ALABAMA VIEW 2023 - 2024 ACTIVITIES
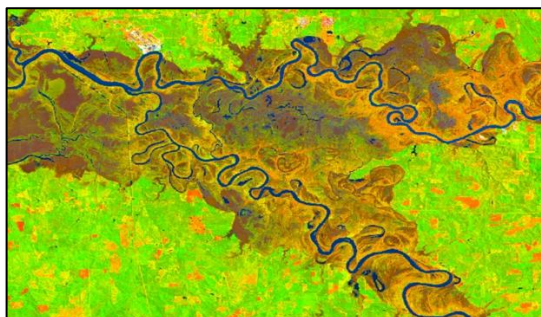
- For this year's HIA, AlabamaView produced Alabama Earth as Art images for three themes.
  - **The Beautiful Earth**
    Fiery Folds – a geologic structure near Birmingham, Alabama
    Spiraling Through Flood Plains – river in Mobile, Alabama
  - **The Human Footprint**
    Teddy Putt – golf course near Dothan, Alabama
    Splash of Rainbow – urban heat island Montgomery, Alabama
    Tree of Life – human footprint around Tensaw Delta, Alabama
  - **Future of Our Beautiful Earth**
    Womb of Nature – hope for a healthy future for the Earth
    Serpentine Connection – ecosystem connection of waterways
- Alabama View maintained both a YouTube channel and a Facebook page which highlighted remote sensing and its applications for environmental monitoring.

Image of a golf course named "Teddy Putt". Just one part of the human footprint.
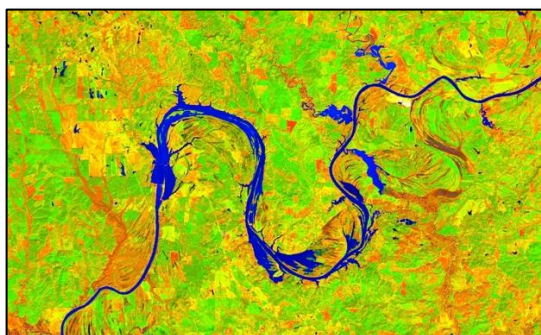
"Serpentine Connection" – waterways connect our ecosystems and must be protected.

- The PIs along with a student contributed a publication in the Special AmericaView edition of the Geographical Bulletin titled "A Remote Sensing Investigation of the 2022 Invasion of Eastern Ukraine on Agricultural Landcover." The student also presented this work at the 2024 ASPRS Mid-South Regional Conference in May.
- We have found exciting opportunities for outreach and display of Alabama Earth as Art Images.
  - Working closely with the Director of Auburn University Dining, we are printing the images to create a display on one of the main walls of Auburn's main dining service facility. There are opportunities to display Earth as Art Images in the other dining halls as well.
  - Collaborating with Auburn's Biggio Center, we have managed to create virtual reality labs where students will have the chance to explore Earth as Art Images. These labs raise awareness on the importance of remote sensing for environmental analysis and awareness.
  - We are compiling images to include in a coffee table book for display on social media and the Alabama View website.

"Spiraling Through Flood Plains" – a magnificent display of our beautiful earth in Mobile, Alabama.

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BENEFITS TO ALABAMA

- AlabamaView has participated in raising awareness on remote sensing and its capabilities.
    - We presented about remote sensing science and education at the AmericaView annual meeting in the spring of 2024.
    - We have set in place a plan for printing and displaying remotely sensed images on the Auburn Campus to raise awareness about remote sensing science and its capabilities.
    - We have had an increase in opportunities to promote remote sensing science on campus including an "Extended Reality Meet and Greet" with the Biggio Center on the auburn campus to discuss how we are using virtual reality to help promote remote sensing science education.
- The virtual reality modules created will help Auburn students in basic introductory science labs understand remote sensing and its importance in environmental science.
- The conversations between the PIs and graduate and undergraduate students have helped develop critical thinking and collaboration skills. The skills and knowledge derived from their experience aid them in presenting AlabamaView research. Students who have participated:
    - Al Artat Bin Ali
    - Alex Burns
    - Subhasis Ghosh
    - Jake Swartz
    - Michael Selorm Agbozo

The poster presentation presented at America View 2024
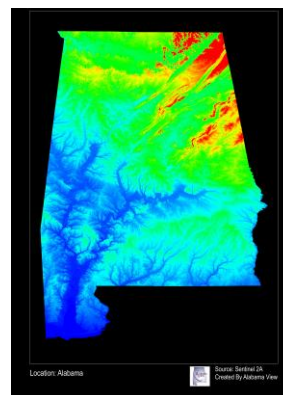
This is one of five images which will be on display at the Edge Dining Hall.

ALABAMA VIEW CONSORTIUM MEMBERSHIP

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

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ALASKAVIEW 2023 - 2024 ACTIVITIES

Goal: To advance remote sensing research of forested ecosystems to support forest health protection and effective forest management.

Research Objectives:

1) Estimating above-ground biomass
2) Assessing tree mortality and stand-level forest loss
3) Connection between forest loss and recovery, biomass and carbon budget

In GY23, we focused on Research Objective 1; by integrating UAVSAR and LiDAR data we developed a methodology to estimate above-ground biomass (Badola et al., 2024). Co-PI Badola presented this research at the 2024 American Association of Geographers Annual Meeting in Honolulu (Apr. 16 - 20) and at the 2024 AmericaView Spring meeting in Blacksburg, Virginia.

Also, we carried out research focused on spatial and temporal variation in forest canopy conditions using Lidar data (Badola et al., 2024). PI Panda presented this research at the 2024 IGARSS meeting in Athens, Greece (July 7 – 12).
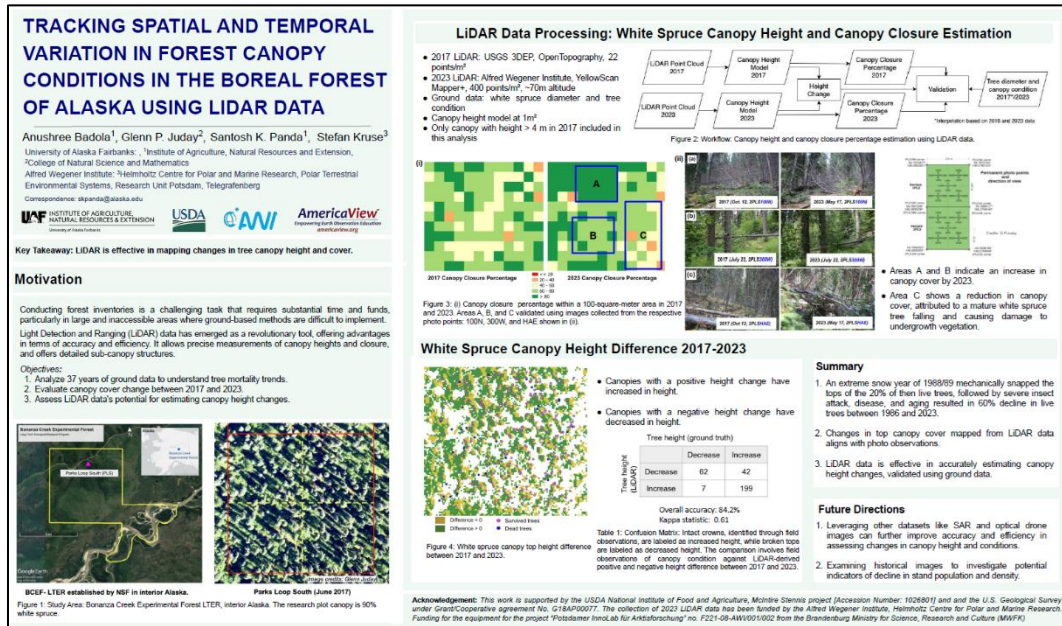
GY23 outcome:
- 3 conference abstracts (2024 AFE, AAG, AGU)
- 1 conference paper (2024 IGARSS)
- 1 journal article (in review)
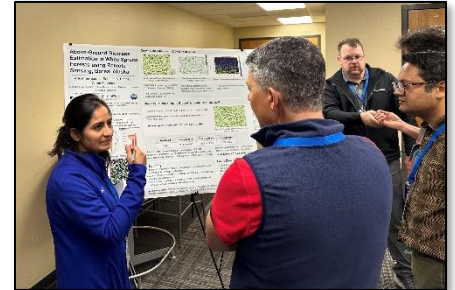
Co-PI Badola presenting at the 2024 AmericaView Spring Meeting, Blacksburg, Virginia

Tree census survey

Poster presented at the 2024 IGARSS meeting in Athens, Greece

We continue to support 4 open access online GIS courses on edX.org:

- GIS Foundations
- 3D GIS
- GIS Image Analysis
- Remote sensing of wildfires

AlaskaView 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 G23AP00683.

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BENEFITS TO ALASKA

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

Our research generated new knowledge and map products that directly contributed to mission of Alaska Forest Health Protection program and Alaska Division of Forestry.

Enrollment in edX courses: Total enrollment 45,000+ (as of Nov. 2024) from 181 countries. Among the top 10 enrollment countries 5 are developing countries (India, Nigeria, Pakistan, Bangladesh, and Ghana).

Research Support: Anushree Badola, Postdoc, received salary support. She presented at 2024 AAG, AFE, IGARSS, and AGU meetings.

We offered $1,000 fellowship to:
- Alex Baughman, a BS student, conducting research on boreal forest disturbance dynamics

PI Panda served as guest editor for a special issue, *Earth from Above: AmericaView, Remote Sensing and Geospatial Technology*, in **The Geographical Bulletin** that attracted 10 student led publications.

2024 STEM Night at a local elementary school

Public Outreach: In GY23, we participated in 2 events organized by University of Alaska Fairbanks, and 1 event organized by a local school
- 2024 CNSM Science Potpourri
- 2024 Arctic Research Open House
- 2024 Pearl-Creek Elementary Science Night

Exhibit included: a poster on forest health research, Landsat board games, NASA posters, USGS Landsat Science booklets, and Alaska As Art displays:
- to increase awareness of satellite earth observation in education, research and societal well-being
- to increase awareness of the climatic and geologic processes that continue to shape the Alaska's dynamic landforms and forest ecosystems

Consortium Development: Collaborated with UAF eCamups, UAF Institute of Agriculture, Natural Resources and Extension, edX.org, NSF Alaska EPSCoR program, U.S. Forest Service, and U.S. Fish and Wildlife Service.

ALASKAVIEW CONSORTIUM MEMBERSHIP

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ARKANSASVIEW 2023 - 2024 ACTIVITIES

- ArkansasView has launched a multi-year initiative, "Developing a Summer Internship Program", with two primary objectives: first, to establish a sustainable internship program that provides valuable professional experience for students; and second, to utilize multi-temporal optical and radar remote sensing data to monitor environmental changes across Arkansas. These data will help identify and assess regions of the state vulnerable to geohazards, such as landslides, floods, and other geological threats. Spanning five years, the project made significant progress in GY23, laying the foundation for continued growth and expansion in the coming years.

- In summer 2024, ArkansasView provided critical training to two graduate students pursuing a PhD in Geosciences at the University of Arkansas. Funded in part by ArkansasView, these students gained advanced skills in geospatial technology and remote sensing, preparing them to contribute to the study of geohazards and geospatial data analysis. The internship program is designed to nurture a highly skilled, future-ready generation of researchers equipped to tackle pressing environmental challenges.

- Concurrently, ArkansasView conducted a comprehensive study on geohazards in Northwest Arkansas, leveraging cutting-edge remote sensing technologies to monitor active landslides, land subsidence, and other hazards. By integrating these advanced tools, the program aims to enhance the state's capacity to assess and mitigate geohazard risks, ultimately strengthening preparedness and resilience strategies across Arkansas.
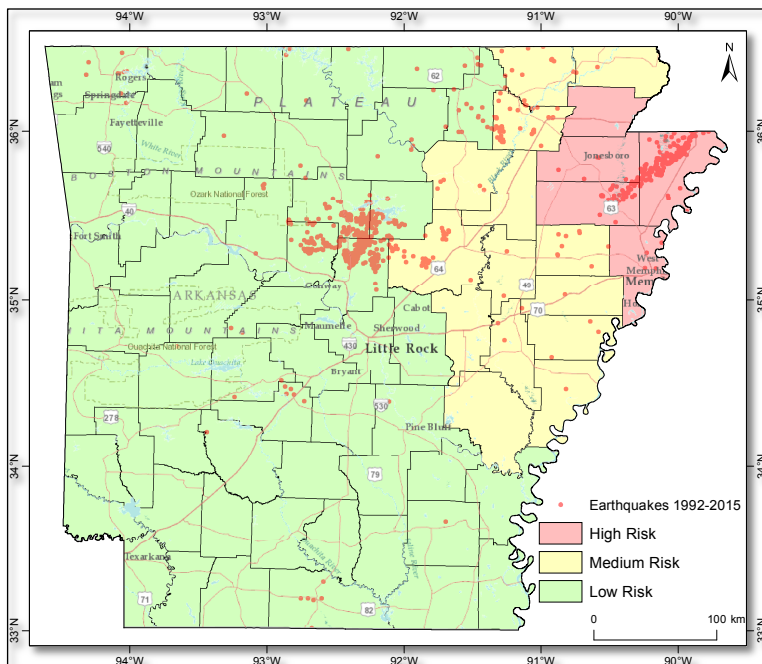
Summer interns collect and analyze various geospatial datasets, including seismic data, to assess seismic hazards in Arkansas. On the map, small red dots represent recent earthquake occurrences, visually highlighting areas of recorded seismic activity. These markers are essential for identifying trends in earthquake frequency and location, providing valuable insights into the region's seismic risk. Such observations are crucial for guiding preparedness and mitigation efforts.

Notably, some recent seismic events in north-central Arkansas occurred within a low-risk zone. The seismic risk levels across the state, as determined by the United States Geological Survey (USGS), are color-coded based on proximity to the New Madrid Seismic Zone, a major fault system in the central U.S. that extends into northeastern Arkansas and has the potential to produce significant earthquakes.

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- The summer internship program will directly benefit Arkansas by training future researchers in Synthetic Aperture Radar Interferometry (InSAR), a key tool for monitoring geohazards such as landslides, ground subsidence, and seismic activity. By equipping interns with expertise in advanced remote sensing techniques, the program will help build local capacity for geohazard assessment, improving the state's ability to identify and mitigate risks. The program's real-world focus on Northwest Arkansas will generate valuable data to support informed decision-making, enhance disaster preparedness, and improve land-use planning. Ultimately, it will foster a highly skilled workforce capable of addressing the state's growing geospatial and environmental challenges.

- Geohazards in Northwest Arkansas, including landslides, subsidence, flooding, tornadoes, and seismic events, pose significant risks to infrastructure and public safety. Effective monitoring is essential, and remote sensing offers powerful tools for mapping and analyzing these threats across large areas. This study focuses on using InSAR to monitor ground deformation from landslides, subsidence, and seismicity, providing high-precision, cost-effective insights into spatial and temporal patterns of crustal movement. Unlike traditional survey methods, which offer limited point-based measurements, InSAR enables continuous, millimeter-level tracking of ground motion over wide regions, regardless of weather or time of day. By identifying areas at risk of failure, InSAR will improve hazard mapping, resource management, and decision-making, ultimately enhancing the understanding and management of geohazards in the region.

- Further strengthening its research impact, ArkansasView initiated collaborations with key figures at the Office of the State Geologist (OSG), formerly known as the Arkansas Geological Survey, including Scott Ausbrooks, Angela Chandler, and Martha Kopper. These initial contacts aim to share findings from ongoing geohazard studies and establish long-term research partnerships. Efforts to solidify these collaborations and expand the scope of geohazard research in Arkansas will continue in the coming years.

- The Director of ArkansasView took on leadership roles at the University of Arkansas as Coordinator for the Graduate Certificate in Geospatial Technologies and Undergraduate Faculty Advisor for the Certificate of Proficiency. He helped shape the geospatial curriculum and taught online courses through the Global Campus, sharing his remote sensing expertise with off-campus students from diverse industries and institutions across Arkansas. These courses play a crucial role in training the next generation of geospatial researchers and scientists.

ARKANSASVIEW CONSORTIUM MEMBERSHIP

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

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CALIFORNIAVIEW 2023-2024 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 2023, CaliforniaView's applied research focused on the state's 1.5 million acres of almond orchards, the cover cropping (CC) in particular as a strategy for regenerative orchard systems and soil conservation. Our graduate student prototyped the machine learning algorithm to map the presence of winter cover crops using time series of Sentinel-2 multi-spectral imagery. A pilot study was also done to estimate CC biomass with UAV photogrammetry and multi-spectral imagery. These remote sensing based cover crop monitoring will help us to understand the adoption rate of CC practice in almond orchards and assess its carbon benefits.

Fig. 1 Example of almond orchards with cover crops (white) in four counties.

STEM workforce development via High School Summer Camp on AI-Remote Sensing-Robotics. CaliforniaView partnered with the AI Institute for Next Generation Food Systems (AIFS), organized and hosted our first summer camp targeting high school STEM students from greater Sacramento and Bay area. The camp showed how AI and remote sensing are being applied in agricultural and environmental monitoring, and exposed students to new career paths. Hands on fun activities included IoT programming microcontrollers connected to different types of sensors and flying AI-enabled drones over a vineyard.

Public engagement with remote sensing technology. CaliforniaView continues outreach activities with various stakeholders including large growers, commodity industry, non-profits, and state agencies. We also hosted exhibitions at the annual University Open House with more than 35,000 visitors. Various drone platforms and imaging cameras were showcased. Poster presentations and thermal imaging photo booth also attracted many visitors, demonstrating the UAV applications in sustainable agriculture and the concept of thermal remote sensing.

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BENEFITS TO CALIFORNIA

California's landscape is ecologically and climatological diverse, vulnerable to warming, drought, and wildfires. As a most productive agricultural state, it also faces the challenge of minimizing water and N use while maximizing the yield. CaliforniaView has been contributing to cost-effective monitoring across scales with remote sensing technology and facilitate data-driven adaptive management for sustainable natural resource and agriculture. Our research, education and outreach activities have benefited a broad range of stakeholders by

- Demonstrating and providing support to state agencies and the specialty crop industry on satellite and UAV remote sensing technology and AI.
- Training students from multiple disciplines via targeted curriculum development, mini project mentoring, and workshops to equip next generation workforce with remote sensing foundation and tools.
- Educating broader audience including high school students about the benefits and recent advancements of remote sensing and AI applications.
- Showcasing and sharing 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.
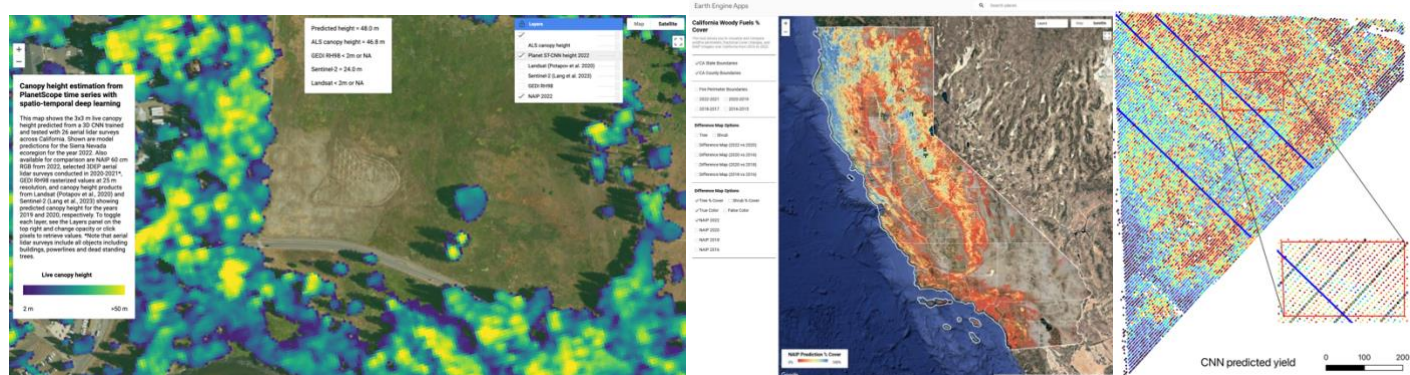
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**@CalView**

COLORADOVIEW 2023 - 2024 ACTIVITIES

Accurate ET estimation is crucial for water resource management, irrigation scheduling, climate change impact prediction, and ecological studies. While existing surface-energy-balance methods are sensitive to various factors, this project leverages the power of machine learning with labeled in-situ ET data, Landsat satellite imagery, and meteorological observations to reduce uncertainties. This year's focus is on data preparation and baseline model development using supervised regression.

The project leverages in-situ ET measurements from 161 stations across the US (1995-2021), Landsat satellite imagery, and diverse meteorological datasets (Daymet, GridMet, ERA5, MSWEP). Additional features include soil properties, elevation, and land cover. Features are transformed using sine/linear scaling, Z-score normalization, log and Yeo-Johnson power transformation.

Two baseline models were developed: Linear (LN) and Random Forest (RF) models. The LN Model (test R^2: 0.76) primarily relies on soil properties and temperature, demonstrating a limited linear relationship with other features. The RF Model (test R^2: 0.86) achieved higher accuracy by leveraging non-linear relationships between spectral indices and environmental factors, demonstrating the importance of capturing complex interactions for improved ET prediction.
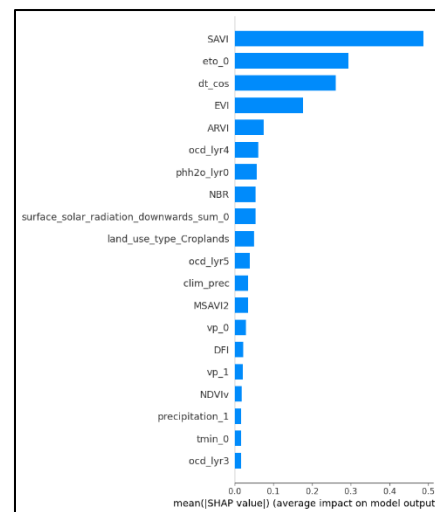
The top 20 important features of the Random Forest ET retrieval model using SHAP.
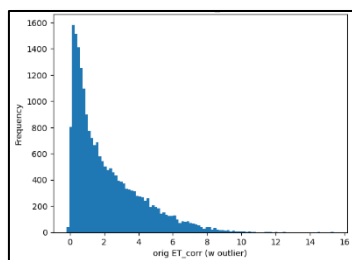
Histogram of original ET values.
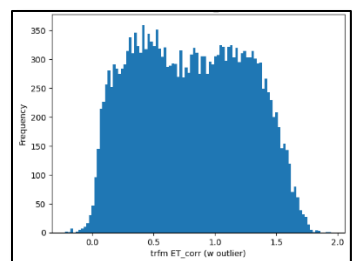
Histogram of power transformed ET values.

Another project investigated the feasibility of predicting cloud fraction (CF) from ground-based shortwave solar irradiance using machine learning. The project uses data from three collocated stations measuring both CF and irradiance: SURFRAD/ARM for CF and UVMRP for irradiance. Approximately 885,000 matched data pairs at 3-minute intervals from IL, MT, and OK are processed for model development.

The team employed linear regression, random forest regression, and a deep neural network (DNN) composed of dense pre-activation residual blocks. The DNN outperformed other models, explaining over 95% of the variance in thick/total cloud fraction based on instantaneous irradiance measurements (R^2 = 0.959). However, model performance was notably lower for thin clouds (R^2 = 0.668), suggesting the need for improved input features.

The project's findings were published in *The Geographical Bulletin*, highlighting the potential of using ground irradiance data for accurate CF retrieval, particularly for thick clouds. The research provided valuable training opportunities for student interns. Intern Jamison Lerma received two awards from CSU recognizing his contributions: runner-up for Student Employee of the Year (Innovation & Technology) and the Undergraduate Research Award from the Warner College of Natural Resources.

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BENEFITS TO COLORADO

- Enhanced Colorado's water resource management by exploring evapotranspiration (ET) estimation using machine learning and satellite data The research has the potential to improve irrigation scheduling, climate change impact predictions, and ecological studies, ultimately promoting water conservation and informed decision-making.

- Provided Colorado student interns with valuable STEM education experience through real research projects. Interns developed skills in:
  - Processing satellite and ground-based Remote Sensing data using scripts;
  - Programming in a team environment;
  - Applying statistical techniques; and
  - Preparing summary reports/papers and present scientific findings.

- The project's educational impact is further demonstrated by resulting peer-reviewed publications and two university awards earned by student participants.

Jamison receiving the undergraduate research award.

Certificate of Recognition: Jamison's Student Employee of the Year Runner-Up.

COLORADOVIEW CONSORTIUM MEMBERSHIP

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

ColoradoView Principal Investigator: Dr. Wei Gao

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CONNECTICUTVIEW 2023 - 2024 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 academic and outreach activities targeted at the education of K - 12 students, undergraduate students, graduate students, and the public. In addition, remote sensing technology is used to develop data and information that address specific issues within Connecticut.

Invasive Plant Monitoring: During the project year of 2023-2024, further analysis was carried on the invasive Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*) mapping beneath the Connecticut forest understory. The main objective of the project launched by ConnecticutView is to identify the distribution of high-risk pixels to be infested by above mentioned two species. The extended leaf phenology of the invasive shrubs was opportunistically detected to distinguish the focal vegetation types (Invasive, Deciduous and Evergreen). The analysis was done using different vegetation indices to identify the most important variables and train the models. Spread of invasive shrubs can alter the soil microclimate and soil pH. Moreover, they compete with germination of native forest tree seedlings and elaborates a greater competitive advantage due to widespread root systems and more than 90 percent of seed viability. The early access to sunlight and nutrients makes community of focal invasive shrubs an aggressive invader due to the extended plant leaf phenology. As mentioned in 2020 Forest Action Plan from the Connecticut Department of Energy and Environmental Protection has identified taking measures to control and manage invasive plants in Connecticut forests as a key priority. Above infestations diminish the overall productive capacity of the forest, depreciates native songbird habitat, and pose risk on human health by making a habitat to blacklegged tick (deer tick) that can be infected with Borrelia burgdorferi bacteria. Due to high adaptability of the invasive shrubs and ability of easy re-emerge makes management practices more difficult and expensive. The resulting maps will be an initial guide to further development of more accurate maps with larger training data sets and will be a guide to begin the management practices to protect future Connecticut forests.

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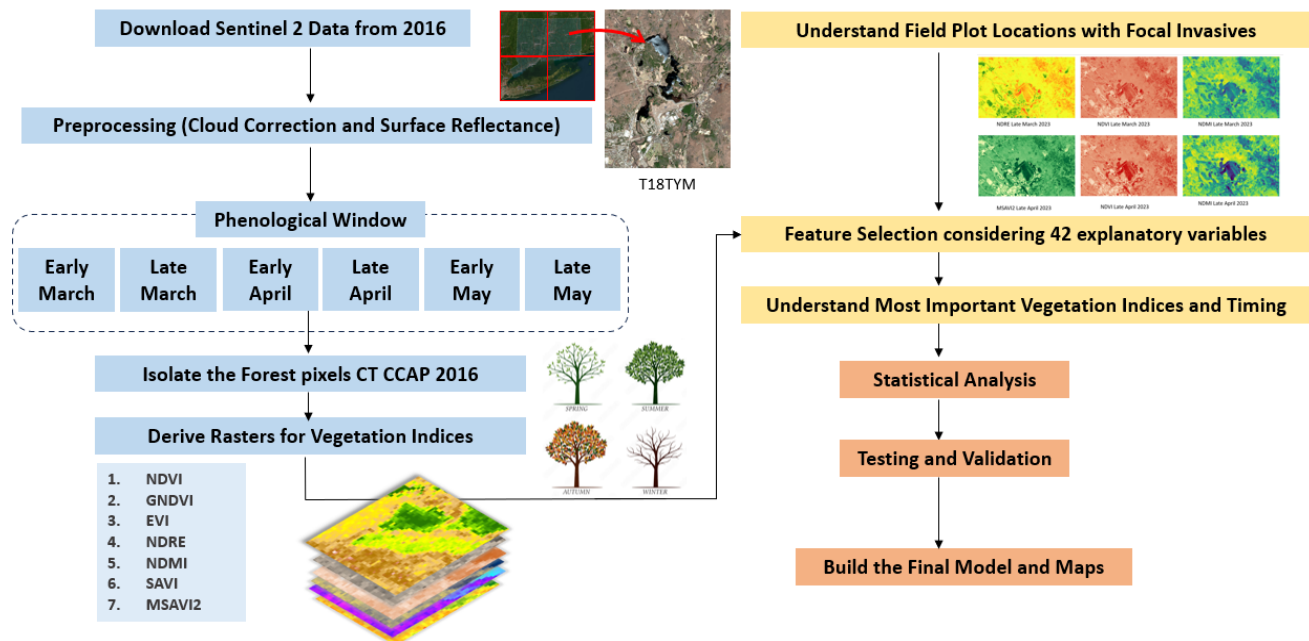
BENEFITS TO CONNECTICUT

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.

ConnecticutView is an active partner of UConn's Natural Resources Conservation Academy - an award winning early college experience program. Highschool student engaged in various geospatial and drone activities. (July 2024)

CONNECTICUTVIEW CONSORTIUM MEMBERSHIP

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

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DELAWAREVIEW 2023 - 2024 ACTIVITIES

DelawareView PI and Delaware Center for Geographic Education Director completed the **Infusing Earth Observation and Geographic Analysis in the 5th Grade Geography Lesson Project** that inserted age-appropriate interactive web maps and imagery in 10 lessons for the Delaware 5th grade geography curriculum. Each lesson has a structured format of a title, suggested time, lesson introduction, geography standards met, lesson objectives, lesson essential question, key concepts, resources, student warm-up, and activities. The literary story - *Seaman: The Dog who Explored the West with Lewis and Clark* - served as the framework for 5th grade standards-based lessons.

Three teacher training workshops were conducted (Nov 6, 2023, Dec 13, 2023, Jan 26, 2024). Both workshops in 2023 were virtual. The Dec 13 workshop was recorded and posted to the State of Delaware maintained Schoology site for 5th grade instructional materials. The Jan 2024 workshop was in person for teachers in the Appoquinimink School District. Virtual 'Office Hours' were held monthly from January – April 2024.

The geospatial technologies utilized in the lessons include i) Big Clickable Maps, ii) National Geographic Mapmaker, ii) ArcGIS Online, and iv) Google Earth. The features and uses of each technology are introduced in the Introductory lesson through an activity.
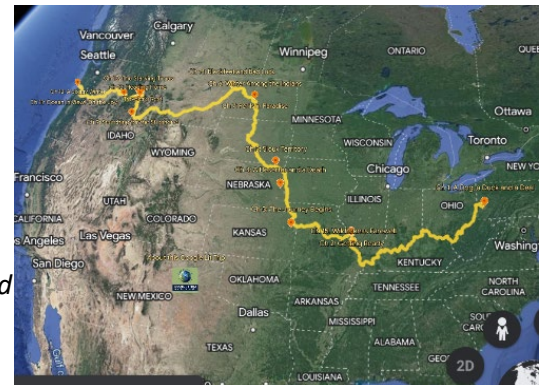
The Lewis and Clark Expedition as identified in the Google Lit Trip for Seaman: The Dog Who Explored the West with Lewis and Clark.

Introductory module to the model lessons.
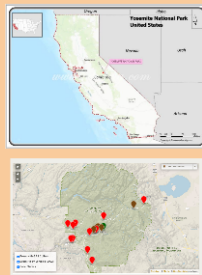
Model Lesson One content format

Model Lesson One: Introduction to Geospatial Technologies Lesson was written to introduce both teachers and students to the various digital mapping platforms utilized throughout the lessons. The lesson introduces geospatial terms and concepts with a short reading on how GPS collars help forest rangers track bears in Yosemite National Park.

Model lesson 12 introduction.

Model Lesson 12: A Soggy Winter utilizes an ArcGIS interactive map to review with students the landforms of the United States, make connections between landforms, climate and biomes. The lesson further extends to have students explore whether or not landforms and climate impact where people choose to live, and whether or not landforms and climate influence the growth and/or decline of cities

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BENEFITS TO DELAWAREVIEW

DelawareView has continued leading and engaging in K-12 outreach events to showcase the use of imagery and geospatial technologies, as well as career opportunities. Each activity is listed below.

ESRI Annual Storymap Competition – organizing, promoting and providing mentor support to 11 middle and high school students who created StoryMaps that explored and communicated issues or stories relevant to Delaware. Secretary of Education hosts students at state capital to recognize their accomplishments and give awards.

University of Delaware College Readiness Scholars Institute – first year participated by providing two sessions to 15+ first-generation and underserved high school students in Delaware.

Geospatial Career Panel tracks at annual YES! (Youth Environmental Summit) **Conference** - continue raising awareness amongst environmentally oriented high school students about college and career paths in geospatial science and technology, and showcasing the amazement of satellite imagery

Geospatial Track in Annual Green Jobs program for Wilmington Youth introduce a select group of urban youth summer interns to geospatial technologies.

EcoCamp – Two-day focus during a one-week camp on the technologies used to study and protect the environment. 12 Black Girls Dive students joined the camp this year.

Earth Observation Day Outreach Activities - taking Landsat poster games to elementary and middle school geography classrooms

GIS Day Field Trip Event – 200+ 5th grade students learning about all about satellite observations

2024 Storymap Competition Awards Ceremony

EcoCampers exploring a big map of DE.

DELAWAREVIEW CONSORTIUM MEMBERSHIP

Tracy DeLiberty
Delaware View PI

Mary Schorse
Geographic Education Director

Nora Lucas
Geography & Spatial Sciences Graduate Student

Delaware GeoEducation
Delaware Geographic Data Committee (DGDC)

Delaware Center for Geographic Education

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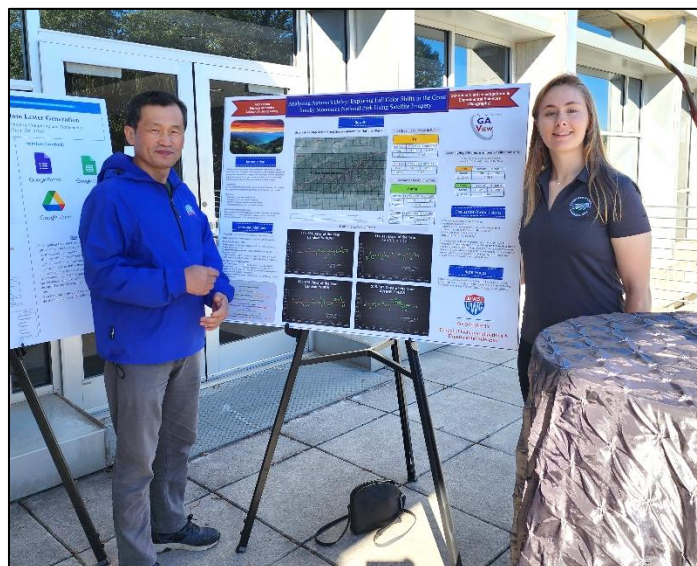
GEORGIAVIEW 2023 - 2024 ACTIVITIES

GeorgiaView has brought meaningful impact on K-12 and university students, as well as on local and national communities. Key highlights include:

- Hosting Earth Observation Day events
- Surveying Dual enrollment programs on high school coordinators
- Promoting undergraduate career development and research in the GIScience fields

Earth Observation Day event with Central High School Students, Carrollton, Georgia, on March 8, 2024

GeorgiaView's activities are highlighted by two major activities. One is the dual enrollment survey on high school coordinators and counselors. Seven high schools were surveyed in depth, representing 2,873 11th graders and 2,849 12th graders, totaling 5,722 students. One finding is that about 21% of students (i.e., 1,194 out of 5,722) are actively participating in dual enrollment programs at various colleges across the state.

Another finding is that most high school coordinators or counselors do not know about GIS and remote sensing fields. Additionally, there is a need to make GIS and remote sensing courses fulfill necessary graduation credit requirements in Science or CTAE (Career, Technical, and Agricultural Education) areas. It was identified that statewide and national initiatives are urgently needed to broaden Science or CTAE fields.

GeorgiaView's second major activity is to promote remote sensing to K-16 students by hosting Earth Observation Day event and directing undergraduate research projects. Undergraduate student research was presented at multiple conferences, and published in an academic journal. GeorgiaView's undergraduate student support has helped students to pursue careers at renowned companies like Carroll EMC power and The Ray (https://TheRay.org) transportation consulting firm.

Undergraduate student research presentation at UWG Scholar's Day

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GeorgiaView has brought broad impacts to the State of Georgia by promoting geospatial technologies, providing science education, and helping decision making about natural resources. The following are testimonials about the Earth Observation Day event, undergraduate student support, and a research project.

- Earth Observation Day
  - *"I thought the experience was great. It was awesome to see how the things work in the geoscience part of the university!"*
  - *"I enjoyed it! Everybody was nice and open."*
  - *"This event was very good! The stations were all very interesting and enjoyable. This event provides more insight and information to me about how agriculture can impact the environment as I hope to pursue a career in sustainable agriculture."*
  - *"It was great, the sandbox was particularly fun and all the guides and professors were extremely nice. I'm definitely thinking at looking at geology as a major option."*

- Undergraduate student research
  - *"I believe that my involvement in these GeorgiaView projects helped me to secure my GIS internship at our local utility company … The experiences I've gained through my work with Dr. Seong and GeorgiaView have given me opportunities I otherwise would never have had. I will be eternally grateful …"*
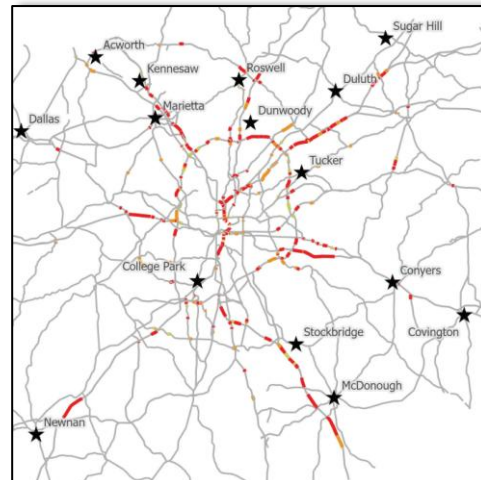
Undergraduate research: crash hotspots in metro Atlanta (2017-2021)

High School students making 3D models with the Sandbox system

GEORGIAVIEW CONSORTIUM MEMBERSHIP

University of North Georgia (Dahlonega)
Kennesaw State University
University of North Georgia (Gainesville)
Rotorworks
University of Georgia
Atlanta Regional Commission
Georgia State University
University of West Georgia
Georgia College
Georgia Southern University
Skidaway Institute of Oceanography
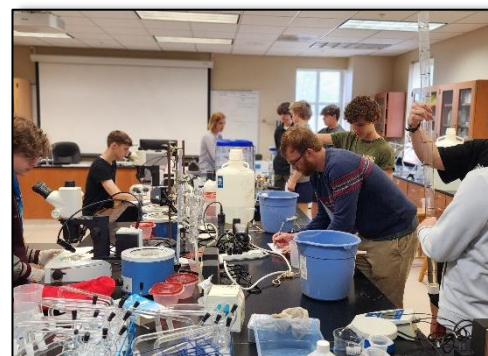
High School students measuring and analyzing water quality properties

GeorgiaView Principal Investigator:

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HawaiiView 2023 - 2024 Activities

Lidar is the most accurate technology for mapping vegetation height. However, the existing airborne lidar data over Kauai, which were acquired for individual conservation and environmental projects, only cover a relatively small portion of the island in the north side. To fill in the gap, we combined island-wide Landsat-8 cloud-free mosaic (generated from the GY19 activities, https://bit.ly/2ILmzJo) and airborne lidar data to map vegetation height over Kauai's mountainous areas (KMA). We first estimated vegetation height over lidar coverage areas, then used the data over the overlap areas to create a model of predicting lidar-based height from Landsat imagery, and finally predicted height over mountains using the model and the Landsat-8 mosaic.

Landsat-8 Cloud-free Mosaic

+

Airborne Lidar

Integration of Landstat-8 Cloud-free Mosaic, Airborne Lidar, and Machine Learning for Island-wide Tree height Mapping

36 m

0 m

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- We produced a new map of vegetation height over the forest areas in Kauai using massive airborne lidar-derived vegetation height as the reference, which led to a much better accuracy than the existing vegetation height maps in Hawaii (such as the LANDFIRE Existing Vegetation Height, EVH) (see Figures below as an example).

- This new map (https://tinyurl.com/34wryu9f) of vegetation height provides a critical input for understanding the role of forests in ecosystem functioning and services (such as water supply, carbon storage, and biodiversity conservation) in the island of Kauai.

- One master graduate student was trained and supported for airborne lidar data processing and vegetation height modeling and mapping.

ArcGIS Base Imagery (Locations A)
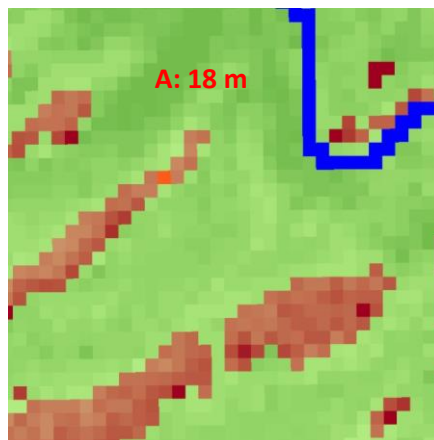
Landfire Existing Vegetation Height Maps
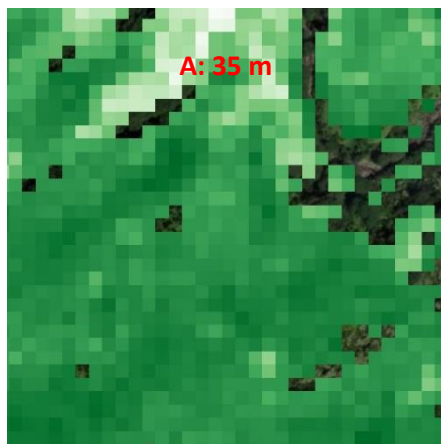
Our product: L2FHM
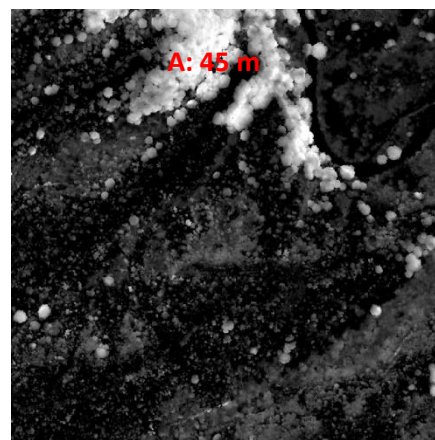
Airborne lidar point cloud

Note: Numbers at locations A and B indicate the vegetation heights from different products

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https://bit.ly/3lOmoex

IOWAVIEW 2023 - 2024 ACTIVITIES

Continue Expanding Iowa's K-12 Earth Observation Education Network Through Workshops and Creating Resources for K-12 Educators

This grant year was a year of transition for the IowaView Program. In January 2024, IowaView's longtime Principal Investigator (PI), Robin McNeely retired from Iowa State University after over 25 years. Thank you, Robin, for leading the IowaView state consortium for the past nine years and for your service as an AmericaView Board Member. Fortunately, Robin agreed to continue to serve out her term on the AmericaView board.

In December 2023, Dr. Brian Gelder, a professor in Agriculture and Biosystems Engineering at Iowa State University, was appointed as the new PI for IowaView and Amy Logan, continues to serve as the state coordinator. As with any transition, there has been a learning curve as the IowaView team adjusts to new roles and responsibilities. While this has required adaptations in some regards, these changes have also brought opportunity for growth and change for IowaView and the opportunity to reach out to new groups to join the IowaView state consortium.

*Celebrating Retirements - Members of the ISU GIS Facility: Robin McNeely (retired January 2024); Josh Obrecht; Amy Logan; Kevin Kane (retired Septemver 2024); Wael Alhaj. *Not pictured: Colton Clack and Brian Gelder.*

During GY 2023, our focus continued reaching across disciplines to show how GIS, remote sensing, and geospatial thinking apply to all. This year we were able to visit a pre-service social studies classroom, share professional development sessions at K-12 teacher conferences, and continue partnering with educational partners to provide complementary programming.

Dr. Thomas Larsen, a geography professor at the University of Northern Iowa presenting at Earth Observation Day.

Earth Observation Day Attendees.

Highlights from GY23:

Outreach Events

Earth Observation Day 2023 - A Day to Explore Geospatial Careers and Pathways - Five geospatial professionals from diverse sectors came and shared about their GIS pathway and about their current GIS career.

GIS Day 2023 at The Catalyst in ISU Parks Library - IowaView provided outreach materials: posters, books, trading cards, and geocoins. This was a day long collaborative event with the university library and the GIS Facility.

Professional Development for K-12 and Pre-service Teachers

- Iowa Technology Education Conference for IT professionals in Nevada, Iowa. on 2/16/24, "An Introduction to Managing and Deploying ArcGIS Online Orgs in K-12 schools."
- Visited Dr. Amy Rutenberg's pre-service social studies classroom at ISU on 4/1/24, "Using GIS and Digital Mapping in Social Studies Classrooms."
- Presented at the National Art Education Association National Conference in Minneapolis, Minnesota, on 4/4/24, Data Visualization Deep Dive, "Discovering Earth as Art."

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BENEFITS TO IOWA

IowaView Website: IowaView continues to have an active website presence (12 posts during GY23 and 184 archived posts). In GY23, the website recorded 2,700 users viewing 3,984 pageviews. The IV blog had a special outreach effort during Geography Awareness Week in November 2023.

Some metrics from the GY23 reporting year:

o EOD and GIS Day Outreach events included a total of approximately 50 students, 10 professors, and 50 general public/professionals

o 40 K-12 teachers received training during conference sessions and workshops

o 8 pre-service social studies teachers attended a GIS classroom visit from IowaView state coordinator

o Over 200 K-12 teachers received emails and/or social media regarding Iowa GIS resources and training notifications

o IowaView employed one graduate student who worked to develop a lesson plan for our IowaShots images
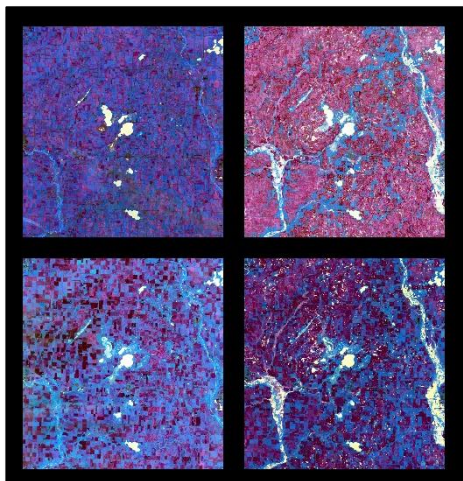
Cautionary Waters is an Iowa as Art piece that was created during GY23. The piece shows images of two major flood events in 1993 and 2024 compared to two non-flood years in Northwest Iowa. The image statement asks viewers which scenarios we are planning for in our communities. It is currently a part of a local exhibit called "Do Justice," which runs October 2024 to January 2025 in Ames, Iowa.

Iowa Atlas: The Iowa Atlas is being developed by a group of volunteer GIS professionals and is targeted towards K-12 students. This effort started as a partnership between IV Coordinator Amy Logan and Dr. Thomas Larsen, a professor at the University of Northern Iowa and co-director of the Geographic Alliance of Iowa. In August 2024, the first mapathon was held at ISU with 8 volunteer GIS professionals.

Photos: Iowa Atlas Mapathon held on August 10, 2024. Testimonial below from an Iowa Atlas mapathon participant.

"I am grateful to have joined GIS practitioners from around the state of Iowa at the first statewide Mapathon aimed at producing an Iowa atlas for K-12 students. As a former 7-12 social studies teacher and a current history education specialist, I was particularly interested in developing maps that highlight Iowa's historical narrative" … "This work allowed me to collaborate with GIS professionals from across the state, where we shared ideas and developed new approaches to making these maps accessible and useful for K-12 classrooms. These conversations have been invaluable in helping me think creatively about how this atlas, combined with the exceptional educational resources from the State Historical Society of Iowa, can support teachers statewide."

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 various departments at ISU as well as from public agencies and organizations.

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IDAHOVIEW 2023 - 2024 ACTIVITIES

Thermal refugia in streams are essential for the survival of coldwater fish species such as Redband trout (*Oncorhynchus mykiss*). Heterogeneity in stream temperature is caused by changes in daytime warming and cooling effects from cliff walls and riparian vegetation, and changes over the season from variations in sun angle. Thermal models have the potential to demonstrate how stream temperature changes spatially throughout the day and over time. In the late summer of 2022 we surveyed a 500 m reach of Little Jacks Creek, Idaho once an hour for 24 hours using an uncrewed aerial system (UAS) with a thermal infrared (TIR) sensor and in-stream water temperature loggers to capture hourly thermal spatial heterogeneity (Figure 1).
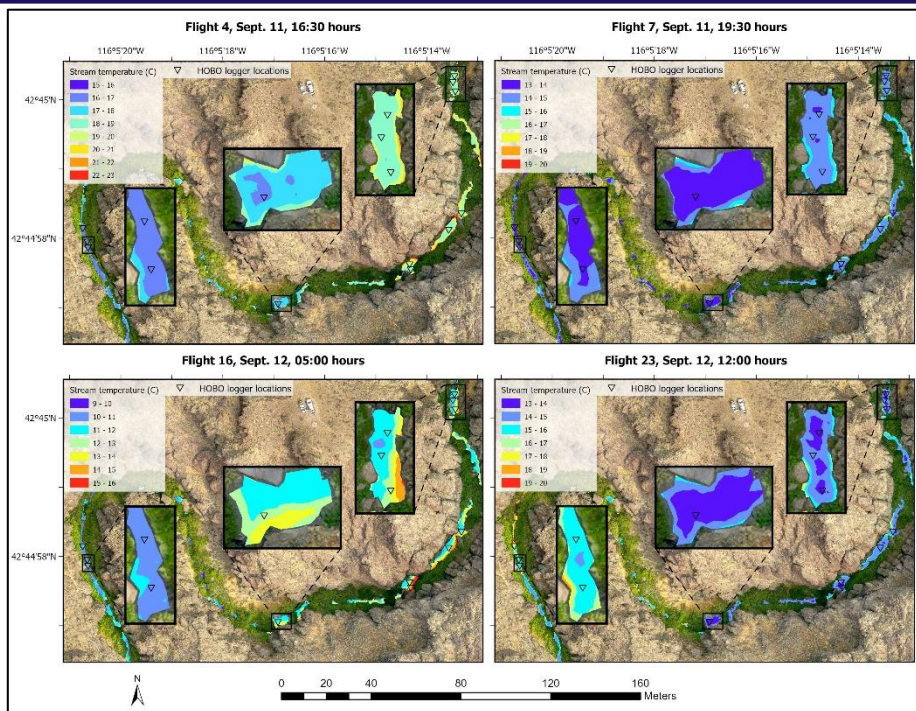
Figure 1. Diel stream temperatures along Little Jacks Creek, Idaho

Figure 2. Little Jacks Canyon, Idaho.

In 2023, we conducted remote sensing analysis and prepared a journal manuscript on the findings from our data to highlight the diel variation in both stream temperature and TIR sensor accuracy in this desert stream environment (Figure 2). This study revealed specific patterns in TIR sensor accuracy that were dependent on the time of the flight. These findings will enhance future efforts in conserving cold water organisms that rely on cold water refuges. In addition to supporting student research in remote sensing, this project is in alignment with NLRSEORA Objective 4 (Advance Education and Training, Technology Transfer, and Outreach) goals. This applied research project included both underrepresented graduate and undergraduate students in data collection, analysis of UAS data, and advanced modeling.

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Engaging Students in STEM Activities for Workforce Development

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.

IdahoView actively works with local growers to assist in using remotely sensed data to identify crop threats and monitor crop health through the growing season. Several student-led projects using Landsat and Sentinel satellite imagery are helping to monitor crop vigor by providing information to growers to improve variable rate fertilization practices. Preliminary trials are underway to link vegetation indices with yield data shared by local farmers in southeast Idaho.

Agriculture is an important contributor to Idaho's economy. We work to help growers with remote sensing to detect crop threats.

Undergraduate research for Landslide Hazard Mapping. GPS Data collection along Idaho Transportation Corridors.

IDAHOVIEW CONSORTIUM MEMBERSHIP

IdahoView works with public and private sector partners to:
- Promote the development of novel tools and techniques to translate remotely sensed data into information that is meaningful to decision-makers
- Use remote sensing to promote STEM interest and learning
- Expand work force development opportunities in remote sensing across all higher education institutions in Idaho
- Advance remote sensing literacy through workshops and extension
- Encourage the use and scientific application of remotely sensed data from advanced sensors
- Provide opportunities for graduate and undergraduate research experiences in remote sensing

Federal consortium members do not receive funding from AmericaView.

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INDIANAVIEW 2023 - 2024 ACTIVITIES

IndianaView Student Scholarship Program

IndianaView provided scholarships for six students (five graduate and one undergraduate) from the member educational institutions to participate in remote sensing and geospatial projects. Each of the student provided a fact sheet about their project and a testimonial on how the scholarship assisted them.

Completed students' projects include: Eastern towhee migration study at central Indiana; Analysis of short- and long-term controls on the variability of event-based runoff coefficient in the Ohio River region; Optimizing irrigation for corn and soybean cultivation; Constraining formation hypotheses for irregular mare patches on the moon with orbital reflectance spectra; Simulation of the effect of groundwater storage and withdrawals in the Wabash River basin; and applying deep learning to predict comprehensive land and river topography for hydrological and hydraulic simulations.

Students' testimonials show that the scholarship opportunity motivated them to apply remote sensing data in their disciplinary studies, opened opportunities for their data collection and analysis, and improved their confidence in using cutting edge technology in field data collection.
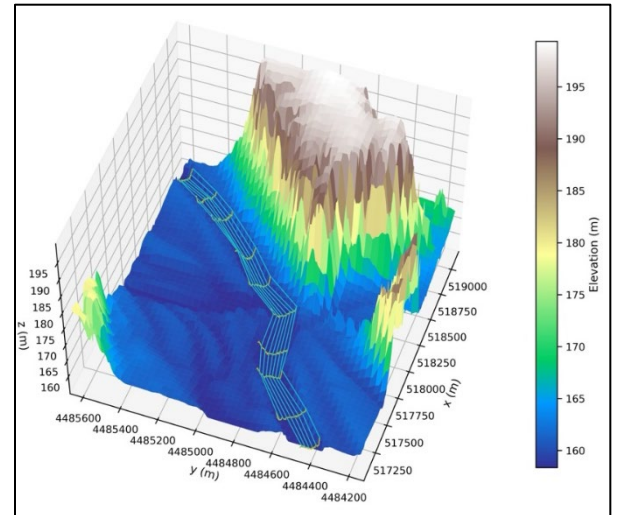
Riverbed topography or bathymetry is crucial for hydrologic and hydraulic applications. But the data are not easily accessible or widely available for large areas. With IndianaView support, the student developed a synthetic mesh of the riverbed surface (blue and green lines) generated by the deep learning model (CGAN).

IndianaView mini-grant Program

IndianaView provided a means for researchers at partner institutions to participate in IndianaView via geospatial projects relative to the state of Indiana. Two mini-grants were funded during 2024. One mini-grant project used remote sensing image to design a hybrid photovoltaic and wind energy system for Franciscan health, a hospital in Lafayette, Indiana. The project has been integrated into a course taught at Purdue Northwest involving 32 undergraduate and graduate students. Another mini-grant project further developed the Indiana Statewide LiDAR data portal, which enabled Cloud Optimized GeoTiff (COG) data format for the statewide ortho images served at the portal, so that users can easily access the image without downloading the geospatial data products to their local machines. This is a continuation work of enabling COG data for Lidar data at the portal.
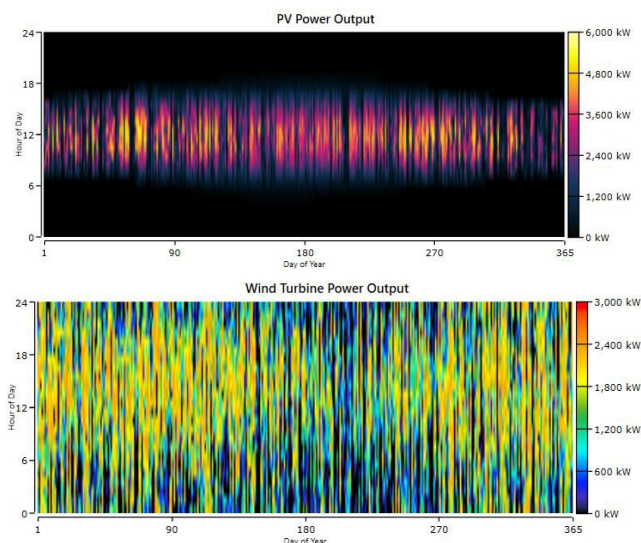
Students at Purdue Northwest designed renewable energy systems (PV panels and wind turbines) for a local hospital.

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AmericaView Website:
www.AmericaView.org
Christopher McGinty, Executive Director:
chris.mcginty@americaview.org
Lisa Wirth, Program Director:
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Lindi Quackenbush, Board Chair:
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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 areas. This year, we have received twelve applications by undergraduate and graduate students.

- The Indiana statewide LiDAR and ortho imagery data portal (https://hub.digitalforestry.org/) was supported by IndianaView for multiple years through the mini-grant program to add QGIS plug-ins and enable cloud optimized data format. The volume of the data served increased significantly after those improvements implemented.

- Led by IndianaView PI, the post-bachelor certificate program in geospatial information science has graduated eleven students in its third year. Forty-seven students were admitted into the program including majors in agriculture, civil engineering, anthropology, earth science, business, and American Studies.

- The Purdue GIS Day event not only gathered researchers and students in multiple disciplines at Purdue university, but also had visitors from Indiana Geographic Information Council, Esri, Amazon AWS, databricks, and students from other universities. It provided a platform to discuss about the recent advancement in GeoAI, as well as a place for students to learn about career opportunities.
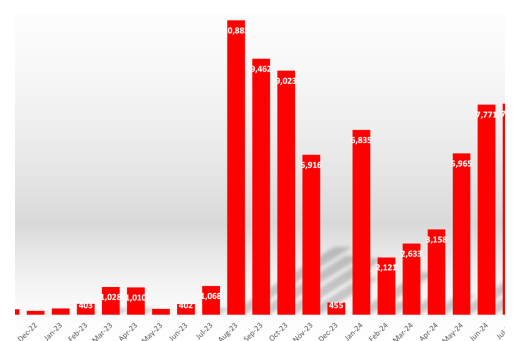
The Indiana LiDAR data portal web service statistics for monthly data volume served in GB.

Students in different disciplines learned geospatial information from the interdisciplinary program.

INDIANAVIEW CONSORTIUM MEMBERSHIP

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

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KANSASVIEW 2023 - 2024 ACTIVITIES

KansasView is building partnerships with state and federal agencies to identify and address threats to grassland biomes in the Great Plains region. The USDA Natural Resources Conservation Service (NRCS), and Kansas Department of Wildlife & Parks (KDWP), and other agencies/partners have active programs to help landowners mitigate Redcedar (and other opportunistic woody species) invasion through physical mechanical or chemical removal. The Kansas Great Plains Grassland Initiative (GPGI), a landowner led, science informed, and agency supported effort, identified woodland expansion by Eastern Redcedar and other opportunistic woody invasives as the greatest threat facing Kansas grasslands due to the attendant reductions in grassland biodiversity and livestock forage opportunity while increasing wildfire risks. Mapping and monitoring woodland expansion are critical for land managers operating at the field, local, state, and federal levels. KDWP and NRCS often use on the ground field assessments to determine the extent of woodland cover and expansion. KansasView developed models to map densities of Eastern Redcedar woody encroachment across Kansas using Sentinel-2 satellite imagery to help agencies identify and prioritize management areas. The interannual maps and technical report are being shared with KDWP and NRCS to help establish strategic partnerships and to expand the scope of this applied remote sensing research. The goal is to support agency and landowners local and landscape level conservation actions across Kansas grassland biome.

An example of Eastern Redcedar expansion into grasslands.

Physical removal of Eastern Redcedar is one conservation action used to protect the Kansas grassland biome.
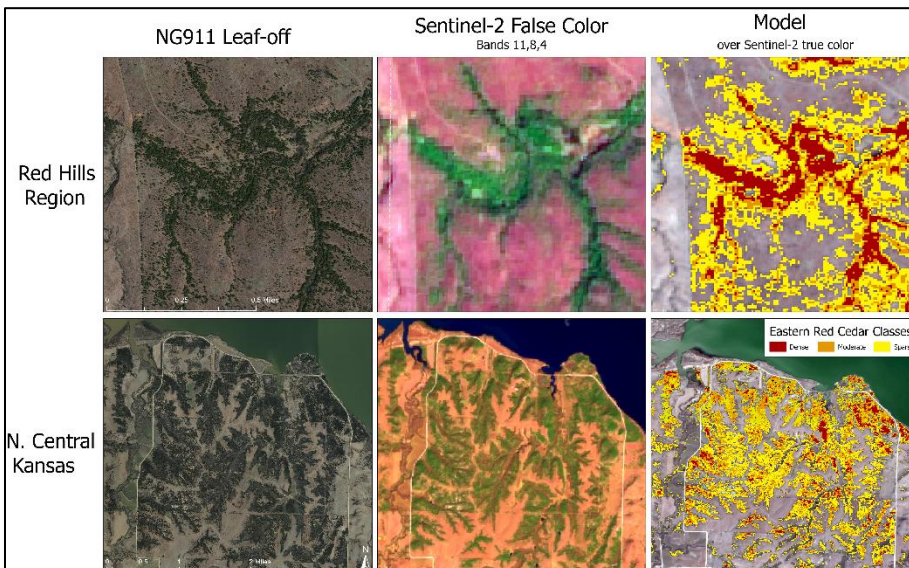
Aerial (left) and Sentinel-2 (center) imagery showing Redcedar invasion and the modeling results of Eastern Redcedar densities (right).

The left graphic shows examples of Redcedar invasion in South Central (top) and North Central Kansas (bottom). Large patches of Eastern Redcedar are visible in the 1-foot NG911 winter aerial imagery (left; dark green) and in the late winter/early spring Sentinel-2 imagery (center; bright green). Three densities of Redcedar (right, yellow-to-red) were mapped statewide between 2019-2023. Future mapping efforts would focus on using higher spatial resolution imagery and/or developing regional rulesets to refine mapping results. Redcedar maps can be explored in a web mapping application available on the KansasView website.

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BENEFITS TO KANSAS

- KansasView participated in the annual Ecosystems of Kansas Summer Institute to educate middle school Kansas biology and environmental science teachers on resources to integrate remote sensing and GIS into their classrooms.

- 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.

- KansasView maintains connections with Kansas stakeholders and consortium members for potential collaborations in outreach, education, and research. Updated land cover maps are a popular educational and outreach tool.

- KansasView attends local and state focused conferences like the Kansas Natural Resource Conference and the Kansas Association of Mappers Conference.

Ecosystems of Kansas Summer Institute

KansasView participated in the 2024 Ecosystems of Kansas Summer Institute to work with Kansas science teachers.

National Land Cover Database – Kansas 2023
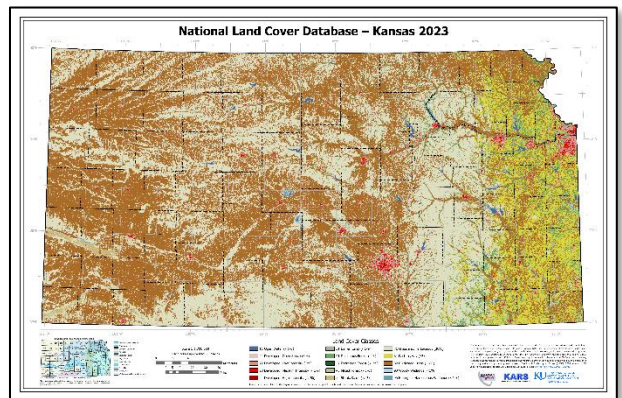
Printed annual land cover maps remain a popular educational and outreach tool to distribute at events throughout the year.

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

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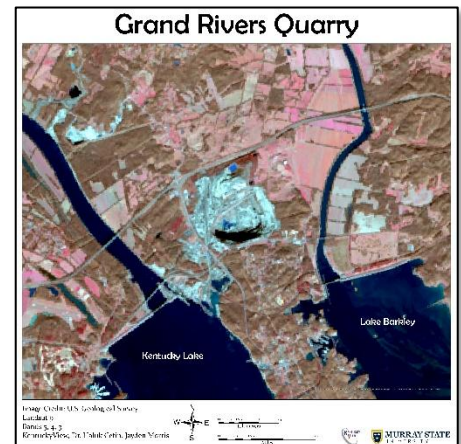KANSAS VIEW

KENTUCKYVIEW 2023 - 2024 ACTIVITIES

Earth as Art and Science (EAS) Program of KentuckyView: The main objective of "Earth as Art and Science" Program of KentuckyView is to develop materials to produce Art Gallery exhibits of Landsat and other sensors "Earth as Art" imagery to bridge the worlds of Art and Science, and conduct outreach activities in Kentucky. These materials were prepared to educate K-12 students and teachers, undergraduate, and graduate students; workforce professionals; local, state, and federal employees; commercial and industrial workers; resource managers; formal and informal learning groups; Native and underserved populations; and veterans. The EAS program initiated a collaboration between the University of Kentucky/Kentucky Geological Survey (KGS) and Murray State University (MSU) researchers under the umbrella of KentuckyView. The EAS group focused on remotely sensed image selection and related landscape images/maps to educate students and the public.

Landsat image of Frankfort (above) and Grand Rivers (below), Kentucky. EAS Collection of Murray State University/Kentucky Geological Survey.

K-12 outreach activities: The MSU student chapter of ASPRS met two times to establish plans to work with K-12 students on a common geospatial project. Kentuckyview participated the Archaeology Day event held in Wickliffe Mounds State Historic Site, Wickliffe, Kentucky. We used several tools, such as a thermal camera, UAS, imagery, poster, and an EOD game poster, to educate the participants.

State-wide undergraduate and graduate student fellowships: The winners of the 2024 student fellowships awards in the amount of $500 were Ms. Shreesha Pandeya, Kentucky State University and Mr. Benjamin Hauschild, Western Kentucky University. The students would use their fellowship monies for their research.

Earth Observation Day (EOD) and Earth Day activities: An EOD/Earth Day event was held at MSU on April 17&18, 2024. Students presented their research.

EOD/Earth Day events, Murray, KY.

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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 remotely sensed 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.

- KentuckyView has conducted research on soil moisture, water quality and quantity, and harmful algal blooms. 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, the EAS program, Earth Observation Day, Earth Day, and GIS Day presentations, have helped inform and educate teachers, students, and the public in Kentucky.

The 2024 Solar Eclipse Day at MSU

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.

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LOUISIANAVIEW 2023 - 2024 ACTIVITIES

Disaster Workshop for Emergency Geospatial First Responders

As a high impact activity, this annual workshop promoting emergency response, held in early June each year, celebrated its 25th anniversary. Through the cooperation of the LouisianaView consortium members and co-sponsored with the local USGS liaison, this workshop was offered free to everyone interested in up-to-date information on data availability for the geospatial emergency responder. The 2024 workshop featured more than 24 speakers from their professional fields and more than 200 attendees (national/international) from 15 countries. Workshop presenters representing local, state, and federal agencies bring valuable resources and updates related to disaster response for both hurricane and wildfire events. Geospatial first responders are the silent heroes battling on the front lines for data acquisition, development, product deployment and analysis for each disaster event.

25th Annual Hurricane/Wildfire Disaster Geospatial Data Mining Workshop
NASA/UL Lafayette Regional Application Center
University of Louisiana at Lafayette
2024

Disaster workshop brochure featuring speaker bios and presentations along with workshop resources and highlights. View here: https://bit.ly/3AudPSI

Enhancing Earth Observation Education Through Art

LAView PI Yantis describing imagery to 8th-12th grade students participating in the Rising Water Workshop in Lafayette, LA.
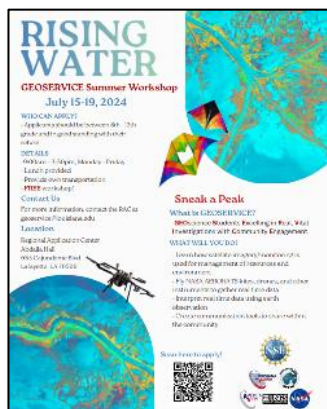
As a high impact activity promoting STEM or STEAM in our case, LouisianaView continues to further develop remote sensing data in the production of "Art Gallery Exhibit" quality images on canvas, puzzles, activities, workshops, etc. relating to study areas across the U.S. to enhance Earth Observation Awareness. These work in conjunction with the NASA/USGS/AmericaView educational outreach materials generated to promote Earth Observation. LouisianaView produced new Art Gallery Exhibit pieces of Earth as Art images, including Landsat, NAPP, NAIP and AEROKAT kite captured images. University, Community College, and K-12 students are encouraged, as in previous grant years, to identify areas of study following "Rivers – Our National Water Resource" game, moving along America's Rivers. Geospatial students are encouraged to identify, create story-maps, and ultimately an Earth as Art image to reel the observer in as they learn through examples of remotely sensed data. Digital online puzzles will also be created to peak the public's interest and made available on the LouisianaView and AmericaView websites.

LAView undergraduate student mentors playing the Rivers Games with workshop participants.

RISING WATER
GEOSERVICE Summer Workshop
July 15-19, 2024

2024 Workshop Flyer

2024 RISING WATER

2024 Rising Water Summer Workshop Group Drone Photo

LAView students with the NASA AEROKAT kites.

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BENEFITS TO LOUISIANAVIEW

The disaster workshop brings together a community of talented individuals to help expand the Regional Applications Center/LouisianaView resources to aid in our response to these disasters quicker, more effective, more productive, and more connected as we move forward. An informed network of geospatial first responders spanning the region - across the states, the Gulf, the Caribbean, and all surrounding areas will always be our best defense.

Group of attendees at the 2024 Disaster Workshop in Lafayette, LA.

The benefit of utilizing the USGS "Earth as Art" program within LouisianaView outreach activities provides active and hands-on learning to engage students in Earth Observation. Students learn how to identify cultural and environmental features using Landsat and other imagery, exploring the artistic aspect of landscapes within the Earth as Art gallery and floor puzzle activities. Additionally, NASA's AEROKAT Kite program allows students to capture images themselves, deepening their understanding of remote sensing. The program produces both digital and physical outreach materials, including imagery, artwork, and puzzles, for use in summer and semester-long events. LouisianaView creates tutorials and test outreach materials that can be adapted by other states, providing support for state-specific educational programs. By promoting Earth as Art, the program brings remote sensing into K-12 STEAM education, fostering awareness and interest in Earth Observation across communities.

Undergraduate and graduate student participants in the SPLIT Geoscience Workshop in Pocatello, ID learning about features in imagery.

Children playing with the Earth as Art floor puzzles at the El Paso Science Festival.

LOUISIANAVIEW CONSORTIUM MEMBERSHIP

Federal consortium members identified above do not receive funding from AmericaView.
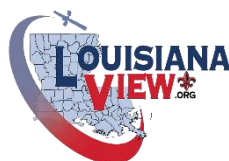
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![MARYLAND VIEW logo]

MARYLANDVIEW
2023 - 2024

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MARYLANDVIEW 2023 - 2024 ACTIVITIES

In summer 2024, MarylandView hosted a 4-day, 3-night geospatial technology summer camp at Towson University (TU) for 26 high school students from 14 Maryland schools. This immersive program featured mini workshops in remote sensing and GIS, led by TU professors and students, along with engaging activities like a NASA Goddard guided tour, a private planetarium show, and hands-on drone operation. Team-building exercises, such as rock climbing and geography trivia, fostered social connections and allowed students to experience college life.

The camp received a 4.4/5 rating from participants, demonstrating its value for students interested in geospatial technology. This initiative directly supported the objectives of the NLRSEORA grant, advancing K-12 education in remote sensing and Earth observation (RS/EO) as outlined in Objective #4, while fostering strategic partnerships with Maryland public schools in line with Objective #2. The camp equipped students with valuable skills and inspiration for future academic pursuits in the field.

Group photo of summer camp participants

Campers engaging with the floor puzzle

Campers touring NASA Goddard Space Flight Center
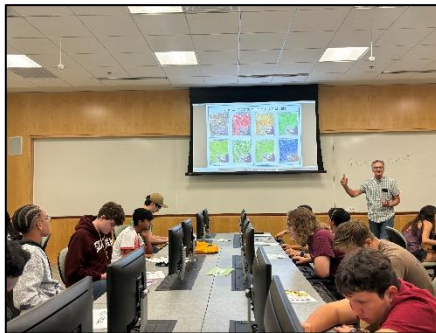
Campers exploring Landsat imagery with ArcGIS software

In spring 2024, MarylandView hosted a UAS remote sensing workshop for local agencies and businesses. The workshop covered diverse topics, including FAA regulations, UAS platforms, digital sensors, UAS operation, aerial photo collection, and digital image processing. It provided educational materials tailored to address training needs in remote sensing and Earth observation (RS/EO), fulfilling Objective #4 of the NLRSEORA grant.

Workshop participants learning UAS operations for air photo collection.

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BENEFITS TO MARYLAND

- The Geospatial Technology Summer Camp benefits Maryland by equipping high school students with vital GIS and remote sensing skills, creating a pipeline of future professionals in these high-demand fields. It also strengthens STEM education, supports workforce development, and fosters strategic partnerships between educational institutions, local agencies, and industries, boosting Maryland's innovation and economic growth.

- The UAS remote sensing workshop enhances the capabilities of Maryland's local agencies and businesses by training them to effectively utilize UAS for data collection and analysis. This collaborative effort improves decision-making and supports economic growth by advancing technology use in sectors such as agriculture, environmental monitoring, and urban planning.

- Overall, MarylandView's activities in the past grant year have equipped students, communities, businesses, and government agencies with advanced geospatial skills, enabling them to leverage these technologies for diverse applications and driving workforce development and industry growth.

Campers exploring Earth observations using Google Earth Pro.

Campers engaging in a team-building activity.

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MICHIGANVIEW 2023 - 2024 ACTIVITIES

As a member of the AmericaView consortium, MichiganView strives to promote remote sensing science within the state of Michigan by establishing partnerships with educators and developing resources that familiarize students with Earth observation. MichiganView's primary focus is to develop tools and activities for K-12 students.

In the 2023-2024 grant year, MichiganView developed tools designed to help meet specific Michigan Science Standards (MSS). The MSS are built on the Next Generation Science Standards and have been adopted by the Michigan Department of Education. Two modules were created for high school Biology, Environmental, and Physical Science classes. MichiganView tools are created with accessibility and open sources in mind, so platforms such as ESRI StoryMaps are typically used to eliminate the need for specialized software.

For students at the high school level, a StoryMap was created to illustrate how human activities are modifying Earth systems using the example of forests in northern Michigan. The tool enabled students to investigate changes in NDVI to assess areas that have been disturbed by timber harvesting, fire, land-use change or non-native insect infestations. USGS's Wildfire Potential Index and biomass/carbon reservoirs were used to study how drought influenced a wildfire in June of 2023 near Houghton, MI. Supplemental StoryMaps were also made for students about controlled burns to promote of native species and ecosystems. Another module/StoryMap is mapping, identifying, and quantifying wetlands, which are one of the most difficult ecosystems to classify using remote sensing. Using data from the Great Lakes Commission and MTRI research in Greats Lakes invasive aquatic plant species, drone imagery is used for identification and classification.

Professional Development for Michigan middle and high school teachers was provided by MTU's Center for Science and Environmental Outreach – "Clear Skies, Clean Waters, Bright Futures" for which air quality was linked with forest fires. A lesson on wildfire smoke was presented to the teachers.

In addition to creating content for use in traditional classroom settings, MichiganView also supervised the Remote Sensing competition for several regions of the Michigan Science Olympiad. Science Olympiad is a national organization that runs STEM related tournaments around the country.
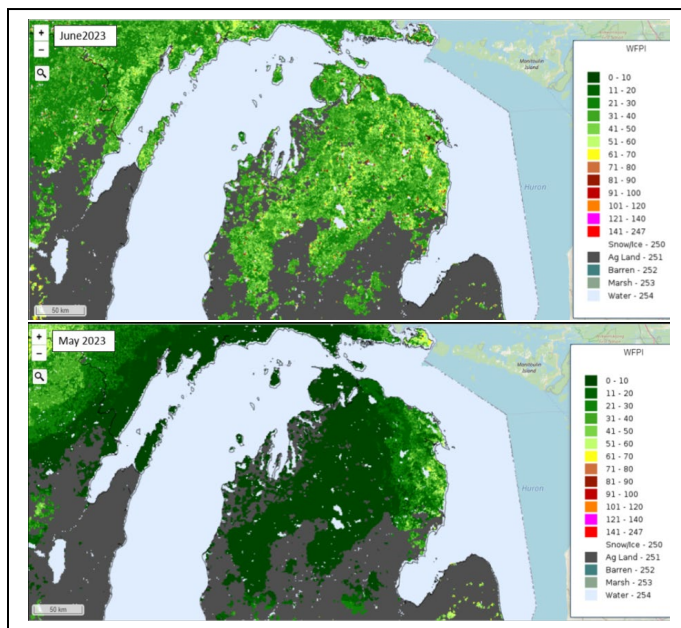
Screenshot of an ESRI StoryMap created for Michigan high school students. The tool focuses on Michigan's forest using USGS's WFPI (Wildfire Flammability Potential Index) that uses the ratio of live fuel to dead fuel. WFPI is a unitless number that ranges from 0 to 150 and relates to vegetation flammability. The two following satellite images are of the northern-lower peninsula of Michigan

RGB and multi-spectral imagery, from a drone, of a wetland on Lake Erie to help identify types of vegetation for classification.

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BENEFITS TO MICHIGAN

- MichiganView creates educational materials that adhere to standards and performance expectations set by the Michigan Department of Education.

- Content developed by MichiganView is created on easily accessible, browser-based platforms such as ESRI StoryMaps and Google Earth Engine and many other open-source government websites.

- MichiganView leverages free and publicly available imagery, such as data from the Landsat mission, in its tools and tutorials.
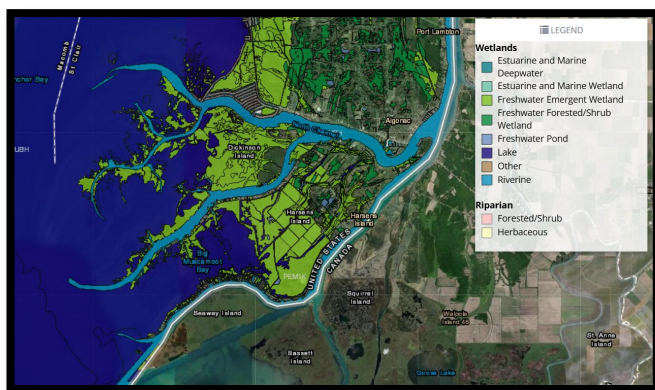
U.S. Fish and Wildlife Service Wetlands Mapper – an open source for students.

Smoke from wildfires raging in Western Canada affected the Great Lakes and most of North America in mid-May 2023. (MODIS)

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MISSOURIVIEW 2023 - 2024 ACTIVITIES

The increasing availability of geospatial data, combined with recent advancements in AI/ML, and cloud infrastructure, presents significant opportunities for breakthroughs in science, policy, and national security. To expand the use of Earth Observation data and simplify the application of AI in remote sensing, the development of user-friendly libraries and teaching materials is essential.

During the 2023–2024 reporting period, we published 10 peer-reviewed papers, organized two workshops (GEOINT and Digital Twin), and developed two comprehensive 40-hour UAV training courses. These courses covered UAV operations, photogrammetry, GPS/GNSS, surveying, and mapping. These initiatives aim to promote the use of geospatial data and align with the mission of AmericaView by advancing K-12 and college education.

MissouriView Consortium students and faculty showcased 40 posters at the Geo-Resolution national conference held at Saint Louis University.
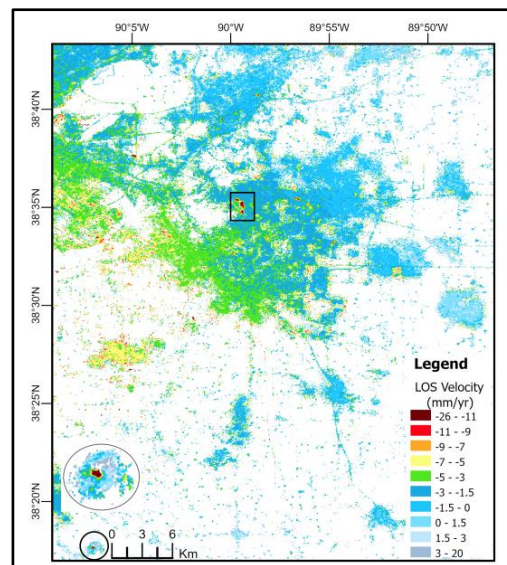
Ground Surface Displacement in Belleville Measured Using InSAR Technology

GEOINT workshop

GNSS survey training course

- Geospatial Data Science Academy
  o The TGI Geospatial Data Science Academy is designed to inspire students to pursue GEO-STEM-related subjects in both high school and college. By providing a dynamic and engaging learning environment, the academy encourages students to challenge themselves through research projects centered around geospatial data science principles. This hands-on approach not only makes learning fun but also fosters a deeper understanding of the subject matter. LINK

- GEOINT Summer Immersive Program
  o We hosted a half-day workshop for 20 students from 13 HBCUs across the country at TGI/SLU. Organized in collaboration with HSSU and NGA, the workshop provided students with an introduction to GEOINT. They participated in hands-on exercises in remote sensing, drone imaging, and GEOINT, including mapping power plants and conducting change detection using satellite data. A newsletter highlighting the program is available at LINK

- TGI Academy UAV Training
  o 15 students were trained in hands-on AV operation, GNSS, geodesy, Surveying and Photogrammetry technologies.

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BENEFITS TO MISSOURI

- Introduced the geospatial ecosystem in St. Louis to students and provided opportunities for them to 'immerse' in GEOINT, advance their skill sets in geospatial technologies and applications.

- Geospatial Data Science Summer camps introduced geospatial science as potential career field to about 50 K-12 students. The goal of the camps was to bring students to campus and talk about mentoring opportunities, and opportunities for college, and to provide two sessions that introduced students to themes in geospatial research. The first theme was devoted to remote sensing and drones and the second theme was devoted to spatial statistics. Students were able to get hands-on experience. They were able to see the power of remote sensing and spatial statistics research.

- The 2024 Geo-resolution conference provide a venue for collaboration among geospatial experts and students in government, academia, and industry. Over 1,000 people, with a combination of in-person and online attendees and over 150 students participated in-person in the conference, the poster session, the mentoring lunch, and the career fair. LINK

- TGI Academy UAV Training produced 15 experts in UAV operations, digital mapping, geodesy, and GNSS surveying, addressing critical needs in Missouri workforce.

Student operating heavy lift drone in UAV training courses

Geo-resolution 2024, Modeling the Future to Address Today's Geospatial Challenges

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MISSISSIPPIVIEW 2023 - 2024 ACTIVITIES

MississippiView was established in 2003 and is led by the Geodata Analytics Laboratory (GDAL) 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 studying the use of machine learning (ML) algorithms for downscaling remotely sensed Earth observation data.

In a world increasingly affected by climate change, there's a pressing requirement for high-resolution, continuous hydrological data to facilitate sustainable water management and predict water-related trends. The Gravity Recovery and Climate Experiment (GRACE) mission, since its launch in 2002 and its successor, GRACE-FO, has indeed transformed hydrological monitoring. By measuring the variations in Earth's gravity field, it provides crucial data on terrestrial water storage (TWS). Despite limitations in spatial and temporal resolutions, GRACE has proven invaluable in studying changes in groundwater storage and aiding in formulating long-term water management strategies.

Groundwater level prediction of the Mississippi River Valley Aquifer (MRVA) for April 2013.

Irrigation for farmland uses a great amount of groundwater. Mississippi River Valley Aquifer (MRVA) faces significant threats due to extensive groundwater withdrawals.

Key issues threatening the MRVA include:

- Since the late 1920s, water levels decreased by nearly half of its thickness
- Led to reductions in the baseflow of streams connected to the aquifer
- Formation of cones of depression in some areas, altering groundwater flow and potentially causing up-coning of brackish water
- Increased chloride concentrations in the aquifer, affecting water quality

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BENEFITS TO MISSISSIPPI

MississippiView brings benefits to the state of Mississippi:

• Supports research to investigate improved flood forecasting, disaster response and recovery, and enhanced methods of education.

• Applications using a variety of the spaceborne, aerial, and terrestrial-based sensors are taught to students of Mississippi and support applied research in the state.

• Ongoing projects in use of machine learning help to better monitor changes to land use which may affect the tax base and urban/development planning of a region.

• Outreach partnership with K-12 and professional educators provide opportunities to introduce remote sensing concepts and Earth Observation.

• MississippiView supports teaching curriculum and expanding our consortium to promote training future users and advancing the workforce in a changing world.

• All these examples and more go to contribute to the economic development in the state of Mississippi.

Students assembling a Landsat 9 puzzle at Pascagoula River Audubon Center on the Gulf Coast and event flyer for Eclipse event.

Students safely observing the 2024 North American Solar Eclipse.

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MONTANAVIEW 2023 - 2024 ACTIVITIES

MontanaView awarded five remote sensing fellowships ($1,667 per student) to students at four institutions across the state of Montana.

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

- Kyla Christopher-Moody, Montana State University, Snow Accumulation and Ablation Pattern Changes impacted by Canopy Cover Alteration in Sourdough Canyon (Dr. Eric Sproles)
- Bianca Giunti, University of Montana, An Analysis of the Transformations of Laguna Melincué Wetland (Dr. Sarah Halvorson)
- Riley Henson, University of Montana, Assessing hydrogeomorphic change in East Rosebud Creek from the June 2022 flood in northern Yellowstone National Park using field measurements and UAV imagery (Dr. Andrew Wilcox)
- Samantha Haak, University of Montana Western, Brine Infiltration into the McMurdo Ice Shelf, Antarctica (Dr. Neil Foley)
- Mohammad Masood, Montana Tech, Estimating Carbon Storage and Vegetation Regrowth Monitoring in Forests Affected by Prescribed Fires Using Hyperspectral and LiDAR Data (Dr. Xiaobing Zhou)

MontanaView also continued to investigate drivers of methane flux variability in boreal wetlands by means of a partial graduate research assistantship for PhD candidate Mary Farina of Montana State University (advisor Dr. Scott Powell).
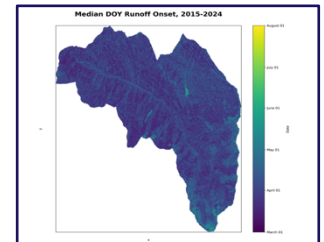

Figure from Kyla Christopher-Moody of Montana State University, depicting the median day of runoff onset melt in Sourdough Canyon, Montana from 2015 to 2024 as estimated from C-band SAR from Sentinel-1.
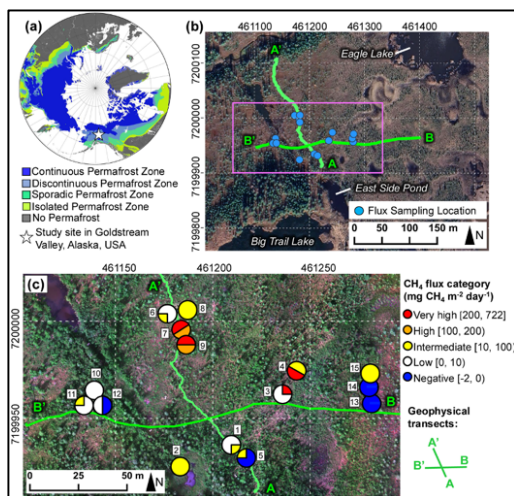
Figure from Mary Farina of Montana State University, depicting arctic permafrost zones and methane flux field sampling observations from Big Trail Lake, near Fairbanks, Alaska.

- The study objectives are to assess spatial variation in methane flux and identify key surface, near-surface, and subsurface drivers in a transitioning boreal forest-fen ecosystem underlain by thawing discontinuous permafrost. We combined *in situ* observations of chamber fluxes and soil conditions; analysis of soil microbial communities; terrain modeling; and geophysical characterization of permafrost structure.

- One key study finding is the observation of methane emission hotspots on relatively dry, moss-dominated escarpments, likely due to deeper subsurface methane contributions, demonstrating that spatial mismatches between surface and subsurface processes can lead to unexpected methane fluxes.

- Such spatial discrepancies pose a challenge for remote sensing-based approaches to modeling methane fluxes, which rely on surface and near-surface datasets.

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BENEFITS TO MONTANA

The MontanaView High Impact Activity "Fellowships for undergraduate and graduate students conducting applied remote sensing projects" has several direct benefits to the state of Montana, namely:

- Supporting students and providing encouragement and resources for them to pursue a career in geospatial sciences and remote sensing.
- Providing information, data, and analysis that will improve the management of Montana's natural resources.

The MontanaView investigation of methane flux variability in boreal wetlands has several direct benefits to the state of Montana, namely:

- Improving understanding of greenhouse gas fluxes, including in ecosystems that are similar to those found in Montana.
- Enhancing graduate education and research opportunities and providing future workforce training.
- Developing strategic partnerships across state, national, and international levels.
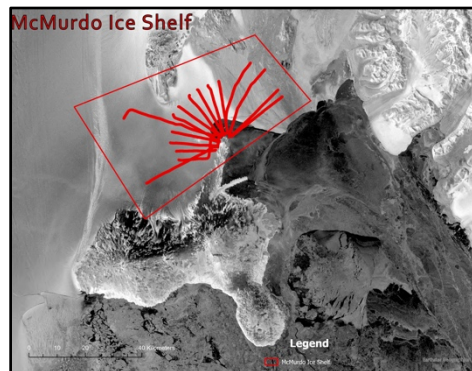
Figure from Samantha Haak of the University of Montana Western depicting a radar image of the McMurdo Ice Shelf in Antarctica along with aerial electromagnetic resistivity surveying locations.

Photograph of Mary Farina of Montana State University and her field research team conducting methane flux measurements at Big Trail Lake, Alaska.

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NORTH DAKOTAVIEW 2023- 2024 ACTIVITIES

Water Balance and Assessment of Agricultural Drought and Crop Yield in North Dakota from 2000-2023 Using Landsat Data

• With a global rise in surface temperature, there has been an increase in the amount of precipitation that falls in extreme events, and North Dakota, a central agricultural region of the US, is witnessing this rainfall intensification

• The objective of the work was to develop and evaluate a combined drought index for North Dakota using high-resolution data to understand better agricultural drought and water resource stress at the state level from 2000 -2024.

• We estimated the main components of the water balance and linked them with information on vegetation growth and drought in North Dakota.

• For the analysis, we estimated monthly precipitation, evapotranspiration, water balance, and vegetable and drought Indices.

• Landsat Imagery was used to estimate the Vegetation Health Index (VHI) and Moisture Soil Index (MSI). We used Landsat 5, 7, and 8.

• The water balance was calculated using precipitation data from PRISM and Evapotranspiration data from TERRACLIMATE.

• We used the USDA NASS Cropland Data Layers for yearly land cover land use information.

•The VHI and water balance results reveal that the study area experienced the most severe drought in 2002, 2003, 2004, 2006, 2007, 2008, 2012, 2017, and 2021.

•This underscores the intricate interplay of moisture and thermal stress in drought development, directly linked to and influenced by rainfall.

•Crop development during drought depends more on moisture than temperature since precipitation reduces thermal stress. These droughts disrupt agricultural assets like crops, livestock, and timber.

•The seasonal VHI anomaly showed a strong correlation with the seasonal rainfall anomaly in June, July, and August, which are also the significant crop growth seasons in the region.
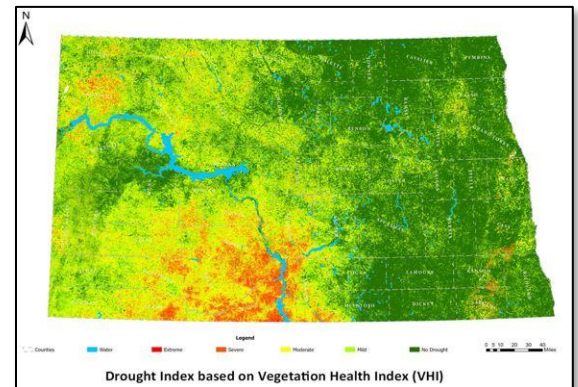
2006 extreme drought year showing drought index based on vegetation health index (VHI)
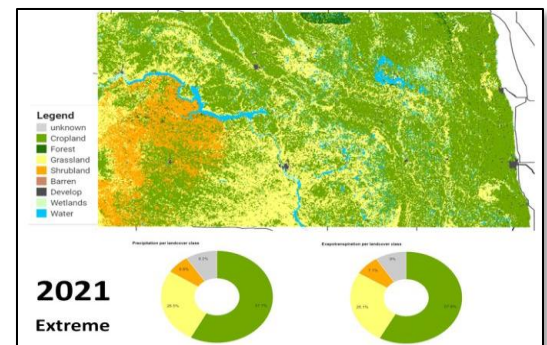
The 2021 extreme drought event year shows precipitation per land-use class and evapotranspiration per landcover class.
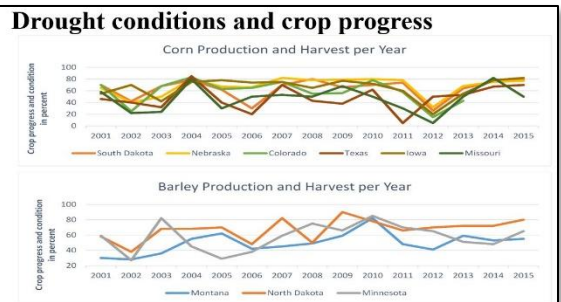
Corn and barley production and harvest for some corn belt states and how the production was affected during the extreme drought years

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BENEFITS TO NORTH DAKOTA

- NDView provided scholarships for three graduate students and one undergraduate student at the University of North Dakota to conduct research and train in remote sensing-related areas. Students used the funds to attend conferences and training seminars and purchase research equipment. The funds were also used to supplement tuition for the undergraduate student.
- NDView hired two graduate research assistants to perform the analysis on drought monitoring from 2000 – 2024 and develop a story map and a web-based North Dakota drought monitoring app.
- NDView provided training in streams and watersheds to more than 100 middle and high school students using an augmented reality sand table at the River Watch Forum in Grand Forks, ND.
- NDView helped support research and education in remote sensing in the state by purchasing equipment and supplies.
- These links can be used to access the comprehensive project through a story map and the North Dakota drought monitoring app.

Geography Graduate students and faculty during the Minnesota GIS/LIS Consortium meeting (October 4-6,2023)

Area students on the augmented reality sand table during the UND gathering for Great Northern Regional Robotics event. (3/7/24)

NORTH DAKOTAVIEW CONSORTIUM MEMBERSHIP

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NEBRASKAVIEW 2023 - 2024 ACTIVITIES

This project allowed NebraskaView to establish new partnerships with the Nebraska Game & Parks Commission (NGPC), the Applied Wildlife Ecology & Spatial Movement Lab (AWESM) at the University of Nebraska-Lincoln, and the Center for Resilience in Agricultural Working Landscapes (CRAWL) at the University of Nebraska-Lincoln.

The primary goal of this project was to use freely available satellite imagery to detect burning, haying, and grazing—three common grassland management practices—and investigate their effects of these disturbances on ring-necked pheasant habitat. An important initial step for this work involved developing an approach for detection and elimination of cloud interference in satellite imagery.

- Graduate student training and research experience.
  - Remote sensing imagery and techniques.
  - Google Earth Engine (GEE).
- Developed an approach for detecting and removing cloud interference in multispectral Sentinel-2 satellite imagery.
- Identified spectral indices that most effectively detected burned areas in grasslands.
- Trained algorithms to detect burned areas with cloud-free satellite images.
- Mapped burned areas across large landscapes.

A grassland not recently managed with burning, haying, or grazing.

A recently burned grassland from an area in eastern Nebraska.

Satellite images showing detection of burning within an area of interest. (Left) Before burning. (Right) After burning.

Spectral index from satellite images showing detection of burning within an area of interest. (Left) Before burning. (Right) After burning.

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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.*

Benefits of NebraskaView to the State included:

- Provided training and guidance to a Ph.D. student at the University of Nebraska-Lincoln on remote sensing data sources to detect grassland disturbance for pheasant habitat evaluation as part of her dissertation research.
- Assisted the graduate student in understanding and applying cloud detection and removal in satellite imagery.
- Provided guidance and assistance to the graduate student in the use and development of writing Google Earth Engine code for this project.
- This project has contributed to Nebraska Game and Parks Commission's goal of investigating the utility of satellite-based remote sensing to fill the information gap about grassland disturbances to increase pheasant populations in the state and assess different management strategies.
- Demonstrated the value of remote sensing data and assist in developing new applications.
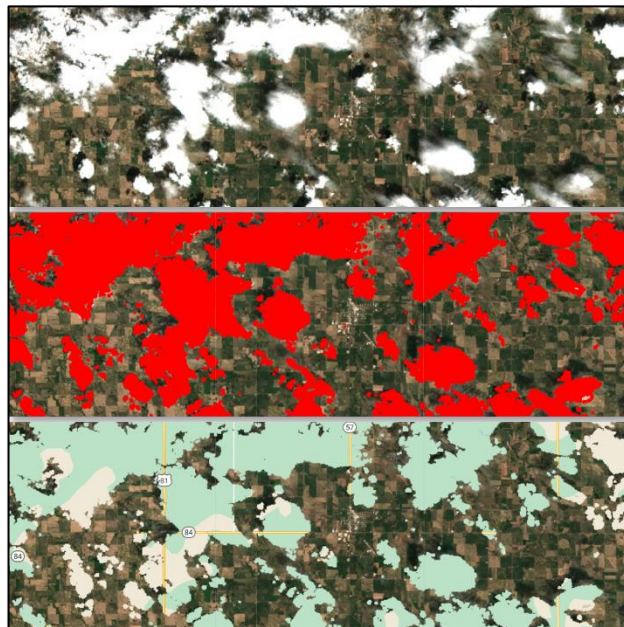
Detection and removal of clouds from a Sentinel-2 satellite image.

NEBRASKAVIEW CONSORTIUM MEMBERSHIP

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NEWHAMPSHIREVIEW 2023 - 2024 ACTIVITIES

NewHampshireView's high impact activity for this year was an analysis to evaluate the potential of satellite remote sensing to assess eastern hemlock health in NH in cooperation with the NH Division of Forests & Lands (Figure 1). A combination of ground sampling and satellite imagery (Landsat and Sentinel 2) was employed to first create a land cover map of the areas in southern NH infected by the Hemlock Wolly Adelgid (an invasive pest) and then to map hemlock health into three decline classes (low, medium, and high). Figure 2 shows the hemlock dominated vs. non-hemlock forest area mapped from Landsat imagery. The ground data collected was divided into half used for training the Random Forest classifier and half used as reference data for an independent validation. The Landsat and Sentinel 2 imagery original bands along with selected ratios and other derivative bands were analyzed to produce the best possible hemlock health classification. The error matrix shown in Table 1 presents the results of the best classification. In this case, the Landsat imagery produced a more accurate hemlock health map with an overall accuracy of approximately 71% than did the Sentinel 2. This result is somewhat surprising given that the spatial resolution of the Sentinel imagery is better than the Landsat imagery. However, hemlock tends to grow in large patches where spatial resolution may not be an important factor.

Figure 1. Map showing year the hemlock wooly adelgid was detected in the New Hampshire town.

Figure 2. A map developed from Landsat imagery showing the distribution of hemlock dominated vs. non-hemlock forest cover in southern New Hampshire.

Once the analysis was performed for the current date, the training data was then used to perform a multi-temporal analysis of the Landsat imagery for the years from 2000-2022. These results were compared to the temporal map in Figure 1 to verify the validity of the image analysis. In this way, this technique can be used to monitor the Hemlock Wolly Adelgid infestation as it progresses north in New Hampshire as a result of warming winters.

		Reference Data				
		Low Decline	Medium Decline	High Decline	Row Totals	User's Accuracy
Classification Data	Low Decline	41	5	0	46	89.13%
	Medium Decline	6	16	7	29	55.17%
	High Decline	4	10	21	35	60.00%
Column Totals		51	31	28	110	
Producer's Accuracy		80.39%	51.61%	75.00%		**70.91%**

Table 1. An error matrix showing the results of the Landsat classification of the three hemlock health decline classes.

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BENEFITS TO NHVIEW

- NHView Director, Russ Congalton, presented four talks on NHView work this year; one at the GeoWeek Conference in Denver, a second was an invited lecture at the University of Wyoming, the third was an invited presentation at the National Renewable Energy Lab in Boulder, CO, and the last was an invited presentation to MAXAR Corporation.
- NHView funded a graduate intern, Molly Cahill, to work in the Basic and Applied Spatial Analysis Lab (BASAL) to aid our research. Molly's work on hemlock wholly adelgid is reported on the front of this fact sheet.
- Shea O'Connor, an undergraduate researcher in the BASAL lab, presented her land cover mapping research at the University of New Hampshire Undergraduate Research Conference.
- NHView continued its support of the University GeoSpatial Support Center (GSC). This facility provides consulting and workshops on remote sensing and geospatial analysis to students, staff, and faculty. Molly Cahill presented four workshops in Spring 2024. (see pictures to the right)
- NHView supported our colleagues in the New Hampshire Division of Forest & Lands by providing expertise and aiding with analysis of imagery collected to monitor forest conditions throughout the state.

Consulting and workshops in the GeoSpatial Support Center

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.
- **NH Department of Natural and Cultural Resources – Division of Forests and Lands**
  State agency responsible for the forest resources of the state.
- **Dartmouth College**
- **NH Planning Commissions**

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NEW MEXICOVIEW 2023 - 2024 ACTIVITIES

During 2023, New MexicoView emphasized outreach events demonstrating Earth observation education via GIS and remote sensing resources for New Mexico students, STEM educators, and citizen scientists. Graduate student support for remote sensing research met the objectives of the USGS/NLI by exploring Earth observation education. Two Graduate Assistants (GA's) were supported in 23-24; Samuel (Kojo) Abakah joined the program in August, and Pablo Viramontes defended his Master's degree in December 2023.

In addition to research support, the USGS and AmericaView provided outreach and professional development participation opportunities for students at the national level. Kojo and Pablo gave presentation at the United Nations International Youth Day in August 2024.

AmericaView coordinated a team from TexasView, New MexicoView and LouisianaView for participation in the El Paso Science Festival. This effort reached almost 10,000 participants from El Paso and southern New Mexico.

New MexicoView goes to Washington!
In October, 2023, Hispanic Heritage Month saw Pablo Viramontes tour the capital and the USGS offices. In June 2024, Juneteenth saw Samuel Abakah make a similar tour of USGS and the capitol. Main Point

NMView Graduate assistants Samuel (Kojo) Abakah and Pablo Viramontes, at the El Paso Science Festival, April 6-7, 2024.

Pablo Viramontes represents New MexicoView in celebration of Hispanic Heritage Month in Washington DC.

Kojo Abakah, in Washington DC for the Juneteenth Blacks in Space celebration.

Stream table demonstration at the El Paso Science Festival, April 6-7, 2024. Dan Dugas, NMSU Geography & Environmental Studies with Rodney Yantis from Louisiana View

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BENEFITS TO NEW MEXICO

New MexicoView is helping to build the geospatial workforce in New Mexico.

Graduate students from NMView demonstrated the Earth Observation Education opportunities to 3rd and 5th grade students in southern New Mexico.

Pablo Viramontes completed his Master thesis, "Embellishing K-12 Geography Education in New Mexico through GIS and Citizen Science."

Established a strong connection with Math, Engineering, Science Achievement (MESA) high school teachers in southern New Mexico.

Career Exploration Camp was provided on the NMSU campus for 14 high school students in June 2024.

USGS Guest, Tom Cecere, with Geography & Environmental Studies students September 9, 2024.

El Paso Science Festival, April 6 & 7, 2024.

Top: Kojo Abakah, NMView Graduate Assistant supporting "Earth as Art" puzzle completion.

Middle: Families get involved putting the Satellite image puzzles together.

Bottom: Pablo Viramontes, NMView and Geography & Environmental Studies alumni, demonstrates thermal imaging for all ages at the El Paso Science Festival.

NEW MEXICOVIEW CONSORTIUM MEMBERSHIP

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THE JORNADA

EDAC | EARTH DATA ANALYSIS CENTER

NMGIC since 1984

NATIONAL GEOGRAPHIC NETWORK OF ALLIANCES FOR GEOGRAPHIC EDUCATION — NEW MEXICO

TRIO UPWARD BOUND

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NEVADAVIEW 2023 - 2024 ACTIVITIES

In 2023/2024 NevadaView held a logo contest and adopted its logo. The winner of the competition was Ms. Hannah Potts, an undergraduate at the time in the Department of Geography at the University of Nevada Reno. The logo uses a statewide composite of 2020 Landsat imagery displayed using (shortwave infrared, near-infrared, and red band combinations).

NevadaView now has a website! The website is hosted by the College of Agriculture, Biotechnology, and Natural Resources at the University of Nevada. Please take a moment to check out our website at https://naes.unr.edu/nevada-view/.

NevadaView focuses on 1) advancing Earth observation education through remote sensing science, 2) applied research, 3) workforce development, and 5) community outreach. We provide community outreach through the slow development of a web-based agricultural atlas. We conduct applied research and the advancement of Earth observation education through grants to graduate and undergraduate students who conduct remote-sensing-based research in Nevada and the Great Basin.

In 2023/2024 NevadaView held a logo contest. The winner of the competition was Hannah Potts with this logo.

NevadaView now has a website. Check out our website at https://naes.unr.edu/nevada-view/

In 2023/2024 NevadaView began working on NevadaAtlas and some maps have been made available through ArcGIS Online (search for NevadaAtlas). We look forward to more datasets coming online during 2025.

In 2023/2024 NevadaView dispersed scholarships for three graduate students and one undergraduate student. Congratulations to our contest winners!

1) Mr. Weylin Gilbert, PhD candidate and the NevadaView graduate research associate mapping the groundwater resources of the state of Nevada using the GRACE satellite.

2) Ms. Sydney Cochran, PhD candidate, is using NASA's ECOSTRESS sensor to conduct "Thermal RS of Evapotranspiration across the Great Basin"

3) Mr. Carson Browder, undergraduate, who is assisting the "Seasonal Targeted Grazing Project: "Fuel Loads Reduction of an Annual Invasive in Northern Nevada"

4) Mr. ConTuarius Walker, MS graduate student, who is "Mapping Belowground Biomass in Sagebrush Steppe using GPR and Satellite Radar"

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- In November NevadaView organized a session at the Nevada GIS (NGIS) conference in Reno in which we brought together speakers from the Desert Research Institute, the University of Nevada Las Vegas, the University of Nevada Reno, and Vibrant Planet to present projects related to remote sensing and academic uses of GIS.

- Mr. Gilbert, NevadaView's Graduate Research Assistant, presented our research utilizing NASA's GRACE and GRACE-FO satellite missions to map and investigate the trend and connectivity of Nevada's groundwater resources at the Nevada GIS Annual Conference in Reno, NV and the International Association for Landscape Ecology (IALE) annual meeting in Oklahoma City, OK. Groundwater is a critical resource in the nation's most arid state, and well-informed management will be needed to ensure that Nevada's ecosystems, agriculture, and strategically-important mining industries remain productive in the face of climate change. The goal of the project is to use the GRACE data and existing well logs to create spatio-temporal maps of groundwater depth across the state of Nevada.

predicted change in water table height in ft/year, 2003-2017
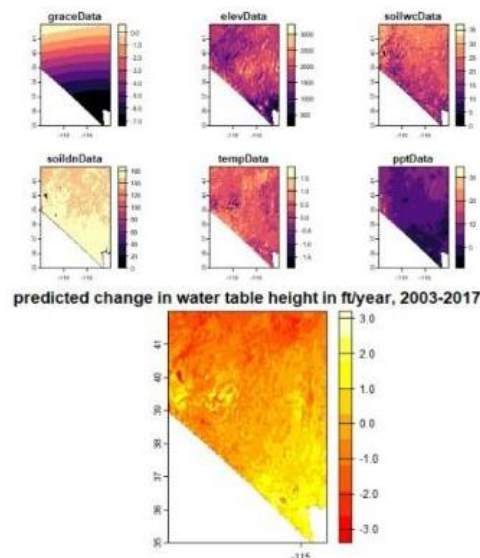
This figure shows the results of integrating GRACE data with precipitation, temperature, elevation, soil density, and soil water capacity data to predict changes in the height of the water table, in this case through a partial least-squares regression. The regression model was validated on in-situ well data.

NEVADAVIEW CONSORTIUM MEMBERSHIP

https://naes.unr.edu/nevada-iew/

NEW YORKVIEW 2023 – 2024 ACTIVITIES

Harmful algae blooms (HABs) have been reported with greater frequency in lakes across New York State (NYS) in recent years. While field-based sampling is important to assess water quality, such observations cannot be used to evaluate the thousands of lakes spread across the state. NYView worked with the NYS Department of Environmental Conservation (DEC) to develop a remote sensing-based method to estimate cyanobacteria concentrations at high temporal (5 days) and spatial (10–20 m) resolution. Our research modeled the relationship between field observations of chlorophyll-a and phycocyanin collected through the NYS Citizens Statewide Lake Assessment Program (CSLAP) program and data derived from Sentinel-2 imagery. CSLAP is a volunteer lake monitoring
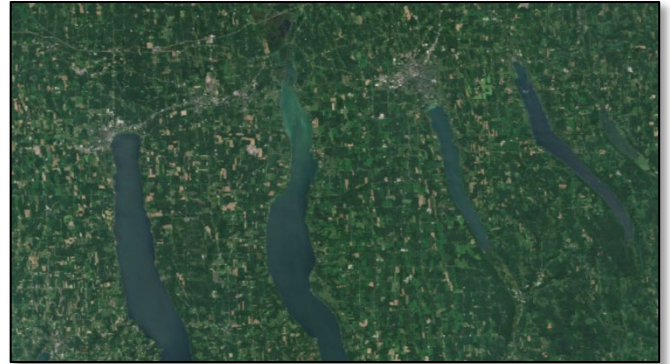
Sentinel-2 image acquired 15 August 2024, showing the Finger Lakes region of Central New York State, with algal blooms visible in the north of Cayuga Lake.

program run by the NYS DEC and the NYS Federation of Lake Associations. Citizen volunteers collect biweekly water quality data and samples from June through September on approximately 180 sites across NYS.

We tested seven remote-sensing-derived indices, two field measurements, two cloud mitigation approaches, and three temporal sampling windows. The models developed provide a means to identify lakes across NYS that have not had field sampling but are at a significant risk of

Field sample locations collected through the Citizens Statewide Lake Assessment Program (CSLAP) program.

algal blooms. Future work will focus on exploring alternative algorithms that can incorporate diverse data sources and lake characteristics, contributing to a deeper understanding of the relationship between remote sensing data and water quality parameters.

Faculty, staff, and graduate students from the SUNY College of Environmental Science and Forestry (ESF) have also supported NYView's remote sensing outreach efforts. NYView teamed with the ESF Department of Environmental Resources Engineering and the ESF Open Academy to develop a Landsat-based floor puzzle highlighting portions of the Lake Ontario Watershed. This puzzle was used as part of a display at the New York State Fair and will be used in a variety of geospatial training efforts.

ESF graduate student with children at the New York State Fair using the Landsat-based puzzle.

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BENEFITS TO NEW YORK

As part of the AmericaView Consortium, NYView has supported the application of remote sensing data and products to solve challenges in New York State (NYS) since 2009. Remotely sensed imagery provides a unique viewpoint and supports a wide range of applications in NYS including analyzing land use and land cover change to monitor critical resources, quantifying water quality, characterizing vegetation dynamics, planning or monitoring urban growth, and supporting emergency response.

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 supported training of high school teachers, undergraduate and graduate students, and demonstrated applications of remote sensing data for visitors at the New York State Fair using Landsat change pairs from sites across the state and using a handheld spectrometer to perform observations. NYView has also developed video modules and lab exercises to support development of skills in 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.

In addition to the activities described above, NYView has explored integration of airborne lidar and Landsat data for quantifying forest aboveground biomass and investigated remote sensing and spatial analysis for assessing vegetation trends along riparian corridors and monitoring wetlands. Ongoing research focuses on using remote sensing data to support assessment of water quality in lakes to support state agencies charged with monitoring this vast resource.

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, and SUNY Fredonia. NYView also has collaborators at other institutions of higher education and agencies within NYS as we seek to encourage 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.

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OHIOVIEW 2023 - 2024 ACTIVITIES
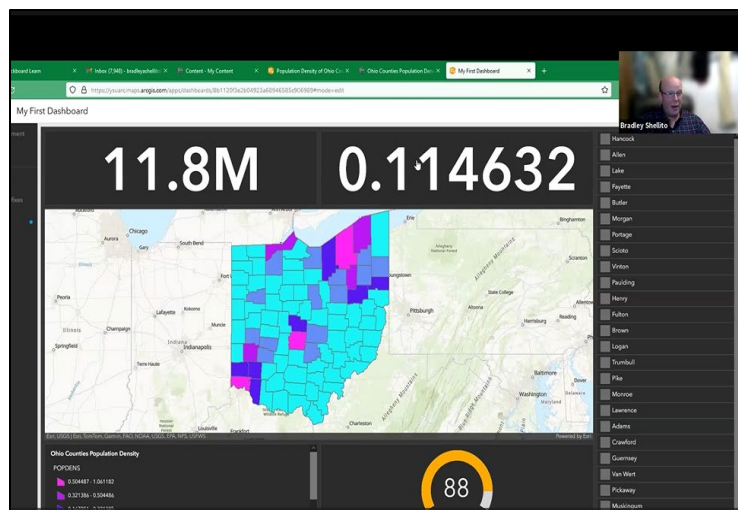
OhioView Presents: Workshop Series

OhioView member universities Youngstown State University, University of Toledo, Bowling Green State University, Kent State University, Miami University, and University of Dayton presented three workshops on February 9, 16, and 23, 2024. There were six sessions held across the three days with between 25 to 45 participants per session. PIs from each university presented sessions that covered a variety of remote sensing and geospatial topics that used freely available software and data. These workshops are the latest in an ongoing series and were held online to be open to participants from across the country throughout AmericaView.

OhioView Teacher Training

Ohio teachers participated in professional development to learn how to incorporate GLOBE observations and satellite imagery through Google Earth Engine into student projects. Teacher professional development focused on the solar eclipse in April 2024 and connecting GLOBE observations to the Toledo Zoo Prairie Project.

Crop Status Monitoring and SPLIT Workshop

Bowling Green State University (Dr. Anita Simic Milas) led the SPLIT Spatial Remote Sensing Program, involving undergraduate and graduate students in fieldwork. Students utilized radiative transfer models and various machine learning regression algorithms applied to multispectral and hyperspectral data to map chlorophyll, nitrogen, and phosphorus content in crop fields with different chemical practices and soil treatments. SPLIT Geoscience workshop was organized at Idaho State University to bridge the gap between education and workforce.

Attendees of the 2024 OhioView Presents workshops participated online via Zoom to receive instruction on multiple types of remote sensing and GIS applications using freely available software and data, including designing ArcGIS Dashboards.

SPLIT Geoscience students participated in a workshop organized in collaboration with Idaho State University. The workshop featured a series of hands-on lectures led by NASA and USGS researchers, as well as university professors. A field trip to Craters of the Moon National Monument was also included.

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BENEFITS TO OHIO

- Initiated in 1997, OhioView is a consortium of Ohio universities 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.

- The OhioView "Online and Open-source GIS and Remote Sensing: This Is The Way" workshops served numerous faculty, students, and workforce members in Ohio and across the US over three days. Instruction included using building ArcGIS Dashboards (Dr. Bradley Shellito), analysis using ArcGIS Survey 123 (Ms. Robbyn Abbitt), LIDAR analysis using QGIS (Dr. Joseph Ortiz), crop type classification in Google Colab (Dr. Anita Simic Milas and Mr. Henry Osei), vegetation mapping in Google Earth Engine (Dr. Umesh Haritashya and Dr. Siddhi Garg), and processing high resolution imagery in R (Dr. Kevin Czajkowski and Ms. Kim Panozzo).

- 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 Michigan. and provides teachers and students with hands-on, inquiry-based science and STEM education using geospatial technologies. The annual SATELLITES Conference was held on May 6, 2024 this year at the Toledo Zoo and 384 students presented their authentic research projects.

- The SPLIT Remote Sensing program established a network of institutions, researchers, and students, both nationally and internationally, who applied existing algorithms and developed new ones for monitoring crop status.

- The SPLIT Geoscience program enhanced students' understanding of geoscience through the use of geospatial information, incorporating fieldwork and hands-on training. This program was also funded by the NSF. Regional and national partners include AmericaView, Bowling Green State University, Idaho State University, University of Louisiana at Lafayette, University of Wyoming, NASA and USGS.

Students at the University of Toledo participated in GLOBE observations to study the April 8, 2024 solar eclipse and urban heat island effect
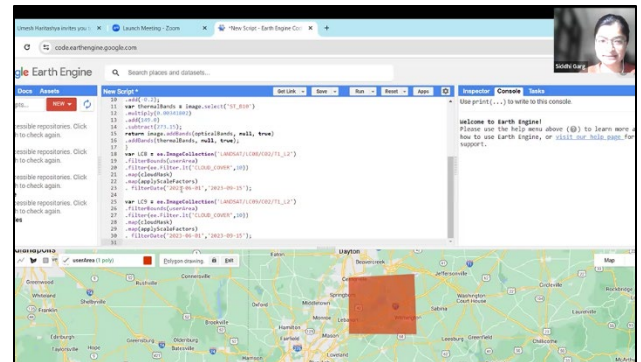
Participants at the 2024 online OhioView Presents remote sensing workshops receive instruction on using Google Earth Engine for image processing and vegetation analysis.

K-12 students presenting their research projects at the SATELLITES Conference at the Toledo Zoo, May 6, 2024.

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Anita Simic Milas

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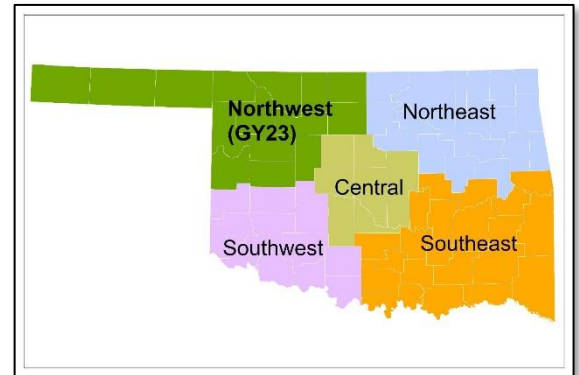
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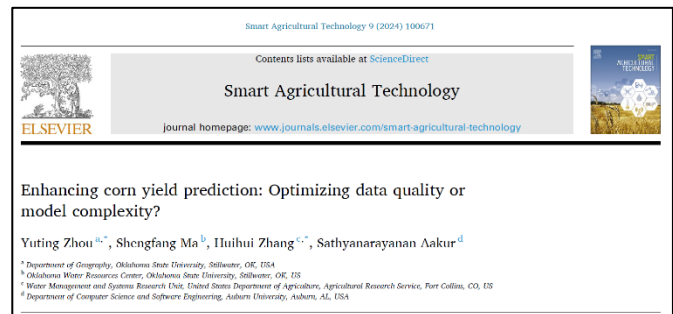
OKLAHOMAVIEW 2023 - 2024 ACTIVITIES

The proposed HIA for GY23 was to promote the usage of remote sensing in agriculture and natural resource management in local communities in northwest Oklahoma. The HIA was designed to embed remote sensing introduction/training session into the Oklahoma State University (OSU) Agriculture Field Days, work with OSU extension. In GY23, we plan to focus on the northwest region of Oklahoma, an area of intense agriculture and frequently affected by drought. However, the OSU Field Day that we targeted to tell farmers about remote sensing in the panhandle of Oklahoma, was canceled and we were not able to execute the plan.

OklahomaView conducted other activities such as supporting student research, holding EOD/GIS events, and contributing to educational outreach activities.

OklahomaView supported two peer-reviewed articles on using Unmanned Aerial Vehicle (UAV) imagery to estimate corn health and yield. Both of the papers were published in high impact journals. In addition, OklahomaView supported three posters in professional conferences such as the AGU fall meeting.

Different regions of Oklahoma we plan to focus on in next five years and the focus area of GY23.

Soil & Tillage Research 244 (2024) 106266

Contents lists available at ScienceDirect

Soil & Tillage Research

journal homepage: www.elsevier.com/locate/still

Evaluating maize (*Zea mays* L.) management practices implementing sensitivity analysis of vegetation indices

K. Colton Flynn [a,*], Douglas R. Smith [a], Trey O. Lee [a], Doris Laguer-Martinez [b], Shengfang Ma [c], Yuting Zhou [d]

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Smart Agricultural Technology 9 (2024) 100671

Contents lists available at ScienceDirect

Smart Agricultural Technology

journal homepage: www.journals.elsevier.com/smart-agricultural-technology

Enhancing corn yield prediction: Optimizing data quality or model complexity?

Yuting Zhou [a,*], Shengfang Ma [b], Huihui Zhang [c,*], Sathyanarayanan Aakur [d]

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[d] Department of Computer Science and Software Engineering, Auburn University, Auburn, AL, USA

OklahomaView promoted Earth Observation Day at Oklahoma State University in two classes showing Earth Observation Day posters and a Landsat 7 model. USGS Earthshots cards were distributed to students in the classes. The students really enjoyed this event and many of them expressed further interest in remote sensing. In addition, the OklahomaView coordinator attended the 2024 GIS Day at the Capitol to promote OklahomaView and AmericaView. The GIS Day at the Capitol is an annual and state-wide event to promote applications of GIS, which attracts at least 200 attendees every year.

2024 GIS Day at the Capitol

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BENEFITS TO OKLAHOMA

OklahomaView contributed to big events at OSU including the 2024 Junior Day and Up Close. The Junior Day event is an exploration event for high school juniors for them to learn about the diversity of majors that the College of Arts and Sciences has to offer. The event had over 900 registrants. The Up Close event provides prospective students with an in-depth experience of what it means to be a student in each department. In both of the events, we showed the animation of Landsat imagery showing the changes around the world such as amazon deforestation and expansion of Las Vegas. We also distributed USGS Earthshots cards and a card showing the Landsat imagery of Oklahoma.

- One undergraduate student and one graduate student learned how to process Landsat data in Google Earth Engine and make animations.
- More than three hundred undergraduate students were approached about the potential of remote sensing in various applications.
- GIS Day at the Capitol helped state agencies and local communities to understand the potential of remote sensing.
- Publications and professional presentations increased the visibility of OklahomaView and AmericaView.

The booth of the Department of Geography in the 2024 Junior Day.

The booth of the Department of Geography in the 2024 Up Close event.

OKLAHOMAVIEW CONSORTIUM MEMBERSHIP

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

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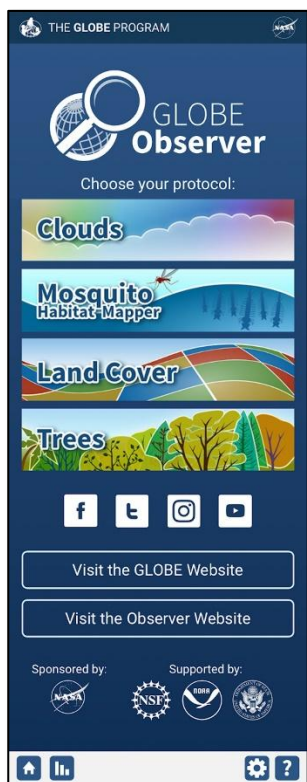**yuting.zhou@okstate.edu**

https://okview.org/

OREGONVIEW 2023 - 2024 ACTIVITIES

Earth observation satellites provide the ability to apply decades-long time series of data to analyze change and make predictions. These capabilities are critically important in the Pacific Northwest, which faces threats ranging from wildfires to drought to the impacts of a potential Cascadia Subduction Zone megathrust earthquake, including tsunami inundation.

In 2023-2024, the OregonView consortium conducted research, education and outreach focused on time series for understanding both long-term and episodic changes in our region and generating models that can support policy decisions.

OregonView State Coordinator, Peder Nelson, making remote sensing citizen science observations.

OregonView led the acquisition of citizen science ground reference information supporting time series analysis using satellite imagery. The data were used to assess predictions of change using *in situ* photos. Multiple campaigns were conducted to collect the reference data, which will be used in developing new techniques assessing change across a range of spatial and temporal scales and assessing geospatial models and predictions.

These activities also provided education and outreach opportunities focused on time series analysis using remote sensing. Graduate students led outreach activities at the Oregon Museum of Science and Industry. Tutorials were generated and will be disseminated through the OregonView Learning Academy. The data will also contribute to evaluation of the USGS Annual National Land Cover Database product suite.

OregonView invites participants to use Globe Observer app to participate in our science.

Image credit: Trees Around the Globe Student Research Campaign : https://www.globe.gov/web/trees-around-the-globe/overview/hands-on-activities-and-resources

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BENEFITS TO OREGON

OregonView engaged local, state, and regional participants in a number of events, including:

- GeoFest: Engaging Oregon's teachers in Earth Observation

- Undergraduate research in Earth Observation

- Citizen science activities
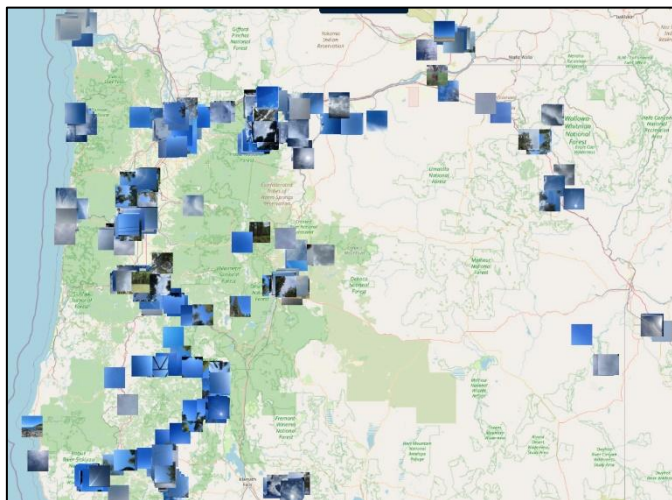
Map showing type and location of ground photos from community of scientists. Available: https://vis.globe.gov/GLOBE/
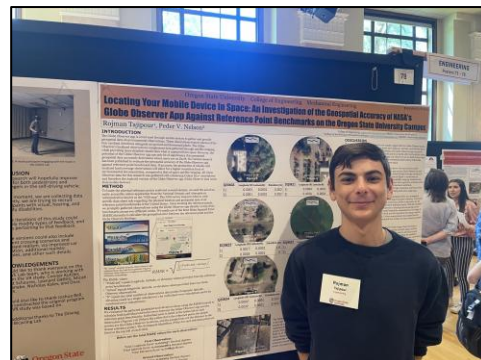
OSU undergraduate student, Rojman Tajipour, presents at the Spring Research Symposium.

OSU student, Heather Murillo, collecting field data.

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, USGS Forest & Rangeland Ecosystem Science Center, Oregon Framework Implementation Team, Oregon Geospatial Enterprise Office, Portland State University, Oregon State University College of Engineering, College of Forestry, and College of Earth, Ocean, and Atmospheric Sciences.
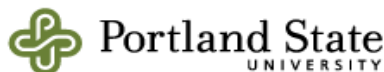
Federal consortium members identified above do not receive funding from AmericaView.

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PENNSYLVANIAVIEW 2023 - 2024 ACTIVITIES

During the 2023-'24 program year, PAView focused on projects and activities that provided opportunities for research for graduate and undergraduate students across the Commonwealth. Topics of concern included land use change, water and air quality, and ecological habitat assessment. Several universities contributed the time and talent of students and faculty mentors to these research endeavors.

Faculty mentors trained university students to work with K-12 partners in related projects. Faculty-led projects included water quality sampling associated with abandoned mine drainage and subsidence, along with analysis of landscape response to natural and manmade processes including coastal erosion and sediment loading to streams. University student mentors worked with undergraduate and K-12 students on water quality sampling and assessment, surface and groundwater interaction, and development of field skills for environmental careers.

Hillslope on the banks of Muncy Creek, Sullivan County, PA. Local geology contributes to the dynamic behavior and high sediment loading in the creek.

University students surveying subsidence features over mined areas.

10th grade students learn water sampling from a university mentor.

Specific projects included…

- Sediment accumulation and migration in Muncy Creek
- Habitat potential for reintroduction of the American Chestnut
- Abandoned Mine Drainage sampling for air and water quality impacts, including CO_2, Metals, Nutrients, and bulk parameters of pH, alkalinity, and conductivity
- Acquisition of "loaner" field equipment for K-12 teachers to deploy in classes for real-world data collection, including Infrared Cameras, Laser thermometers, and water test kits
- Aerial imagery analysis of impacts of conflict in the Darfur area of Sudan, in northeast Africa
- Passive treatment wetland assessment for continued effectiveness of Iron removal
  - o This joint project included students of the Pennsylvania State System of Higher Education (PASSHE) teaching K12 students water testing procedures

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- Pennsylvania collaborators from across multiple institutions worked together to solve problems related to environmental issues, both historical and emerging. Students from nearly a dozen universities and several K12 schools participated in multiple projects related to water quality and the work of environmental sampling.
- As we consider the changing demographics of the state, including workforce needs, we emphasize the potential careers in Environmental Science, Biology, and Geology that will be in high demand in the coming years.
- Diverse projects aimed at a diverse audience increase the visibility of science careers as well as their importance to Pennsylvania families and the economy.

PASSHE students visit an abandoned mine drainage site to measure water chemistry.

Emergent American Chestnut (Creative Commons).

A PennWest – California student observes shoreline erosion along the Lake Erie coast.

PENNSYLVANIAVIEW CONSORTIUM MEMBERSHIP

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RHODE ISLANDVIEW 2023 - 2024 ACTIVITIES

Rhode IslandView study uses satellite imagery to detect algal blooms

Harmful algal blooms (HABs) pose a significant risk to public health and the environment. Early detection of HABs is important for issuing timely advisories to protect public health. In Rhode Island, HAB detection relies on public reporting and site visits by the Department of Environmental Management (DEM). Satellite imagery may provide a more efficient approach for detecting potential HABs and provide timely advisories. In this project, we explored the feasibility of using satellite imagery to detect algal blooms for inland waterbodies in Rhode Island.
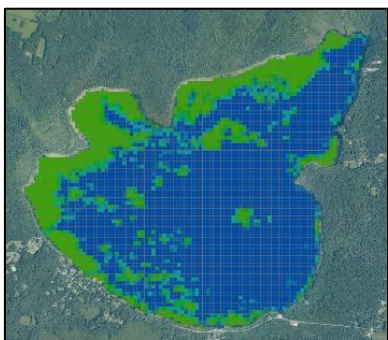

The Landsat and Sentinel-2 satellites provide multispectral imagery at 8-day and 5-day intervals which provides the potential for near real-time monitoring of lakes and ponds throughout the state. These multispectral images allow for the calculation of the Normalized Difference Vegetation Index (NDVI) which is a metric that is particularly effective for detecting green vegetation. Historical HAB advisory notices indicate when ponds have been affected by past algal blooms and served our training and validation data.
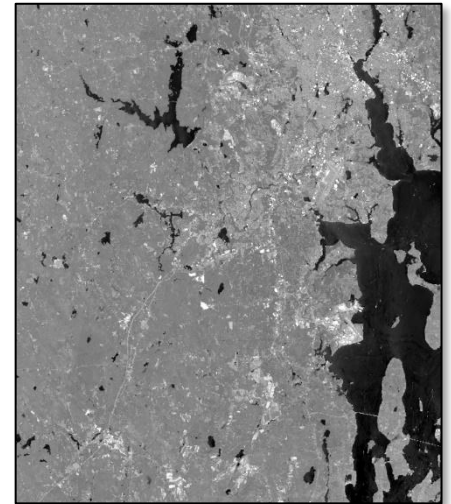
The near-infrared band of a Sentinel-2.
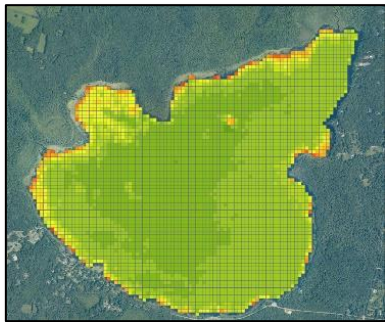
NDVI for Worden Pond in South Kingstown, RI on 9/05/18

In many ponds, aquatic plants can create high NDVI values that may be mistaken for algal blooms. However, aquatic plants are perennial whereas algal blooms tend to occur only in mid- to late summer and in certain years. To avoid confusing aquatic plants with algal blooms, we established baseline NDVI values using summertime imagery for years when no algal blooms had been reported. Algal blooms would be indicated by higher-than-normal NDVI values compared to the baseline.

Using high-resolution summertime aerial imagery, we found that satellite imagery is effective for detecting surficial aquatic plants. However, work is ongoing to determine the threshold above baseline NDVI that indicates algal blooms. The process is complicated by the difficulty in getting accurate algal bloom locations that correspond to the time of the satellite imagery and the dynamic nature of algal blooms.

Plant coverage in Worden Pond

This research found some challenges and limitations of using satellite imagery for detecting algal blooms. Some lessons learned in this research include:

- In Rhode Island, cloud-free (<10% cover) images are relatively infrequent in a typical summer which limits real-time detection potential. Cloud masks are imperfect and can cause false aquatic plant and HAB detections.
- Level 1 imagery (i.e. not atmospherically corrected) should be used for water applications to avoid inaccurate NDVI values;
- Harmonized Landsat-Sentinel image datasets seem to exacerbate the "mixed pixel" problem in near shore areas possibly due resampling of the data.

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BENEFITS TO RHODE ISLAND

**Important implications for the early detection and monitoring of HABs in freshwater systems**

Our work has had important implications for the monitoring of Rhode Island water bodies. As a matter of public health, the efficient detection of HABs by management agencies is of vital concern. Understanding the benefits and limitations of satellite monitoring of HABs will provide guidance for DEM's monitoring efforts.

Future work will explore the use of surrounding land cover, water depth, temperature, and other environmental data to predict HAB occurrences. These efforts are aimed at guiding efforts (e.g. implementing green infrastructure) to mitigate the factors that contribute to HABs.

The Rhode IslandView activities supported one graduate student during the Spring of 2024. The student gained valuable experience in the analysis of remote sensing datasets, the automation of processes using Python, and the analysis of data within geographic information systems. The student also developed skills in interpersonal communication and experimental design. He will continue the research begun in this project as a research associate at the University of Rhode Island.
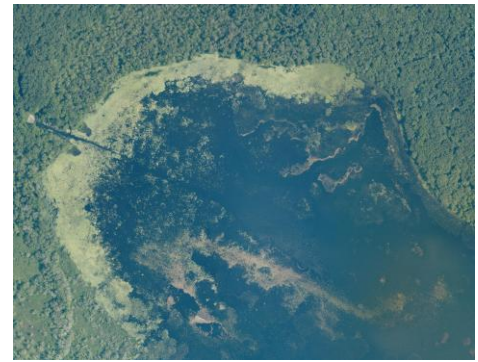
Aquatic plants in the northwestern corner of Worden Pond, South Kingstown, RI (July 2019).
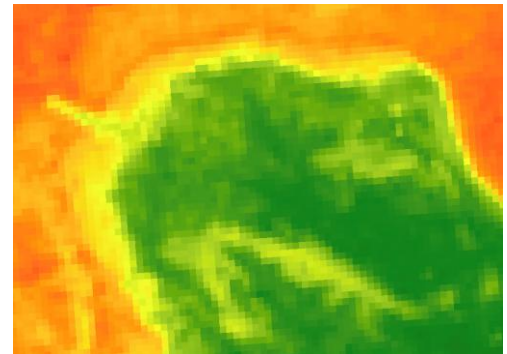
NDVI derived from a Sentinel-2 image in the same area of Worden Pond (July 2019).

RHODE ISLANDVIEW CONSORTIUM MEMBERSHIP

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

Rhode IslandView Principal Investigator:

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SOUTH DAKOTAVIEW 2023 - 2024 ACTIVITIES

The innovative approaches and solutions developed in this project for crop growth monitoring and yield forecasting offer substantial contributions to precision agriculture, sustainability, and the development of scalable, technology-driven strategies for enhancing food security. By integrating satellite and UAS remote sensing with advanced artificial intelligence and machine learning (AI/ML) algorithms, the project has introduced novel methodologies for monitoring crop growth, evaluating crop health, and forecasting yield and quality. These advancements support improved decision-making for farmers, agronomists, and policymakers by facilitating timely interventions, optimizing resource allocation, and mitigating losses attributable to diseases and environmental stressors.

Beyond its scientific impact, the project has provided significant educational and professional development opportunities aligned with NLRSEORA Objective 3. Three students received hands-on training with state-of-the-art technologies, with one achieving certification as an FAA Part 107 UAS pilot. The methodologies developed and the data collected during the project are integrated into the UAS Remote Sensing and Agricultural Remote Sensing courses curricula, fulfilling NLRSEORA Objective 4. The project's broader influence is further evidenced by a peer-reviewed publication and 17 presentations at international, national, regional, and local conferences, underscoring its role in advancing scientific knowledge and fostering cross-disciplinary collaboration.

Ubaid Janjua (Ph.D. student) collects light intensity measurements using a LICOR device.

Drone Day: A student attempts to fly a drone through an obstacle.

Students identify locations from Landsat satellite images.

- **Big Sioux Water Festival**
  - May 7, 2024. Attended by over 1,200 fifth- and sixth-grade students and K-12 educators from east-central South Dakota.
  - Provided educational materials for students and teachers and an interactive StoryMap of before and after Landsat images.
- **Drone Day (Second Annual)**
  - April 25, 2024. Drone displays and flight activities. Attended by >70 students.
- **55ᵗʰ Annual South Dakota State Geography Convention**
  - April 4-5, 2024. Students presented remote sensing research posters.
  - Interactive display: Physiographic identification from Landsat imagery.
  - South Dakota as Art display. Open to the public (>200 visitors).
- **2023 South Dakota Geospatial Conference**
  - October 18-19, 2023. Presented South Dakota as Art display highlighting the state's unique landscapes. 123 attendees.
- **GPRM Annual Meeting 2023**
  - October 6-7, 2023. Students presented remote sensing research posters. 98 attendees.

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BENEFITS TO SOUTH DAKOTA

- The use of satellite and UAS remote sensing combined with AI and ML is crucial for enhancing crop growth monitoring, yield forecasting, and quality assessment in South Dakota. This technology provides real-time, high-resolution data for early crop stress detection, enabling targeted interventions and resource optimization. These advancements help mitigate risks from climate change, improve decision-making, and enhance global food security by increasing crop productivity and reducing environmental impact. Additionally, the cost-effectiveness of these technologies enables efficient monitoring of agricultural systems.

- Hosting and participating in academic and educational conferences in South Dakota to promote knowledge transfer and research development by facilitating collaboration between local institutions and visiting experts, exposing students to cutting-edge research, and fortifying academic networks. They offer a platform for South Dakota universities and technical colleges to showcase their strengths and build partnerships while aligning with the state's economic development, particularly in emerging fields like geospatial technologies and agriculture.

Students perform UAS crop monitoring over a South Dakota study site.

Madison DeJarlais shows changes on Landsat images to 5th and 6th-grade students at the Big Sioux Water Festival.

SOUTH DAKOTAVIEW CONSORTIUM MEMBERSHIP

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

South DakotaView Principal Investigator:

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TENNESSEEVIEW 2023 - 2024 ACTIVITIES

TennesseeView (TNView) is dedicated to advancing Earth observation research, education, outreach, and workforce development across the state of Tennessee. In Fiscal Year 2023 (GY23), TNView undertook several impactful activities:

- **Student Competition:** In collaboration with the Tennessee Geographic Information Council (TNGIC), we hosted a student competition at the TNGIC Annual Conference. This event provided students with a platform to showcase their skills and connect with a wider professional network within the state.

- **Training Workshops:** We conducted a 4-hour workshop titled "*Cloud Computing with Google Earth Engine and Geemap*" at the TNGIC Annual Conference. This session equipped students, researchers, and professionals with the knowledge to leverage cloud computing platforms for analyzing remote sensing data using open-source tools. Additionally, TNView PI Qiusheng Wu presented "*Interactive Visualization of Geospatial Data with Leafmap,*" further enriching the conference's educational offerings.

- **Development of Learning Resources:** We launched an online open-access course, "*Introduction to GIS Programming,*" focusing on Python fundamentals and open-source packages for visualizing and analyzing geospatial data. The lecture videos, available on YouTube, have attracted over 30,000 views. More than 80 students globally have enrolled in this course, earning certificates upon completion.

Tennessee Geographic Information Council
630 followers
7mo · 🌐

This year, TNGIC was lucky to partner with TennesseeView and Dr. Qiusheng Wu to host the TNView Student Remote Sensing Presentations Contest. We award four cash prizes:

1st: Noah Hall, ETSU
2nd: Mimi White, UTC
3rd: Mark Rine, TN Tech & Mahnaz Meem, UTK

Thanks to all the students who participated! We are excited to continue to host this contest at future TNGIC annual meetings thanks to our partnership with TNView-- students, be thinking about what remote sensing applications you can present on next year!

TNView led a cloud computing workshop at the TNGIC Conference

TNView PI Wu presented at the TNGIC Annual Conference

An online open-access course: Introduction to GIS Programming

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BENEFITS TO TENNESSEE

The activities of TNView provide significant benefits to the state of Tennessee by offering accessible and comprehensive learning resources focused on cloud-based remote sensing. By utilizing cloud computing platforms such as Google Earth Engine, Microsoft Planetary Computer, and Amazon Web Services (AWS), we empower students and professionals to efficiently process and analyze large volumes of remote sensing datasets. Our learning resources and video tutorials are adaptable for undergraduate and graduate programs throughout the state.

Understanding the importance of nurturing the next generation of remote sensing professionals, we awarded five TNView student fellowships—four at the graduate level and one at the undergraduate level. These fellowships promote in-depth study and research in cloud-based remote sensing. This investment not only enhances their educational journey but also contributes to the development of a skilled workforce in remote sensing technologies.

Additionally, we supervised an undergraduate research assistant at the University of Tennessee, who processed 400 GB of high-resolution historical imagery for Tennessee. This data is now available through an interactive web app, serving as a valuable resource for visualizing and analyzing land cover changes in the state over the past two decades.
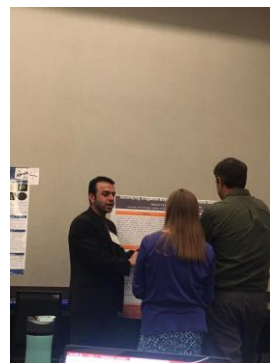
TNView fellow Mabood Farhadi presented at the TWRS conference
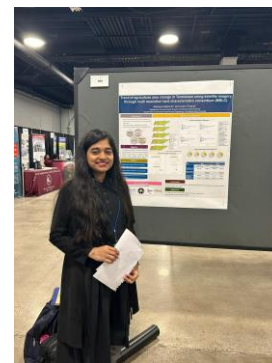
TNView fellow Maheen Mehnaz presented at the ARD Research Symposium

An interactive web app for visualizing Tennessee historical imagery: https://bit.ly/tn-imagery

TENNESSEEVIEW CONSORTIUM MEMBERSHIP

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

TennesseeView Principal Investigator:

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University of Tennessee, Knoxville

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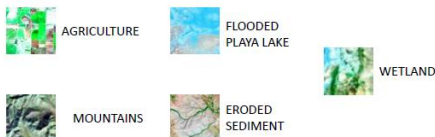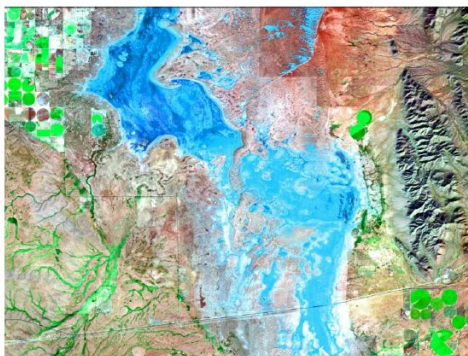**tnview@utk.edu**

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@TennesseeView

TEXASVIEW 2023 - 2024 ACTIVITIES

TexasView recognizes the impact on outreach and education through the **Earth as Art** exhibitions hosted by StateViews in recent years. TexasView has developed exhibition materials for **Texas as Art**, with the intent of displaying the exhibition in cooperation with TexasView partner institutions over the next several years. The exhibit is focused on 10 ecoregions of Texas defined by Texas' Department of Parks and Wildlife (TPWD), whose online resources support the exhibit.
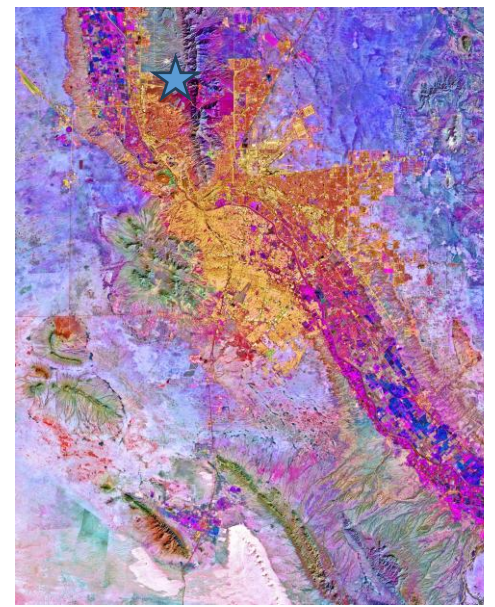
The exhibit highlights the applications of satellite imagery across a broad range of challenges that affect Texas' ecoregions, including landcover change related to urbanization. Focusing on Texas State parks "brings the challenges home" and makes the exhibit relevant for diverse venues and audiences. New artwork is developed for each new host institution, in partnership with local stakeholders.

Texas as Art has been disseminated through public and conference presentations (two); exhibits at two partner institutions (University of Texas at El Paso and Midwestern State University); three public exhibits; three outreach events, and one workshop. Three abstracts were accepted for conferences taking place in the September and October of 2024. On art exhibit has been arranged to begin at El Paso Community College in September of 2024, with a local artist co-exhibiting.

The Rio Grande valley separates El Paso and Juarez across the Texas/Mexico border. Franklin Mountains State Park* is one of the largest urban parks in the United States.

Landcover/Landform Key
Salt Basin

AGRICULTURE

FLOODED PLAYA LAKE

WETLAND

MOUNTAINS

ERODED SEDIMENT

Landcover/landform key for art activity.

Implementation of materials for educational outreach continues. Engaging students with recognizing different types of landcover and landforms is the focus of an art activity in which students create their own artwork, choosing colors to represent different landcover and landform types. They learn how to make a map while being artistically creative.

*Partner Sibley Nature Center hosts several annual **Girls in Science** workshops for middle-school girls. In TexasView's event, students interpreted landcover and landforms as art, using Landsat imagery basemaps from the **Texas as Art** exhibit covering the Trans-Pecos Ecoregion.*

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BENEFITS TO TEXAS

Texas as Art is focused on connecting viewers to the ecoregions and landscapes of Texas. By choosing state-managed lands as the "anchor" for each scene, the artwork directs viewers' attention to the geographic features and human infrastructure around the state parks, wildlife management areas, natural areas, and historic sites that are managed, protected, and restored by the Texas Parks and Wildlife Department (TPWD). Using the NASA Landsat Collage activity as a model, TexasView substituted **Texas as Art** imagery and offered the hands-on activities to teachers from multiple grade levels and disciplines from Midland and Odessa ISDs during a workshop at Sibley Nature Center. The **Texas as Art** exhibit was part of the workshop, and teachers also engaged with quizzes and games including a matching game for change detection and a scavenger hunt for landforms and landcover found on the exhibited artwork.

Teachers could choose among colorful artwork images that linked to State Parks including Big Bend Ranch, Davis Mountains, Palo Duro Canyon, and Monahans Sandhill state Parks, as well as Fort Lancaster State Historic Site, the Sierra Diablo Wildlife Management Area, and the Chinati Mountains State Natural Area. Posters with QR code links to TPWD videos and maps offered information about the ecoregions in which all of these areas are found (Trans-Pecos, Rolling Plains, High Plains).

Teachers created diverse artworks from Texas as Art imagery.

TEXASVIEW CONSORTIUM MEMBERSHIP

Established in 2002, the TexasView Remote Sensing Consortium consists of thirteen 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   The University of Texas at Austin   The University of North Texas   Sul Ross State University   Texas A&M   Texas Tech   University of Texas of the Permian Basin

Stephen F. Austin   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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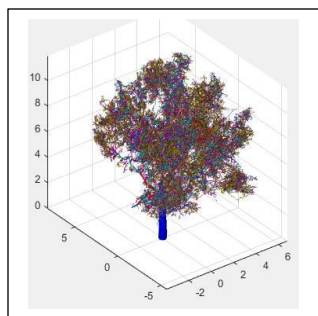
Facebook.com/ TexasView

TEXASVIEW 2023 - 2024 STUDENT RESEARCH ACTIVITIES

TexasView identifies the need to increase the number of undergraduate and graduate students who use remote sensing in an applied, project-oriented fashion. This High-Impact Activity (HIA) 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.*   One institution participated this year:
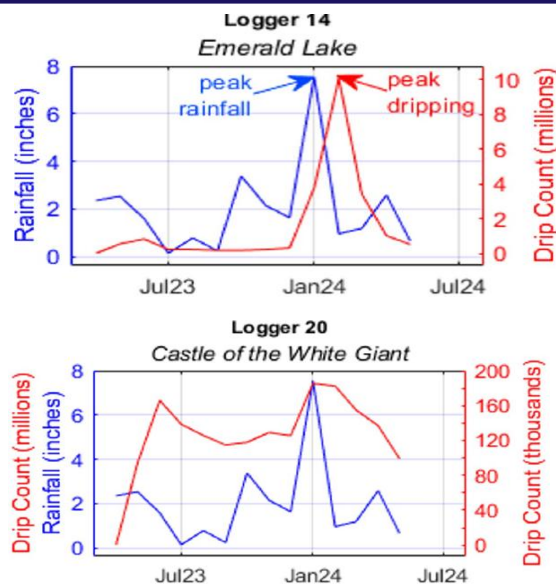
- **Estimating Urban Above-ground Biomass using an Automated Terrestrial Laser Scanning Algorithm.** *Midwestern State University (MSU) Kimbell School of Geosciences.*

- **Estimating Water Infiltration Using Drip Loggers and LiDAR at Natural Bridge Caverns, Texas**. *Midwestern State University (MSU) Kimbell School of Geosciences.*

- **The Impacts of Wildfire Smoke Aerosols on Surface Air Quality in California: A Multi-year Study using Geospatial Technologies.** *Midwestern State University (MSU) Kimbell School of Geosciences.*

Monthly drip counts vary in response to rainfall.
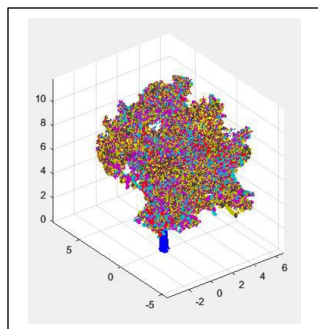
Clean LiDAR point cloud of tree #2

3D model (QSM) of tree #2

- An MSU graduate student evaluated the accuracy of high-resolution LiDAR data and a state-of-the-art tree segmentation algorithm for understanding overall carbon sink capacity.
    - o The algorithm created detailed models that provide accurate estimations for parameters used to predict urban tree biomass, when compared to field measurements.
- An MSU graduate student investigated subsurface groundwater flow through the critical Edwards aquifer in central Texas.
    - o The combination of LiDAR data and water infiltration monitoring within Natural Bridge Caverns is used to evaluate karst controls on subsurface water movement.
    - o This is crucial for effective planning and development of water resource management policies for karst aquifers, which supply 55% of Texas' water supply.
- An MSU graduate student assessed high-resolution particulate matter (PM2.5) pollution driven by wildfire smoke aerosols in the western U.S., where increased wildfire activity has wiped out nearly one-half of the total air quality gains made from 2000 onwards.
    - o Imagery from Landsat and MODIS satellites provide critical data input for air quality assessment.

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BENEFITS TO TEXAS

Support for student research has multiple benefits. Students address issues affecting the State of Texas and develop new workforce skills.

- *I continued to learn to troubleshoot LiDAR equipment and open-source algorithms. I have had many opportunities to travel to present and talk to other people who are researching similar topics. I enjoyed my time on this project. I have learned many practical skills and expanded my knowledge in this field. I am appreciative of this opportunity and truly enjoyed my time working on this project.*
- *The most challenging aspect of the project was working with the LiDAR data, which I had limited experience working with prior to starting this project. I was additionally able to use ArcGIS and its available toolsets to create a location map for the study area that incorporates the Edwards Balcones Fault Zone Aquifer, of which Natural Bridge caverns are located within the contributing zone. The ability to develop my own geographic data ensures that I am able to display only the information that is pertinent to my study site. This will also enhance my presentation at upcoming conferences including the National Association of Black Geoscientists (NABG) and Geological Society of America (GSA) annual conferences in September 2024.*
- *As a student with a background in geography, I love to learn and utilize Geographic Information Systems (GIS) techniques to deal with geospatial data. Overall, this opportunity benefited my understanding in geospatial technologies and further research in this field. I am grateful to TexasView for providing me this opportunity. I hope it will help me further excel my skills in accessing and analyzing geospatial data for air quality assessment.*

1989 - 1998
Total fires: 1,910
Total acreage burned: 2.73 mil

2009 - 2018
Total fires: 3,356
Total acreage burned: 7.08 mil
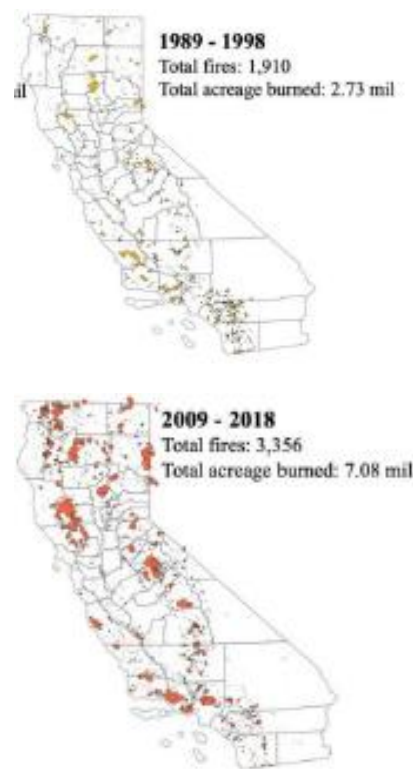
Georeferenced Fire Perimeters Data from Calfire.

TEXASVIEW CONSORTIUM MEMBERSHIP

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Midwestern State	The University of Texas at Austin	The University of North Texas	Sul Ross State University	Texas A&M	Texas Tech	University of Texas of the Permian Basin

Stephen F. Austin	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

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Facebook.com/TexasView

UtahView 2023 - 2024 ACTIVITIES

Great Salt Lake Ecological Function

The purpose of this work was to map the distribution and temporal variation of shore bird tactile foraging habitat as levels of the Great Salt Lake, Utah fluctuate over a given year. Lake level fluctuations can significantly affect the availability of available forage for shorebirds since they forage in shallow water (<1' in depth). As lake levels wax and wane, variations in submerged topography alter available foraging habitat.

Our progress to date has been to develop Google Earth Engine scripts to analyze Landsat, merged with Sentinel-2 imagery to map lake levels for each month of a given year. Coupled Landsat and Sentinel-2 images provided a complete view of the lake 16 days per month (~1 view every 2 days) not accounting for cloud cover. Monthly cloud-masked image collections resulted in a cloud-free image for each month. Surface water was mapped for each month using a normalized difference water body index that utilized the green and NIR spectral bands ((green − NIR) / (Green + NIR)). An index threshold of > 0.1 was used to separate open water from the surrounding non-water area. This resulted in a binary (0,1) output where open water was identified as 1. The summation of the binary water image across all 12 months resulted in the image presented in Figure 1 which the number of months any given area across the Great Salt Lake is covered in water.

Figure 2 shows the Bear River Bay area inundation frequency along with sample points along transects to record forage availability and water depth. Figure 3 shows the temporal inundation profile for a selected pixel. Figure 4 shows water depth within the inundated area derived from USGS 3DEP 1m elevation data.
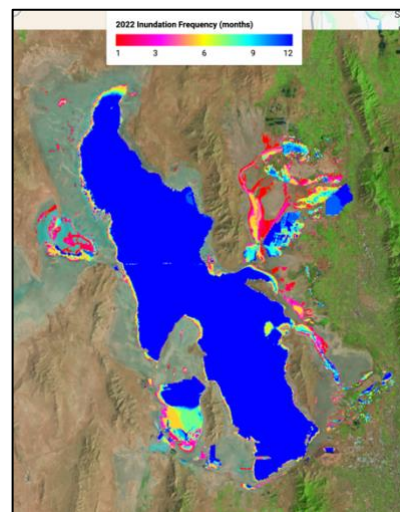

Figure 1. Great Salt Lake Inundation frequency for 2022. Colors refer to the number of months water covered an area indicating habitat changes for foraging shorebirds.
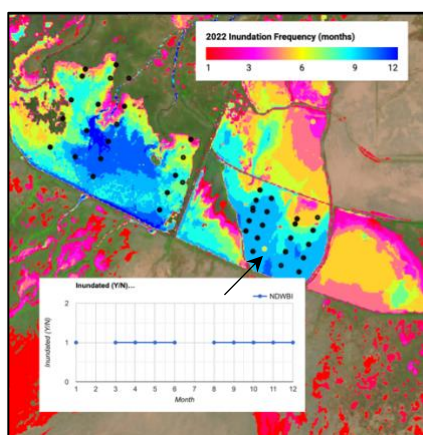

Figure 2. Bear River Bay, the northeast arm of the Great Salt Lake and home to the Bear River migratory bird refuge. Colors refer to the number of months an area was inundated and black dots identify sample areas that measured forage availability.

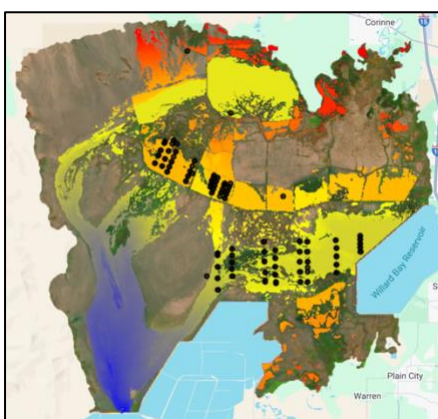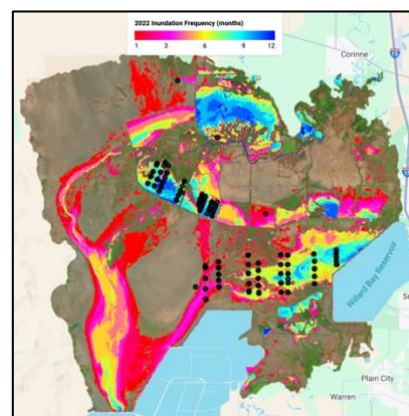*Figure 3. Temporal inundation profile for a selected pixel (yellow point)*

Figure 4. Water depth within the 2022 inundated area for Bear River Bay derived from USGS 3DEP 1m elevation data. Maximum depth (blue) is ~ 5m

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BENEFITS TO UTAH

The Great Salt Lake provides a major stop-over for migrating waterfowl making the lake a critical resource for birds as well as other wildlife. This project can provide managers with an additional tool to help manage habitat.

Other UtahView activities includes outreach to citizens and students to increase awareness of Utah's beautiful landscape as well as promote the use of remote sensing instruments to help in the management of the state's resources. This year we visited "Posters on the Hill", a yearly event for geospatial professionals to showcase their work. This venue also hosts elementary school kids who took full advantage of the giant AmericaView puzzle of the Four Corners area in SE Utah. Once the kids left, the adults attending the event had their chance at the puzzle as well.

Posters on the Hill – a yearly event where geospatial professionals gather at the state capitol building to show their stuff

Students exercise their prowess at putting together a satellite puzzle of the Four Corners area.

Posters on the Hill provided a venue for us to show off our Utah as art series

Once the kids left, the adults had a go.

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; 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
UVU
UNIVERSITY

UGIC
UTAH GEOGRAPHIC
INFORMATION COUNCIL

UtahView Principal Investigator:

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UTAH VIEW

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VIRGINIAVIEW 2023 - 2024 ACTIVITIES

VirginiaView continues to support remote sensing education through a multipronged approach that engages a range of clients, including pre-college and higher education students and faculty, local, state, and federal government employees, and private industry. VirginiaView provides an array of learning options that include both face-to-face instruction and online instruction. In addition to workforce development, we provide educational resources available in different formats (text, video, etc.) along with sample data for individuals who want to learn in a self-paced environment. Many of these tutorials provide remote sensing experiences using satellite-based and drone-based sensor platforms.
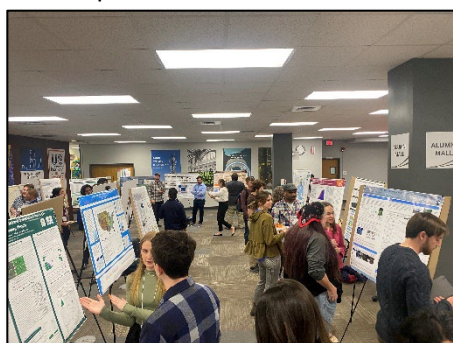
OGIS student research symposium

In celebration of Earth Observation Day, VirginiaView cohosted and sponsored the Virginia Tech Office of GIS and Remote Sensing (OGIS) Symposium in the spring of 2024. The OGIS Symposium provides university students with the opportunity to showcase their research experiences with other students and geospatial faculty from multiple universities. Thirty-six graduate and undergraduate students presented at the symposium.

Hands-on drone workshop for teachers.

VirginiaView continues to engage with educators at all levels. This year, VirginiaView created an 8' x 8' floor puzzle exhibit for Montgomery County's Wonder Universe (a children's museum) utilizing Landsat imagery of the New River Valley, and an Earth as Art remote sensing exhibit at the Virginia Tech library. These exhibits appeal to students across the educational pipeline and introduce them to relevant information about the role of Earth Observation in supporting agriculture, water resource planning, urban planning, and forestry across both rural and urban regions.

Earth as Art: The New River, as it flows through Brush and Gap Mountains near Radford in southwest Virginia near Radford

The large Landsat Floor Puzzle Exhibit on display at the Montgomery County Wonder Universe Museum
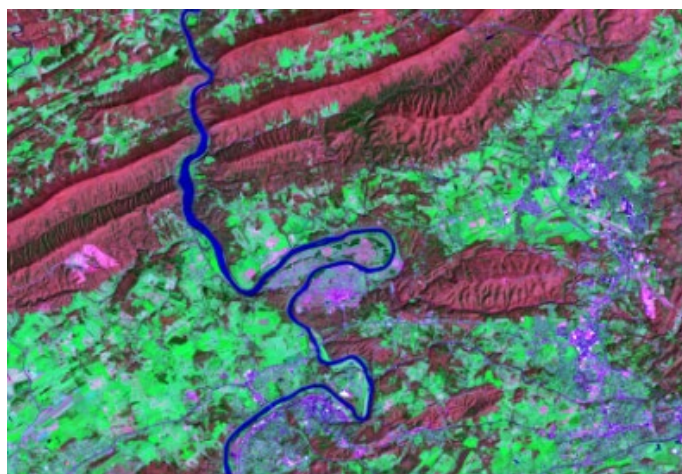
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BENEFITS TO VIRGINIA

In addition to face-to-face professional development programs, VirginiaView develops and publishes both text-based and video resources for self-paced learners. These educational resources are specifically designed to introduce STEM related skills to help prepare the workforce of the future.

• Instructional video tutorials have been viewed over 569,000 times, with 51,800+ views during GY 2023 alone.

• Video tutorials have been viewed for over 18,400 hours, with 2,200+ hours watched during GY 2023 alone.

• ~30 individuals received remote sensing professional development training during GY 2023 through the Mapping with Drones workshop series.

Free learning resources are available both in eBooks and videos

VirginiaView continues to develop, update, and publish remote sensing book (and eBook) tutorials on Amazon. These publications have been extremely popular, with over 142,600 Kindle pages read and 3,600+ books downloaded. We have granted requests to translate these materials into different languages.

VirginiaView is in the process of migrating these resources to PressBooks, an online publishing platform to streamline the updating of materials and encourage broader dissemination and reach through this free platform. These educational resources often utilize Landsat imagery, since the archive responds to real-world application needs.

Publication title	Copies sold	Kindle pages read
RS in Arcmap (eBook 2015)	516	11,890
Lidar ArcGIS Desktop (eBook 2016)	360	20,567
Lidar ArcGIS Desktop (print 2016)	77	.
RS in Arcmap, 2nd ed (eBook 2017)	237	9,360
RS in Arcmap, 2nd ed (print 2017)	123	.
RS with ArcGIS Pro (eBook 2019)	911	55,518
RS with ArcGIS Pro (print 2019)	600	.
Lidar ArcGIS Pro (eBook 2020)	318	23,322
Lidar ArcGIS Pro (print 2020)	150	.
RS with ArcGIS Pro, 2nd (eBook 2023)	206	21,957
RS with ArcGIS Pro,2nd (print 2023)	185	.
TOTAL	**3,683**	**142,614**

VIRGINIAVIEW CONSORTIUM MEMBERSHIP

VT COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT VIRGINIA TECH™

Virginia Cooperative Extension — Virginia Tech • Virginia State University

B Blacksburg High School

VIRGINIA PENINSULA COMMUNITY COLLEGE

VIRGINIA SPACE GRANT CONSORTIUM

VT | CONSERVATION MANAGEMENT INSTITUTE

GERMANNA COMMUNITY COLLEGE

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VirginiaVIEW

http://www.virginiaview.net

https://www.flickr.com/photos/vageospatial/

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VERMONTVIEW 2023 - 2024 ACTIVITIES

Drones to Satellites: K-12 Educational Outreach

VermontView participated in this year's Year End Studies Program at Burlington High School to support remote sensing education. VermontView worked with high school students ranging from 9th to 12th grade exploring the possibilities of satellites, drones, and mapping. Drones pose a new and exciting piece of technology that all students in the program were familiar with therefore proved to be a natural hook for excitement in the program. Students participated in short educational presentations from staff and faculty associated with VermontView, scavenger hunts exploring campus and the basics of mapping, hands-on experience operating multiple drone platforms, and various software platforms to process imagery and create maps. All students from this program successfully passed the TRUST exam (The Recreational UAS Safety Test) before operating drones to ensure all students were aware of the protocols surrounding drone use and operation. Throughout this program students excelled in learning how to use drones for multiple purposes (emergency response and recreational use) and learning new platforms to look at the data. Utilizing feedback from this session, further curriculum development is planned for next year's (2025) program that will incorporate more hands-on experience and focusing on use-cases of the advantages of drones and satellite data.
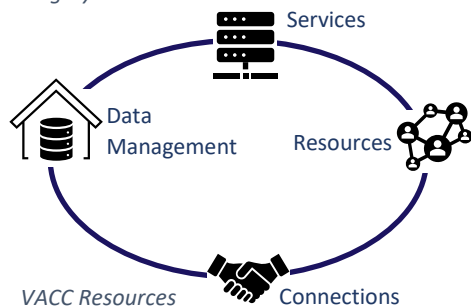

UAS Technician (Lauren Cresanti) explaining drone components to BHS-YES students.

High-Performance Computing: Vermont Advanced Computing Center (VACC)

VermontView has joined the network of organizations and university departments who are utilizing the higher-performance computing clusters that support large scale computation, beyond the capabilities previously needed or available. This network has allowed for VermontView to process geospatial data with higher efficiency while exploring the use of both machine learning and artificial intelligence workflows on current processes. VermontView has also sponsored the Vermont Center for Geographic Information (state government agency) inclusion into this center to conduct quality assurance and control workflows on the Q1 LiDAR (elevation) data collected by Vermont in 2023. The resources provided by this center include 1) data management, 2) services such as technology consultations and programming assistance, 3) research storage and resources through Enterprise Technology Services, and 4) connections beyond current VermontView networks. The VACC has improved VermontView's capabilities to process remote sensing data for both educational and research purposes.

BHS Students piloting a drone to collect imagery.

VACC Resources

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BENEFITS TO VERMONT

Educational Outreach
Introduced high school students to the many uses of drone and satellite data, mapping, and regulations. Students completed the TRUST exam and got hands-on experience flying.

Curriculum Development
Developed an inclusive and accessible 2-week course. These modules will be the basis for further development of professional development and continuing education around drones and GIS including a 3-credit UVM course.

Improved Processing Efficiency
Increased processing power of large remote sensing datasets for research and practical purposes with the VACC including updating infrastructure inventory across Vermont.

Increased Capacity for AI
VermontView collaboration with state agencies has increased capacity for integrating machine learning and AI into state projects associated with infrastructure resilience, damage assessments due to flooding, etc.

Web map showcasing the difference between aerial and UAS imagery collected by BHS students.

Q1 LiDAR Tile processed on the VACC.

VERMONTVIEW CONSORTIUM MEMBERSHIP

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WISCONSINVIEW
2023 - 2024

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WISCONSINVIEW 2023 - 2024 ACTIVITIES

WisconsinView's "High Impact Activity" leverages its *RealEarth* mapping platform and visualization tool to empower Earth observation education and outreach. The goal is to assist StateView members of AmericaView in sharing educational materials and research results by utilizing *RealEarth* as an Earth science communication tool. 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. RealEarth is also being used to bring imagery into third-party websites such as the USGS National Water Dashboard and LoveMyAir - Wisconsin.

WisconsinView launched its new website in April 2023, continuing its mission of coordinating remote sensing imagery access and use. The site includes educational tools, embedded RealEarth maps, and data discovery interfaces. Visit https://wisconsinview.org

RealEarth is a flexible tool that allows visualization of nearly any spatial data. The *RealEarth* platform facilitates data visualization across the atmospheric science and Earth science domains. *RealEarth* is structured around time and location, making it possible to synchronize visualization and animation of data of different types. Because much of the imagery in *RealEarth* is acquired and displayed in near real-time, it is useful for event-based monitoring of severe weather events and natural hazards like wildland fires and flooding. It is being used by the prototype NOAA Next Generation Fire System (NGFS) to pair near real-time fire detections with related satellite imagery and land cover maps. This HIA advances education, training, technology transfer, and outreach.
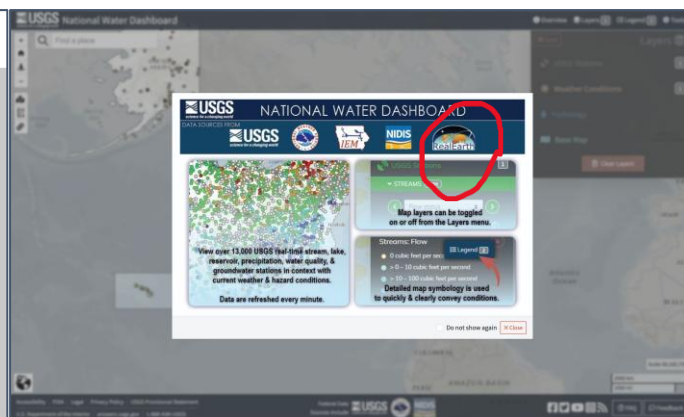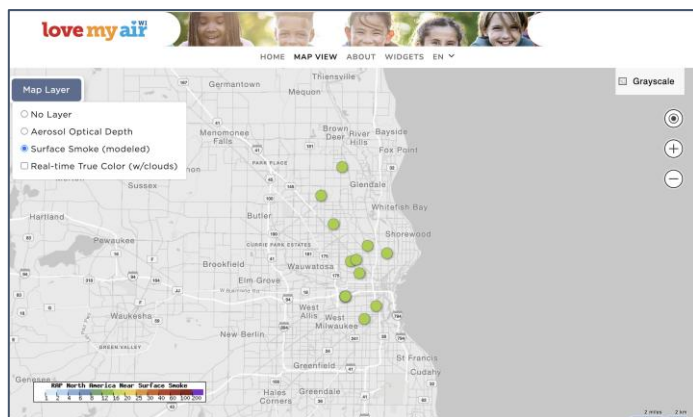
WisconsinView partners with organizations to bring web map services into visualization platforms. The left image shows a RealEarth smoke layer in a citizen science air quality network of schools called "Love My Air" featuring Milwaukee, WI. The right image shows the USGS National Water Dashboard crediting RealEarth for weather imagery data layers they are using. https://dashboard.waterdata.usgs.gov/app/nwd/en/

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BENEFITS TO WISCONSIN

Since its establishment in 2004, WisconsinView has supported Earth observation education and outreach across Wisconsin 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.

WisconsinView collaborates with other StateViews with similar goals and regional concerns, sharing research and education ideas and leveraging the power of the AmericaView network.

Students enjoy a 3D experience of a terrain model at a museum outreach event in Milwaukee, WI.
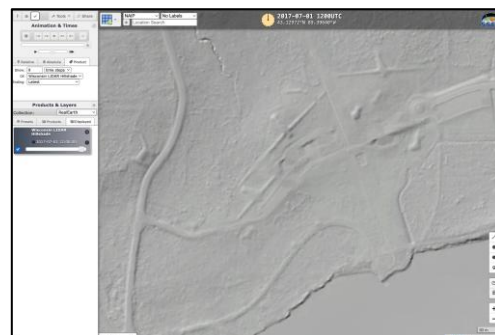
*Shaded relief imagery derived from LiDAR displayed in **RealEarth**, showing earthworks in Wisconsin made by the Effigy Mounds Culture during the Late Woodland Period (1400-750 B.P.).*

CURRENT WISCONSINVIEW CONSORTIUM PARTNERS

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

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https://wisconsinview.org

https://ssec.wisc.edu/realearth

X **@WisconsinView**

X **@SSECRealEarth**

WEST VIRGINIAVIEW 2023 - 2024 ACTIVITIES

Our **HIA** this year focused on updating our course materials, which are freely available on the WV View website. We specifically:

- Completed a full update of our **Client-Side Web GIS** course including updating our ArcGIS Online content to reflect recent changes in the software, adding new materials associated with ArcGIS ExperienceBuilder, introducing ESRI's Arcade language, and expanding our JavaScript content. This course is available at: https://www.wvview.org/cswg.html

- Updated all ArcGIS Pro labs associated with our **GIScience** course. We now offer 29 lab exercises. This course is available here: https://www.wvview.org/gisc.html.

- Expanded our **Geospatial Deep Learning** seminar into a complete course. This material is available here: https://www.wvview.org/geospatdl.html
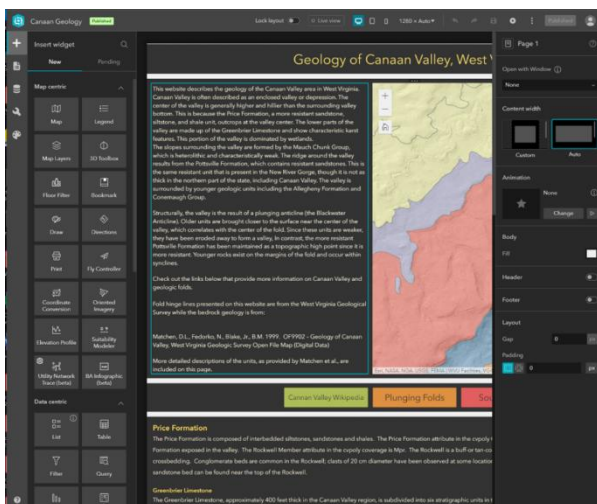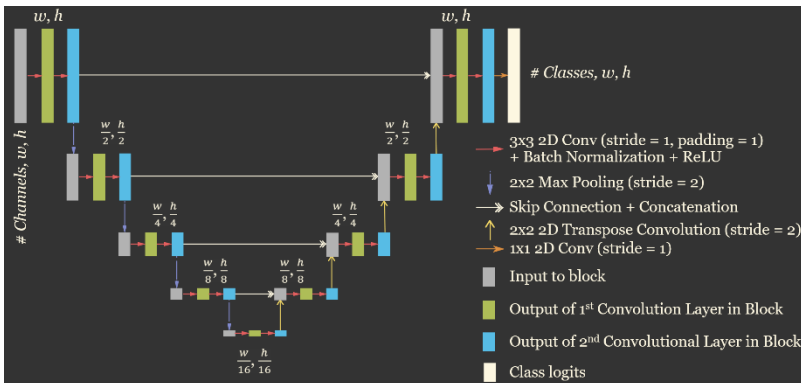
*(Above) Our **Geospatial Deep Learning** course demonstrates how to build, train, and evaluate deep learning-based semantic segmentation models for pixel-level classification (such as UNet, conceptualized above).*

*(Left) Our **Client-Side Web GIS** course now includes content associated with ESRI's ArcGIS ExperienceBuilder, which allows for generating web maps and multi-page websites.*

*(Right) Our **GIScience** course includes 29 recently updated ArcGIS Pro labs.*

E1: Intro to ArcGIS Pro
E2: Datums and Projections
E3: Exploring Spatial Data
E4: Digitizing
E5: Georeferencing and Resampling
E6: Data Queries
E7: Geodatabase Creation
E8: Intro to Symbology and Cartography
E9: Symbolizing Image Data
E10: Intermediate Cartography
E11: Intro to ArcGIS Online and Web Apps
E12: Intro to Spatial Analysis
E13: Intermediate Vector-Based Analysis
E14: Network Analysis
E15: Intermediate Raster-Based Analysis
E16: Data Summarization
E17: Mosaics and Multidimensional Rasters
E18: Digital Terrain Analysis
E19: Viewsheds and 3D GIS
E20: Working with LiDAR Data
E21: Raster Functions
E22: Surface Hydrologic Analysis
E23: ModelBuilder 1
E24: ModelBuilder 2
E25: Weighted Overlay
E26: Spatial Predictive Modeling with RF
E27: Supervised Classification with ML
E28: Intro to Spatial Stats
E29: Intro to Spatial Interp

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BENEFITS TO WEST VIRGINIA

- Provide free educational materials for students and geospatial professionals
- Support workforce development
- Courses available:
  - *Methods in Open Science*
  - *GIScience*
  - *Open-Source GIScience*
  - *Remote Sensing*
  - *Digital Cartography*
  - *Client-Side Web GIS*
  - *Open-Source Spatial Analytics (R)*
  - *Geospatial Deep Learning*
- Foster remote sensing education, outreach, and research
- Provide access to LiDAR data via a web app
- Provide funding for graduate students
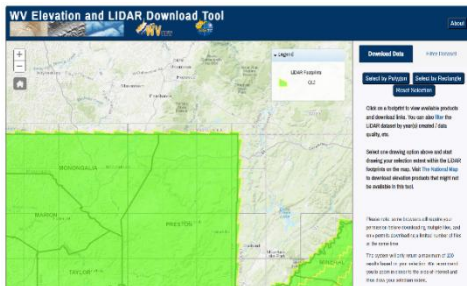
WV Elevation and LiDAR Download Tool.

West VirginiaView courses webpage.

WEST VIRGINIAVIEW CONSORTIUM MEMBERSHIP

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

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WYOMINGVIEW 2023 - 2024 ACTIVITIES

WyomingView Presentations in Geospatial Forums

Dr. Russell Congalton, Remote Sensing Professor and NHView PI, presented his perspectives on the development of accuracy assessment of maps generated from remotely sensed images in Geospatial Forum (fall 2023). More than fifty people were in attendance (in person and online). UW students gained insights on career opportunities. Video recording of this presentation is available in WyGISC's YouTube channel (https://youtu.be/KUPHkh_-J08).

Two WyomingView interns presented their research in the spring 2024 Geospatial Forum. Ms. Devon Borthwick presented her work on quantifying analyst bias in generating flood inundation maps, and Ms. Anna Erdmann described the value of products derived from Landsat data for mapping crop growth in two irrigated fields. This was the first Geospatial Forum where WyView interns presented their research findings. This event also promoted the applied research opportunities available through WyView. Video recording of these presentations is available in WyGISC's YouTube channel (https://youtu.be/2vHa_PEQR80).
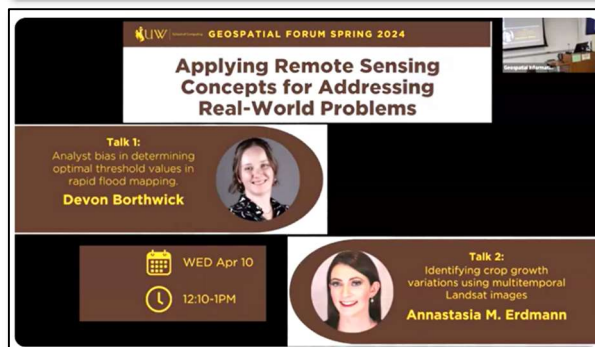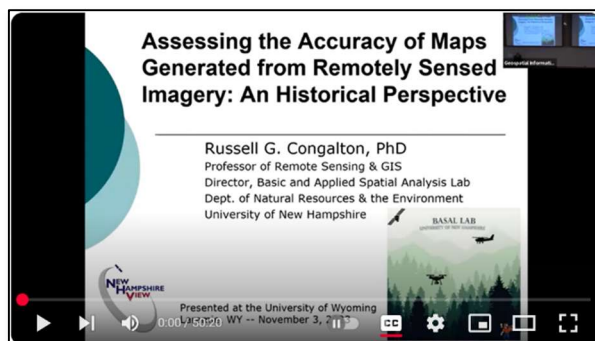
Presentations by Dr. Russell Congalton (fall 2023), and two WyomingView interns (spring 2024) in Geospatial Forums were the major highlights of GY 2023-24.

Students learned how thermal sensors can measure changes in body temperature and how scientists use them for observing animals and Earth surface.

K-12 Outreach Activities

WyomingView participated in the 2024 STEM Carnival. This event, hosted every fall, is aimed at introducing school students to various careers in STEM disciplines. This GY, students were introduced to concepts and applications of *thermal sensors*. Students measured the temperature of their palm before and after holding ice cream cups. More than 100 students participated in this event held in the Laramie Extension Station (West Laramie).

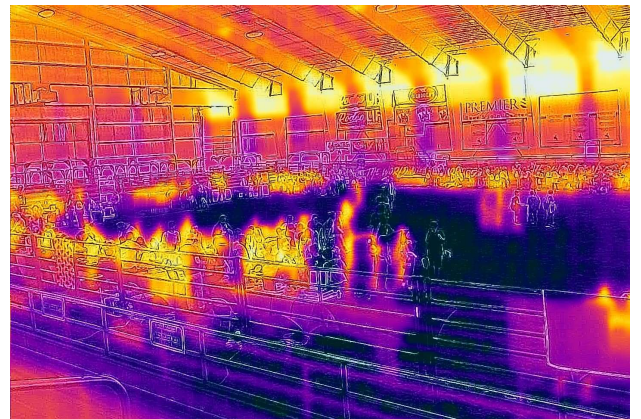In GY 2023-24, WyomingView reached out to 167 students (grade levels K-8).

- Eighth graders at Laramie HS learned how multispectral sensors measure annual green-up and senescence at the continental and global scale *(147 students)*.
- Fifth graders in Spring Creek ES saw the effects of how diverting water from two rivers converted the 4th largest inland water body – Aral Sea – to the world's newest desert (*20 students*).

EOD and outreach activities are effective to promote remote sensing technology and applications.

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BENEFITS TO WYOMING

- WyomingView participated in several educational outreach activities such as STEM carnivals.

- These annual events are organized by University of Wyoming to highlight and promote STEM disciplines and career opportunities.

- Activities organized by WyomingView (floor puzzle and thermal cameras) were well attended.

- Organizers have extended a "forever" invitation to WyomingView PI for conducting similar activities in future carnivals.

- UW has invested resources to promote this annual event aimed at recruiting students to various STEM disciplines (Women in STEM, Science Kitchen, etc.).

These educational outreach activities help UW and Wyoming community colleges to showcase opportunities across STEM disciplines and career opportunities to K-12 students.

RGB (top) and Thermal IR (bottom) photos show a section of the audience in 3rd Annual STEM Carnival held in Laramie.

WYOMINGVIEW CONSORTIUM MEMBERSHIP

WyomingView consortium partners include individual **farmers and ranchers**.

- In this GY, three WyomingView interns mapped crop growth in three crop fields in Albany and Laramie counties.

- Ms. Anna Erdmann used Landsat-derived products provided by the USGS for mapping crop growth in two flood-irrigated fields.

- These fields are managed by a private foundation which has expressed interest in collaborating with WyomingView for mapping center-pivot irrigated fields and several non-irrigated pastures.

- This partnership will enable future WyomingView interns who do not have access to crop fields or rangelands.
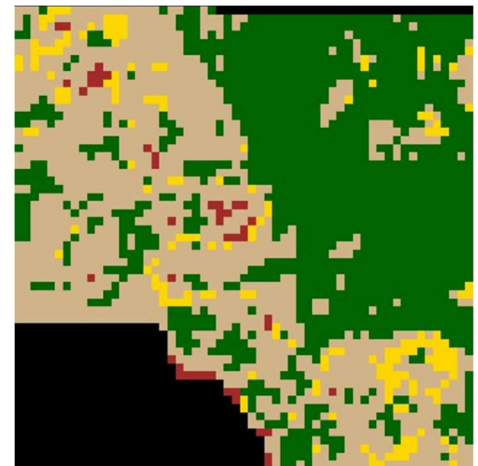
Map of crop growth patterns in a flood-irrigated field in Albany Co. Wyo., generated by classifying 4 early season Landsat derived products.

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