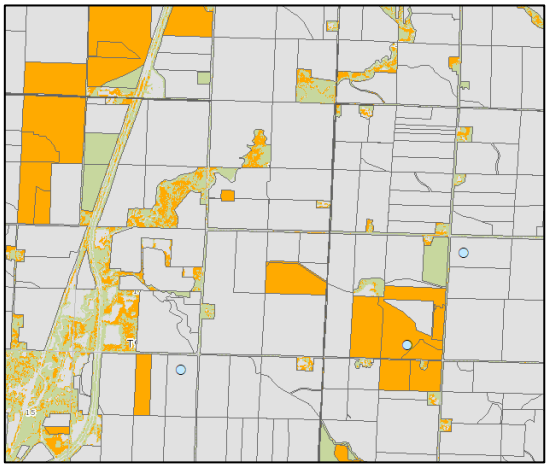
- The primary goal of this project was to create a data model that was easy to use and publicly accessible. A secondary goal was to create a statewide dataset showing potential cover crops across the state. Both of these will benefit conservation managers and natural resource professionals across the state. It also has potential to be applied in surrounding Midwest states with similar cropping patterns.

- The IowaView Cover Crop Detection Model was built in ArcMap and is available in for use in ArcMap and ArcGIS Pro. While the software usually comes with a cost, downloading and using the model is free, as is acquiring the input imagery.

- As new imagery becomes available , the NDVI can be calculated and analyses performed to generate an updated cover crop map. This model can provide a rapid roll out of cover crop analysis. It could aid in determining cover crop success across the state in the late spring of a particular year. Natural resource or conservation professionals can use this type of data in their watershed planning.

- Two student employees participated in portions of the project. They gained training in setting up and running a model in ArcGIS Desktop and evaluated the results in conjunction with known field-level data.





The upper image is an example of tool output and the lower image is a generalization of the output data using field boundaries in Osceola County, Iowa. Light blue dots denote fields from a sample cover crop data set. Gray areas indicate No Cover Crop; green areas are Potential Cover Crop and orange areas are Cover Crop.

IowaView Consortium Membership

The mission of the IowaView consortium is to increase the knowledge and use of remote sensing and other geospatial technologies for the benefit of the citizens of Iowa, through education, research and service. IowaView supports the collection and management of publicly accessible remote sensing data archives (ortho.gis.iastate.edu) which includes current and historic imagery, LiDAR elevation and other datasets useful for research and education. Collaborators come from several departments at ISU as well as from public agencies and organizations.

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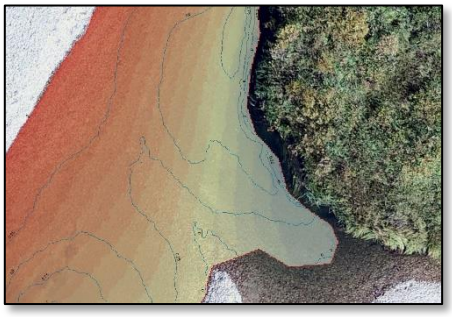
IDAHOVIEW 2019 - 2020

IDAHOVIEW 2019 - 2020 ACTIVITIES

The Unmanned Aircraft Systems (UAS) Working Group, now the Earth Sensors Research Committee (ERSC), collected highlights detailing stateviews' UAS domain expertise, research, and sensor/platform capabilities. Images and specific examples of education, outreach, and research were coalesced into a StoryMap (*see image on right*). The StoryMap showcases the diverse use of UAS sensors across urban, agriculture, forestry, and other natural resource sectors. Further, links to educational resources on AmericaView's Youtube channel were included in the StoryMap.

AmericaView StoryMap highlighting UAS expertise, research, and capabilities across the AV network. https://storymaps.arcgis.com/stories/efc33add7bf34b3d85e9f23896cd2b15

Floating temperature loggers



Mapping thermal gradient in stream system

IdahoView's 2019-2020 HIA was to map thermal environments of sagebrush and Red Band Trout and their response to heat stress using advanced thermal sensors. Using the MicaSense Altum multi-camera system (thermal, multispectral, optical) mounted on a boom we surveyed small desert streams and sagebrush plots. Red Band trout is a fish species native to Idaho that inhabits desert stream systems in south central Idaho. In the summer of 2020, IdahoView PI Delparte and a graduate student surveyed stream temperatures and water depths along 5 small desert stream systems.

To calibrate the thermal sensor, we used floating temperature loggers (*see left top image*). The MicaSense camera recorded surface temperatures that were within +/- 0.2 °C. Each individual camera image was stitched together using structure from motion software and exported to a thermal mosaic for digital mapping (*see image bottom left*). To determine the difference of temperatures within the water column, we recorded temperatures at different depths and secured a logger to the river bottom with another floating above. There was no temperature difference between depths which indicated sufficient water mixing through stream flow. The thermal mapping revealed that certain areas along the stream corridor exceeded trout survival tolerances. To avoid these areas, trout are forced to navigate via different connecting pools and water corridors. Collaborating scientists are collecting genetic material from these fish to examine thermal thresholds and their ability to adapt.

IdahoView 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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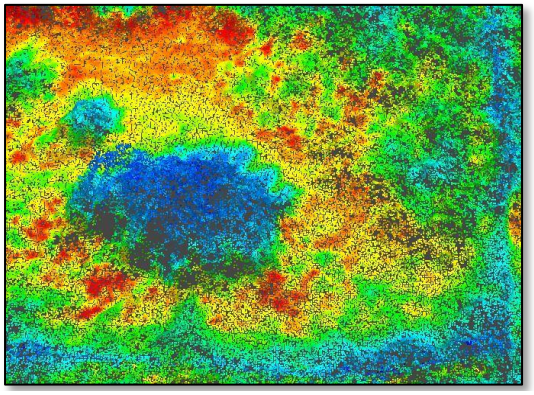
Benefits to Idaho

IdahoView's HIA using advanced sensors to map thermal environments is a high priority in Idaho because remotely sensed information about thermal stress on sagebrush and trout could aid in understanding the adaptive capacity of plant function and fish tolerances in a changing climate. For example, decision making for native plant restoration projects in areas impacted by fire or other disturbance can be informed by the work done in this project as we study the long-term survivability of different species of sagebrush to thermal stress in common gardens. This project will continue and also act as a seed grant for future proposal development.

Engaging Students in STEM Activities

It is vital to Idaho's economy to educate a qualified workforce in Science, Technology, Engineering, and Mathematics (STEM) professions. Industries that require STEM are expected to increase in Idaho and across the nation. IdahoView actively engages graduate and undergraduate students in field data collection and the hands-on use of advanced sensors to address issues that impact Idaho's natural resources to aid decision making. Both undergraduate and graduate students are encouraged to participate in the research and communication of results to stakeholders through one-on-one interactions, posters and oral presentations.



Thermal capture of sagebrush in common garden

College of Southern Idaho students examine sagebrush characteristics in a common garden (Fall 2019)

IdahoView Consortium Membership

Idaho State University

Boise State University

University of Idaho

IdahoView partners:

- Promote the development of novel tools and techniques that allow translating remotely sensed data into information that is meaningful to decision makers
- Use remote sensing as a means to promote STEM interest and learning
- Seek to expand involvement to incorporate all higher education institutions in Idaho and any other interested parties
- Advance the availability and timely distribution of data by maintaining links to archives of publically available satellite imagery for Idaho
- Encourage the use and scientific application of remotely sensed data from advanced sensors

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IDAHOVIEW
Supporting remote sensing in Idaho.

http://www.idahoview.org

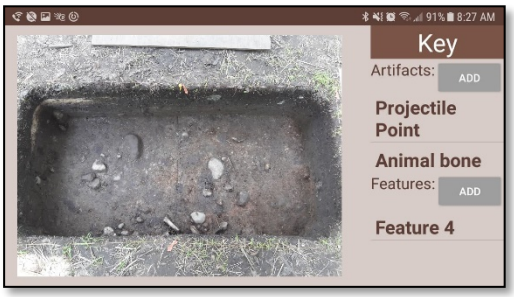
INDIANAVIEW 2019 - 2020

INDIANAVIEW 2019 - 2020 ACTIVITIES

IndianaView student scholarship program

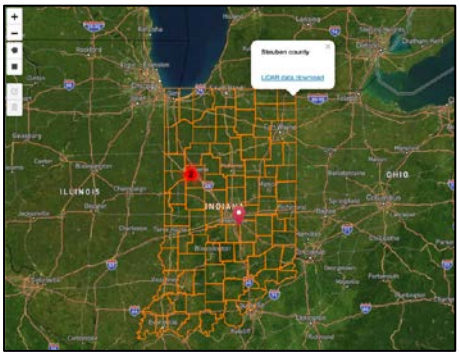
IndianaView provided scholarships for eight undergraduate and graduate students from the member educational institutions to participate in geospatial projects. The scholarships represented four of the educational institutions in the IndianaView consortium.

Each of the students provided a fact sheet about their project and a testimonial on how the scholarship assisted them. Examples of activities that the students completed include: designing K-12 instructional materials to integrate geospatial technologies in discovery and learning; studying the mycorrhizal drivers of non-native pest richness in U.S. forests; spatial analysis and habitat usage study of snapping turtles within an urban wetland; mapping archaeological excavations at Fort Ouiatenon using a self-developed geospatial mobile app; mapping local climate zone for Indianapolis using GIS-based methods and variables including building morphology and impervious surface; and study the evidence of alteration of sediments from past habitable environments in Gale crater, Mars using the Mastcam Imager.



A screenshot of Mapp – an Android based application created by an IndianaView student scholar, which allows archaeologists to map excavation sites and store images and notes.

Scholarship Testimonial: The scholarship rejuvenated my passion for this project. I was already excited to conduct this research, but the alleviation of my financial concerns made me even more eager. Earning the scholarship demonstrated that I can be successful as a woman in a male-dominated field (software development in archeology research).



Indiana Statewide LiDAR data portal main interface.

Tree canopy map for Delaware County, IN

IndianaView mini-grant program

IndianaView provided a means for partner institution to participate in IndianaView via geospatial projects relative to the state of Indiana. Two mini-grants were funded during 2020. One mini-grant project was the development of Indiana Statewide LiDAR data portal. The portal provides access to both 2011-2013 and 2016-2019 Indiana Statewide LiDAR and aerial imageries, which is available at: https://lidar.jinha.org. The project also developed additional geospatial data products such as DSM (Digital Surface Model) and NDHM (Normalized Digital Height Model) from the LiDAR for downloading. In addition, this portal visualized DTM (Digital Terrain Model) and NDHM layers, which allows information users to see these layers without downloading the LiDAR data.

Another project is to develop tree canopy mapping for Delaware county, IN, using LiDAR and color-infrared air photos. The product is the first high-resolution, countywide tree canopy map, which will be useful for prioritizing tree plantings and for tracking changes over time. The data is publicly available for urban forestry management and other applications.

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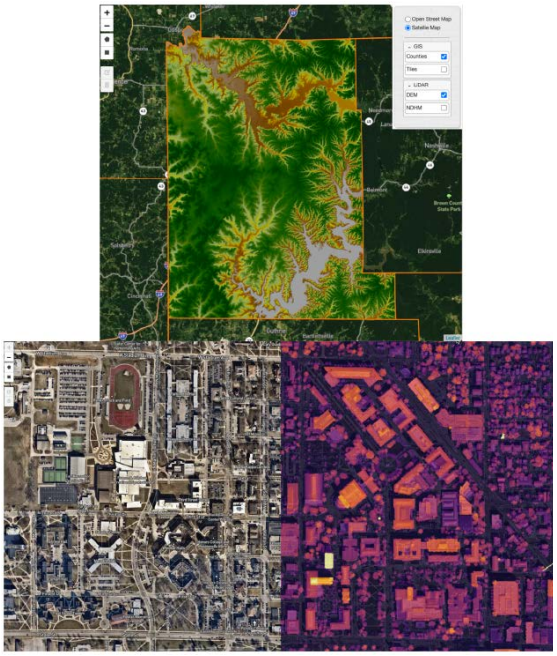
Benefits to Indiana

- The student scholarship program has greatly encouraged students across Indiana educational institutions to apply geospatial information in their specific research area, including K-12 education, forestry, biology, archeology, geography, and planetary science.
- The mini-grant program allows researchers in IndianaView consortium to generate additional geospatial data products and tools for the state of Indiana. The results derived from both of the projects have been shared publicly and presented at Indiana GIS virtual Conference.
- Supported by IndianaView, the Indiana Statewide LiDAR data portal (https://lidar.jinha.org) provides a convenient way to share the state LiDAR data and derivative products to public.
- One of the student scholarship projects has developed a course module for GER^{2}I (Gifted Education Research & Resource Institute) at Purdue, which teaches the GIS principles and data collection methods to K-12 students.
- IndianaView has been working with faculty members across disciplines at Purdue University to generate a proposal for Graduate Certificate program in GIS, which is under approval process. The education program will encourage students in different disciplines to learn geospatial information, including agriculture, engineering, science, archeology, technology, pharmacy and beyond.



The Indiana LiDAR data portal project provides a public accessible visualization platform for several geospatial data products derived from the Indiana Statewide LiDAR data (top: DTM, bottom left: Aerial Imagery, bottom-right: NDHM).

IndianaView Consortium Membership

Ball State University; Indiana State University; IUPUI Indiana University Purdue University Indianapolis; Vincennes University; Indiana University; Indiana University South Bend; Purdue University; Purdue University Fort Wayne; Purdue University Northwest; Martin University; University of Notre Dame; Valparaiso University; INSGC; Indiana Geographic Information Council; GENI; Indiana Geological Survey

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

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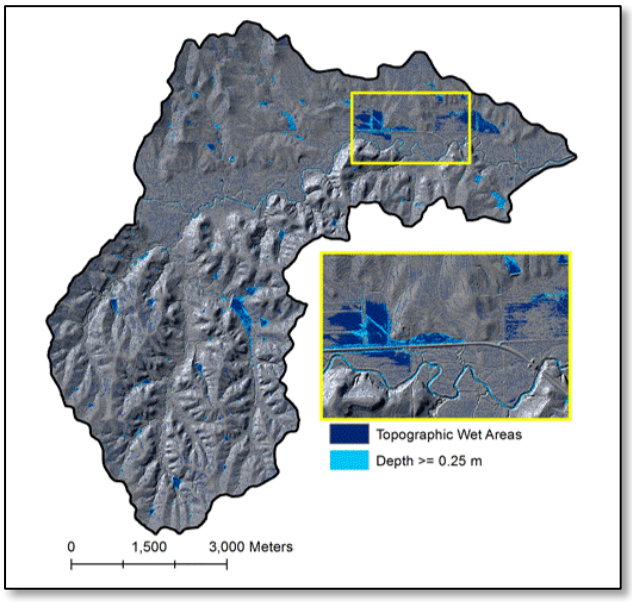
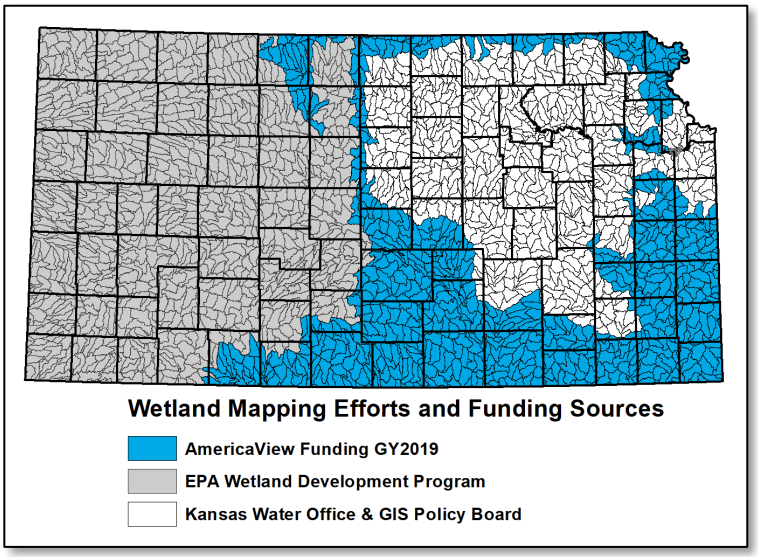
KansasView 2019 - 2020

KansasView 2019 - 2020 Activities

In GY19 KansasView completed the development of a statewide wetlands database for Kansas. Developing a statewide wetland database is a collaborative effort among multiple state and federal agencies, including KansasView. This activity supports secretarial priorities by focusing on remote sensing needs at the local and state levels and, by identifying and collaborating with our stakeholders, maintains a relationship of trust between KansasView and local, state, and federal agencies. KansasView leveraged previous wetland mapping efforts to map the remaining 30% of Kansas using statewide flown LiDAR data. Stakeholders have and will continue to use the Kansas wetland database for local and regional conservation efforts. The statewide database is publicly available through the KansasView website and the state data repository. A young professional who graduated in May of 2020 with a degree in remote sensing and geographic information systems was hired to map the remaining wetland areas in Kansas, shown as blue in the map below.



The topographic wetness index (TWI) identifies potential wetland areas with low slope and high flow accumulation.



The statewide wetland database was developed using multiple funding sources, including AmericaView (blue). Mapping occurs at a sub-watershed.

Aerial view of playa wetlands in Western Kansas. Image Source: Kansas Geological Survey.

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Benefits to Kansas

Stakeholders for the wetland database include:

- Ducks Unlimited
- Kansas Alliance of Wetlands and Streams
- Kansas Biological Survey
- Kansas Department of Wildlife, Parks, and Tourism
- Kansas Water Office
- Playa Lake Joint Venture

- KansasView also maintains connections with consortium members for potential collaborations in outreach, education, and research.

- KansasView is represented at the GIS Policy Board, a consortium for promoting geospatial technology, acquiring critical geospatial datasets, and funding database development that support the mission and objectives of the Kansas Water Office. Over the years, many of these agencies have provided joint funding for projects partially funded by AmericaView.

- KansasView awards mini-scholarships to students at partner institutions to support remote sensing related education and research activities.

KansasView sponsored 13 students and 1 professor from Haskell Indian Nations University to attend and present at the regional AAG conference.

KansasView Consortium Membership

Emporia State University

Fort Hays State University — Forward thinking. World ready.

Haskell Indian Nations University

K-State — Kansas State University

KARS — Kansas Applied Remote Sensing Program

KU The University of Kansas

KU Edwards Campus — The University of Kansas

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

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KansasView

http://www.ksview.org

KentuckyView 2019 - 2020

KentuckyView 2019 - 2020 Activities

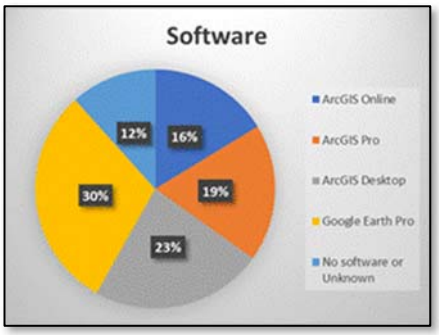
Two of the KentuckyView consortium members, Kentucky State University (KSU) and Murray State University (MSU) conducted two virtual workshops educating, high school, undergraduate and graduate students, and in-/pre-service teachers.

Center for Geospatial Intelligence and Environmental Security at KSU conducted a virtual Geospatial Workshop for high school educators on Tuesday, June 16, 2020. The major purpose of this one-day workshop was to offer hands-on opportunity to high school students to educate them about basics of remote sensing applications. The workshop focused on basics of working with remotely sensed data using Geographic Information System (GIS), and exploring opportunities for integrating geospatial technology into high school curriculum. ArcGIS online and ArcGIS pro were showcased for accessing, processing, and analyzing remotely sensed data. The participants also discussed opportunities for continued collaboration for integrating geospatial technology in the high school curricula. There were 62 participants during the time of registration. Majority of them were using PC or laptop along with windows operating system. Number of participants familiar with ArcGIS software were limited. 21 participants responded to survey conducted after workshop. Majority of them agreed with workshop design, expectations, and repetition of similar workshop for next year.

A Train-The-Trainer (TTT) teacher workshop was held at MSU. Four in service teachers, and seven undergraduate and graduate students attended the TTT workshop conducted by Dr. Haluk Cetin, the KentuckyView PI. Several USGS and NASA products, such as Landsat 5, 7, and 8, DEMs, as well as aerial imagery, were utilized. The students worked on remote sensing modules, wrote a report for each module and answered questions related to the exercises in the modules.

A virtual Earth Observation Day (EOD) event was held at MSU on October 13, 2020. Two Keynote speakers, Dr. Bassil El Masri of MSU and Dr. Patricia Kambesis of Western Kentucky University, gave presentations. There were 34 participants at the event. Also, a virtual 2020 GIS day event was organized by KSU. The participants included university instructors, GIS officials, planners, and others. Women in the Geographic Information Sciences (WIGIS), Geography and Geospatial Sciences, and Networking and Leadership in Geospatial Science were the overarching topics of the event.

A fellowship program for graduate and undergraduate students in Kentucky was established last year. The 2020 undergraduate awards in the amount of $500 were given to Ms. Kim Kusler, Northern Kentucky University and Ms. Rebecca Moskal, Eastern Kentucky University. The 2020 graduate award in the amount of $1,000 was split between Mr. Kevin Takashita-Bynum, MSU and Ms. Smriti Kandel, Kentucky State University. The students will be using their fellowship monies for their research.



Pie-chart showing percentage of participants familiar with respective geospatial software.

Map showing location of participants.

The 2020 EOD event at MSU

The 2020 GIS event at KSU

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Benefits to Kentucky

KentuckyView 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. KentuckyView currently comprises 12 member institutions and agencies. As KentuckyView continues to grow we expect that additional universities, colleges, non-profit organizations, and state and federal agencies will add their knowledge, experience and shared goals to ours as we seek to improve life for citizens throughout the Commonwealth. The primary focus of KentuckyView is on the use of images collected from remote sensors, as well as other geospatial technologies, to support K-16 education, applied research, and public outreach. The Kentucky Spectral library has been utilized to help process satellite data, such as Landsat 8.

KentuckyView has conducted research on soil moisture, and water quality and quantity. For the state of Kentucky, these projects inform the water research community and improve understanding the environmental conditions which allows Kentucky to manage the water resources more efficiently.

We are developing workshop modules to improve K-16 education in the state. Also, more assessment tools have been developed. Remote sensing education and outreach activities, such as workshops, story maps, Earth Observation Day, Earth Day and GIS Day presentations, have helped inform and educate teachers, students and the public in Kentucky. Andy Beshear, Governor of the Commonwealth of Kentucky, proclaimed November 18, 2020 as GIS day.

Proclamation

by

Andy Beshear

Governor

of the

Commonwealth of Kentucky

To All To Whom These Presents Shall Come:

WHEREAS, Geography has played a defining role in the settlement, history and cultural heritage of Kentucky, and understanding geographical concepts is crucial to maintain a balance among the wise use of the Commonwealth's natural resources, continued economic prosperity, and the well-being of its citizens; and

WHEREAS, The use and application of geospatial technology is crucial to operating our infrastructure, sustaining our natural resources, rapidly responding during emergencies, and stimulating economic growth, thus benefitting the welfare of the general public throughout the Commonwealth; and

WHEREAS, Kentucky has maintained its long-term commitment to utilizing Geographic information Systems (GIS) to inform decision making, better serve its residents and make useful geographic information open and easily available to the public, as a platform for innovation; and

WHEREAS, GIS technology allows us to see and model complex relationships and patterns between people and places and to better understand how the two interact and exist within the built and natural environment; and

WHEREAS, Kentucky has long been recognized as a leader in managing and sharing geospatial information, minimizing duplication, reducing costs, developing standards, and promoting the free and open sharing of data, methods and knowledge; and

WHEREAS, National Geography Awareness Week is recognized and celebrated annually in that week being observed November 13-19, 2020; and the global GIS community has joined to declare November 18 as National GIS Day 2020;

NOW, THEREFORE, I, ANDY BESHEAR, Governor of the Commonwealth of Kentucky, do hereby proclaim November 18, 2020, as

GIS DAY

in Kentucky.

DONE AT THE CAPITOL, in the City of Frankfort the 2nd day of November, in the year of Our Lord Two Thousand Twenty and in the 229th year of the Commonwealth.

ANDY BESHEAR
GOVERNOR

Proclamation by Andy Beshear, Governor of the Commonwealth of Kentucky

KentuckyView Consortium Membership

- *Murray State University - MARC and the* Department of Earth and Environmental Sciences (official member of record)
- *Morehead State University*
- *Kentucky Division of Geographic Information*
- *Kentucky Geological Survey*
- *Eastern Kentucky University – Department of Geography*
- *Jefferson Community and Technical College*
- *Kentucky State University*
- University of Kentucky – College of Agriculture
- Western Kentucky University – Department of Geography and Geology
- University of Louisville – Center for Geographic Information Sciences
- Northern Kentucky University – History and Geography Department

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

KentuckyView Principal Investigator:

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LOUISIANAVIEW 2019 - 2020

Promoting the Benefits of Remote Sensing Science and Applications

Louisiana .....*"We're Still Standing"*

..... Even after 6 direct hits and a slap in the face.

Right: Hurricane Laura late on August 26, 2020 near peak intensity at 150 mph just before landfall.

LouisianaView, along with it's many colleagues; just months prior were taking part in the 21st annual (*first year virtual*) disaster response workshop, were now putting into practice the lessons, tools and network of geospatial first responder contacts that this annual workshop provides for this undaunting emergency response group.

In a year for the record books….

LouisianaView (LaView) responded to the Hurricane season acquiring imagery through sources of The International Charter, FEMA, NASA, NOAA, USGS and state geospatial programs working in collaboration with the state USGS Liaison and multiple state agencies. Louisiana saw the true strength of an informed and networked body of responders in action as the state tackled, ***the year of the storms!***

BENEFITS TO LOUISIANA

Data Mining Virtual Workshop for Emergency GeoSpatial First Responders

This annual workshop, held in early June each year, played out it's 21st year as our first virtual workshop. Through the cooperation of the LouisianaView consortium members and co-sponsored with the local USGS liaison, this workshop was offered free to those in Louisiana, surrounding states and across the Caribbean interested in up-to-date information on data availability for the geospatial emergency responder. One Hundred and twenty-five (125) Geospatial First Responders from more than 20 different countries attended this workshop held June 4, 9-11, 2020 via Zoom from the UL Lafayette Regional Application Center. This 4-day virtual workshop hosted 24 speakers from multiple Federal, State and Private Response Teams, each presenting their data, websites, links, and contacts while also fielding questions live from those in attendance. This workshop has proven again and again what a cohesive and informed network of geospatial data responders can mean to the inhabitants and economic base for the state of Louisiana and now the Gulf of Mexico and the Caribbean.

Document Link below:

https://drive.google.com/file/d/1HhQTfWyLTza8mpSo_o4QWSaeQLq8sA2Y/view?usp=sharing

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Bridging the gap between science and the public's perception of science

Step aboard the STEAM Train !

and follow the …….

Earth as Art Traveling Gallery Exhibit –

the Intersection of ……

Science, Technology, Engineering, Art and Mathematics

All Aboard! The Fall of 2019 began what was planned as a "***Year on the Move***" with the gallery exhibit traveling across the state, the region…… the nation. Beginning at the Southern Energy Conference in LA after traveling the prior months in Louisiana, South Dakota, and Virginia. ***Next Stop***, URISA GIS Pro Conference, where a keynote presentation and Earth as Art exhibit entertained over 500 participants. This event debuted our 12' x 12' floor puzzle that enthralled audiences both young and old. ***Moving North***, the STEAM train embarked for Baltimore, to engage over 300 industry professionals and over 100 visiting students at the 2019 engagement of PECORA. In this traveling gallery exhibition; working with the USGS "Earth as Art" program, utilizing NASA Landsat and other satellite systems, images have been identified to excite the imagination and entertain creative thinking. Over 60 Images from Satellite systems are displayed; entertaining all with images that depict the science of the Earth and invoke the art of the earth's natural landscape. ***"Go West Earth as Art",*** to the Black Hills for the Digital Mapping Association Conference at the South Dakota School of Mines and Technology where 150 Industry and University professionals attended and over 100 university students engaged with the exhibition. It was now time to ***Venture South again***, *way south*, for the 2019 URISA Caribbean GIS Conference in Trinidad with a new virtual component of the traveling gallery exhibit artwork and presentation on hand. Outreach and teaching materials were distributed and discussions began on the creation of a Caribbean EAA traveling exhibit to tour the islands. ***Heading back north*** of the Gulf of Mexico, a new undertaking was taking place in Alabama. The images above, are part of the "Mother Earth as Art" gallery exhibit LouisianaView assisted AlabamaView in creating for the state. As the invited speaker for the opening of the exhibit, both public audiences and students were entertained with images, ideas, science and beauty. Auburn University's Department of GeoSciences undergraduate and graduate students developed an exciting exhibit at the Jule Collins Smith Museum of Fine Art. It was now time to depart for yet another adventure down the rails, but …. like colliding with a herd of cattle on the tracks, ***Our Train got De-railed,*** but this was no herd, it was COVID-19. LaView retooled and began a new endeavor in the virtual world to educate all on the Earth as Art.

Louisiana Continues Earth As Art Education and Outreach

As the head of ***STEAM*** continued to build again on this traveling exhibit, LouisianaView began working with TexasView to create the Texas as Art collection and will continue to work with states to connect, engage, and encourage ***this Intersection of …….*** **Science, Technology, Engineering, Art and Mathematics** to all who are ready to ***Board the STEAM Train!***

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University of Louisiana at Lafayette

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Facebook.com/LouisianaView

MichiganView 2019 - 2020

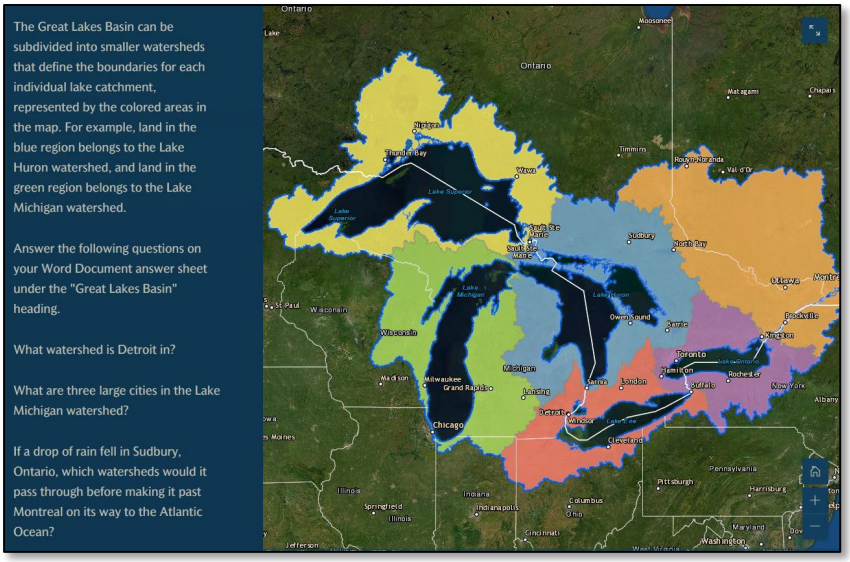
MichiganView 2019 - 2020 Activities

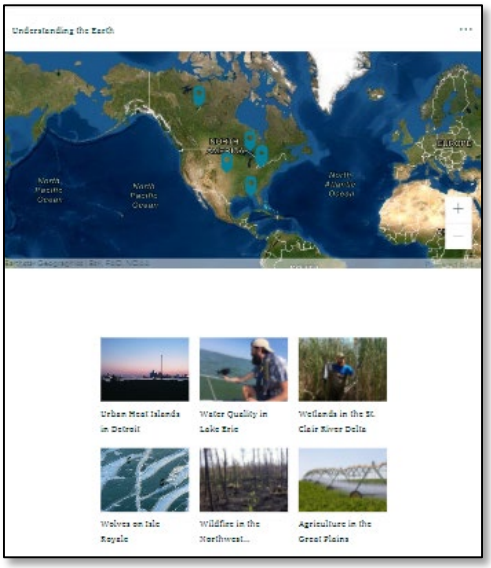
As a state member of the AmericaView Consortium, MichiganView strives to promote remote sensing within the State of Michigan. The primary goals of MichiganView's activities are to advance remote sensing education and training, technology transfer, and outreach in the state. These activities rely on the establishment of strategic partnerships with educational institutions and non-profit organizations, which serve to connect MichiganView to students and the public.

One of MichiganView's priorities has been providing web-based tools designed to expose students to remote sensing across a variety of education levels. While many past MichiganView activities included hands-on data collection and in-class presentations, the transition to virtual learning by many schools across the state allowed MichiganView to work with educators to develop engaging activities for students to complete while learning from home. These activities were designed to have broad appeal by focusing on state curriculum standards.

A cloud-free composite of Michigan's upper and lower peninsulas created with Landsat 8 imagery from September of 2019 and 2020.

MichiganView also works to make remote sensing data and technology more accessible to the public via its website (http://www.michiganview.org). by providing access to basic remote sensing tutorials, web-apps showing the results of consortium members, and maintaining an archive of Michigan-specific data remote sensing data.





Many schools in Michigan are operating remotely for the 2020-2021 school year. MichiganView has created several virtual outreach activities to provide interactive tools accessible for students learning from home. Shown above are screenshots of tools created for various education levels

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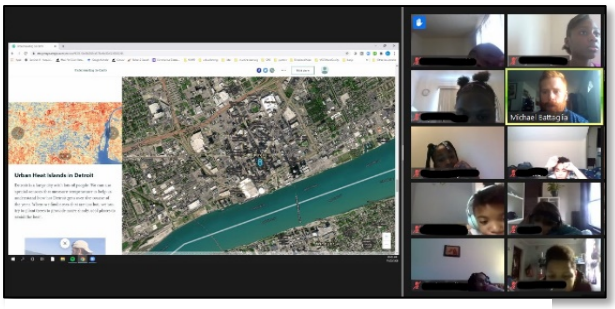
Benefits to Michigan

- Activities and tools created by MichiganView are created to assist educators in meeting grade-level-specific science and social studies standards.
- When possible, MichiganView events include hands-on activities that promote the connections between remote sensing and the natural environment.
- MichiganView uses intuitive, modifiable web-based platforms, such as ESRI StoryMaps, to create engaging activities that can be easily customized for individual schools or organizations. Examples include:
  - *Great Lakes Watersheds and Water Quality (Community College Level): https://arcg.is/1KHGiL*
  - *Tools for Understanding the Earth (Elementary School Level): https://arcg.is/zXj0C*
- Publicly available remote sensing data, such as that available via the Landsat archive, are leveraged to encourage widespread public exposure and increase science literacy.

Washtenaw Community College students collect field data to connect in situ measurements to remotely sensed data



4th graders from Mark Murray Elementary School participate in a virtual activity about geospatial

MichiganView Consortium Membership

Michigan Tech Research Institute

1885 Michigan Tech

Washtenaw Community College

Wayne RESA Leading... Learning for All

Michigan State University

University of Michigan

University Prep Schools

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MichiganView

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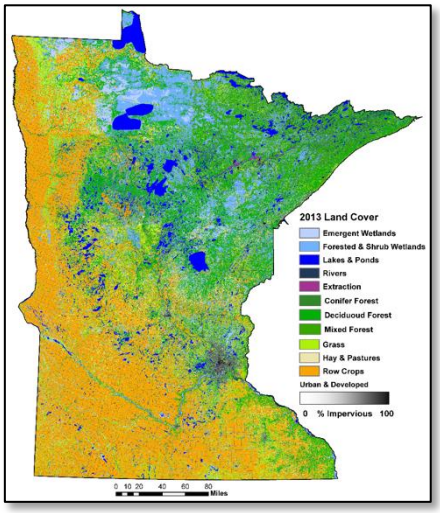
MinnesotaView 2019 - 2020

MinnesotaView 2019 - 2020 Activities

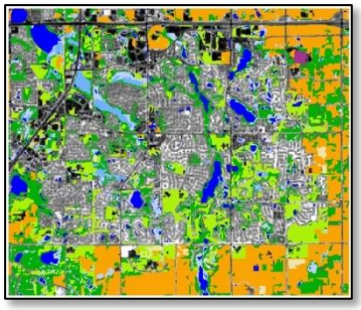
MinnesotaView undertakes research, education, and outreach activities in remote sensing. The broad goals of these activities are to help stakeholders use remote sensing methods and products, to enhance public appreciation of the importance of remote sensing, and to publicize the results of remote sensing research done by MinnesotaView members. We particularly focus our efforts on outreach to users and potential users of remote sensing data and methods. The awareness of remote sensing has increased dramatically in Minnesota over the last several years, but there are numerous opportunities to further increase use, and to help ensure that such use is consistent with accepted best practices.

MinnesotaView also supports the development, distribution and application of geospatial information derived from remote sensing data for mapping, monitoring and analysis of land and water resources. Key activities in recent years have been mapping water clarity for over 10,000 Minnesota lakes and completing land cover/use maps for Minnesota (see figures on this page). Our remotely sensed data products can be viewed on our recently revised data portals:

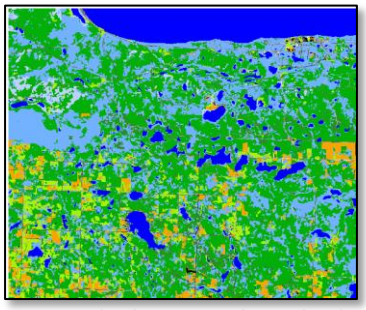
Water Clarity Data Portal: https://lakes.rs.umn.edu
Land Data Portal: https://z.umn.edu/landcover



Land Cover/Use of Minnesota mapped using Landsat imagery



Mixed land cover in Woodbury, MN



Lower Red Lake area with cropland, forest, wetland and lakes.

Conversion of rural landscapes to urban and suburban land uses (e.g. Woodbury, MN in the figure to the left) results in increasing amounts of impervious surface area. Imperviousness affects the amount of runoff to streams and lakes and is related water quality of surrounding lakes and streams, to urban heat island effects, habitat degradation and fragmentation, and aesthetics of landscapes.

The University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory has completed classifications of land cover and impervious surface area of the state and for the Twin Cities metro area over several decades. Classification using Landsat Thematic Mapper data enables quantifying the spatial and temporal patterns of impervious surface area over large geographic areas at modest cost.

MinnesotaView was established in 2008 and is working with state agencies and universities in Minnesota to advance remote sensing research and application, education and outreach. The Consortium is led by the University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory, and includes the Minnesota Geospatial Information Office, the Minnesota Pollution Control Agency, and Minnesota Department of Natural Resources.

MinnesotaView 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 Minnesota

An ongoing focus of MinnesotaView is offering workshops on remote sensing to Minnesota stakeholders. We have developed a large amount of workshop content for lidar, object-based image analysis, and Unmanned Aircraft Systems (UAS). UAS operations and applications are increasingly of interest for a variety of stakeholders, including the Department of Natural Resources (DNR) Forestry group, DNR's Resource Assessment group, the MN Pollution Control Agency's wetlands and water scientists, county land management agencies, and many others. In the 2019-2020 grant year, we conducted two workshops for stakeholders around the state.

The images to the right depict data products derived from our research. The top image shows the structure of a forest plantation, colored by height (red is taller). Such a dataset is useful for management planning, monitoring of tree health, and forest inventory studies. The bottom image is a high-resolution photo of a forest canopy in northern Minnesota, near Ely.

MinnesotaView performs substantial remote sensing research outreach. We believe it is vital that stakeholders and the public see the results of our work.

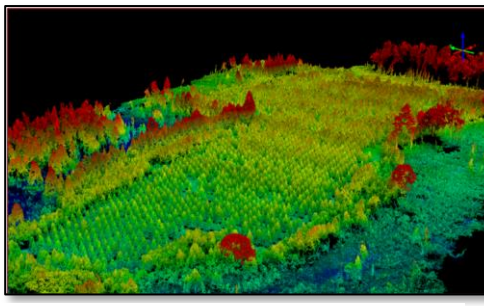

Photo-derived point cloud of a plantation forest in Minnesota

Drone image of a forest research stand in northern Minnesota

MinnesotaView Consortium Membership

University of Minnesota

Department of Natural Resources

Minnesota Pollution Control Agency

U.S. Fish & Wildlife Service — Department of the Interior

Forest Service — U.S. Department of Agriculture

United States Environmental Protection Agency

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

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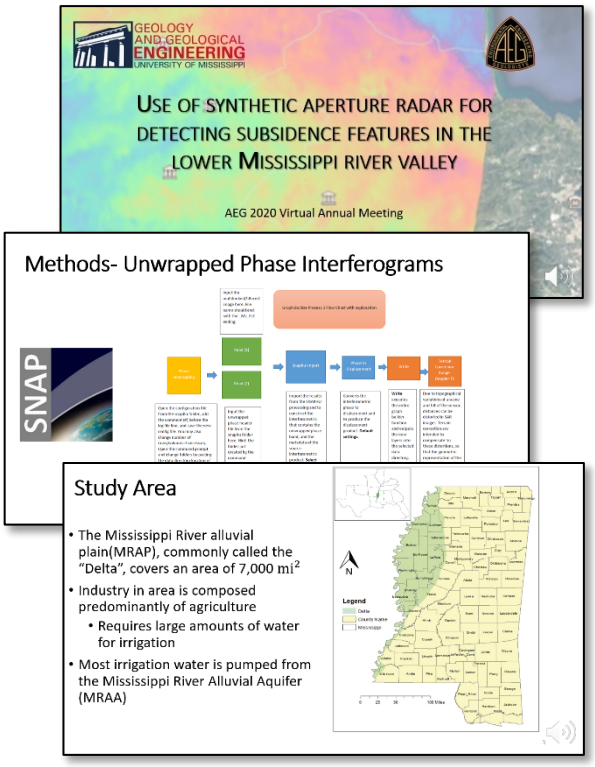
MISSISSIPPIVIEW 2019 - 2020

MISSISSIPPIVIEW 2019 - 2020 ACTIVITIES

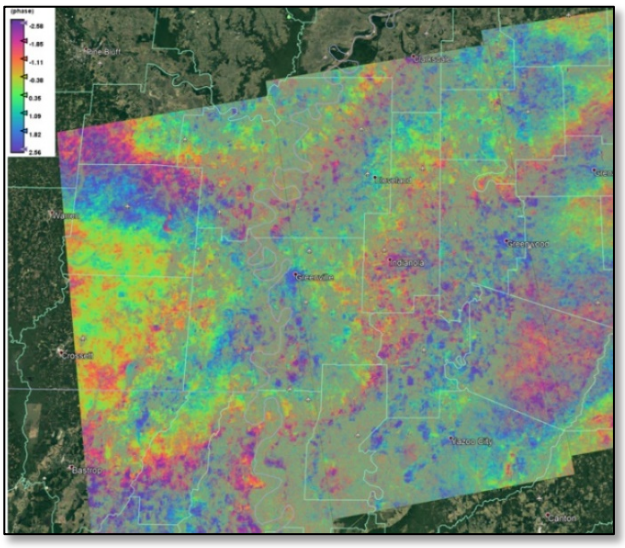
MississippiView was established in 2003 and is led by the Mississippi Mineral Resources Institute (MMRI) at the University of Mississippi. We promote and facilitate geospatial data usage, research, and collaboration among the geospatial community in Mississippi while fostering national and international cooperation.

Our high impact activity (HIA) involved the use of satellite-based synthetic aperture radar (SAR) to detect and monitor ground surface subsidence. This activity brought a focus on the use of satellite data, processing software, and methods for elevation changes in the Lower Mississippi River Valley. Not only is radar data an excellent way to monitor flooding and the extent of inundation, but by comparing waveform data (interferometry) from two different dates, this data can also be used to detect elevation changes. This is important because changes in elevation can impact how well levees and floodwalls protect cities and other important infrastructure.

This HIA supported the research work of a geological engineering graduate student. A thesis was successfully completed, and results were distributed at conference and several local presentations.



Student presentation of the research results during annual meeting of the Association of Environmental Engineering Geologist (AEG) in September 2020.



Sentinel 1 satellite interferogram derived from Feb-March 2019 data of the Lower Mississippi River Valley. Very wet spring with significant flooding.

In addition to active research, MississippiView is engaged in developing partnerships within the state to promote use of geoinformational data and tools. We have teamed with outreach efforts from the University of Mississippi's School of Engineering to provide spatial data and aerial imagery to support student groups at Rust College in Holly Springs, Mississippi—the state's oldest HBCU.

RUST COLLEGE

MississippiView 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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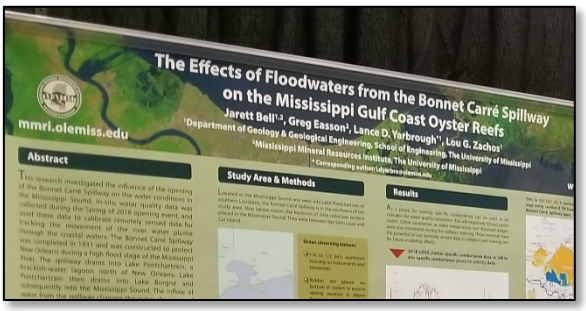
BENEFITS TO MISSISSIPPI

- Flooding and groundwater withdrawal are of utmost importance to the State of Mississippi. Monitoring these processes lead to a more effective response to a natural disaster and better management of a valuable resource.
- The state of Mississippi is susceptible to several geohazards including flooding, river/lake bank stability issues, regional and local subsidence, and expansive soils. Satellite-based radar products can provide valuable tools for the detection and monitoring of these geohazards.
- Seismic activity in the northern part of the state can induce liquefaction hazards. Groundwater withdrawal from shallow aquifers can, over a long period of time, produce damaging ground subsidence.
- Other projects that benefit the state include the use of satellite imagery to monitor habitat of gulf coast oysters. Oysters are an important resource to the Mississippi Gulf Coast. Landsat data is used to monitor water quality parameter such as turbidity, thermal and land use change in upland watersheds.
- The M-Partners is a program that connects University of Mississippi capabilities with the goals and needs of local communities. MississippiView has participated by collaborating with the leaders of Charleston, Mississippi. We provide geospatial and remote sensing data related to their economic development and policy, marketing and tourism, and resiliency efforts.



Student research poster presented the preliminary results of water quality monitoring of oyster reefs in the Mississippi Gulf Coast. PECORA 21 in Baltimore, Maryland in October 2019.

Monitoring water quality at depth using a custom-built sensor platform (PODs). After several weeks in the Mississippi Sound, the PODs are retrieved, analyzed, and compared to remotely sensed data.

Example product for our M-Partner community, Charleston, Mississippi. In additional to satellite imagery, Mayor Sedrick Smith requested digital restorations of several historical high-angle oblique photos and relevant updates.

Results from the research supporting our HIA and non-HIA was presented at:

- Terracina, Steven, L.D. Yarbrough, G. Easson, and B. A. Davis, 2020. Use of Synthetic Aperture Radar for Detecting Subsidence Features in the Lower Mississippi River Valley, Association of Environmental Engineering Geologist (AEG) News, (63) 4. in Program with Abstract 63rd Annual Meeting, 6–10 September 2020.
- Bell, Jarret, Greg Easson, Lance D. Yarbrough, and Lou G. Zachos, 2019. The Effects of Floodwaters from the Bonnet Carré Spillway on the Mississippi Gulf Coast Oyster Reefs, *presented at* Pecora 21-American Society for Photogrammetry and Remote Sensing and 38th International Symposium on Remote Sensing of Environment, October 6–11, Baltimore Marriott Waterfront, Baltimore, MD.

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MONTANAVIEW 2019 - 2020

MONTANAVIEW 2019 - 2020 ACTIVITIES

MontanaView successfully completed two "High Impact Activities" during the grant period 2019 – 2020.

High Impact Activity #1 was titled, "Fellowships for undergraduate and graduate students conducting applied remote sensing projects." The goal of this activity was two-fold: 1) to support students and provide encouragement and resources for them to pursue a career in geospatial sciences and remote sensing; and 2) to benefit the state of Montana by providing information, data, and analysis that will improve the management of natural resources. MontanaView awarded 7 fellowships (ranging from $750 to $1,500) to students at four institutions across Montana.

The following is a list of the students and their institutions, project titles, and mentors (in parentheses):

- Matthew Cunningham, University of Montana, Deriving surface fuels from conventional UAS imagery for new fire models (Anna Klene)
- Lochlin Ermatinger, Montana State University, Investigating the abundance and distribution of nectar resources for natural enemies of the wheat stem sawfly (David Weaver)
- Zachary Goodwin, University of Montana, Snowpack ablation and ditch irrigation in the Skalkaho Creek subbasin, Bitterroot Valley, Montana (Anna Klene)
- Patrick Jackson, Montana State University, Geographic patterns of the invasive pathogen PKD in headwater streams of the Missouri River (Nick Fox)
- Sierra Luoma, Montana Tech, The integration of a fluxgate magnetometer with an unmanned aircraft system (Xiaobing Zhou)
- Andrew Mullen, Montana State University, Assimilating UAV and satellite data for improved albedo products (Eric Sproles)
- Logan Swanson, Salish Kootenai College, Encroachment in the wildland/urban interface in the Jocko Valley (Robert Kenning)

Each student presented their work at the MontanaView Annual Fellowship Meeting on April 23, 2020, and submitted a final written report to MontanaView and the identified project stakeholder(s).

Albedo sensor framework (left) and derived high resolution albedo map (right) from Andrew Mullen's MontanaView remote sensing fellowship project.

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MontanaView 2019 - 2020 Activities

High Impact Activity #2 was titled, “Remote sensing research for precision agriculture.” The goal of this activity was to provide support for undergraduate research assistants to assist in precision agriculture research at Montana State University. Two undergraduate students were funded through this High Impact Activity: Hailey Webb and Nathaniel Barnes (pictured below), both 2020 graduates of Montana State University, from the Department of Land Resources and Environmental Sciences. Hailey and Nathan led the remote sensing and field data collection efforts, as well as data processing, data analysis, and writing. A manuscript based on their work is currently in review in the journal *Precision Agriculture*, titled, “Does drone remote sensing accurately estimate soil pH in a spring wheat field in southwest Montana?

Hailey Webb (left) and Nathaniel Barnes (right), 2020 graduates of Montana State University, conducting field data collection for a precision agriculture research project.

Aerial photograph acquired from a drone in late summer of 2019 (above), and ground photograph (below) of a precision agriculture study site near Bozeman, Montana.

MontanaView Consortium Membership

Montana State University

Salish Kootenai College

University of Montana

Montana Technological University

MontanaView Principal Investigator:

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NORTH DAKOTAVIEW 2019 - 2020

NORTH DAKOTAVIEW 2019 - 2020 ACTIVITIES

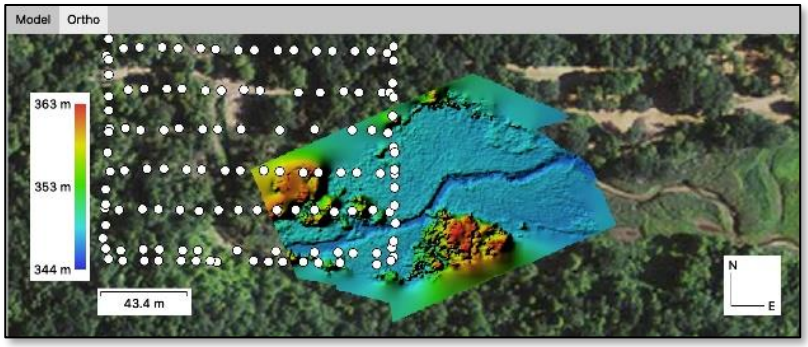
North DakotaView provided important remote sensing skills training so that students can be successful in their future careers.

- **Training on use and analysis of UAS data for mapping Earth Systems.** Students were introduced to drone flight planning and image acquisition of a tributary of the Turtle River. Students worked with several software packages for the flight planning, combining all the images into a georeferenced mosaic, and creating a 3D digital elevation model of the area.
- **Training on creation of 3D models of river bank erosion using imagery and Structure from Motion (StFM).** Students collected overlapping images of streambank erosion along the Turtle River. They then used a GPS to measure the location of ground control points so that the images could be georeferenced and combined. Students were able to create a 3D model of the streambank that could be used to analyze the erosion and predict continued bank change.
- **Scholarships for student training and research.** Competitive grants were awarded to three students to further their training in remote sensing skills, and support their graduate research.

Dr. Mbuh demonstrating flight planning for drone data collection training at University of North Dakota.

Collection of streambank erosion data for developing 3D models.

The funded projects include a study to detect birds near wind farm towers using drones, and a spatial study of animal movements along highways in the state. The bird study ran almost 500 drone flights to acquire images, and is working with neural network image classifiers to detect the birds in the images. The second study of animal movements looked at landscape versus DNA sequencing to see how animals tracked on roadways are related to one another.



Drone flight planning map and elevation model from imagery.

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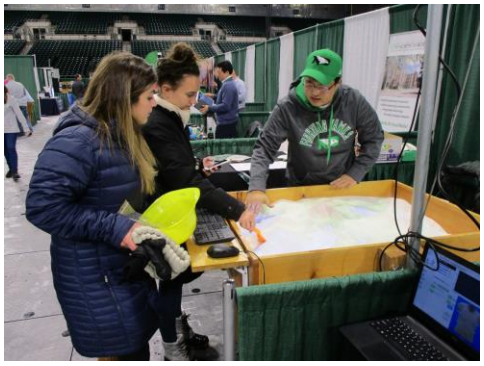
Benefits to North Dakota

- NDView led education workshops on remote sensing at Valley Middle School and the Nathan Twining Elementary and Middle School. More than **150** students participated in these events, using an augmented reality sand table to link landforms to computer generated topographic maps.

- NDView and the Department of Geography & GISc. at the University of ND led demonstrations in remote sensing as part of the Northern Valley Career Fair Expo in 2019, in Grand Forks. More than **1,800** students from regional high schools participated in the career fair.

- NDView provided remote sensing-related assignments and resources to area teachers after the Corona virus pandemic forced area students online.

- NDView has funded thousands of dollars for the purchase of remote sensing software for students and faculty at the University of North Dakota to assist in training and research.



Students at Northern Valley Career Fair learning about remote sensing and watersheds.

Geospatial Analysis and Remote Sensing Lab at University of ND with NDView-funded software.

North DakotaView Consortium Membership

University of North Dakota

Bismarck State College

Turtle Mountain Community College

Dakota Science Center — Science is for everyone!

North Dakota Geographic Information Systems — Be Legendary. — Information Technology

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North Dakota View

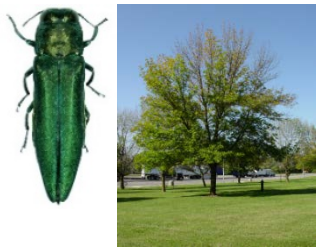
https://arts-sciences.und.edu/academics/geography/index.html

Facebook.com/groups/91074880028/

NebraskaView 2019 - 2020

NebraskaView 2019 - 2020 Activities

The NebraskaView program partnered with the City of Lincoln Parks and Recreation to assess the utility of airborne remote sensing for detecting and managing emerald ash borer infestations within the city's urban forests. The emerald ash borer (EAB) is invasive to Nebraska leading to widespread mortality of ash trees in Lincoln and other communities across the state. Lincoln Parks and Recreation manages the city's ~10,000 ash trees in public areas and is facing a considerable financial investment to either treat or remove EAB-impacted ash trees.

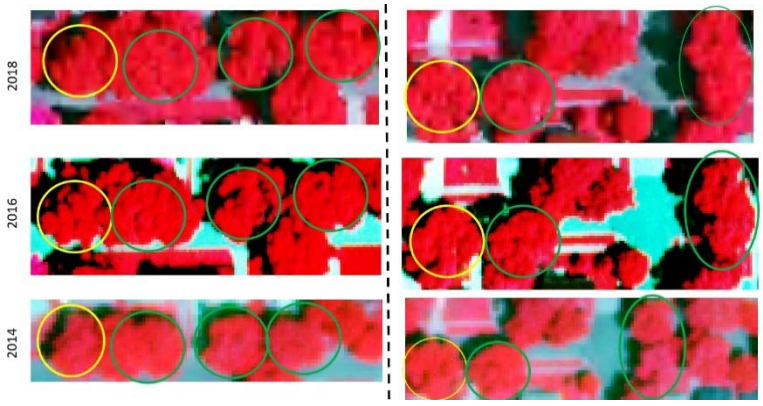


Invasive emerald ash borer and early-stage damage to green ash tree in Lincoln, NE.

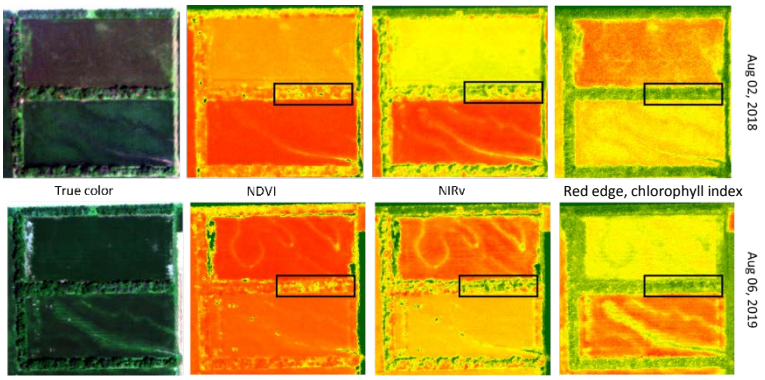
The goal was to investigate the use of free, publicly-available National Agricultural Imagery Program (NAIP) imagery from USDA as a cost-efficient data source for the detection of EAB-infested ash tree areas in Lincoln compared to more expensive airborne hyperspectral imagery.

Results:

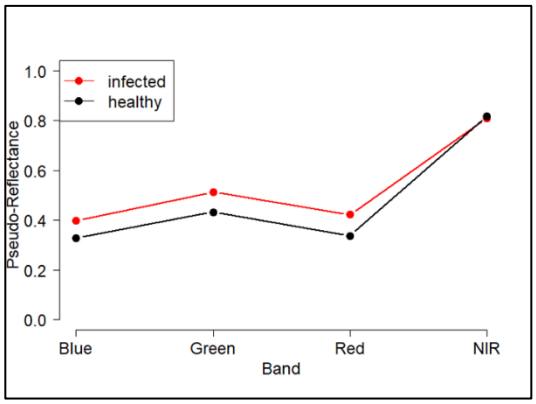
- NAIP imagery could only detect EAB-infested ash trees with part of the tree canopy that was dead.
- EAB-infected ash trees with little to no canopy mortality, were difficult to distinguish from healthy trees in the NAIP imagery.
- Initial analysis of hyperspectral imagery indicates that pre-visual signals of EAB-induced stress can be detected in ash trees not exhibiting mortality, which could serve as an early indicator for urban forest managers.



Multi-year, false-color, USDA NAIP imagery for selected healthy (yellow circles) and EAB-infested (green circles) ash trees in Lincoln, NE



True-color, 1-meter hyperspectral imagery over ash trees (in black rectangle) with simulated EAB-induced damage at the University of Nebraska-Lincoln's Agroforestry site near Mead, NE



Multispectral profiles of remote sensing signal differences between healthy and EAB-infested ash trees obtained from USDA NAIP imagery

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BENEFITS TO NEBRASKA

The mission of NebraskaView is to ensure ***that Nebraskans make full use of satellite and airborne imagery, aerial photography and other geospatial data products through technologies such as geographic information systems (GIS) and remote sensing*.**

Specific benefits of Nebraska View to the State include:

- Support decision makers in evaluating and selecting the most appropriate remote sensing imagery and other spatial data for a specific application.
- Demonstrate the value of remote sensing data and assist in developing applications.
- Providing remote sensing education and training to students, professionals, and others in the general public.

Hands-on demonstration of basic remote sensing concepts of vegetation for students in Community and Urban Forestry Program, School of Natural Resources at the University of Nebraska-Lincoln.

Airborne hyperspectral imagery over the University of Nebraska-Lincoln East Campus and surrounding area that can be used for a wide range of agricultural, natural resource and other applications.

NEBRASKAVIEW CONSORTIUM MEMBERSHIP

City of Lincoln, Nebraska Parks and Recreation

Nebraska Forest Service

The Nebraska Environmental Trust

University of Nebraska-Lincoln Community and Regional Forestry Program

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

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NewHampshireView 2019 - 2020

NewHampshireView 2019 - 2020 Activities

Our High Impact Activity for this year was the evaluation of very high spatial resolution imagery to assess the impact of forest edges. As our landscapes become more fragmented because of increased development, more and more edges are created. Edges (boundaries between forest and other land covers) allow more light and wind as well as increased temperatures changing the ecosystem and altering the flora and fauna in these locations (Figure 1). As edges increase, the core areas necessary for many plants and animals decreases (Figure 2). Transects are typically collected on the ground to measure the edge influence (Figure 2). In this study, very high spatial resolution imagery was evaluated as a substitute for the ground transects (Figure 3). Measurements made in the Depth of Edge Influence (DEI) and the Canopy Openness (CO). Transects were measured first on the ground to determine the DEI and CO and then these results were compared to the same measurements made on the very high spatial resolution imagery.

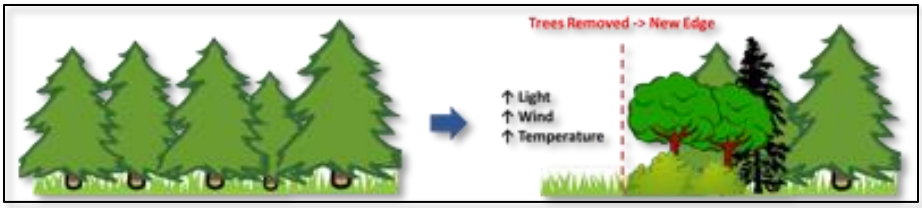

Figure 1. Example of impacts from creating forest edges.

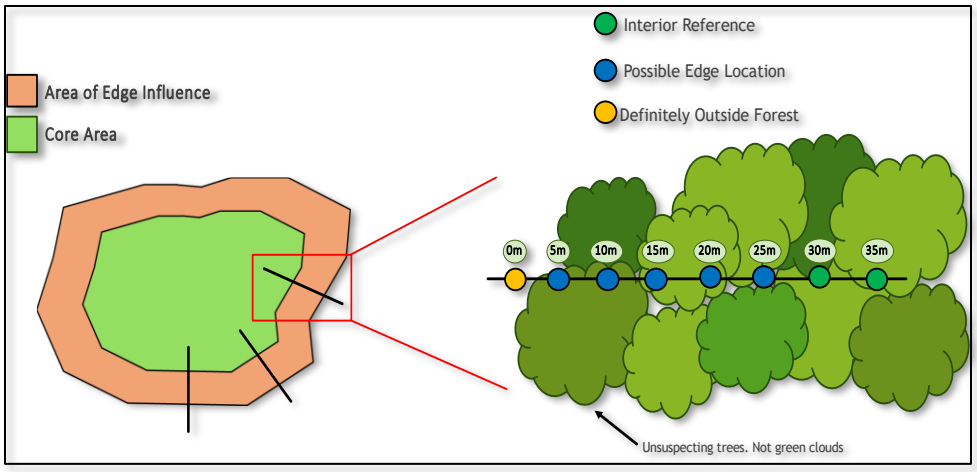

Figure 2. Example showing forest polygon core and edge with transect sampling.

Figure 3. Very high spatial resolution image showing transect locations.

Results of this research have shown:

- Many more transects can be obtained from very high spatial resolution imagery than can be collected from the ground for the same amount of effort.
- Imagery-based measurements tended to overestimate CO.
- There are issues, as reported in previous studies, with the imagery detecting the forest understory because of the canopy density.
- Age of edge is an important factor in determining success.

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Benefits to NHView

- Our work evaluating the use of very high resolution imagery for forest edge detection shows promise to be able to more effectively and efficiently monitor changes in the forest landscape caused by landscape fragmentation that directly impact the ecology of the area. Our information will provide the means for natural resource managers, wildlife biologists, conservation planners, and others to make better decisions about their land.
- This year NHView assumed the lead role in the University GeoSpatial Support Center (GSC) after the departure of the GeoScience librarian. This facility provides consulting and workshops on remote sensing and geospatial analysis to students, staff, and faculty. NHView, the GSC, and others teamed up for GIS Day to showcase remote sensing and geospatial analysis campus wide.
- NHView funded two undergraduate interns to work in the Basic and Applied Spatial Analysis lab to help with research resulting in two posters on this work presented at the Undergraduate Research Conference.

Undergraduate collecting forest canopy data.

Very high spatial resolution image of the College Woods Natural Area used by many classes and students adjacent to the University of New Hampshire campus.

NHView Consortium Membership

- **Department of Natural Resources & the Environment, UNH**
  The Basic and Applied Spatial Analysis Lab (BASAL) conducts basic research on spatial data uncertainty/map accuracy and applied research applying the tools of remote sensing, GIS, and spatial data analysis to solve natural resource problems.
- **NH GLOBE Partnership, UNH**
  Carries out GLOBE teacher training in atmosphere, land cover, hydrology, soil and earth system science with a focus on land cover mapping and geospatial technologies.
- **EOS-EarthData, UNH**
  A digital library of Earth science data that serves scientists, educators and the public.
- **NH GRANIT GIS Repository, UNH**
  A cooperative project to create, maintain, and make available a statewide geographic data base serving the information needs of state, regional, and local decision-makers.
- **Diamond Library, UNH**
  The library maintains an extensive map and aerial photo collection for NH and houses the GeoSpatial Support Center.
- **Forest Watch, UNH**
  A New England environmental education activity using field, lab, and satellite data analysis methods for assessing the state-of-health of local forest stands.
- **Cooperative Extension, UNH**
  Offers short courses in geospatial technologies including GIS, GPS, and field mapping.
- **Dartmouth College**
- **NH Planning Commissions**

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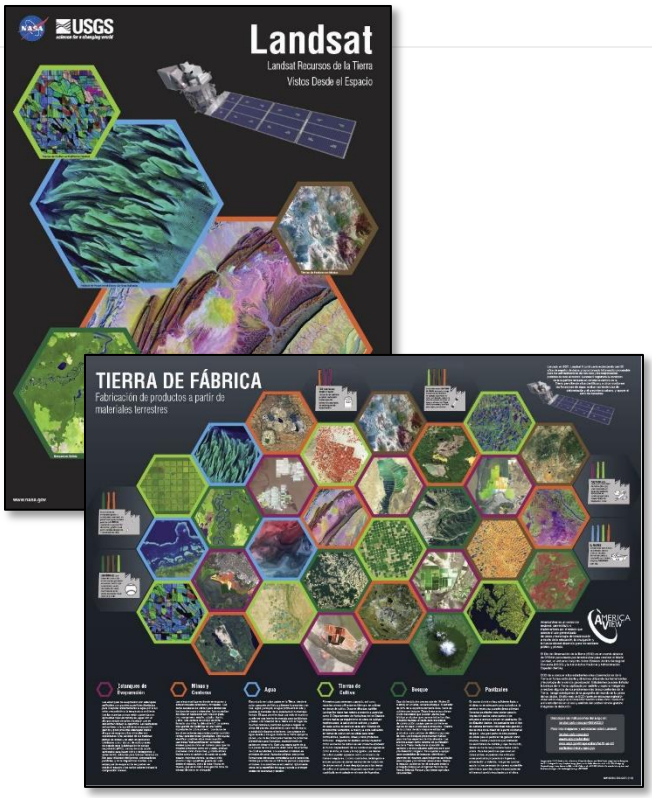
NEW MEXICOVIEW 2019 - 2020

NEWMEXICOVIEW 2019 - 2020 ACTIVITIES

NMView collaborates with The Wildlife Society (TWS) state chapters (AZ, NM, and TX) and the Southwest Section in the Southwest Section Geospatial Advisory Committee. TWS is an international professional society focused on wildlife management and conservation. The committee represent government agencies, non-governmental organizations, universities, and private companies.

Lego Landsat model of New Mexico

Participation in this multi-year effort has increased as the committee's efforts continue to conduct outreach and education. NMView assists in posters, factsheets, webinars and workshops. For FY19, the committee presented at the Joint Arizona-New Mexico Chapter meeting in Prescott, AZ attended by 350 people and the Texas Chapter meeting in Corpus Christi, Texas with 600+ attendees. The effort continues to establish strategic partnerships, as well as gathering information on remote sensing data and information requirements. This effort also promotes undergraduate and graduate research and advance education and training while supporting the U.S. DOI Secretarial Priorities.



Spanish translation of the 2020 Earth Observation Day poster

NMView continues to work on the yearly edition of the AmericaView EOD educational poster and provide outreach on the Globe Observer's app and Land Cover module ("Adopt a Pixel"). NMView has completed the Spanish translation of the 2020 installment of the EOD poster and provided this file as a downloadable pdf from the AV, NASA, and NMView websites. We continue to use current Globe Observer curricula to train personnel on the Land Cover module. This includes the creation of a state-based Lego product modeled after Landsat 8.

As part of the NMView EOD efforts, the Globe Observer Land Cover module was used in a Senior/Graduate Student course of 28 students. The students also participated in a MapGive effort in November of 2019. We anticipated more work with area high schools, but that effort was modified with the closing of schools for Covid-19. The impact of the Spanish translated EOD poster is unknown as the pdf is readily available via the AV website and the NASA website. The effort advances education and training, technology transfer, and outreach. The effort also establishes strategic partnerships, promotes undergraduate and graduate research and employment skills as well as support the U.S. Department of the Interior Secretarial Priorities.

New MexicoView 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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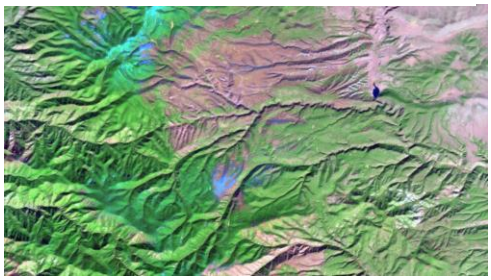
Benefits to New Mexico

New MexicoView is working to provide increased awareness about remote sensing data, products, and the uses of the data, and to facilitate methods to get the data into user's hands. Remotely sensed data are used in New Mexico by state and federal agencies, universities, private entities, and non-profit organizations. Uses have included natural resource management activities (including fire and range management), and biodiversity conservation. A challenge for the New Mexico remote sensing community is to get applications into the hands of managers in a format that can be applied on the ground. These applications have been developed by USGS, USDA, and New MexicoView partners. The New MexicoView consortium is working on methods to bring the research and application communities together in New Mexico. These efforts include:

- Expertise
- Collaboration and community building
- Data use and applicability
- Cutting edge applications
- State and regional contacts

An example of community building is the collaboration of New MexicoView with The Wildlife Society (Southwest Section and New Mexico Chapter) to support a geospatial advisory committee to provide information to wildlife managers seeking to address ecological questions with remotely sensed data and geospatial technologies.

Students participating in Earth Observation Day Activities



Landsat imagery of the Gila National Forest

New MexicoView Consortium Membership

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

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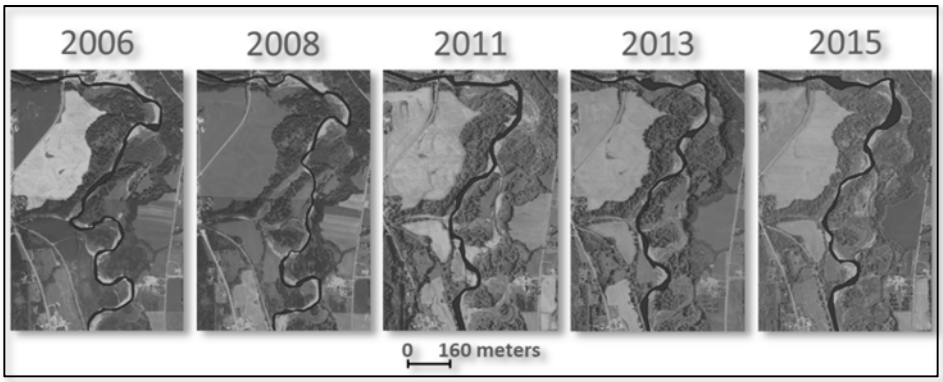
NEW YORKVIEW 2019 – 2020

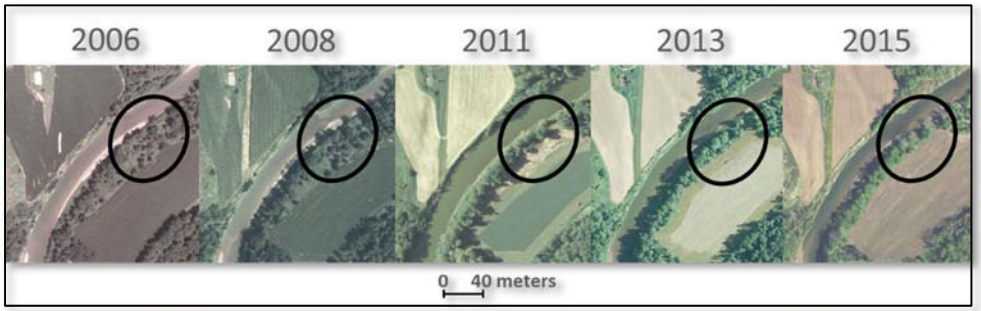
NEW YORKVIEW 2019 – 2020 ACTIVITIES

Riparian vegetation provides many important ecosystem functions and conservation benefits. Recent studies have utilized newly developed remote sensing technologies to explore high spatial resolution riparian vegetation delineation. In GY19, New YorkView (NYView) focused on stream riparian analysis within two related components. The first used Google Earth Engine (GEE) to assess temporal and spatial changes in river geomorphology and riparian vegetation. We developed a new approach using GEE to quantify changes in river channel location and adjacent floodplain vegetation extent and fraction over time. Our method incorporated automatic multi-temporal image classification based on publicly available 1 m aerial images. We tested the method by characterizing temporal and spatial trends in riparian vegetation and river channel position for the mainstem of the Genesee River, New York, USA from 2006–2015. Our method allows stakeholders and managers to process remotely sensed imagery and investigate trends in river channel and riparian vegetation dynamics over time, while reducing the cost of data processing, storage and software licensing compared to traditional methods.



An example of National Agricultural Image Program (NAIP) images showing channel changes over time on the mainstem of the Genesee River in Alleghany County, NY (in black).

The second component of the GY19 study focused on developing a framework to quantify riparian vegetation delineation accuracy, which was tested by comparing riparian vegetation maps produced through two independent processes at different spatial resolutions. One process created riparian maps based on 1 m pixel aerial photographs using random forest classification within an online image processing environment, while the other used maps from a variety of 30 m pixel satellite images created with a decision tree classifier in a proprietary image processing software package. An important consideration within this project was identifying factors that influence the accuracy differences between the processes in order to characterize product applicability. We quantified accuracy of the two processes in terms of riparian vegetation and channel boundary delineation for two rivers in New York State, USA. Accuracy of channel boundary delineation and vegetation classification were both 20% higher for the higher spatial resolution product. Several factors influenced these differences, including detection of higher order streams, land use, and riparian zone width. The procedure developed in this study can enable the holistic quantification of riparian vegetation delineation accuracy for both channel boundary delineation and vegetation classification.



An example of NAIP images showing riparian vegetation conversion into agricultural land use in Alleghany County, NY.

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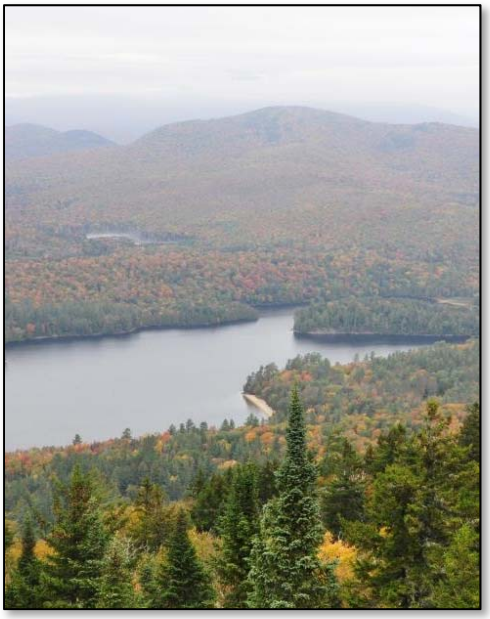
Benefits to New York State

NYView has been supporting the application of remote sensing data and products to solve challenges faced by New York State citizens as part of the AmericaView Consortium since 2009. Remotely sensed imagery provides a unique opportunity to observe the ground surface from above. This imagery is used for a wide range of applications in New York State including analyzing land use and land cover change, quantifying water quality, characterizing vegetation dynamics, planning or monitoring urban growth, and supporting response to a wide range of emergency situations.

NYView initially focused on facilitating access to diverse remote sensing data and products, and supporting collaborative research, teaching, and outreach among consortium members. Since becoming a full member of AmericaView in 2014, NYView has also supported training of high school teachers, undergraduate and graduate students, and used Landsat change pairs from sites across the state to demonstrate applications of remote sensing data for visitors at the New York State Fair. NYView has also invested time in developing video modules and lab exercises to support use of the cloud-based Google Earth Engine platform.



Rich Lake from Goodnow Mountain at the Adirondack Ecological Center in Newcomb, NY

The reservoir of the Mount Morris Dam in the Genesee River in Letchworth State Park.

Beyond the important education focus described above, NYView has also performed research that explored the integration of airborne lidar and Landsat data to quantify forest aboveground biomass as well as investigating the utility of remote sensing and spatial analysis to assess trends in vegetation extent and vigor along riparian corridors.

New YorkView Consortium Membership

Current NYView consortium members include: the State University of New York (SUNY) College of Environmental Science and Forestry (ESF), the Institute for Resource Information Sciences (IRIS) at Cornell University, SUNY Fredonia, and SUNY Plattsburgh. NYView aims to continue to support collaboration and enhance remote sensing activities across the state. Interested researchers and users of remote sensing data should visit the NYView webpage (www.esf.edu/nyview) or contact the NYView Principal Investigator for more information.

ESF

Cornell University

IRIS

Institute for Resource Information Sciences

Plattsburgh

STATE UNIVERSITY OF NEW YORK

FREDONIA

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NEW YORK VIEW

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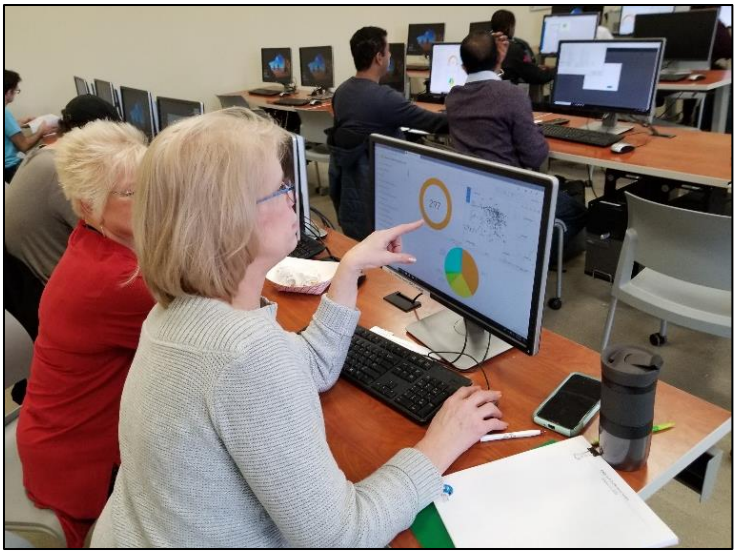
OHIOVIEW 2019-2020

OHIOVIEW 2019-2020 ACTIVITIES

OhioView Multi-University Remote Sensing Workshop

OhioView member universities Youngstown State University, University of Toledo, Bowling Green State University, Ohio University, and University of Dayton presented a day-long workshop for approximately 65 participants on February 7, 2020, that covered a variety of remote sensing and geospatial topics. Each university's PI presented their section of the workshop to not only the individuals at their site but across the internet to the other sites simultaneously, and then participants at all four sites worked together on hands-on applications of remote sensing.



Participants in the OhioView Multi-University Workshop design and publish geospatial dashboards at University of Toledo, one of five locations involved in the hybrid workshop.

ArcGIS Pro Training

OhioView member university Youngstown State University (YSU) held two workshops (entitled "ArcGIS Pro: The Next Level") on February 28, 2020 and March 6, 2020 for local and regional geospatial professionals for training in using the new GIS industry standard, ArcGIS Pro.

SPatial LITeracy - SPLIT Remote Sensing

Bowling Green State University (Dr. Anita Simic Milas) teamed up with St. Ursula Academy high school on several occasions where students learned how to use remote sensing data for their project, for which they won the Lexus Eco Challenge award. In addition, a series of SPLIT Remote Sensing YouTube videos and webinars were created by students and offered to the public.

St. Ursula Academy's students learn how to use a spectroradiometer for soil quality and crop vigor as part of the SPLIT remote sensing program.

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BENEFITS TO OHIO

- Initiated in 1997, OhioView is a consortium of universities in Ohio dedicated to furthering education, research, and workforce training in Earth Observation Science. OhioView is overseen by a Board of Directors made up of PIs from several of the universities in the consortium. Many OhioView schools participate in the OhioView Software Pool, by which the member schools contribute to a central fund dedicated to purchasing specialized remote sensing software at a significant cost savings to each school. This software enables the classwork, educational efforts, and research conducted by OhioView universities.
- One of the longest running OhioView initiatives is the SATELLITES (Students and Teachers Exploring Local Landscapes to Interpret the Earth From Space) Program. This is offered yearly to K-12 teachers (particularly middle and high school level) in Ohio. and provides teachers and students with hands-on, inquiry-based science and STEM education using geospatial technologies. The student created projects are then presented and showcased at the annual SATELLITES Conference held each spring in Toledo, Ohio.
- The OhioView Multi-university remote sensing workshop served approximately 65 faculty, students, and workforce members in geospatial techniques including designing and publishing geospatial dashboards (Dr. Bradley Shellito), lidar analysis (Dr. James Lein), calculating temperature from Landsat imagery (Dr. Umesh Haritashya), image classification (Dr. Anita Simic Milas), and training in the NASA Globe Observer app and tree height measurement (Dr. Kevin Czajkowski). There were also short guest presentations by Peder Nelson and Brian Campbell from NASA Earth Science Education Collaborative.
- Similarly, approximately 50 participants (drawn mostly from local and regional workforce) attended the two ArcGIS Pro day-long workshops at YSU, which also included a demonstration of remote sensing imagery and content held on the new 4K visualization system of the YSU planetarium.
- Likewise, the SPLIT Remote Sensing research-educational cascade model supported surface water quality related research and offered high school and university students the opportunity to gain hands-on field remote sensing research skills.
- Regional partners include NASA Glenn Research Center and the Old Woman Creek State Nature Preserve.

K-12 students presenting their remote sensing research at the annual SATELLITES conferences at the Penta Career Center in a previous year.

Participants at the OhioView Multi-University Workshop at the University of Dayton worked outside with the NASA Globe Observer app to calculate tree heights.

Participants in the OhioView Multi-University Workshop at Youngstown State University receive instruction from another location.

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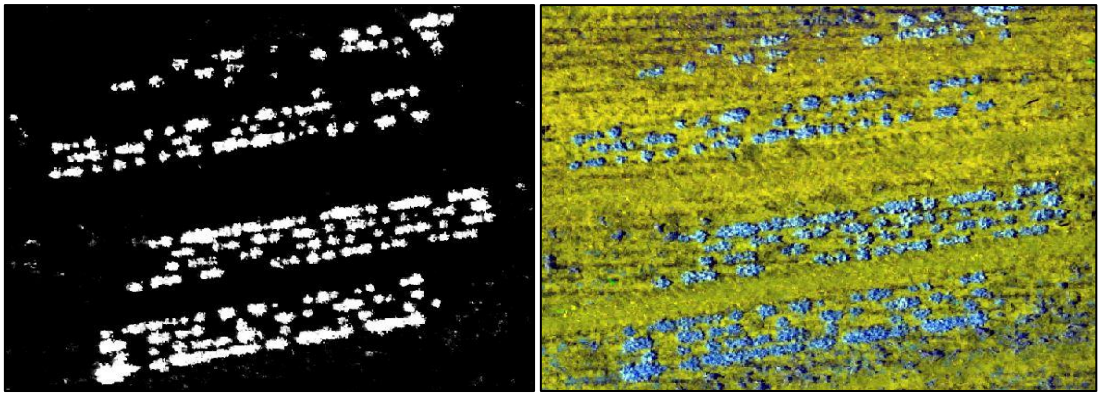
OklahomaView 2019 - 2020

OklahomaView 2019 - 2020 Activities

OklahomaView's HIA was "A comparison of pixel-based and object-based image analysis (OBIA) with machine learning algorithms in mapping peanut seedlings using UAV imagery." Early detection of in-field peanut germination is important to promote higher yields by allowing farmers to replant in the event of peanut germination gaps. Advancements in remote sensing, such as unmanned aerial vehicle (UAV) and machine learning provide the potential of detecting peanut seedlings accurately at the field scale. Identification of plant seedlings can be achieved through both pixel-based and object-based image analysis. However, it is not clear that which method is superior. This study used images collected by a UAV flight, taken by the USDA - Agricultural Research Service (USDA-ARS) Grazinglands Research Laboratory (GRL) in El Reno, Oklahoma in July 12, 2019 with a MicaSense Red Edge sensor with 5 bands (Blue, Green, Red, Red Edge and Near Infra-Red), to detect peanut plants with both pixel-and object-based image analysis.

PIXEL BASED PEANUT CLASSIFICATION USING NEURAL NETWORK

Neural networks were used to recognize patterns and to make predictions. The neural network that was built utilizes the pixel values of all the bands of the image and predicts the binary peanut class (peanut or non-peanut). The neural network for the classification model was built using Keras on TensorFlow. The loss function used was "categorical sparse crossentropy" and the optimizer used was "RMSprop" in this model. The model produced an **accuracy of 80.7%** with 12 hidden layers and 25 epochs.



Identified peanut seedlings (white color) for a zoomed in area from pixel based classification and the color composite image (EVI, Green, and RedEdge as RGB) for the same area same.

OBJECT BASED PEANUT DETECTION USING DEEP LEARNING

Object detection was used to identify and localize an object from an image. It can be accomplished by labelling the data using bounding boxes around the target object. Various band combinations had been tested (see table below) to find the combination that has the best performance. A total of 1827 bounding boxes or annotations were manually drawn across the peanut field. All of the samples were divided into 70% and 30% for training and validating, respectively. The algorithm used to build object detection model is a Single Shot MultiBox Detector (SSD) in ArcGIS Pro. The confidence threshold was set to 0.4 and we can conclude that the band combination of **Red, RedEdge, and Near Infra-Red outperforms all the other band combinations**, with an **accuracy of 79.02%**. Pixel based classification had a better accuracy than object based peanut detection. However, further segmentation of pixel based results is needed to count the number of peanut seedlings to determine germination rate.

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Benefits to Oklahoma

Advancements in technologies such as remote sensing, especially the unmanned aerial vehicle (UAV), and machine learning algorithms that provide accurate classification and prediction models, greatly benefits the field of agriculture.

- Save time for breeders in determining germination rate of peanuts, which was previously achieved by physically counting the seedlings throughout the peanut fields.
- The data obtained and used to train the model and therefore knowledge obtained can be easily transferred to other peanut fields for accurate detection of peanuts.
- The basic tools used for the project, ArcGIS Pro and python, can be transferred to identify other crops.
- A graduate student, Bhagya Hosur from the Department of Computer Science at Oklahoma State University, get trained in the project.
- The project was collaboration between USDA-ARS GRL and OSU, which strengthens the connection of the OKlahomaView Consortium members.

OklahomaView Consortium Membership

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

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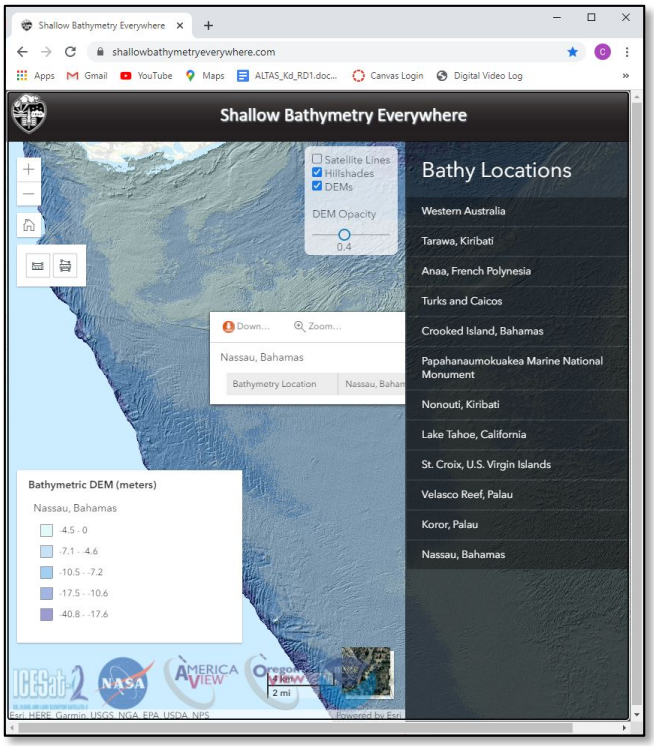
OregonView 2019 - 2020

OregonView 2019 - 2020 Activities

OregonView created a new **webGIS for disseminating bathymetric digital elevation models** (DEMs) generated from fusion of Landsat 8 and Sentinel-2 multispectral imagery with NASA ICESat-2 lidar data. Developed by OregonView-supported graduate student, Ben Babbel, the webGIS (https://shallowbathymetryeverywhere.com/) contains data for 11 sites with the following functionality:

- View satellite tracklines
- View bathymetric contours and hillshades
- Download bathymetric DEMs

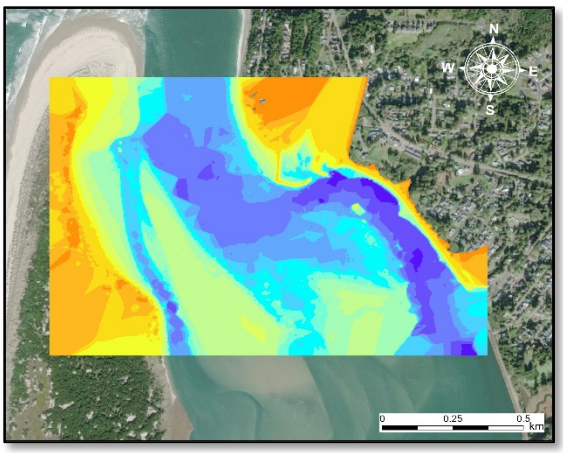
Additionally, OregonView completed a 2019-2020 High Impact Activity (HIA): **Netarts Bay Bathymetric Data Fusion using Satellite Imagery**. Led by OSU graduate student, Selina Lambert, this project investigated the ability to create high-resolution topographic and bathymetric data from a range of remote sensing and field data. The DEMs generated in the project are anticipated to support water quality studies and erosion monitoring in Netarts Bay, a shallow-water estuary on the northern Oregon Coast. The site is of economic and ecological importance within the state and has experienced significant change in recent decades.



ShallowBathymetryEverywhere webGIS developed by OregonView-supported graduate student, Ben Babbel.

Data acquisition in the Netarts Bay project site was completed in July – September, 2020. Multiple Oregon State University graduate students participated in the fieldwork, which was coordinated with Oregon Parks and Recreation Department (OPRD) GIS Program Lead and OregonView member, Brady Callahan.

Field data collection in Netarts Bay, Oregon.



Netarts topobathymetric DEM.

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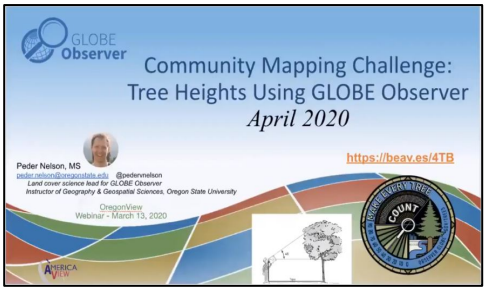
Benefits to Oregon

OregonView is active in K-12 STEM education activities within the state. OSU graduate student, Selina Lambert, designed and built a remote sensing demo and led OregonView K-12 outreach at two events:

- *Family Science and Engineering Night* at Monroe Grade School in Monroe, Oregon (elementary and middle school STEM event)
- *Discovering the Scientist Within* at OSU (free half-day event designed to encourage young women to pursue STEM careers)

OregonView member, Peder Nelson, has also been active in outreach, delivering multiple presentations and workshops focusing on GLOBE Observer, citizen science, and use of Landsat imagery.



OregonView presentation on GLOBE Observer, given by Peder Nelson and available on the OregonView website: https://media.oregonstate.edu/media/t/0_h4842d0u

OregonView remote sensing demos for K-12 outreach events.

OregonView Consortium Membership

The OregonView consortium membership comprises leaders in the remote sensing and geospatial information communities within Oregon and extends across the government, commercial and academic sectors. Member organizations include: Oregon Department of Parks & Recreation (OPRD), USGS Forest & Rangeland Ecosystem Science Center, Oregon Framework Implementation Team (FIT), Oregon Geospatial Enterprise Office (GEO), Portland State University (PSU), Oregon State University (OSU) College of Engineering, College of Forestry, and College of Earth, Ocean, and Atmospheric Sciences.

Oregon State University

USGS science for a changing world

Portland State University

GEO

Oregon State Parks — Nature HISTORY Discovery

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

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OregonView

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PennsylvaniaView 2019 - 2020

PennsylvaniaView 2019 - 2020 Activities

In 2019 – 2020 PennsylvaniaView decided to create an outdoor classroom in the Pike Run Watershed. Pike Run, a fourth-order stream in eastern Washington County, Pennsylvania, is a tributary to the Monongahela River. Its course begins at the headwaters in West Pike Run Township and winds through mostly rural and minor residential areas to its outflow between Coal Center and California Boroughs. Pike Run's proximity to California University of Pennsylvania (CalU) makes it an ideal "outdoor classroom" for university courses in Earth Sciences and Geospatial Technology. Students use existing remote sensing imagery and geographic data to create a watershed evaluation map and pursue undergraduate research. In the Summer 2020 – Fall 2020 semesters, the PI and his fellow colleagues created a plan on creating and utilizing the outdoor classroom.

Two students won PennsylvaniaView Scholarships for their work on this project. Ms. Makayla Froseth, a GIS Major, completed a report on current spatial data on the Pike Run Watershed. Ms. Lauren Rockwell, a Geology major, completed an examination on the integration of equipment and the spatial data

Lauren Rockwell.

. Makayla Froseth

The Plan for this project was to:

1) Collect data from the Pennsylvania Spatial Data Access website and then organize and edit remote sensing imagery and geospatial data of the Watershed area. This includes State-wide LIDAR, imagery and hydrological data
2) Purchase and install permanent environmental monitoring station – such as atmospheric and hydrologic instrumentation to collect real-time data including in-stream parameters and precipitation. Instruments include a tipping bucket rain gauge (~$500), a manometer (~$600), in-stream multiprobe (~1500), and multi-stage thermistors (~600). The Pike Run Watershed Association installed and will maintain the equipment.
3) Create a project involving a few select students to compile and analyze data from several sources. They will also examine the GLOBE protocols for hydrology and land cover's specifically their data sheets and exercises for possible integration.

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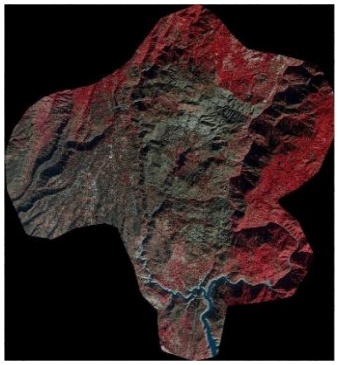
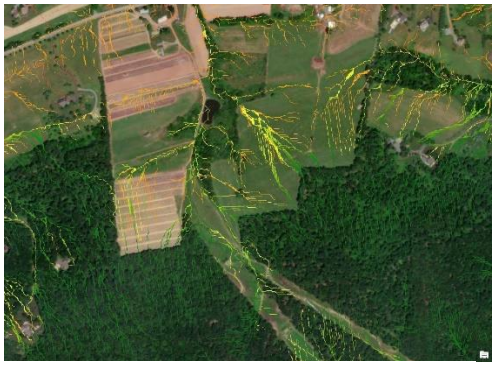
Benefits to Pennsylvania

PennsylvnaniaView's projects are not just focused in southwestern Pennsylvania. We are a consortium of members throughout the Commonwealth of Pennsylvania. Our major goal is to educate the public about remotely sensed imagery and to provide information in a public forum. Here are a few examples:

1) **Penn State** hosts the PennsylvaniaView website. This website provides lessons and examples on the use of remote sensing. They also administer and host the Pennsylvania Spatial Data Center – Pennsylvania's Spatial Data Clearinghouse.
2) **Villanova University** used imagery to demonstrate to students how remote sensing technology can be used to undertake scientific geospatial analysis. The imagery for natural disaster assessment and environmental effects included the area of the Camp Fire in Butte County, California
3) **Bucknell University** used imagery and spatial data to work on an alternative, physically-based index for sediment transport in Turtle Creek Watershed in Lewisburg. Faculty and students completed this research.



SPOT false-color image of the Camp Fire



Normalized Difference **Flow** *Index map of Turtle Creek Watershed*

PennsylvaniaView Consortium Membership

PennsylvaniaView Principal Investigator:

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RHODE ISLANDVIEW 2019 - 2020

RHODE ISLANDVIEW 2019 - 2020 ACTIVITIES

Rhode IslandView continues providing unique opportunities for undergraduate students to work alongside aerial drone professionals.

With support from Rhode IslandView, the University of Rhode Island Environmental Data Center recruited and mentored an undergraduate research assistant who learned how to process remote sensing data collected by small Unmanned Aerial Systems (sUAS). The assistant concentrated on creating a semi-automated data processing workflow for multispectral imagery (e.g. true color and infrared data), and developed additional workflows for collecting and processing aerial photographs for creating virtual 3D models of buildings.

This initiative provided a unique employment opportunity for a student who represented a local historically underserved community, and also directly supported USGS National Land Imaging Program Objective 3: Promote Undergraduate and Graduate Research and Employment Skills. Rhode IslandView created a valuable opportunity for a student entering the workforce with cutting-edge sUAS knowledge.

sUAS flight operations team at work.

Original 1939 historical aerial imagery available from RIGIS.

1939 historical imagery enhanced by Rhode IslandView.

Rhode IslandView improves the usefulness of publicly available historical remote sensing data. Collaborating with the Rhode Island Geographic Information System (RIGIS) and the Rhode Island Division of Statewide Planning, Rhode IslandView is exploring approaches for improving the appearance of historical aerial photos from 1939 by manipulating them with specialized remote sensing data processing software.

This ongoing pilot study is focusing on a region in the vicinity of Quonset Point, North Kingstown, an area that has undergone rapid land use changes since these photos were taken in 1939. RIView is investigating how to efficiently georeference and mosaic these photos so they may be more easily used by Geographic Information Systems (GIS) for a wide range of applications, such as municipal planning and climate change studies.

This research initiative ties into USGS National Land Imaging Program Objective 5: Support the U.S. Department of the Interior Secretarial Priorities.

Rhode IslandView 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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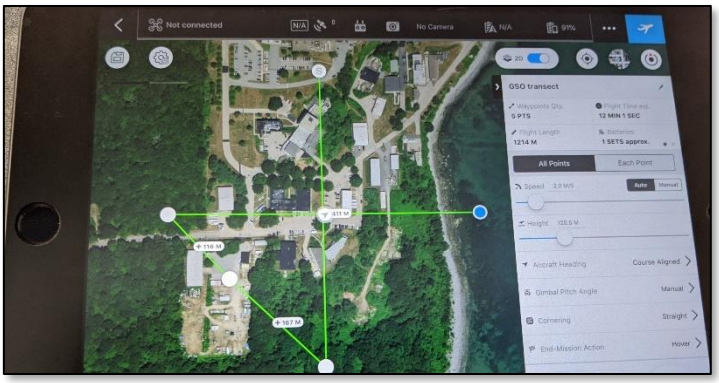
Benefits to Rhode Island

Rhode IslandView fosters local applications of drone-based technologies. Drones have an unmatched capability to quickly and inexpensively capture detailed aerial photographs of small areas. Upon joining AmericaView in 2014, RIView has focused on facilitating online access to remote sensing data and promoting the use of small Unmanned Aerial Systems (sUAS). The consortium's approach to this is largely through conducting demonstrations, providing undergraduate student training opportunities, and building data acquisition partnerships.



Snapshot of a simple sUAS mission plan.

Remote sensing datasets of Rhode Island historically have been difficult to view by the general public. The computer file formats, complex software, and robust computer hardware used to efficiently access these types of data are not readily accessible by most. Rhode IslandView has created web-based map services in partnership with the Rhode Island Geographic Information System consortium (www.rigis.org). These services are used behind-the-scenes by online map application developers to directly connect our communities with remote sensing imagery and detailed lidar-based elevation models.

Critical applications, such as STORMTOOLS, use the services that are maintained with the support of Rhode IslandView.

Rhode IslandView Consortium Membership

THE UNIVERSITY OF RHODE ISLAND

RIGIS

STATE of RHODE ISLAND — HOPE

DEM RHODE ISLAND

USDA United States Department of Agriculture
Natural Resources Conservation Service

BROWN

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

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RHODE ISLAND VIEW

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SOUTH DAKOTA VIEW 2019 - 2020

SOUTH DAKOTA VIEW 2019 - 2020 ACTIVITIES

South DakotaView is focused on remote sensing education and outreach to students, educators, and current workforce personnel across South Dakota. SDView activities during this past year include:

- **K-12 Teacher Workshop**
  This past year's SDView High Impact Activity was a workshop titled "Drone for Educators." SDView partnered with numerous institutions around the state and nation to provide expertise in several different areas related to UAS instruction. This activity supported the curricula, workshops, technology transfer and outreach portions of NLRSEORA Objective 4. In addition, the workshop provided an experience for teachers to explore, introduce, and develop STEM training with drones in the classroom.
  Selected topics covered by the Drone for Educators Workshop included:
    - Introduction and UAS Applications, UAS Sensors, and Curriculum Options
    - The Academy of Model Aeronautics (AMA) Supporting Education through Model Aviation
    - Drone Platforms for Education, FAA Part 107 Preparation, and Drone Insurance

Processing drone imagery of Mitchell Technical Institute

Drone used for precision agriculture applications at South Dakota State University

AmericaView displays at Black Hills Digital Mapping Conference

Poster session at South Dakota State Geography Convention

- **The BIG Event**
  - September 21, 2019 - Ramkota Conference Center, Sioux Falls, SD
  - Promote STEM training, UAS demo, and hands-on indoor flying
  - Open to the public (>1000 attendees)
- **Black Hills Digital Mapping Conference**
  - October 22-23, 2019
  - Earth as Art Exhibit and presentations by Brent Yantis (LAView)
  - Educational poster featuring Black Hills Landsat mosaic
- **Landsat and Sentinel mosaics of Black Hills for Black Hills National Forest**
- **51st Annual South Dakota State Geography Conference**
  - March 5-6, 2020
  - Brookings, SD
  - Student remote sensing poster presentations
  - Open to the public (>200 visitors)
- **ArcGIS Online student mapping project for Brookings School District**
- **Two $1000 mini-grants**
  - Competitively awarded to graduate students for projects involving geospatial technologies

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Benefits to South Dakota

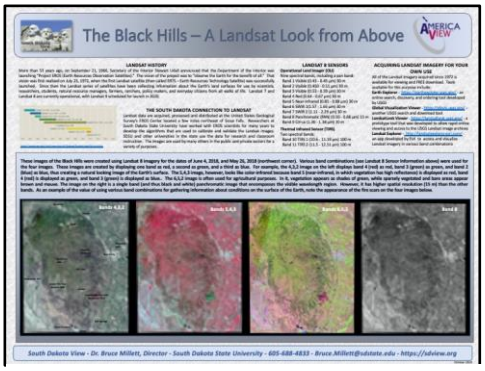
K-12 Teacher Workshop

The one-day online Drones for Educators Workshop provided an experience for teachers to explore, introduce, and develop STEM training with drones in the classroom. The workshop provided curriculum and software applications to successfully engage students in the classroom. It also included a hands-on activity using flight simulation software to develop flying skills and knowledge prior to actual UAS flights. The workshop's objective was to promote UAS technology so that teachers can then use this technology to advance learning in remote sensing and prepare students for careers in this growing field.

3D animation of Mitchell Technical Institute.

Black Hills Digital Mapping Association Annual Conference

At the invitation of the conference organizers, South DakotaView prepared an educational poster that was prominently displayed at the conference and distributed to participants in a smaller version. The poster presented information about Landsat's history, sensors, and connection to South Dakota (EROS) as well as links to various websites for acquiring the images. The poster featured a 2018 Landsat mosaic of the Black Hills in various band combinations.



Educational poster featuring Black Hills Landsat mosaic in various band combinations

51st Annual South Dakota State Geography Conference

Fifteen students presented remote sensing posters at the conference. Students applied remote sensing principles and methods to analyze data and solve problems in a variety of areas such as land use planning.

South DakotaView Consortium Membership

USGS science for a changing world

South Dakota State University

University of South Dakota

Black Hills State University

DENR South Dakota

South Dakota Mines — An engineering, science and technology university

City of Sioux Falls

bit

South Dakota Bureau of Information and Telecommunications

South Dakota DOT — Connecting South Dakota and the Nation

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

South DakotaView Principal Investigator:

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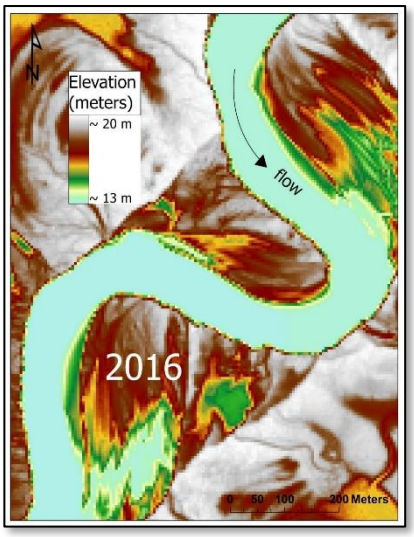
TexasView 2019 - 2020

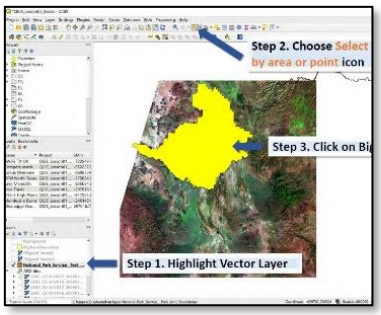
TexasView 2019 - 2020 Activities

TexasView identifies the need to increase the number of undergraduate students who use remote sensing in an applied, project-oriented fashion. This High-Impact Activity (HIAs) addresses grant ***objective 3: Promote research and remote sensing experience at the university undergraduate and graduate level to increase numbers and visibility of graduating students with employment skills in remote sensing.*** Four member institutions participated this year; students imagery and field observations in diverse projects.

- **Analysis of Meander Bend Erosion along the Lower Neches River, TX** evaluated *channel migration and sediment transport* related to hurricanes
- **Techniques for Classifying Riparian Vegetation in Black Gap Wildlife Management Area (BGWMA)** evaluated mapping technology for *invasive species removal*
- **Investigating the Effects of Elevated Water Storage in the Occurrence of Extreme Monsoon Flooding** analyzed the *flood-prediction capabilities* of GRACE and GRACE-FO satellite data
- **Investigation of the effect of land cover on particulate matter during the COVID-19 shutdown in El Paso** analyzed the *changes in air quality* associated with the pandemic shut-down.

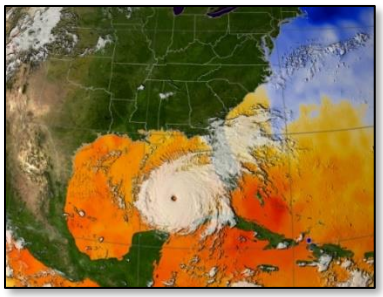


Digital Elevation Model (DEM) images support analysis of meander bend erosion with respect to channel migration and sediment transport during flood events.



QGIS activities support image analysis.

Development of materials for and participation in training of professionals has been a sustained effort for TexasView. Co-PI Teresa Howard offered the **"Earth Observation with Satellite Remote Sensing"** at the Texas GIS Forum a two hands-on seminars to introduce GIS professionals to remote sensing software and methodologies using two different software tools - ArcGIS Pro and QGIS. Attendees included National- and State-level professionals and professionals from industry and academia. Workshop materials were shared with AmericaView members.



ESRI Story Map lessons support online teaching about hurricanes, and assessment of learning

Development of materials for and participation in training of educators continues. Workshops went virtual this year; a new workshop was designed to guide Earth and Environmental teachers at Middle and High School levels towards resources that enable them to easily integrate exciting satellite imagery, image-based animations, supporting videos, literature, and learning activities into curriculum. "**Integrating Satellite Imagery, Animations, and Videos into Your Curriculum: Developing a Portfolio of Resources and Topical Units**" offered resource elements from TexasView, NASA, the U.S. Geological Survey, NOAA and the U.S. Forest Service to form the foundation for a portfolio of teaching tools for classroom or distance teaching. Examples of topic-specific resource units were shared. Standards correlations were available for multiple subjects and grade levels.

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Benefits to Texas

- Support for student research has multiple benefits.
  - *"Being introduced to the actual process of creating a Digital Elevation Model provided insight into the field of GIS and allowed the me to gain hands-on technical skills, practice immense precision, and gain the ability to deduce situations."*
- Results benefit natural resource management in Texas and prepare students for diverse careers. Faculty research mentors gain case histories to use in teaching and recruiting.
  - *"Recent restoration projects on the Rio Grande in the Big Bend region of Texas have focused on the removal of non-native, undesirable vegetation through burning. This project focuses on techniques utilized by restoration teams to map the abundance of various vegetation and other land cover types."*
- Support for K-12 educators, particularly in finding resources for online teaching, was critical this year. Teaching units and resources will remain useful when classroom teaching resumes.
  - *"As an Earth/Space and Environmental Systems teacher grade 11/12, information/perspectives are VERY valuable. "*
  - *"Thank you so much for these amazing activities "*
- Training of professionals introduces them to new technologies, new data sources, and a new network of users within the geospatial community in Texas. Academic attendees can connect students within this professional network.

Burning invasive Arundon plants in the BGWMA.

My NASA Data Story Map lesson "Volcanic Eruptions"

TexasView Consortium Membership

Established in 2002, the TexasView Remote Sensing Consortium consists of twelve university partners distributed across the state. Members include universities large and small, public and private. TexasView members work closely with state, regional and local agencies to promote remote sensing at all levels.

TexasView is founded on the concept of free and public exchange among its members of data, information and knowledge concerning the Earth and its processes, as observed by remote sensing and GIS technologies, for education, research, and local government applications.

Midwestern State University

The University of Texas at Austin

The University of North Texas

Sul Ross State University

Texas A&M

Texas Tech University

Stephen F. Austin University

Texas A&M at Corpus Christi

The University of Texas at El Paso

Texas State University

The University of Texas at San Antonio

University of Houston

TexasView Principal Investigator:
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Facebook.com/TexasView

UTAHVIEW 2019 - 2020

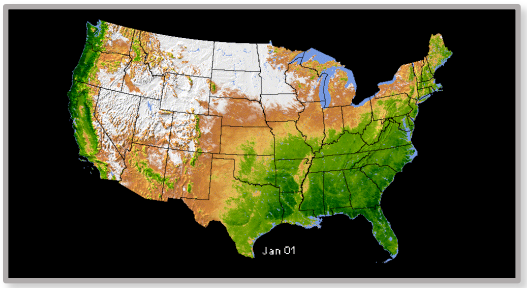
UTAHVIEW 2019 - 2020 ACTIVITIES

UtahView is hosted by the Remote Sensing/GIS Laboratory in the Quinney College of Natural Resources at Utah State University in Logan, Utah. Dr. R. Douglas Ramsey is the UtahView Principal Investigator and Ellie Leydsman McGinty is the UtahView State Coordinator. During GY19, UtahView continued to develop scripts in Google Earth Engine and continued to create maps for the Utah As Art collection.

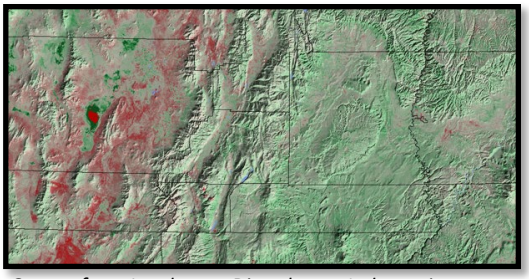
The following **Google Earth Engine scripts** were developed by Dr. R. Douglas Ramsey:

1) **Landsat/Sentinel Mosaic:** This script generates an up-to-date state mosaic using Landsat OLI or Sentinel-2 imagery. The mosaic is fused with a hillshade and then sharpened using a 3x3 convolution filter.
2) **Green Wave Visualization:** This script generates a 17-year average NDVI for 46 8-day periods that represent the average photosynthetic activity across one year. The green wave visualization combines Terra and Aqua MODIS 13Q1 products. The output is an animated image that is visualized over a shaded relief.
3) **Landscape Disturbance Index:** This script applies a disturbance index developed by Mildrexler et al. (2007) to the Landsat 5, 7 and 8 time series to identify deviations of a selected year from average normal values. The disturbance index (DI) is based on a ratio between yearly maximum surface temperature (LST) and yearly maximum NDVI. The index for a given year is generated and then compared to the average index of the preceding years. Further details can be found here.
4) **Steady-State Plot:** This script generates a "steady-state" plot for a defined polygon. The plot is based on the average NDVI and the standard deviation of NDVI, both of which are calculated on a yearly basis for a selected month. The outputs can indicate if a landscape disturbance has forced a permanent transition to another land cover state. An example of the script output can be found here.

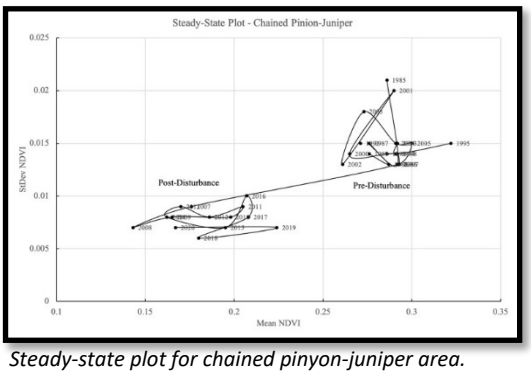
The **Utah As Art map collection**, a localized version of the USGS Earth As Art program, uses Landsat and Sentinel-2 imagery to create maps that increase geographic awareness and literacy, demonstrate one of the many values of satellite imagery, and display the diverse landscapes of Utah. The following 10 maps have been created by Ellie Leydsman McGinty: Bonneville Basin, Canyonlands, Capitol Reef, Goosenecks, Great Salt Lake, Lake Powell, San Rafael Swell, Uinta Mountains, Utah Lake, and Zion Canyon. These maps are currently located on Google Drive and are available for download at https://bit.ly/UtahView_UtahAsArt.



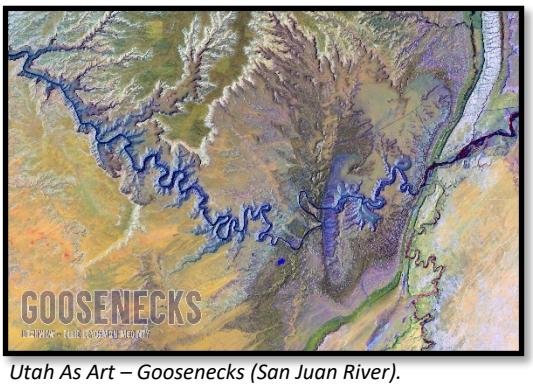
Output from Green Wave Visualization script.



Output from Landscape Disturbance Index script.



Steady-state plot for chained pinyon-juniper area.



Utah As Art – Goosenecks (San Juan River).

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Brent Yantis, Board Chair:
rodney.yantis@louisiana.edu

Benefits to Utah

During the past few years, UtahView has participated in a series of educational events and outreach activities that promote and further the understanding of geospatial science and applications. In terms of education, UtahView has coordinated with local schools to work with primary, secondary, and higher education students. These events include Earth Observation Day (EOD) activities as well as hourly and daily workshops. Additionally, UtahView continues to partner with the Utah Geographic Information Council (UGIC) Education Committee during the annual UGIC Conference to develop a GIS Day for local high school students. Through these events, UtahView has assisted educators and teachers by providing instruction on how to best incorporate geospatial tools in the classroom. In terms of outreach, UtahView has participated in several activities and programs aimed at engaging community members and land managers. These events have not only provided unique learning opportunities, but they have assisted people in identifying tools and programs which can provide value to management practices.

UtahView Consortium Membership

The UtahView consortium membership consists of Dr. R. Douglas Ramsey, Professor in the Quinney College of Natural Resources and Director of the Remote Sensing/GIS Laboratory at Utah State University; Dr. Phoebe McNeally, Research Associate Professor and Director of the DIGIT Laboratory at the University of Utah; Dr. Sowmya Selvarajan, Assistant Professor of Geomatics at Utah Valley University; Ellie Leydsman McGinty, Researcher III in the Remote Sensing/GIS Laboratory and UtahView State Coordinator; and the Utah Geographic Information Council (UGIC). Collectively, these consortium members bring a wealth of scientific, outreach, and technical experience to the urban, rural, and wildland regions of Utah.

S.J. & JESSIE E. QUINNEY COLLEGE of NATURAL RESOURCES UtahStateUniversity REMOTE SENSING/GIS LABORATORY

THE UNIVERSITY OF UTAH

UTAH VALLEY UNIVERSITY

UGIC UTAH GEOGRAPHIC INFORMATION COUNCIL

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UTAH VIEW

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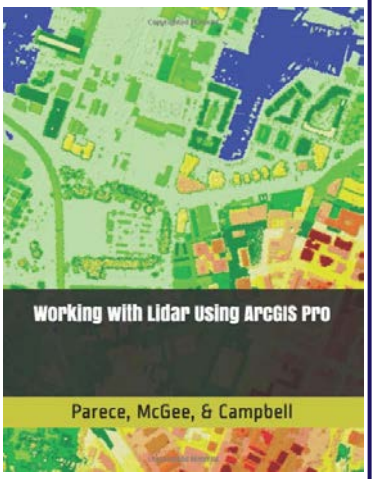
VIRGINIAVIEW 2019 - 2020

VIRGINIAVIEW 2019 - 2020 ACTIVITIES

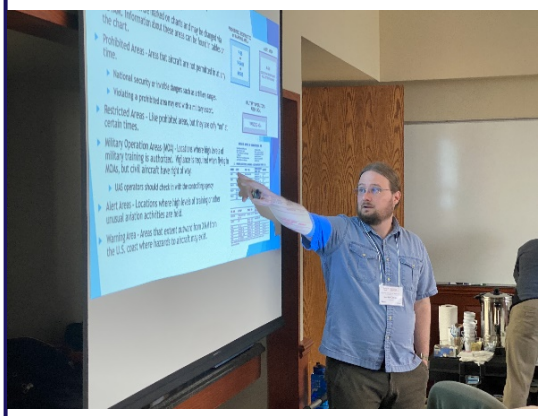
VirginiaView, a longstanding member of the AmericaView Consortium, has contributed to a broad range of activities that bring teachers, students, and the public into contact with remote sensing imagery through learning and educational resources, and an introduction to new applications. Through workforce development opportunities, VirginiaView provides remote sensing education for an array of stakeholders, including students, middle school / high school educators, 2-year college and university faculty and staff, government employees, and private industry. VirginiaView pursues programs to support Virginia's geospatial educational pipeline.



New eBook available through Kindle

During 2019-2020, VirginiaView continued to support educational needs of Virginia's communities, and published a new tutorial textbook: *Working with Lidar Using ArcGIS Pro*. This tutorial supports needs of educators and professionals in Virginia, especially those who are learning remotely. The publishing of VAView's lidar book coincided with the acquisition of 'wall to wall' lidar data across Virginia which was completed in 2018. All of Virginia's lidar data conform to USGS 3DEP standards. Our lidar book tutorial augments other educational resources, including *Remote Sensing with ArcGIS Pro*. VirginiaView's tutorials are available through Amazon as free ebooks (through Kindle Unlimiited), or for $3.99. Hardcopy editions are available as well. Many of these tutorials were converted to video and published on YouTube for visual learners and are available at no cost.

Remote Sensing video tutorials were published, and in-person and virtual workshops were conducted during the 2019-2020 grant year. The workshops provided instruction on remote sensing data acquisition, work flows, UAV's, and image processing options. Our workshops have been attended by Virginia Cooperative Extension (VCE) personnel, local and state government employees, private sector employees, precollege educators, and 2-year and 4-year college faculty.



Both face to face and virtual instruction were conducted for stakeholders during GY 2019

This was by far one of the best training programs I have attended in my 30+ years of Extension work. The instructors were extremely well prepared and knowledgeable. -VCE Agricultural Extension Agent

This workshop was of tremendous value. The content was all-encompassing and took me as a student from the understanding of bare basics to feeling confident.... I also feel confident in my ability to explain a more simple version of all I learned to any 4-H youth that I may have the opportunity to program for. Daniel Cross had an obvious interest in, and knowledge base for, the topic and was well-equipped (along with John McGee) to answer any questions among the group and direct us to resources that we could consult for our further specific explorations. I'm especially appreciative of the efforts made to provide this workshop online during COVID-19 isolation. -VCE 4-H Agent

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Lisa Wirth, Program Manager:
lisa.wirth@americaview.org
Brent Yantis, Board Chair:
rodney.yantis@louisiana.edu

Benefits to VirginiaView

- The USGS and other partners completed acquisition of Virginia statewide lidar data in 2018. The *Working with Lidar using ArcGIS Pro* tutorial book supports the needs of local communities and stakeholders, who may not have ample expertise to work with these data.
- 15 new online lidar video tutorials were published to the VAView YouTube Channel during GY 2019.
- sUAS flight planning and safety video tutorials were published during GY 2019.
- YouTube instructional videos have been viewed over 406,000 times, with 56,000 views during GY 2019 alone.
- Video tutorials have been viewed for over 12,000 hours, with 1,800 hours watched during GY 2019-2020.

In person workshop (January 2020).

Workshops included classroom learning and hands-on demonstrations in the drone cage.

Remote Sensing Book & eBook Metrics

Book Description	Pub. Type	Year Pub.	# Copies down-loaded	# Kindle pages read
RS in ArcGIS ArcMap	eBook	2015	516	11,890
Lidar ArcGIS Desktop	eBook	2016	317	16,524
Lidar ArcGIS Desktop	print	2016	68	N/A
RS in ArcMap, 2nd ed	eBook	2017	187	6,918
RS in ArcMap, 2nd ed	print	2017	95	N/A
RS with ArcGIS Pro	eBook	2019	252	18,646
RS with ArcGIS Pro	print	2019	118	N/A
Lidar ArcGIS Pro	eBook	2020	48	5,200
Lidar ArcGIS Pro	print	2020	16	N/A
Total	--	--	**1,617**	**59,178**

- We anticipate that interest in ebook and video tutorials will continue, with increased numbers of remote learners searching for online and self-paced instruction due to COVID.

VirginiaView Consortium Membership

College of Natural Resources and Environment, Virginia Tech

Virginia Space Grant Consortium

Thomas Nelson Community College

Conservation Management Institute

Colorado Mesa University

National Weather Service

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

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@GeospatialVA

VermontView 2019 - 2020

VermontView 2019 - 2020 Activities

Vermont's natural resources are crucial to the state's economy, its identity, and the health and well-being of its citizenry. To effectively manage these natural resources, they need to be mapped and accounted for. Just as important is understanding how they change over time so that decision-makers can employ policies and procedures to preserve them for future generations.

VermontView captured Vermont's foliage in all its glory this past fall using remote sensing technology.

A VermontView partnership led to the development of Vermont's first high-resolution land cover data set, which provided an unmatched accounting of Vermont's natural and built environment. To keep this product up to date, VermontView developed new, cost-effective methodologies that leveraged the USGS's satellite-based change mapping data (LCMAP). Current, high-quality data will result in better decision-making.

Vermont's high-resolution land cover dataset is the most detailed and comprehensive of any in the nation. Now it is up to date.

VermontView is supporting Vermont's efforts to grow and retain a high-tech workforce. With geospatial technology slated to be one of the top 10 growth fields in the coming decades, K-16 outreach activities such as the 4-H Teen Science Café on Earth Observation led by VermontView are crucial in getting Vermont's youth engaged and excited about potential educational and career opportunities.

During the 4-H Teen Science Café VermontView exposed over 80 students to geospatial technology.

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rodney.yantis@louisiana.edu

Benefits to Vermont

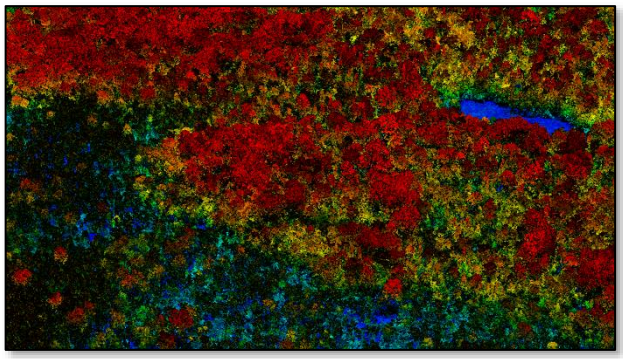
Expertise
With no remote sensing professionals employed within state government, VermontView is the resource agencies and elected officials turn to when they need unbiased advice.

Actionable Information
Vermont has a vast collection of publicly available remotely sensed data. VermontView helps to turn these data into information so that managers can make for informed decisions.

The Future Workforce
Developing the workforce of the future starts today. VermontView is active throughout the state in K-16 outreach and education, providing students with STEM learning opportunities.

Collaboration
With resources strained we know collaboration is more important now more than ever. VermontView brings people together to solve problems using geospatial technology.

VermontView has used remotely sensed technology to capture the extent of algal blooms, which routinely close state beaches.



3D maps generated from LiDAR are providing new insights into Vermont's forest resources. VermontView works with state agencies to harness the power of this technology.

VermontView Consortium Membership

The University of Vermont
Middlebury
VTrans Working to Get You There — Vermont Agency of Transportation
Burlington Electric Department
Forest Service U.S. Department of Agriculture
VCGI
Vermont Agency of Natural Resources
University of Vermont SAL TRC Unmanned Aircraft Systems Team
NRCS Natural Resources Conservation Service
USGS science for a changing world

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

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VermontView

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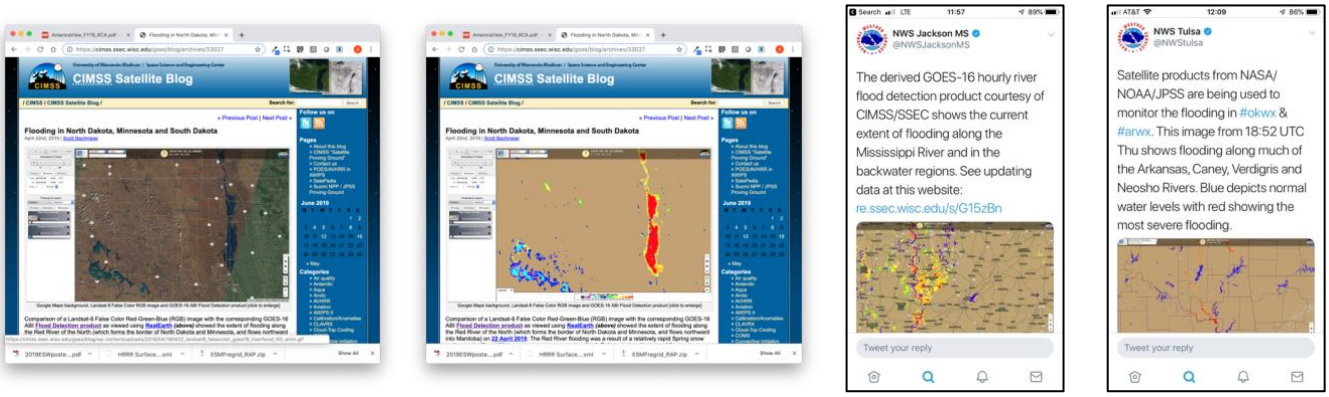
WISCONSINVIEW 2019 - 2020

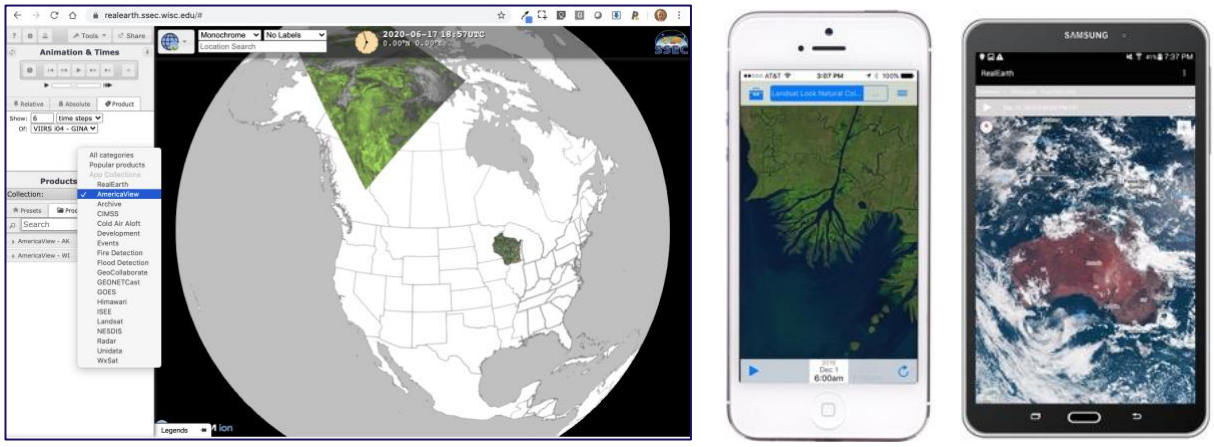
WISCONSINVIEW 2019 - 2020 ACTIVITIES

WisconsinView is engaged in two "High Impact Activities" (HIAs). The first involves bring satellite-derived flood mapping products from the atmospheric sciences into GIS formats to expand accessibility. This supports the establishment of strategic partnerships across disciplines. To bridge the gap between scientific data and public, we process the maps into our *RealEarth* mapping platform. Once in *RealEarth*, they also become available for sharing in social media. Here are some Blog and Twitter examples that utilize the results of this HIA:



Satellite-derived flood mapping products made available in map services and picked-up by social media, as a result.

The Second HIA promotes the use of the *RealEarth* mapping platform among StateView members of AmericaView. Our goal is to assist StateViews in sharing their educational materials and research results by utilizing *RealEarth*. The platform is flexible and works in both web browsers and mobile devices. Mobile devices with locational services give educators an opportunity to put their students "into the data" as an immersive experience. This year PennsylvaniaView will be developing curriculum specifically to utilize *RealEarth* in the classroom. This HIA advances education, training, technology transfer, and outreach.



Examples of the RealEarth *visualization platform from L to R: web browser, showing Alaska data and Wisconsin data; iOS mobile app showing a Landsat 8 imager of a river delta; Android mobile app showing geostationary imagery of Australia.*

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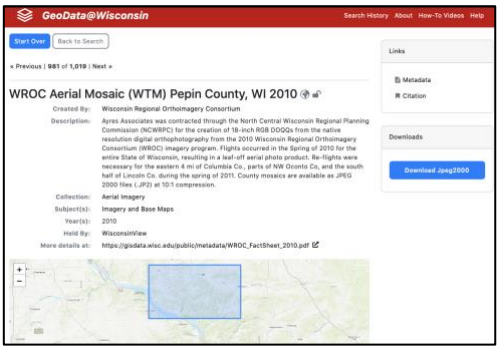
Benefits to Wisconsin

Since its establishment in 2004, WisconsinView has support Earth observation education and outreach across Wisconsin. We do this in the following ways:

- **Presenting** Earth observation data and information at public science events across the State and in local classrooms.
- **Enriching** access to high-value data sets such as LiDAR and aerial photography through a 100TB ftp server.
- **Demonstrating** how to utilize emerging web mapping technologies such as OGC WMTS in workflows by professionals as well as in the classroom.
- **Partnering** with organizations and agencies to leverage expertise and synergies.

We continue to collaborate with other StateViews as we learn from each other and leverage the power of the AmericaView network.

Students enjoy a 3D experience of a terrain model at a museum outreach event in Milwaukee, WI.



WisconsinView partners with the State Cartographers Office to catalog data sets for improved data discovery.

Current WisconsinView Consortium Partners

Geographic Information Office, WISCONSIN

WISCONSIN LAND INFORMATION ASSOCIATION

Sea Grant University of Wisconsin

USDA Farm Service Agency

Wisconsin State Cartographer's Office

NOAA — National Weather Service — U.S. Department of Commerce-NOAA

WISCONSIN UNIVERSITY OF WISCONSIN–MADISON

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

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WISCONSIN VIEW

https://wisconsinview.edu

https://ssec.wisc.edu/realearth

@WisconsinView

@SSECRealEarth

WEST VIRGINIAVIEW 2019 - 2020

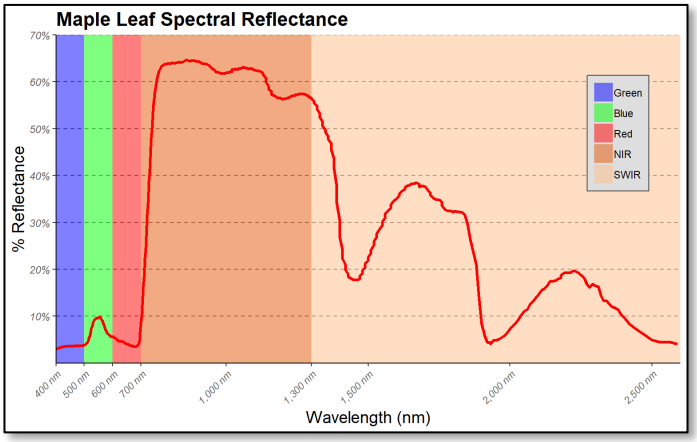
WEST VIRGINIAVIEW 2019 - 2020 ACTIVITIES

Our HIAs this year focused on the development of **free, online course materials** appropriate for undergraduate/ graduate courses and professionals learning independently. Specifically, three courses were produced:

- **Open-Source Spatial Analytics (R)**
- **Client-Side Web GIS**
- **Open-Source GIScience**

These courses cover a wide variety of topics including:

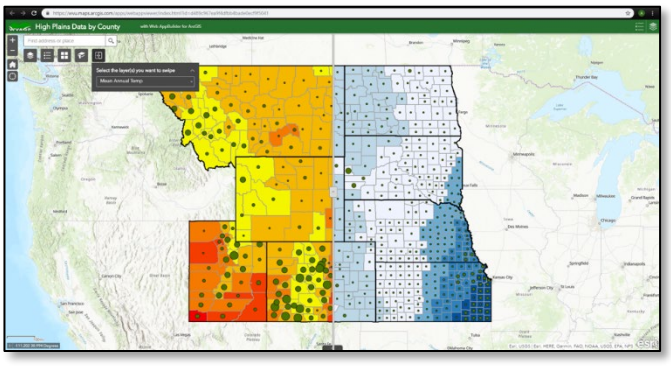
- Coding and **data science** in **R**
- Visualizing spatial data and making maps in R
- Performing vector and raster spatial analysis in R
- Creating **spatial predictive models** with **machine learning** in R and Python
- Creating **web apps** using ArcGIS technologies
- **Web development** with HTML, CSS, Bootstrap, JavaScript, jQuery, the ArcGIS API for JavaScript, and the Leaflet JavaScript API
- Visualizing, editing, querying, and analyzing geospatial data using the **QGIS open-source software**
- Analyzing remotely sensed data with **QGIS** and **Orfeo Toolbox**
- Data science with **open-source Python**
- Data query with **SQL**



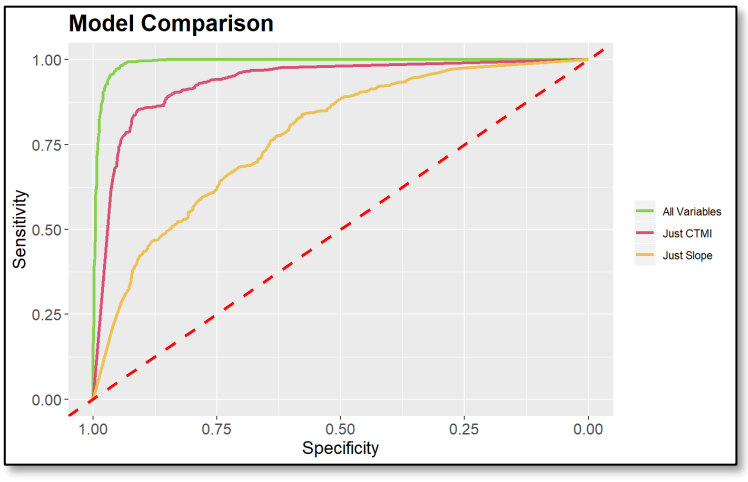
Spectral reflectance curve for maple leaf created using R and the ggplot2 package

Other projects for the year included:

- Maintaining our YouTube channel and adding more content
- Generating remote sensing labs to be hosted on our web page.
- Updating our *WV Elevation and LiDAR Download Tool* web app
- Funding software purchases



Web app developed with the ESRI Web AppBuilder



Assessment of machine learning models using R and the caret and proc packages

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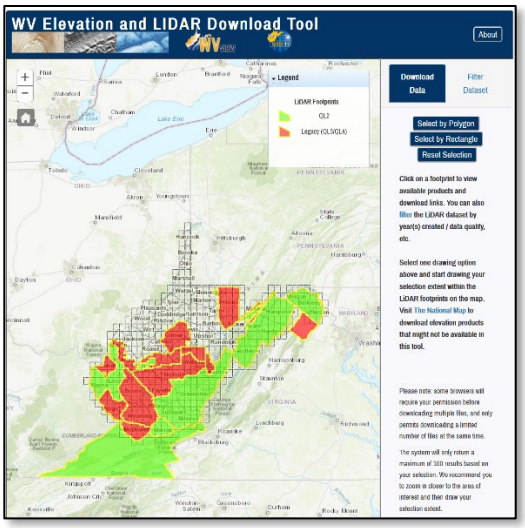
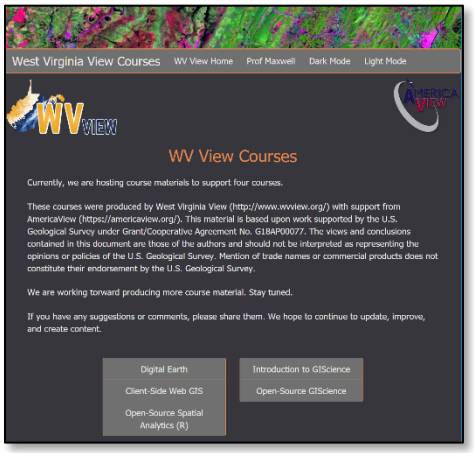
Benefits to West Virginia

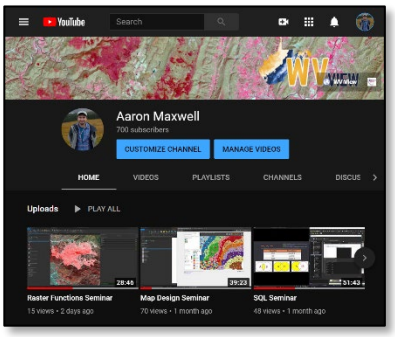
- Provide educational materials for students and geospatial professionals
- Foster remote sensing education, outreach, and research in the state
- Provide access to LiDAR data via a web app
- Fund software purchases
- Support graduate student travel and data needs
- Provide summer funding for graduate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



WV LiDAR download web app



WVView courses web page



WVView YouTube channel

Leaflet web app from Web GIS course

West VirginiaView Consortium Membership

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

West VirginiaView Principal Investigator:

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WyomingView 2019 - 2020

WyomingView 2019 - 2020 Activities

WyomingView conducted educational outreach activities and trained four interns (University of Wyoming students).

Sixth graders are learning the connections between Earth's 4 spheres (atmosphere, hydrosphere, geosphere, and biospheres), and how changes in one can influence the rest of the spheres. WyomingView PI presented how diverting the water flowing into Aral Sea (*hydrosphere*) influenced the fishes, birds, and animals (*biosphere*), and created the earth's newest desert (*geosphere*). Historical satellite images of Aral Sea generated by the USGS and NASA were used as the primary visual aids in this educational outreach activity. (*Number of students reached: 254 – 12 sections*).

Landsat images showing changes in Aral Sea because of the diversion of two rivers flowing into once the fourth largest inland lake in the world. Place: *Laramie Middle School.* Date: *Jan 23, 2020.*

Eighth graders learned the relationship between leaf conditions (live versus dead) and spectral reflectance. Students used ALTA II Spectrometer and measured reflection in 11 regions of the electromagnetic spectrum. Plot of spectral reflectance highlighted the value of infrared measurements. Following this activity, WyomingView PI described how infrared measurements obtained by sensors onboard Landsat and other satellites can be used for monitoring vegetation and water conditions around the world. This multiday activity was conducted over 6 days. (*Number of students reached: 245 – 12 sections*).

Students are measuring the difference in the spectral reflection of live and dead leaves using ALTA II spectrometer. Place: *Laramie Middle School.* Date: *Jan 7, 8, 10, 14, 15, & 17, 2020.*

Phenology of aspen trees that were growing under sunny and shady conditions in Laramie, WY.

Sarah Weidler analyzed fall 2015-2018 phenology data of aspen trees recorded by students enrolled in a UW applied remote sensing course. She presented following findings in the 2020 ASPRS conference:

- Aspen trees exposed to less sunlight in spring & summer, changed color and lost their leaves quickly than those that received more sunlight,
- This pattern was consistent for all 4 years under different weather conditions (varying temperature and precipitation), &
- Citizen Science data forms must collect data on the differences in sunlight received by individual Aspen trees.

The proceedings paper was published in ISPRS archives (https://doi.org/10.5194/isprs-archives-XLIV-M-2-2020-105-2020).

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BENEFITS TO WYOMING

Jacob Disney (WyView intern) analyzing vegetation regrowth in a 40-acre ranch owned by his parents. Term: Spring 2019.

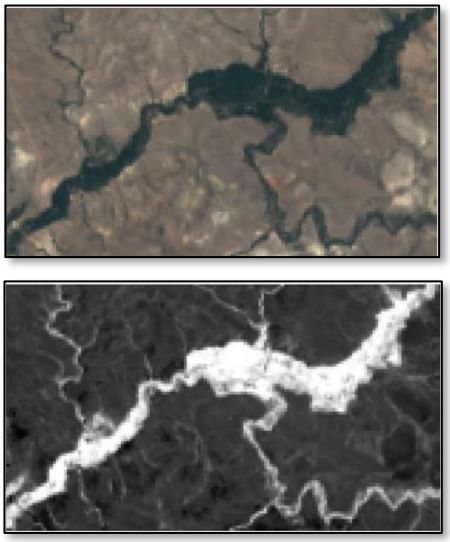
- Past WyomingView interns are currently working federal, state, and local government agencies
- Some interns have confirmed the value of the training they received as part of the internship
  Analyzing satellite images, extracting information, and presenting them in conferences were identified as important skills
- New testimonials from past interns will be uploaded to: https://wyomingview.blogspot.com/p/then-now.html.
- WyomingView will continue to recruit and train more interns (future workforce development).

WYOMINGVIEW CONSORTIUM MEMBERSHIP

WyomingView continues to work with farmers and ranchers to promote remote sensing applications:

- 2019-20, WyomingView intern Logan Heward worked with 2 farmers in SE Wyoming and obtained crop production or yield data for their fields.
- Heward obtained Landsat NDVI images for the corresponding years from USGS EarthExplorer. These dates corresponded to the peak crop growth on the ground.
- Heward compared the average NDVI values with the crop yield data and found statistically significant relationship for few but not all years.

Working with farmers and ranchers allows WyomingView to reach out to non-technical users and showcase the benefits of Landsat and other remotely sensed data. Testimonials provided by farmers and ranchers are valued highly by AmericaView and USGS. WyomingView will continue to work with farmers and ranchers.



Relationship between Landsat NDVI images (bottom) and crop yield data were analyzed by WyView intern Logan Heward.

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