

**National Land Remote Sensing Education Outreach and  
Research Activity (NLRSEORA)**



**AmericaView: A National Remote Sensing  
Consortium**

**Grant Award Number G14AP00002**

**AmericaView Technical Report  
for Grant Year 2014**

**Period of Performance from  
September 16, 2014 to June 30, 2015  
(With a NCE from July 1, 2015 to December 31, 2015)**

**Submitted to the  
USGS Project Officer and Grant Administrator  
AmericaView Consortium Board of Directors**

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# AmericaView Technical Report for Grant Year 2014

## I. Introduction and Overview

### Report Purpose and Structure

This report summarizes the activities for U.S. Geological Survey Grant Award G14AP00002 to AmericaView (AV) from September 16, 2014 to June 30, 2015 for Grant Year 2014 (GY 2014), which was provided a “no cost extension” from July 1, 2015 to December 31, 2015. This report satisfies the grant year reporting requirement for Period 2 of the award. A detailed description of completed activities for GY 2014 is available on the AV online portal that can be queried by any AV Board or staff member, or authorized USGS employee at [www.avportal.org](http://www.avportal.org).

This report is organized into the following sections:

- Section I. provides background about the AV Consortium;
- Section II. presents the four Grant objectives, aligns those objectives with the AV program areas, and summarizes AV’s achievements in completion of grant deliverables;
- Section III. details the progress made towards completion of the four grant objectives, including numerical summaries and benefits of completed activities; and
- Section IV. includes fiscal management information.

Appendix H includes copies of all the Fact Sheets completed by the StateViews summarizing their efforts toward meeting the grant objectives in GY 2014.

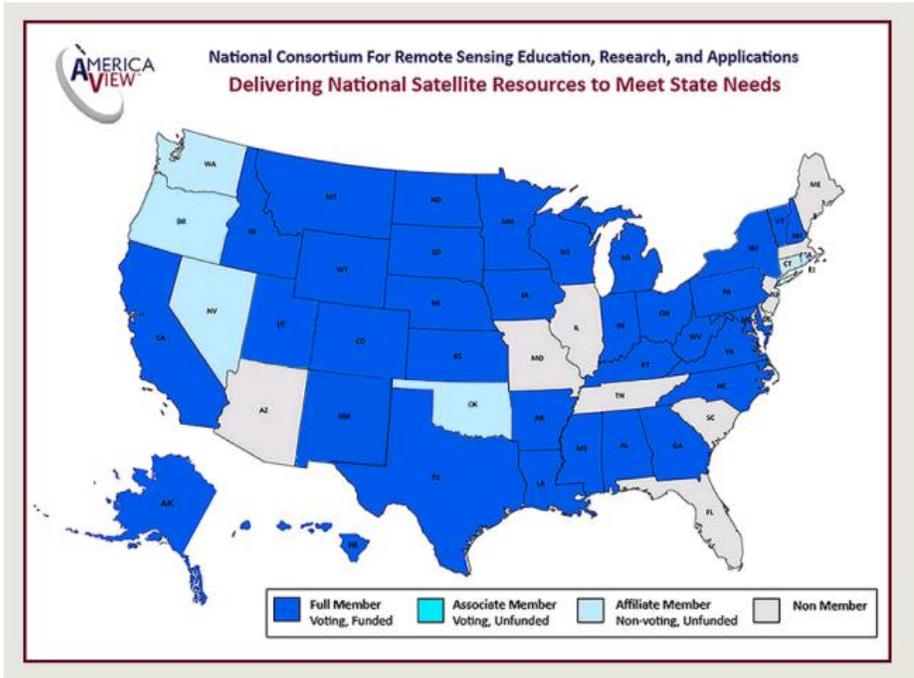
### Overview of AmericaView

[AmericaView](http://www.avportal.org) (AV) is a nationwide, university-based, and state-implemented consortium advancing the widespread use of remote-sensing data and technology through education and outreach, workforce development, applied research, and technology transfer to the public and private sectors.

Remote sensing involves gathering information about an object, an event, or a situation without using the sense of touch. AmericaView’s intellectual expertise, its networks, facilities, and other technological capabilities are highly leveraged and used for sharing and applying Landsat and other public domain remotely sensed satellite data in a wide range of civilian applications; formal and informal education; ecosystem analysis; natural resource management; urban planning; and disaster response.

AmericaView is a 501 (c) (3) non-profit incorporated in 2003. AV’s primary goal is to support the many beneficial uses of remote sensing in service to society. The AmericaView Mission is *“to advance the availability, timely distribution, and widespread use of remote sensing data and technology through education, research, outreach, and sustainable technology transfer to the public and private sectors.”* (AmericaView Charter March 12, 2002)

In June 30, 2015, the AV national consortium comprised 40 individual state consortia (StateViews). Each StateView is coordinated by a lead academic institution, whose partners often include academic institutions; government agencies and offices; non-profits; and some business members. AV has more than 300 StateView consortia partners across the U.S. During GY 14, consistently following prior award periods, StateViews successfully built and expanded working relationships with partners at the state and national levels on a wide range of projects within AmericaView's traditional four program areas.



AmericaView Members and Staff at Fall Technical Meeting, USGS EROS Center, Sioux Falls - 2015

The signature success of this consortium recognizes that each state has unique needs as well as regional and national involvement. StateViews have requested funding support for high priority projects, formalized and monitored annually through a national peer-reviewed proposal and reporting process. StateViews were also encouraged to work together on projects of mutual interest, typically supported by AmericaView's education, outreach, technology, research committees,

some working groups and the AV staff. All efforts optimize the leverage of AV's funding.

### Administration and Coordination

As described in the proposal for this grant, during GY 2014, AV had a progress-committed nine-member Board including StateView members from California, Kansas, Louisiana, Montana, Georgia, New Hampshire, South Dakota, Texas, and Vermont, representing the diversity of the Consortium. The AV

Board provided fiscal oversight, approved organizational priorities, monitored grant deliverables, and oversaw organizational outreach efforts. The Board used conference calls at least monthly, met for full days in person during the national Fall Technical and Winter Business Meetings, and contributed well over 700 hours to organizational governance annually. In addition, AV held monthly member teleconferences to conduct business and sponsored webinars to share members' remote sensing knowledge. To improve the value of these meetings, AmericaView replaced audio conference calls with GotoMeeting video-audio capability. Each of these meetings, as well as copious email communication enabled progress towards completion of the objectives of the current USGS grant.

Programmed management for AV's national program in GY 2014 included a .25 FTE Executive Director (ED) Bobbi Lenczowski, a .75 Program Director (PD) Debbie Deagen, a .33 to .44 FTE Fiscal Manager (FM) Terri Benko, and a .25 FTE Meeting and IT Coordinator (MIC) Jeanie Congalton. The PD was an employee of Montana State University. The ED, FM, and MIC were retained as consultants to AmericaView. Therefore, AmericaView had no employees.

The ED and PD administered the program on a daily basis, and answered directly to the Board of Directors in all matters. The ED served as an advisor to the Board, was responsible for implementing the plans and priorities of the Board, managed external communications, and oversaw AV's programs and staff. The PD was responsible for internal communications, required reporting and annual workplan development, and oversight of day-to-day business and financial affairs. The FM was the contract officer for AV sub-awards, completed AV level bookkeeping, reviewed invoices, made disbursements, coordinated with the contracted accounting firm, and started the transition to an enterprise-based accounting system with the ability to manage multiple grants used by the Ohio Aerospace Institute. Jeanie Congalton was hired as the Meeting and IT Coordinator in June 2015. Jeanie assisted with planning for FTM 2015 and initiated the clarification of AV's information management needs to prepare a database design best serving AV's ~350 members, and ~120 university-related fiscal contacts.

AV's USGS Liaison for the past grant year was Sarah (Sally) Cook. Tom Cecere provided additional guidance and interface with USGS.

## II. Summary of NLRSEORA Grant and Achievements by AmericaView

### Scope of Grant

AmericaView was the recipient of a competitive five-year grant titled the *National Land Remote Sensing Education Outreach and Research Activity* (NLRSEORA) issued by the U.S. Geological Survey's Land Remote Sensing Program, effective December 1, 2013. "The National Land Remote Sensing Education, Outreach and Research Activity has funded projects that assure that all users of remotely sensed data have equal, affordable access to the data and can establish the means to conduct research using the data. Additionally, this program has funded projects focusing on K-16 outreach, remote sensing course development for the public, and tailoring of remotely sensed imagery for State and local scientific and public use."

<https://www.cfda.gov/?s=program&mode=form&tab=step1&id=e87521f8a9d69c45f00dc1e68d17190e>

Project duration was initially intended to extend over five grant periods. However, USGS, working with AV, determined that the funding should be compressed into four grant periods to encourage extending membership into more states. The stated objective of the USGS is "to promote the uses of space-based land remote sensing data and technologies through education and outreach at the State and local level and through university based and collaborative research projects. Technologies of interest include multispectral and hyper-spectral electro-optical, thermal, and radar."

### NLRSEORA Objectives

AV was funded to achieve the following four objectives identified in its NLRSEORA proposal:

#### **Objective 1 – Nationwide Remote Sensing Data and Information Requirements**

AV will seek to improve the nation's capabilities and resources in land remote sensing to meet the needs of users both within its member states and nationally. This will be accomplished through AV's national and state consortia, which will continue to collect information on the ability of existing remote sensing data products to meet the needs of its user constituencies (including academic, scientific, and end user communities), assemble this information at the national level into a consolidated format, and communicate that information to data providers, as appropriate.

#### **Objective 2 – Remote Sensing Applications**

AV will identify new and expand existing remote sensing applications nationwide through its distributed national network. Research and development of new technologies will be directed through AV's state-based university consortia, while expansion of the use of these technologies will occur through a targeted combination of education, training, and outreach activities with AV's many partners.

### **Objective 3 – Undergraduate and Graduate Research**

AV will use its strength as a consortium whose StateView members are each led by a university, and whose StateView consortia include over 180 colleges and universities, to provide meaningful remote sensing research opportunities for undergraduate and graduate students. AV members' proven success at generating research grant dollars will enable this objective to be highly leveraged. These student-involved research activities will increase, both quantitatively and qualitatively, the ability of the nation's future workforce to successfully incorporate remote sensing technologies as a basic component of our nation's infrastructure.

### **Objective 4 – Education and Training, and Technology Transfer, and Outreach**

*Education and training.* AV will seek to increase the remote sensing competency of the nation's current and future workforce. Quantifiable objectives include supporting remote sensing science instruction in K-12<sup>th</sup> grades to improve STEM education and to strengthen national science education standards and utilizing AV's academic university network to enable agile use. AV consortia have credibly demonstrated the ability to enrich the quality of instruction at the university and college level. The tools, materials and curricula enhancements, widely distributed and used at all educators' levels, contribute to the employability and effectiveness of current and future employees in the public and private sectors.

*Technology transfer.* AV seeks to embed remote sensing technologies and data, including some uniquely effective applications, through the targeted transfer of techniques, best practices, and data products to end users. Measurable objectives include data product and tool transfers from AV members to end users, such as providing data to first responders and delivering post-analysis maps to decision makers in communities facing emergencies; providing remote sensing data-based products in easily used formats to end users; working with public land managers in analyzing land status and change; and assisting private land owners/managers with information to assist in such areas as farm and ranch management, water availability and supply, and forest health.

*Outreach.* AV will continue its decade-long efforts to advance understanding, awareness, and use of remote sensing data and products throughout the United States and to familiarize individuals and groups with the agencies that produce that data. Impacting objectives include conducting annual educational outreach with local, state, and national decision makers; creating and posting displays in public venues and at community events; sponsoring a nationally endorsed and locally sponsored Earth Observation Day; assuring that prospective users know how to access Landsat and other readily available remote sensing sources; and including other sources and derived information throughout AV member states' geospatial consortia and within state data libraries.

## Metric Summary of AV's Accomplishments and Impact during Grant Year 2014

GY 2014, as the second period of the NLRSEORA grant, provided excellent progress towards achieving the grant's goals and workplan deliverables. AV maintains an online database, designed by GeorgiaView, to track metrics of progress, to facilitate StateViews' yearly proposal preparation and submittal, and to collect their semi-annual reports of progress in a templated format. To sustain reporting continuity with the previous five-year grant and work plans and each period of the current grant, the AV Portal bins the various activities into AV's established program areas: (1) Data Archive and Distribution, (2) Consortium Development and Outreach, (3) Research activities, and (4) Education. Quite clearly, an activity filed within one of these categories may actually address more than one of the NLRSEORA objectives, which will be clarified throughout the report. During GY 2014, StateViews reported progress on 236 activities aligned with those four program areas.

Realistically, as the number of AV member states grew, the funding share from the fairly consistent grant year value, which is distributed in equal sub-awards, was accordingly reduced. In the final period (GY 2012) of the previous award, at the suggestion of its USGS liaison, AV migrated from myriad small projects to the High Impact Activity (HIA) approach. During the current grant periods, StateViews have been encouraged to focus, during each performance period, on high impact activities that address one or more of the objectives. In several cases, these activities will be accomplished over multiple grant years with milestone achievements reported at the end of each grant year. This report and the accompanying Fact Sheets from each StateView reflect how effective the HIA focus has been on making a real difference at the local, state, regional, and national levels. One, however, should not diminish the importance of well-chosen smaller initiatives that address the four grant objectives.

The summary distribution of the efforts and a comparison with the prior grant year follows. In GY14, approximately 30 % of the activities completed were HIAs.

Activity Category	Completed Activities in GY13	Completed Activities in GY14
Consortium Development and Outreach	68	83
Education	56	67
Research	47	52
Data Archive and Distribution	35	34

AV's metrics for the quantitative impact of the approved activities for GY 2014, (for the period September 16, 2014 to June 30, 2015) follows:

## **For StateViews**

### **1. Contribution to AV Activities**

- Contribution to AV committees: 1,376 hours
- Contribution to AV Board of Directors: 690 hours
- Contribution to AV Outreach Activities: 97 educational visits to decision-makers

### **2. Web Statistics**

- SV Web visitors: 71,693 visitors
- SV Web page views: 220,921 page views
- Total remote sensing data archived in SV websites: 32,721 GB
- Remote sensing data newly added in this reporting period: 14,623 GB
  - IAView established an 11,800 GB 2000-2014 Landsat data state archive
- Remote sensing data downloaded: 6,480 GB
  - Landsat data downloaded: 331 GB
  - MODIS data downloaded: 453 GB
  - Orthophotos downloaded: 982 GB
  - Other remote sensing data downloaded: 4,714 GB

### **3. Education Statistics**

- K-12 students trained: 11,342 students
- K-12 minority students trained: 3,258 students
- K-12 teachers trained: 211 teachers
- Higher education students trained: 21,173 students
  - 1,173 students face-to-face
  - Estimated 20,000 via NHView webinars on YouTube
- Higher education faculty/staff trained: 223 faculty/staff
- Current workforce trained: 2,444 workforce personnel
  - 444 workforce personnel in person
  - Estimated 2,000 via NHView webinars on YouTube

### **4. Research Statistics**

- New remote sensing courses or programs started that resulted from AV partnerships/efforts: 4 courses or programs
- Presentations on AmericaView, StateView, or remote sensing : 51 presentations
- Attendees at presentations : 2,889 attendees
- Research papers published or accepted or submitted that reference AmericaView, USGS grant support, or a StateView's activities : 24 papers

## **For AmericaView.org**

AV website visitors: 8,289

AV website page views: 21,613

AV Blog page views : 16,884

## AmericaView Highlights in GY 2014

### Membership Changes

AV membership accounts for all changes when a new member is admitted or when any StateView PI position rotates from one individual to another or one lead university to another. AV adheres to a rigorous policy, carefully reviewing any proposed changes and directly engaging with the StateView, which has submitted a formal request, before the Board and voting members give approval.

- In December, 2014, Dr. Lindi Quackenbush, of State University of New York College of Environmental Science and Forestry, was approved as PI for **New YorkView**.
- In February, 2015, Lisa Wirth, of the University of Alaska Fairbanks, was approved as PI for **AlaskaView**, replacing Mr. Tom Heinrichs.
- In April, 2015, Dr. Rebecca Dodge was approved as PI for **Texas View**, replacing Mr. P. R. Blackwell. The realignment for the TXView consortium-lead university from Steven F. Austin State University to Midwestern State University was also approved.

In addition, the following StateViews secured advances in their membership or funding status:

- **ColoradoView** returned to Full Member funding, after a one year hiatus.
- **New York View** was advanced from an Associate to a Full Member.
- **New MexicoView** was advanced from an Associate to a Full Member.

### AV Staff

In June, 2015, Ms. Jeanie Congalton joined the AV Staff as a consultant to serve as the Conference Planner for the AmericaView national events, the Fall Technical Meeting and the Winter Business Meeting.

### Annual Meetings

AV, in each calendar year, expects to conduct two annual meetings, a Fall Technical Meeting (FTM) and a Winter Business Meeting (WBM). The FTM program is planned around technical presentations from both AV and invited speakers and includes several short workshops to allow attendees to learn more about new tools, techniques, or programs. The venue of the meeting alternates between the USGS Earth Resources Observation and Science (EROS) Center in Sioux Falls, SD, and one of the StateView universities. The WBM is held in late winter in Reston, Virginia. Typically, a day is spent in the USGS footprint to allow both formal presentations and informal exchanges between USGS scientists and AV principal investigators (PIs). Another day of the meeting allows for additional presentations, in-person Committee and Working Group meetings, and for an in-person business meeting of all members to elect new members to the Board, to encourage networking among all, to identify the possibility of collaborative activities, and to discuss plans for forthcoming years.

### **AV Fall Technical Meeting (FTM)**

AV's FTM was hosted by CaliforniaView at University of California-Davis California on October 20-21, 2014. A full agenda, including presentation, workshop, and poster abstracts is attached in Appendix D. Highlights included:

- Keynote presentation: "Sustaining Earth Observations: Continuing the Landsat Legacy" *Jennifer Lacey, Observing Systems Branch Chief (USGS EROS)*
  
- Member and guest presentations:
  - "Removal of Thin-cloud removal in Landsat 8 Imagery using Cirrus and QA Bands" *Yong Wang (North CarolinaView)*
  - "Outreach Tools" *Chris McGinty (UtahView)*
  - "The Future of Imaging Spectroscopy for Land Cover Mapping" *Susan Ustin (CalView)*
  - "The Matrix Arrived Late: Teaching Remote Sensing & Geospatial Technologies in a Virtual World" *Bradley Shellito & Teri Benko (OhioView)*
  - "Data Fusion Approaches to High-Resolution Land Cover Mapping" *Jarlath O'Neil-Dunne (VermontView)*
  - "Leveraging Social Media for StateView Outreach Activities" *Sam Batzli (WisconsinView) & Ramesh Sivanpillai (WyomingView)*
  - "UAS Research and Applications Panel Discussion" *Jim Campbell & John McGee (VirginiaView), Michael Wing (OregonView), JB Sharma (GeorgiaView), Leo Liu (UC Davis)*
  - "Resources for Landsat Workforce Development, Education and Citizen Science" *Jeannie Allen (NASA)*
  - "The Earth Observation Depot Network" *Sam Batzli (WisconsinView), P. R. Blackwell (TexasView), Nancy French (MichiganView), Martin Swany*
  - "The AmericaView Educational Resource Portal" *John McGee (VirginiaView)*
  - "Bringing Global Climate Change Education (GCCE) to Alabama Classrooms" *Chandana Mitra (AlabamaView)*
  
- Workshops:
  - "MapGive" *Kevin Dobbs (KansasView)*
  - "International Charter, Space and Major Disasters" *Brenda Jones (Disaster Response Coordinator, USGS EROS Center)*
  - "Use of R for Image Analysis (Parts I & II)" *Rick Lawrence (MontanaView)*
  - "Google Earth Engine" *Tyler Erickson (Google)*
  - "Object-based data fusion approaches to feature extraction using eCognition" *Jarlath O'Neil-Dunne (VermontView)*

- Networking Dinner with Discussions:
  - "Future Remote Sensing Needs, Summary from ASPRS 2014 & Update on Future Landsat Needs Survey" *Ramesh Sivanpillai (WyomingView)*
  - "National Plan for Civil Earth Observations Open Discussion" *Bobbi Lenczowski (AmericaView Executive Director)*
  
- Lunch Presentations:
  - "High School Drone Debate Project" *UC Davis Senior High School Students*
  - "Progress and Ideas on AmericaView Outreach Materials" *Mary O'Neill (South DakotaView) & Brent Yantis (LouisianaView)*

A field trip on October 22 allowed participants to discuss with Gallo Vineyards, the first known company in the U.S. beverage industry to use Landsat data in viticulture practices, their pioneering efforts for water management practice and their analytical observations about the impacts to water use in California.

### **AV Winter Business Meeting (WBM)**

AV's WBM was held in Reston, VA and Washington, DC on February 23-24, 2015. A full agenda, including poster abstracts is attached in Appendix E. Highlights for Monday included:

- USGS Briefings
  - Land Remote Sensing Program, Landsat 8 and Landsat Continuity,
  - Landsat Applications Survey,
  - Sustainable Land Imaging Architecture Study,
  - Support for Citizen Science efforts
  
- Overview of AmericaView and its accomplishments
  
- Poster session with invitation to USGS/Reston Staff
  
- Lunch Conference Call Discussion: Overview of the U.S. Department of the Interior (DOI) Climate Science Centers and Update on Pilot Project Involving Seven StateViews Collaborating with the North Central Climate Science Center
  
- Technical discussions between USGS staff and AV StateViews
  - Advancing AmericaView's Educational efforts. *Ginger Butcher, NASA Landsat Communications and Public Engagement, SSA.*
  - Supporting Citizen Science efforts. *Susan Aragon-Long, U.S. Global Change Research Program (invited)*
  - Strengthening AV's Outreach Efforts. *Chris Trent, Public Affairs, USGS*
  - Advancing AmericaView's efforts with UAS. *Presentations by Jacqueline R Jackson, Manager, Tactical Operations Section, FAA; Mark Jordan, JMA Solutions, supporting*

*Unmanned Aircraft Systems Integration Office, University/College Liaison for FAA; Bruce Quirk, (UAS Liaison, USGS); Jim Campbell (VAView, AV UAS Working Group Chair)*

- Connecting AV capabilities with partners and collaborators in the USGS Science Mission areas to enable research and applications that leverage similar interests, resources, technologies, and expertise. Overview of current Land Remote Sensing Program science projects *Greg Snyder, Commercial Satellite Imagery Coordinator, USGS National Mapping Division*; Overview of Research Projects by AV; Land Cover, ECVs and Phenology; *John Jones, Research Geographer, Eastern Geographic Science Center*; Nutrients, land cover, agriculture, water *Dean Hively*; Chesapeake Bay water / land cover issues *Peter Claggett*;
- Overview of iGETT and GeoTech programs with discussion of beneficial collaborations within mutual areas of interest, including AV's desires to improve community college geospatial educational support and to serve veterans' geospatial education and training needs. *Osa Brand, Director of Project Development, National Council for Geographic Education*; *Mike Krimmer, GeoTech Center*; *Tom Mueller (PAView)*
- Update on Landsat 8 applications. Webex with *Tom Loveland Senior Scientist, EROS Center*

The Tuesday highlights included:

- AV Business Sessions:
  - Committee Meetings and Reports
  - Discussion to Identify of strategic partnerships that AV wants to create/cultivate, including with NASA, CSCs, professional organizations
  - Working Lunch – Discussion on formation of AmericaView Water Quality Working Group
  - Board and Officer Elections
- Special Presentations and Discussions:
  - The National Plan for Civil Earth Observations and U.S. Group on Earth Observations (Presentations, followed by panel session and Q&A)
  - Congressional Educational Outreach: Guidelines and Rules Surrounding Effort, AV's Message and Key Points

The remaining time in the DC area during that week included the Congressional educational visits conducted by the StateViews with the offices of their Senators and Representatives. On Thursday, the AV Board and the USGS AV Grant's liaison met with NASA Goddard leadership to examine opportunities for collaborative educational and outreach efforts surrounding the Landsat program.

## AV Member Teleconference Presentations:

During the monthly Member meeting, often a StateView PI, an associate, or an invited speaker was requested to make a presentation to those attending. Description of three presentations with immediate impact to members and their own StateView work included:

- In April, 2015, Sam Batzli (WisconsinView) and Ezra Kissel (Indiana University) provided a demonstration for pulling data from the Earth Observation Data Network (EODN) to populate a Real Earth Data application. Sam explained that RealEarth is a system for preparing and displaying satellite imagery and related data products in common interfaces. It permits juxtaposition of historical and real-time imagery, time series animation, atmospheric and terrestrial raster and vector data. Any data that can be mapped can be displayed by RealEarth. What makes RealEarth powerful is the simplicity with which new data products can be added, its scalability, and its support of familiar mapping interfaces that allow users to view a wide variety data on desktop or mobile devices. P.R. Blackwell provided additional information about EODN being selected at the GENI Conference for a demonstration to the Director of NSF.
- In May, 2015, Dr. Jan Eitel (IdahoView) made a presentation on the various projects that Idaho supports, emphasizing the Landsat Image Service Project (LISA). Two key objectives are to improve remote sensing products and to use those products to improve K-12 STEM learning.
- In June, 2015 Dr. Michael Coughenour (ColoradoView) and George Jansen, from the UV-B Monitoring Network, provided some insights into their program. High energy ultraviolet solar radiation can significantly damage plants, crops, animals, and ecosystems, alone or in combination with other environmental stress factors such as temperature and moisture. To address these concerns, in 1992 the USDA established the UV-B Monitoring and Research Program at Colorado State University to provide cost-effective monitoring of UV-B levels over wide geographic areas of the United States.

## Research Efforts

AV's research efforts occur at both the StateView level, under several High Impact Activities (HIA), as well as at the national level, as captured in the work of the Working Groups.

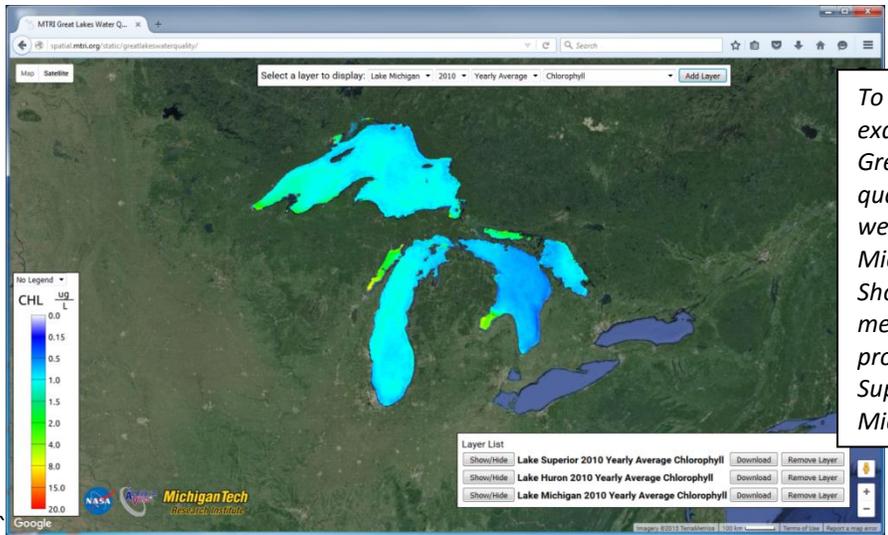
Two small grants from other sources actually provided data, procedures, and analysis that have been of immediate value to this USGS grant. They were exemplars of the AmericaView efforts to leverage other efforts to effect the success of the NLRSEORA objectives.

- AmericaView proposed in June 2013 to help “connect phenology with multi-scale satellite imagery, including Landsat and MODIS, and meteorological observations to better understand the phenology-climate connection.” (*Monitoring Phenology in the North Central Region of the U.S.*, June 2013) That proposal resulted in funding from US Department of Interior, North Central Climate Science Center that resulted in the installation of the cameras, collection of data, and graduate study research in both North Dakota and Nebraska that did comparisons of this close-range collection to Landsat signatures. In early 2015, IowaView joined KansasView, MontanaView, NebraskaView, North Dakota View, and South DakotaView as a sub-grant participant. The phenology data collected from those StateViews as well as others was accessible from the Phenology Network by all StateViews providing some locally referenced information to be included in other StateView vegetation health and growth research activities for this grant.  
 cf. <http://phenocam.sr.unh.edu/webcam/sites/<sitename>>
- In addition, another activity not funded by this award, but of leveraging value to this award was the Harmful Algae Bloom project, under a NASA GRC Award to AmericaView (AV) from November 14, 2014 through May 14, 2015. While in progress, a presentation on this project was presented to AmericaView’s StateView membership in February of 2015. This generated high interest from eighteen states. Several states identified the need for an AV Water Quality/Quantity/ Utility Working Group, given how many states already have separate NLRSEORA activities on water issues. Other members within StateView consortia also wanted to be involved and attended the initial working group teleconference. During that time, an objective was defined for the working group. “AmericaView’s Water Quality/Quantity/Utility Working Group intends to work collaboratively with Federal, State and Industry partners to develop the technical framework needed to enable acquisition, analytics and management of data critical to the development of new standards, processes and measurement techniques supporting assessment and resolution of water quality issues.”

During the NCE of this NLRSEORA grant period, four mini-sub-grants were competitively awarded to MinnesotaView, OhioView, MichiganView, and OklahomaView that advanced the Water Quality/Quantity/Utility Working Group.

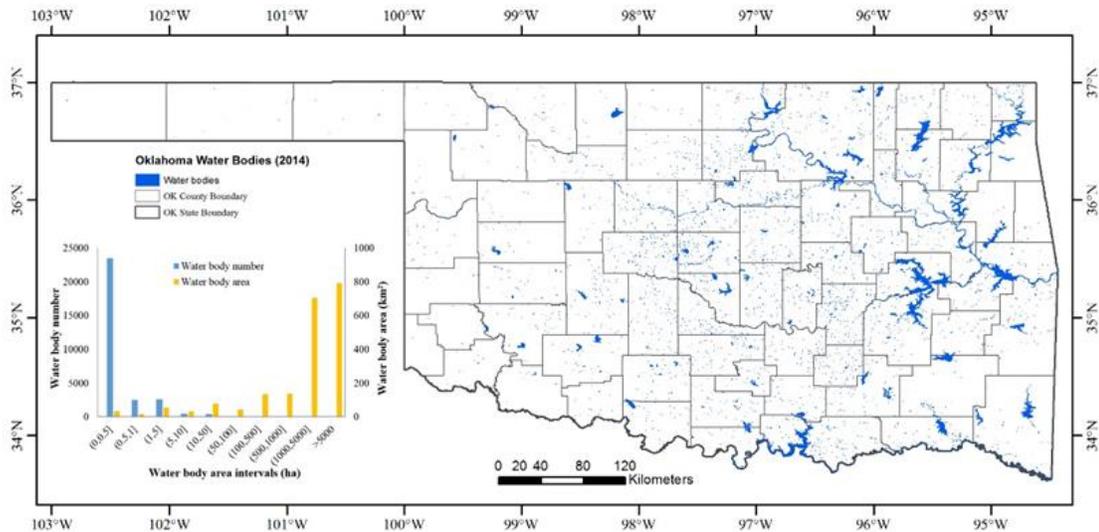
- MinnesotaView delivered a temporal series of water quality maps for Landsat paths 27 and 28, which were posted on the RSGAL website ([portal.gis.umn.edu](http://portal.gis.umn.edu)) as well as the [water.umn.edu](http://water.umn.edu). Minnesota Pollution Control Agency is a key user of these data. In addition, the team members developed and evaluated an initial image processing protocol for normalizing multiple images for classification of water quality. MVView’s intended objective: “Once robust water quality models are developed for an area, they can be applied to any similarly radiometrically corrected images. This should allow for historic images without water quality data to be used for water quality maps and could be applied to recently acquired imagery.”

- Leveraging the analytical work done during the algae bloom project for the NASA grant focused on Lake Erie, OhioView used its mini-grant to extend their studies for monitoring and modeling water quality and harmful algal blooms in the inland waters in Southern Ohio Region with remote sensing and in situ observations. In a summary statement, the principal investigator wrote: “The knowledge and techniques derived from this project will help research scientists, water resource planners and managers, state and local officials, and local communities to detect cyanotoxins, to track the fate of these toxins in the lakes and rivers, and to design intelligent policies and best management practices to prevent, control, and mitigate the occurrence of nuisance HABs.”
- MichiganView proposed to further develop remote sensing derived Great Lakes water quality products and present them in GIS-consumable format like GeoTIFF. In addition, they built an outreach webpage to facilitate better understanding of aquatic ecosystem dynamics. The new webpage is accessible through the MichiganView web portal at: <http://michiganview.org:8090/display/MV/Interactive+Maps>  
 The webpage is also hosted at MTRI and can be accessed at: <http://spatial.mtri.org/static/greatlakeswaterquality/>.



*To the left is an example of the new Great Lakes water quality product webpage created by MichiganView. Shown are annual mean chlorophyll a products for Lakes Superior, Huron, and Michigan.*

- OklahomaView directed its mini-grant funding to deliver a statewide map of open surface water bodies in Oklahoma at 30-m spatial resolution. Existing datasets from USGS surveys of water usage, done every five years, and from the Oklahoma Water Resource Board’s annual report have previously only been in the format of statistical data. That hindered the water resource management and use in the state. This new annual map product, with a high overall accuracy of 98.3%, of open surface water bodies in Oklahoma at 30-m spatial resolution in 2014, was derived using the statistical data and Landsat images from 2014. These water body maps will provide support for water resource management, crop and livestock production, and biodiversity conservation in Oklahoma.



Oklahoma open surface water body distribution in 2014

The Unmanned Aerial Systems (UAS) Working Group was also inaugurated during Grant Period 2. (More detail follows in the Workplan discussion in Section III.) Shortly following the FTM UAS session at UC-Davis, nineteen individuals - including Bruce Quirk, at that time recently named USGS' UAS liaison - established the initial call list for teleconferencing.

At the WBM in February 2015, the WG sponsored an afternoon discussion that included invited speakers from the FAA (*Jacqueline R Jackson, Manager, Tactical Operations Section, FAA; Mark Jordan, JMA Solutions, supporting Unmanned Aircraft Systems Integration Office*) to discuss emerging regulations. Dr. Campbell, AV UAS Working Group chair, accepted the invitation to the USGS/DOI UAS Workshop, 19-21 May, USGS, Reston. He found of specific importance to AV the discussions of developing policies and practices concerning DOI UAS operations that will influence future AV work with remote sensing in areas of coastal geomorphology, debris slides, wildlife monitoring, and glaciers. By the end of Period 2, at least twenty StateViews were engaged in some UAS efforts. Several have UAS Test Site programs. One example of StateView collaboration with this emerging remote sensing capability was the following summary of a story that received the outside attention of the ASPRS Western Great Lakes Region blog.

<http://wgl.asprs.org/2015/01/january-8-9-2015-frozen-uas-tour-blows-grand-forks-north-dakota/>

➤ Frozen UAS 2015 Tour! January 8-9, 2015, Grand Forks, ND



North DakotaView presentation

The ASPRS Western Great Lakes Region hosted and North DakotaView, MinnesotaView, and South DakotaView sponsored in part the "Frozen UAS 2015 Tour." This was a special tour of the University of North Dakota Aerospace UAS program, the Customs Border Patrol UAS Air Operations including Predators, and the USAF 348th Recon Squadron flying Global Hawks. From the micro to

the macro of UAS systems, participants got a chance to see in one location a variety of the latest unmanned aerial systems.

In Periods 3 and 4 of this USGS grant, the actively-involved StateViews will examine what steps AV can take to link the complementarity between satellite and UAS data to strengthen analysis.

The Landsat Working Group continued its work under the AV Research Committee. Its chair held regular meetings for member participants, shared all the on-going updates for the Landsat system, and interfaced with external experts. More information is provided later in this report in the assessment of progress against the workplan.

### Outreach Efforts

Whether at the national or state level, AmericaView's website and printed materials should leave a positive, professional message, project a consistent image, and be current. In GY14, the then- new Executive Director polled members of the Outreach Committee and others about their use, impression, and recommendations for the AV web pages. That material became part of program plan for the Outreach Committee and was shared during the Fall Technical Meeting for GY14 in the agenda shown above. In addition, consideration of templates for fact sheets and slide presentations, as well as discussion about a brochure, addressed the "Outreach" part of Objective 4.

#### Web Site Revisions

AV's Program Director, Debbie Deagen had initiated the first phase of improvement, described in the GY13 Technical Report, using the Blacksburg Electronic Village and VirginiaView's technical assistance.

The second phase, to be accomplished by Sam Batzli (WisconsinView), will redesign the appearance and incorporate elements consistent with the other outreach materials. Word Press tools will be used to build the website, which will facilitate maintenance for accuracy and currency. AV expects to then have a more inviting appearance, an easily synchronized calendar, and easier navigation for all visitors.

#### AV Brochure, Power Point and Fact Sheet Templates

Having a consistent professional look to presentations and fact sheets requires templates which ease the burden of preparing the documents on a variety of operating systems, and tie AV's outreach pieces together via similar "branding".

Under Mary O'Neill's leadership, the AV Outreach Committee finished efforts to design, format, and select content for an AV brochure that members and staff can use during informational visits. This brochure was designed and assembled by students of the University of Louisiana at the Lafayette Regional Application Center, under the direction and support of the LouisianaView

consortium (Brent Yantis is the PI). This eight-page brochure can be downloaded at the <http://americaview.org/> homepage, and is customizable (when desired) with the name of the StateView conducting the visit. The inside back page of the brochure has a pocket for insertion of business cards and StateView fact sheets.

LouisianaView also accepted the challenge to help design a one-page flyer that could be more cost-effectively used for conferences and meetings and advance the message about the value of Landsat remote sensing. After discussion, it was decided that the flyer would become a tri-fold that would coordinate well with the larger brochure. It is expected that this will be available for use in the coming grant period.

During GY14, two formats were tested for use with PowerPoint presentations. The simpler version, with the AV logo and minimal background distraction, was recommended.

For the first time, the StateViews were provided with a template to standardize the look of the factsheets. A color scheme was chosen and guidelines for the placement of descriptions and images or charts were distributed. The process was not flawless but established an approach that will be refined in the coming grant period. Both LouisianaView and UtahView contributed to this outreach improvement effort.

## Educational Efforts

### *Earth Observation Day*

In GY 2014, Earth Observation Day (EOD) had an event in spring 2015. Appendix C contains the report from the participating StateViews. Planning began for a fall 2015 inaugural activity in conjunction with the American Geosciences Institute's (AGI) *Earth Science Week* <http://www.earthsciweek.org/about-esw>, following a membership decision to leverage a well-publicized and acclaimed annual event, which will eventually expand our reach to an estimated 16,000 participants.

In spring, twelve StateViews (CalView, GeorgiaView, IdahoView, IndianaView, KentuckyView, New MexicoView, OhioView, PennsylvaniaView, TexasView, VermontView, VirginiaView and WyomingView) participated in EOD efforts reaching 63 teachers, 759 students, and 65 members of the public.



*IdahoView K-12 students and instructors engaged in field work during a remote sensing class*

Another of AV's GY14 mini-grant awards was competitively awarded to AlabamaView and reflects the AV interest in better understanding the impact of its education efforts that outreach

to the K-16 STEM programs. The AlabamaView proposal delivered a survey tool, using inquiry-evaluation techniques (partially developed under an NSF grant for Alabama elementary and middle schools) to access the value and impact of all AV programs focused on education and outreach. The input from GY14 EOD efforts will be the initial test data. EOD StateViews will be completing the questionnaire.

#### *Development of Materials for Community College Training*

MichiganView developed training materials on the fundamentals and exploitation of synthetic aperture radar (SAR) for both two-year Associate degree programs or for introductory coursework in a four-year program. In particular, this effort was directed toward the effort on the GeoTech Center's Model Curriculum, to include specific Veterans' training programs focused on those transitioning from the military to civilian workplace. Deliverables included electronic copies of PowerPoint lecture aids and zipped folders of lab tutorials and required lab data files. These will be evaluated by TexasView and by the GeoTech Center during GY15.

#### Selecting, Downloading, Displaying, and Understanding Landsat Imagery - Webinar

This webinar was directed to educators, who wish to introduce remote sensing courses but may not have access to specialized remote sensing software packages. The expectation is that this introduction, which included how to search and download Landsat Imagery with GloVis and Earth Explorer using ArcGIS Desktop, assisted the integration of relatively inexpensive remote sensing software and free public data to support decision making at local, regional, state, and federal levels.

VirginiaView\_ (*Tammy Parece, Jim Campbell, and John McGee*) and [Map@syst](#) in partnership with the Virginia Geospatial Extension Program presented this webinar on June 3, 2015. A recording and additional information about the Webinar is available here: <https://learn.extension.org/events/1871#.VUpzWJPd2kk>.

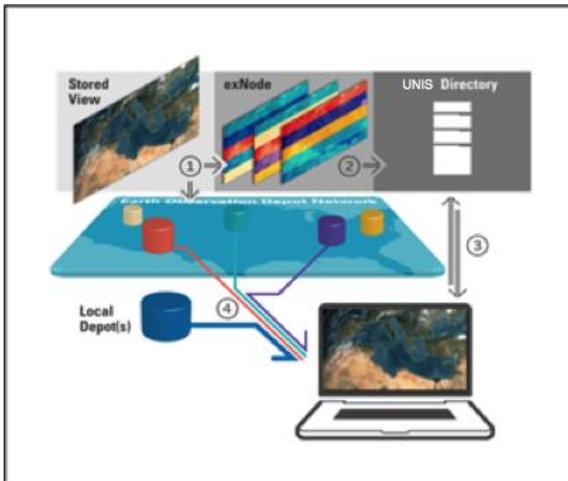
### Technology Efforts

#### *Earth Observation Depot Network (EODN)*

During GY14, AV elevated the EODN project from being supported within the TexasView sub-grant to a national-level effort. The purpose of EODN is to enhance timely access to large remote sensing datasets using the technology developed under the NSF-funded Data Logistics Toolkit (DLT) project. EODN consists of a network of distributed DLT servers, referred to as "Depots" which use advanced "data logistics" to replicate and position data close (in terms of network access) to locations where they are needed. Depots are hosted by AV members in Indiana, Iowa, Michigan, Texas, and Wisconsin on AV-funded servers, within a larger network of

storage resources. EODN enhances AmericaView’s visibility within the larger research community by enabling faster and more robust delivery of data products to everyone, and especially those in areas with poor connectivity or localities experiencing crises. Additional funding will be required to appropriately expand a fully-functional and nationally-extensible system. MichiganView, TexasView and WisconsinView participated as Co-PIs with DLT principles in three major proposal efforts during GY2014, responding to NASA AIST, NSF CC-DNI and NSF SI2-SSI solicitations. An EODN Workshop during the 2014 AmericaView Fall Technical Meeting focused on installing the DLT and maintaining depots. In October 2014, AmericaView help organize an EODN All-Hands meeting at Indiana University attended by AmericaView members as well as DLT developers and PIs from Indiana University, Vanderbilt and the University of Tennessee. In spring, 2015, the joint AV EODN and DLT team submitted a response to the USGS Request for Information (RFI), for EROS Enterprise Architecture Study (EAST). A subsequent teleconference occurred but no RFP was released during GY14. The following is a graphic representation and text explanation of the functionality described in that RFI.

The basic steps in distributing data via EODN follow:



- 1) A remote sensing image/view is uploaded to EODN depots and the metadata that shows how the data is written to the infrastructure (e.g., striped and/or replicated across it) is encoded in an exNode;
- 2) The exNode is registered with the Unified Information Service (UNIS). The Intelligent Data Movement Service (IDMS) performs further policy-driven replication and/or data movement and updates the exNode, insuring data integrity and accessibility;
- 3) Data can be access through a suitable client (e.g., GloVis, Earth Explorer), or an automated process. When a scene is

selected for download, the client software retrieves the corresponding exNode from UNIS and;

- 4) Initiates a multi-threaded (BitTorrent like) download from EODN, pulling segments from the “closest”, depots. If a copy has been localized to a depot in the user's LAN, most or all of the data is likely to come from that replicate. The result is faster, more scalable and reliable access to data.

## Strengths of the Working Relationships within this Program

As reported previously, each year the strength of the consortium and the extent of the positive impact by each StateView improves. Adding two new working groups during Period 2 underscores the collaborative attitude of the members who readily understand and accept the value proposition of the NLRSEORA grant. This report has referenced increased leveraging of related efforts that have funding from a variety of other sources. The return on the investment of the very small sub-grants to each of

these PIs is dependent upon their ability to attract other members of their StateView consortia, to draw forth the talent and effort of collaborative partners, and to articulate the impact they have on their community, their Nation, their Earth.

During this period the support from the USGS liaison, Ms. Sally Cook has been excellent from providing guidance on the program, to sharing updates on the Landsat systems, to sending valued reference material to our listserv of members, and to coordinating the details of our WBM at USGS/Reston. Mr. Tom Cecere, the previous liaison, has not only sustained his involvement with AV but has kept us informed on the status of future free access to the Sentinel data through EROS.

### **Challenges with this Program**

Quoting last year's report, "The strength of the consortium also presents the greatest challenge." StateViews are energized to accomplish even more than already delivered. The quick response to the Board's call for mini-grant proposals is tangible evidence. Among the most pressing issues noted by StateViews is a lack of resources to improve the state consortia, with more participants and more activity. At the AV national level, insufficient funding restricts expanding to states without AV alignment.

### **III. More Detailed Progress Report towards Completion of Four Grant Objectives and Numerical Summaries and Benefits of StateView Activities**

*Italicized text* is found at the beginning of each of the following four grant Objective sections to capture wording for both the *four grant objectives* and the *work plan* proposed for NLRSEORA by AV and funded by the USGS. For the grant year covered by this report, each objective is presented in three sections. First, a bulleted summary, in plain font, details the progress that AV at the national level (board, staff, committees, collaborative SV activities) has made towards that objective. [In contrast to the previous Period 1 report on the workplan, references to the final year of the proposal (Period 5 or GY17) are removed because, per USGS direction, that period will not be funded under this current grant. In addition, each workplan has been revised, where appropriate, to identify any proposed tasks that will not be completed given the elimination of one grant period. Next, a numerical summary of StateView efforts toward the grant Objective completion is provided, and finally, each sub-section concludes with a summary of the benefits that accrue to completion of the grant objective.

#### **Objective 1 – Nationwide Remote Sensing Data and Information Requirements**

*AV will seek to improve the nation's capabilities and resources in land remote sensing to meet the needs of users both within its member states and nationally. This will be accomplished through AV's national and state consortia, which will continue to collect information on the ability of existing remote sensing*

*data products to meet the needs of its user constituencies (including academic, scientific, and end user communities), assemble this information at the national level into a consolidated format, and communicate that information to data providers, as appropriate.*

### *Workplan for AV National-StateView Partner Initiatives for Data and Information Requirements*

*GY 2013-16: AV will strengthen two-way communication with its ~300 current StateView members and partners (including through its online portal) and also establish communication with new end users of Landsat and other USGS data and products in its member states.*

*(Although this element was originally identified only for the first period, AV believes it extends throughout the entire grant.)*

- On an annual basis, StateView PIs are asked to review the online AV portal and to correct or enter the most current name and contact information for all of its SV members.
- Throughout the grant year, at least monthly communications from Sally Cook, USGS/AV Liaison, included valuable information regarding USGS data and products. Those were forwarded to AV StateViews by AV staff or by Ms. Cook.

*GY 2013-16: AV will solicit prompt responses to requests received from the USGS and its contractors regarding data needs of AV's members, partners, and stakeholders and will consolidate and communicate responses to the USGS.*

- In GY 2013, Dr. Ramesh Sivanpillai, to support a request from USGS LRS to AV, prepared and distributed a five question "Landsat Future Needs" survey for all. During GY14, he and the AV Board chair, Dr. Russell Congalton completed a survey summary and analysis article to be printed in the ASPRS PE&RS journal in GY 15. In addition, Dr. Sivanpillai briefed the WBM attendees on the survey results during a technical session, which also included Tim Stryker, Director, U.S. Group on Earth Observations program, White House Office of Science and Technology Policy (OSTP) and Greg Snyder, Lead, Earth Observation Requirements, Land Remote Sensing Program, USGS, who offered a related discussion concerning the "Update on the National Plan for Earth Observing Satellites including Second Iteration of Requirements Gathering."
- In June, 2015, the Landsat Advisory Group began to discuss a survey approach to gather requirements for Landsat 10 and beyond from non-federal users of Landsat. This aligns with the second cycle iteration for the National Plan for Civil Earth Observations. AV's representative to that group, the Executive Director, agreed to help with the design of the questions, to invite AV members to respond to the LAG survey request – as part of a more diverse group of respondents - rather than conduct a separate survey, and to help

with the analysis and report, planned to go to the National Geospatial Analysis Committee (NGAC) during AV's GY15 period.

- During March, 2015, AV received an urgent information request from our USGS liaison and Tim Stryker, the Director of the USGEO program of the National Science and Technology Council, requesting information about the benefits of remote sensing to the state of Michigan, underscoring some of the state's data needs.
- In May, 2015, AV was encouraged to nominate a qualified individual to be a member of the 2017 NRC Decadal Survey funded by NASA, NOAA, and USGS. The selected experts will develop consensus recommendations on an integrated approach for future NASA Earth Science missions from 2017 to 2027. Dr. Nancy French, MichiganView, was identified to represent AV interests.

*GY 2013-16: AV will explore the development of a brief and simple StateView partner survey that could be hosted or linked on the AV website. This survey would collect and aggregate the results of the state's remote sensing product needs by state and would be promoted on each StateView's website and listserv. The survey would be developed by 6/30/2014 and implemented by 12/31/2014. Preliminary results would be summarized by 6/30/2015. The survey would be repeated for 6/30/2016-6/30/2017 (because needs change). The results of each survey will be made available online to serve as a continuous benchmark for the development of remote sensing resources and services within the StateView and national consortia. These results will also drive the development of a preliminary nation-wide catalog of StateView imagery assets, which will, in turn, be tied to benchmarks and service enhancement goals.*

- In GY14, AV launched an update of its website (link to discussion elsewhere). Dr. Samuel Batzli (WisconsinView PI and lead on current AV website upgrade) evaluated that setting up a SV/AV website survey would be technically challenging and beyond the scope of the current website update project. For the remainder of this grant period, AV will focus on expanding the contacts within its AV portal to include state, local and regional decision-makers, resource managers, planners, and other USGS data users. As an outcome, more remote sensing data and product end-users will be identified in each state, which will increase the base from which to conduct future survey efforts. Upon reflection, AV assesses this to be a more robust direct approach to query for needs than would be only a passive web-based survey dependent on web visitation.

### Development of the AV Consortium

AmericaView has been steadily developing its national consortium since 2002. This expansion enables AV to better understand and serve the remote sensing needs of the residents in the states

that it serves. Encouraged growth of the national consortium and state consortia strengthened AV's networking, remote sensing expertise, and knowledge sharing collaboration. In GY14, AmericaView added no additional new members, although Affiliates CTView, RIView and OKView were determined, during the Board meeting at the WBM, to be considered eligible to submit a GY15 Request for Assistance (RFA), as a Full Member. If they are successful passing through the review process, they will become Full Members in GY15. As of June 30, 2015, AmericaView had 40 StateView members: 34 Full Members and six Affiliates. Two Full members, AlaskaView and MarylandView, did not submit a Request for Continuing Assistance (RCA) due to their desire to change Principal Investigators and management structures within their StateViews. See Appendix A for a listing of all StateViews, SV website URLs, and Principal Investigators.

In Period 2, AV added a GotoMeeting license to improve its teleconferenced Board, Members, Committees, Working Groups and Staff meetings. Not only did AV reduce its communications costs by eliminating a toll-free conference number but it improved the quality of the meetings as people became more adept with the technology. AV continued to enjoy excellent attendance at all its meetings. Winter storms, however, impacted attendance at the February 2015 WBM. Typically nearly every StateView has one or two representatives at the WBM. In February 2015, several individuals found themselves without timely flight access to DC. Despite the weather, however, many decided to arrive late rather than not at all. All Full Members are expected at the annual Winter Business Meeting and almost 75% of StateView members regularly attend optional monthly membership telecons. Standing university teaching responsibilities affect this percentage. Presentations at the Fall Technical Meeting, the Winter Business Meeting and the monthly teleconferences in GY2014 were volunteered to openly share products and expertise. That transparency makes national consortium membership most desirable as evidenced by inquiries from non-member states, like Delaware, Arizona, Florida, and South Carolina. During the grant year AmericaView members contributed more than 1,300 hours to committee work to strengthen national collaborative endeavors and to share remote sensing information and knowledge. StateView PIs volunteered, at national, regional, state, and local levels, to give presentations, lead panels, and provide advice; these were all well-received efforts that enhanced the effectiveness of the consortium.

In addition to the host institution in each member state, each state has created state consortia totaling more than 300 members across the United States. Host institutions pass on pertinent information from the USGS to their state consortium members, and send requests for data delivery or products to the USGS. A number of state consortia assist with activities such as organizing geospatial awareness days in their states or meet regularly to share information regarding education and research activities in their states. Examples of these were the OhioGIS Conference in September 2014, the Kentucky GeoED '15 in June 2015, and the Louisiana Remote Sensing and GIS Conference conducted each spring.

## Numerical Summaries of AV's StateView's Consortium Building Activities

As a national organization, AV works aggressively to sustain and strengthen the national consortium. The effort, however, extends well beyond that centralized approach. In GY 2014, StateViews engaged in 40 activities, specifically intended to strengthen StateView consortia, renewing and expanding professional connections throughout their states through activities such as:

- Purchasing shareable software licenses for use by state consortium members (3 activities, by MS, OH, WV)
- Training faculty members among consortia members and within their own institution (2 activities by AR, ND)
- Promoting opportunities for collaborative research among consortia members (2 activities by AR, ND)
- Strengthening StateView consortia through mechanisms such as MOUs or hiring a StateView coordinator (1 activity by CA)
- Improving and maintaining in-state remote sensing capacity through regular conference calls and conferences (StateViews doubled their efforts in GY14 over GY13 with 25 activities by AL, AR, CA, CO, CT, ID, IN, IA, KS, KY, LA, MI, MS, MT, NE, NH, NY, OH, SD, TX, VA, VT, WV, WI, and WY.)
- Partnering with other institutions that sponsor training (e.g., Space Grant, Extension agents, insurance companies, 4H, etc.) (1 activities by AR)
- Contributing to statewide geographic data committee efforts (6 activities by KS, MN, NE, NM, RI, VT)

## Benefits of Activities

The collaborative interaction, between the AV national and solidly established SV consortia, augments the impact of multiple other NLRSEORA grant activities and enables articulation of information needs that rely upon remote sensing data access and use. Sharing software and other geospatial use licenses have helped decrease course costs and resulted in more courses offered at partner institutions. Training activities, be they formal or informal, increased the number of faculty who are familiar with and capable of using remote sensing in their disciplines. In addition, the “train the trainers” approach proliferated efforts in university education programs to prepare future teachers and encourage appreciation of remote sensing science and technology. Collaborative research leveraged other research funding to augment NLRSEORA resources, involved other SV and peer professionals, and, consequently, broadened the scope and effectiveness of the AV consortium’s research endeavors. Collaborative programs also fostered new research opportunities as consortium members discussed their specific applications that stimulated thought about other possible applications. Regular communication between and within StateViews has resulted in improved consortium activity on both the NLRSEORA and other grants. An example of the improved remote sensing knowledge exchange has been eagerness of StateViews to provide webinars and workshops for other AV consortium members. Those successful exchanges have a waterfall effect

within StateView consortia. Similarly, partnerships with state and local government groups encouraged leveraged resources and extended the effectiveness of the state consortia. Participation in statewide geographic data committees has strengthened geospatial capacity at the state level and brought state-wide organizations up-to-date on remote sensing activities occurring in neighboring states and at the national level. In some instances, the work of the StateView introduced decision-makers to remote sensing as a tool for applications such as urban planning or environmental assessment.

## **Objective 2 – Remote Sensing Applications**

*AV will expand new and existing remote sensing applications nationwide through its distributed national network. Research and development of new technologies will be directed through AV's state-based university consortia, while expansion of the use of these technologies will occur through a targeted combination of education, training, and outreach activities with AV's many partners.*

### AV National Workplan– Support for Research Efforts

*The AV Research Committee will identify tools that will facilitate keeping the consortium's research efforts relevant and timely for AV's member states and creating opportunities to share information and opportunities to share information and techniques within and between state-based consortia.*

- AV conducted an annual Technical Meeting in GY14, which was hosted by CaliforniaView at the University of California Davis. In GY13, the contract was not in place soon enough for this annual event but it is anticipated again for GY15 and GY16.
- AV also maintains a segment on the monthly AV all-member teleconference agenda for StateViews to share concise summaries of recent remote sensing activities (e.g., a refereed journal article, book chapter, online spatial decision support system, work in progress, etc.). Some months feature specific topics to elicit others' interest. Specific topics in April, May and June were described above.
- StateViews are also encouraged to arrange a webinar presentation on specific topics if they choose or have requests. As noted above, VermontView provided such an event in this grant period.

*GY 2014: Share in situ and ancillary reference datasets via the AV website at:*

*(<http://www.americaview.org/geospatial-data-resources-accuracy-assessment-0>).*

- An accuracy assessment resource page (for training data) was created by AV's Research Committee in prior grant years and was posted to AV's web site. This link was for internal AV member use.

*GY 2014: Begin to establish an AV-wide research group library (e.g., using George Mason University's Zotero project as a model) that allows us to highlight AV participants' remote sensing publications; a specific subset collection will include and properly acknowledge those publications that were partially or fully supported by USGS. Provide consistent links to the research group library from the various state-based and national web pages in order to raise the visibility of AV and the USGS-supported program.*

USGS research acknowledgement guidelines were developed and distributed to AV PIs in GY14. Research publication information, for articles funded at least in part by AV sub-wards, were collected in December 2014 via the online AV portal DB. A summary of AV publications extracted from the AV portal for GY14 can be found at Appendix G. In GY 2014, there were 24 publications and 59 presentations listed. A brief summary of two of those publications follows:

- In GY14 Dr. Seong published a research paper, titled "Sun Position Calculator (SPC) for Landsat Imagery with Geodetic Latitudes" at Computers & Geosciences 85 (2015) pp. 68-74. The application can be downloaded through a link to AV University found at: <http://avuniv.org/download>.
- ACMAC is an AmericaView project completed in GY13 by Dr. Rick Lawrence of MontanaView. The purpose of ACMAC is to provide the tools and infrastructure to conduct rigorous comparisons of classification algorithms. ACMAC is implemented in the R statistical programming language. Two tools are provided by ACMAC to support classification algorithm comparisons: (1) a collection of 30 datasets, each including separate training and validation data, in a series of comma-delimited (csv) files and (2) sample R code for automatically analyzing the 30 dataset collection (or other user provided datasets) using Random Forest (the Random Forest algorithm can readily be replaced with most other classification algorithms available in R). In GY14, the work was published. A zip file containing these ACMAC tools and datasets was posted and can be downloaded through this link: <http://www.americaview.org/research.html>

*GY 2014-16: Develop action plans for addressing tractable state needs. StateView PIs will first be asked to develop prioritized lists of remote sensing product and research needs in their state; the AV Research Committee will then organize breakout sessions at the FTM and WBM that group StateViews according to prioritized needs in their respective states. Each multi-StateView group will highlight the most important tractable state needs and identify actions that the PIs participating in the group can carry out with existing and/or potential funds.*

- During GY14, AV leaders were involved with research efforts focused on sensors and research topic that benefit or have the interest of multiple StateView groups.

- **AV's Landsat Working Group (LWG)** led by the AV representation on the Landsat Science Team (LST) has the potential to vet, assist, and inform AV research efforts based on state needs. The LWG focused on providing input to USGS about both high level and low level Landsat-based products that are of particular importance at the state (government, private, and research) levels. Input was communicated primarily through the AmericaView representative (Dr. Rick Lawrence, MontanaView PI) to the LST and was communicated directly during the February 2015 meeting at NASA Goddard and July 2015 meeting at EROS Center. With respect to the LST meetings, Dr. Lawrence also provided an update on AmericaView activities at the July 2015 meeting and daily briefed AmericaView membership during both meetings so that the states would be apprised of the latest developments regarding the Landsat program. In addition, in October 2014, numerous members of the LWG provided input to EROS on terminology used by GloVis and EarthExplorer for quick look images.
  
- **AV's new UAS Working Group** led by Dr. James Campbell (Virginia View PI) has been assisting StateViews in utilization of this new emerging fine-scale imagery technology to address state research needs. During GY 14, the AmericaView UAS Working Group was active in developing and expanding UAS activities. AV was represented at the June 2015 UAS workshop, Reston VA, which was valuable in informing AV of the nature and scope of USGS's UAS programs, and its vision for the future. StateViews have been continuing their close collaboration with USGS on technical and operational dimensions of their UAS activities.

The AV UAS working group prepared and distributed an on-line survey to AV StateViews to inventory their interest and engagement in UAS activities. At the close of this grant year, at least 20 StateViews were actively engaged in UAS activities, had initiated UAS-use curriculum programs, or had begun supporting their universities' efforts to acquire UAS vehicles and to secure FAA certification. The working group began collaboratively considering and planning ahead for its efforts for the remaining periods of this grant. Active AV UAS interest, to address varied application research, education, and outreach objectives, is reflected in the trend of RCAs submitted in GY2013 and 2014, proposed for GY 2015 and being evaluated for inclusion in GY 2016:

- GY 2013 1 project: VA (UAS proposed purchase - not supported by this grant's sponsor - that was successfully turned into an education project)
- GY 2014 1 project: VT (four pilot projects, using university equipment)
- GY 2015 2 projects: VT (needs assessment), VT (forestry)
- GY 2016 11 projects: AR (education), ID (crops), MN (forestry), NH (reference data for forestry), OH (general), VT (D-2 data distribution)

portal), VT (E-14 education), VT (D-2 needs assessment), UT (needs assessment), VA (outreach), VA (education).

Further, several StateView universities are participating in federal UAS Test Site programs. The UAS working group has been effective in guiding and training StateView PIs, as they purchase UASs (working with other university funding) and seek FAA certification. Please see Appendix F for the AV UAS poster with supporting graphics and further details of AV UAS activities in this grant period.

None of this grant's funds are authorized for the purchase of UAS equipment. StateViews conduct classes, support applied research, and do training outreach using UAS equipment already available from their universities.

- In GY14, as indicated earlier, a **Water Quality Quantity Utility Working Group** was formed to identify shared needs and research goals pertaining to our participating StateViews' critical water resource challenges. This effort was initiated by Teresa Benko (AV staff), with Nancy French (MichiganView), Lindi Quackenbush (New YorkView) and Anita Simic (OhioView) taking strong roles to energize the efforts. Several other StateViews have attended the Working Group teleconferences as well as some partners from the extended OhioView consortium. AV competitively funded four mini-grants in GY14 that will stimulate further the StateViews' collaborative efforts and could serve as a model for our collaborative research and decision-support approaches to the defined mission areas of the well-publicized USGS Science Strategy: [http://www.usgs.gov/start\\_with\\_science/](http://www.usgs.gov/start_with_science/) The four mini-grants were awarded to MichiganView, MinnesotaView, OhioView and OklahomaView. Deliverables were described in more detail, above in Section II of this report.
- Previously, the **Monitoring Phenology in the North Central Region of the U.S.** project was also described, which – although funded by a different source – has offered additional insight into the underlying value of collaborative endeavor for AV participants. A cooperative approach is a value-multiplier on a variety of levels: students from different StateViews working together; mutual exchange of solutions to common work challenges; using one remote sensing system to validate or to question another system; leveraging lessons learned to improve work on this grant.

*GY 2013-16: Utilize monthly AV teleconferences for StateViews to share “elevator talk” versions of recent remote sensing activities (e.g., a refereed journal article, book chapter, online spatial decision support system, work in progress, etc.) and utilize the AV research group library to archive these presentations.*

- As noted above, in the GY 2014 Highlights, promoting a monthly Membership Meeting forum proved to be a successful approach to sharing research work among AV PI's.
- Sally Cook, the USGS liaison for AV, actively uses the AV listserv to send at least monthly, and usually more often, references and articles and Landsat updates to AV members.
- Similarly, the Winter Business Meetings are designed to include networking time and to provide both podium presentation and open topic discussion time (see the condensed agenda above) for more than the "elevator talk" about significant outcomes of the applied research.

GY 2013-16: Support for Conference Presentations (added in GY14)

*AV will continue to identify national conferences where remote sensing applications can be shared by members who make presentations on behalf of AV. StateView members are encouraged to participate and describe their work and its impact. When appropriate, the AV Executive Director will provide overview presentations about the history, the current vision, mission, and goals, and the nationwide consortia model of AV. In addition, several StateViews are preparing briefings, tutorials, and workshops for use in new venues.*

- PennsylvaniaView leadership presented at the National Science Teachers' Conference in GY14.
- Jim Campbell, VirginiaView, accepted the invitation to discuss his posters at the USGS UAS Meeting.
- Several StateViews, like South DakotaView, NebraskaView, KentuckyView, actively participate in both planning and presenting at state level GIS meetings.
- HawaiiView continues a particularly strong presence at well-attended STEM meetings that attract students with their teachers and parents. The audiences include many otherwise underserved groups.
- In GY 2014, AV's Executive Director represented AV with SDView at the state conference, at the Pecora Meeting in Denver with a display, at the ASPRS IGTF in Tampa distributing flyers and leading a technical "hot topic" session. In addition, she has prepared a standard overview presentation that can be adapted by any StateView.
- A poster, jointly prepared by students from North DakotaView and NebraskaView on their phenology camera research, won award recognition at an AAG student poster presentation.

## Progress towards Objective 2 in GY 2014

AV utilized its expertise to complete applied research projects to assist with pressing decision-making needs at both state and local levels. Activities related to remote sensing research/application projects typically reflect individual state needs and the research expertise of the StateView. Each StateView, therefore, may have a unique research emphasis closely tied to the needs of its particular state. In some instances, however, several states may share a common challenge, like agricultural run-off into major rivers or the ecological problems created by urban heat islands. The opportunity afforded by AV for StateViews to collegially exchange research ideas, approaches, and outcomes helped ensure some best practices could be cascaded throughout a region or to similar situations across the country.

In few cases, did the funds from the GY 2014 sub-awards, alone or within one year, assure completion of complex application research. Most efficacious research projects, in which remote sensing is an essential source, are resource intensive from the funding, manpower, and calendar perspectives. Thus, partnership-based-research activities continued to dominate in GY 2014, embracing the shared goals of AV's academic, government agency, and NGO partners. The Fact Sheets of Appendix H briefly describe many of those research endeavors and the impact that work has.

Since the majority of AV's research is applied research, it is critically important that its research findings are shared with decision-makers, environmental monitors, resource managers, and other academic, government, and private company researchers. In GY 2014, AV members made more than 50 technical and scientific presentations on AmericaView's endeavors to nearly 3,000 attendees. Examples follow to illustrate the range of conferences, state planning meetings, and statewide or regional geospatial data meetings at which AV StateViews presented their work, contributed to or led panel discussions, served as organizing principals, and expanded the network of those who do, can, or will use remote sensing data.

- The GIS Day Expo at the University of Oklahoma in November 2014, celebrated and showcased a broad spectrum of research, education, and outreach activities related to geospatial science, technology, and applications to attract and retain both undergraduate and graduate students in science, technology, engineering and mathematics, and prepare them for future employment in the geospatial sector. **OklahomaView** helped with planning, as well as presentations.
- **OhioView** was instrumental in the planning and presentation of the Geospatial Technologies (VTecCon) held on April 29, 2015. Members of OhioView, together with representatives from Air Force Discovery Labs (AFDL) presented applications of geospatial technologies using the 'virtual world' environment of AFDL.

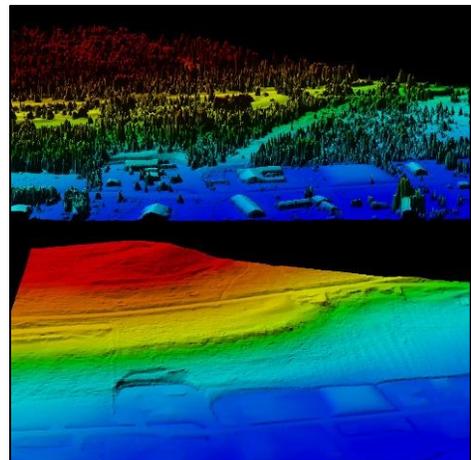
- **LouisianaView** annually organizes and presents at the Louisiana Hurricane Season Geospatial Data Mining for Natural and Man-made Disasters Workshop. In GY14, forty-five Geospatial First Responders attended this Workshop, which was conducted June 4, 2015 at the Regional Application Center in Lafayette, Louisiana.
- Marvin Bauer discussed his poster presentation, "**MinnesotaView**: Remote Sensing Education, Research, and Geospatial Applications" at the Minnesota GIS/LIS annual conference at Rochester on October 1-3, 2014.
- **NEView** was represented by Chris Poulsen of the National Drought Mitigation Center (NEView partner) on April 14, 2015, at the Biennial Nebraska GIS Symposium. NEView has been part of the team to improve the availability of reliable and timely drought data, a high impact activity that extends to all agriculture-based economies. Chris delivered the presentation, "VegDRI and QuickDRI: Multi-input drought indices for long term and flash drought detection", which was also given at the ASPRS Pecora Conference.
- Water Quality research, discussing climate change impacts on environmental adaptation and including the collaborative work of **KentuckyView**, was presented at both the spring 2015 Kentucky GIS Conference and the GeoEd'14 Conference held in Owensboro, KY. A presentation on a soil moisture study was also given at the Scholars Week event.

### A Metric Perspective and Summaries of AV's StateView's Development of Remote Sensing Applications

In GY 2014 StateViews engaged in 52 activities that developed new applications or uses for remote sensing data.

- Collaborated with agency personnel and/or private companies to assess utility of satellite data for monitoring and mapping activities that were not typically performed using satellite imagery (12 activities were completed by: AL, CO, IA (2 activities), KS, KY, MN, MS, OH, PA, VT, WY). Summaries of activities within those HIAs follow:
  - **KentuckyView** worked with the Kentucky Department for Environmental Protection - Division of Water to complete the first key step in establishing a state-wide water quality monitoring program in support of environmental planning and modeling activities.
  - **OhioView** continued partnering with the NASA Glenn Research Center, NOAA-Great Lakes Environmental Research Lab, Naval Research Lab, MichiganView, and multiple State agencies to monitor the Harmful Algal Blooms (HABs) in Lake Erie as a collective team.

- **OhioView** members and partners including BGSU, Ohio Department of Natural Resources (ODNR) and the University of Toledo prepared a report, entitled Building Resilient Shorelines - Assessing impacts of shoreline modifications on nearshore fish communities and ecosystem function in the Western Basin of Lake Erie). This project is being done also in collaboration with NASA.
- **AlabamaView** established a strategic partnership with the Southern Research Station of the US Forest Service to map urban tree canopy and produce a product that Forest Service employees can utilize and share to promote and maintain urban forests.
- **ColoradoView** continued research on a project with end products that will include assessments of the utility of satellite data for assessments of: 1) UVB impacts on grazing ecosystems, 2) grazing impacts on vegetation and wildlife habitats, 3) appropriate management levels and carrying capacities, 4) climate change impacts on grazing ecosystems. Partners include USGS working on wildlife and wild horse grazing lands in Colorado, and researchers at the USGS North Central Climate Center at CSU.
- **IowaView** is coordinating portions of two projects also funded by the Iowa Nutrient Research Center at Iowa State University and the Iowa Department of Natural Resources funds. The projects are developing technologies to inventory and monitor conservation practices that could potentially meet requirements of the US EPA to develop nutrient reduction plans in the Mississippi River basin. Additional partners include Iowa State University Extension and Outreach; ISU Leopold Center and Nutrient Research Center; USDA-ARS National Lab for Agriculture and Environment; USDA NRCS and FSA offices in Iowa; Iowa Dept. of Natural Resources and Dept. of Agriculture and Land Stewardship.
- **VermontView** partnered with the USGS, NRCS, Vermont Agency of Natural Resources, Vermont Center for Geographic Information, and the Vermont Public Service Board in the utilization of recently collected LiDAR data to develop a 7-class (tree canopy, grass/shrub, bare soil, water, buildings, roads/railroads, and other paved surfaces) high resolution (1m) land cover dataset for the majority of Addison County, VT.
- **KansasView** continued its coordination with NASA partners to implement a NASA Flood Dashboard for the State of Kansas that is built on the NASA model, which can be found at <http://matsu-namibiaflood.opensciencedatacloud.org/>. When fully implemented, the Kansas Flood Dashboard will incorporate USGS Landsat and other remotely sensed data, along with USGS stream gaging data, inundation libraries, and other ancillary data for decision support for federal, state, and local stakeholders, emergency managers, and decision makers during flood events in the state.



*Turning millions of dollars' worth of LiDAR data into actionable information for our state and local governments*

- **KansasView** recently began collaboration with KU Advance Computing Facility (ACF) to explore scalability of flood inundation library development and other geospatial processing workflows in a High Performance Computing (HPC) environment. This collaboration seeks to build capacity for HPC-based geospatial research opportunities and to foster interdisciplinary research, with a focus to establish partnerships between the Computer Science program and the Department of Geography.
- **MinnesotaView** continued its project using multi-temporal Landsat TM imagery, other government and commercial satellite imagery, and LIDAR data to map and monitor land and water resources. In GY14, these projects included monitoring the frequency and intensity of cyanobacterial blooms in Lake of the Woods, which was sponsored by the Minnesota Pollution Control Agency; and measuring optical water quality characteristics and in situ reflectance spectra nearly contemporaneously with Landsat 8 and Hyperspectral Imager for Coastal Ocean (HICO) imagery. The latter project is to establish baseline data to investigate the potential of the Landsat-8 and upcoming European Space Agency Sentinel-2 and -3 satellites to monitor water quality.
- Collaborated with researchers within or between other StateViews (4 activities by NY,TX, WV, WY) A summary for one of those projects follows:
  - **WyomingView** and **West VirginiaView** made progress on a collaborative project for calibrating Landsat index-based methods for classifying glacier extent. A comprehensive study was carried out using receiver operator curves (ROC) of the effect of adjusting the threshold of the Landsat spectral index normally used to map glacier extent.
- Tested innovative uses for remotely sensed data to address economic, ecological, and environmental issues (11 activities were completed by CO, ID, KY, NH, MS, NH, SD, VT, and WV each finished one; NC completed 2). Summaries of activities within those HIAs follow:
  - **KentuckyView** utilized Landsat 8 satellite imagery, spectrometer data, and moisture estimation algorithms for a regional scale monitoring program; and continued to collect soil spectra to be used for in situ studies and calibration purposes, which will be added to the Kentucky spectral library.
  - **IdahoView** conducted a study to assess the suitability of a low-cost, autonomously operating terrestrial laser scanner (ATLS) to 1) monitor crop growth dynamics and 2) calibrate satellite imagery for estimating crop biomass. Partners involved in this research included Idaho wheat farmers and researchers from two USDA funded projects (Site Specific Climate Friendly Farming [SCF] and Regional Approaches to Climate Change [REACCH]).

- **MississippiView** used historical Landsat data to map changes in the Mississippi Gulf Coast and began to investigate the use of remote sensing as a tool to monitor the status of restoration projects.
- **MontanaView** developed new analytical methods to produce a map of percent tree mortality for a portion of the Helena National Forest. This map will be combined with a map of pre-mortality biomass being prepared by Colorado State University to estimate standing dead biomass that can potentially be used by decision makers involved in converting beetle-killed trees to biofuels. Region 1 of the U.S. Forest Service was also a primary funding partner.
- **New HampshireView** continued to evaluate and compare the capabilities of the new Landsat 8 sensor with previous Landsat sensors (e.g., Landsat 5 TM or 7 ETM+) for mapping land cover and especially forest land cover in New Hampshire. The results of this activity showed that there were no significant improvements in using Landsat 8 imagery over using Landsat 5 at least for the forest map classes used in this study. Efforts to validate the use of Landsat 8 to map and assess submerged aquatic vegetation (SAV) under coastal waters to meet state regulations were continued.
- **North CarolinaView** began developing an algorithm to convert SONAR depth data into categorical data to be used as the ground truth for assessing the applicability and accuracy level using Landsat data.
- **North CarolinaView**, building on its analysis of Landsat-8 data in GY13, developed two techniques: 1) “Removal of Thin Clouds Using Cirrus and QA Bands of Landsat-8”; and 2) “Removal of Thin Clouds in Landsat-8 OLI Data with Independent Component Analysis”.
- **VermontView** partnered with local, state, and federal agencies to conduct four pilot UAS projects:
  - a. Forestry. Post-harvest analysis of a plot in Essex, VT that was damaged during a wind storm. This provided the most current and accurate remotely sensed data for the area allowing researchers to quantify changes to the forest ecosystem.
  - b. Agriculture. Demonstration of UAS technology as the 2015 Farm and Field Day expo in Auburg, VT. Crop mapping in collaboration with High Mowing Seeds. In both cases these projects demonstrated the use of UAS technology to the agricultural community with an emphasis on how such data can be integrated into precision agriculture systems.
  - c. Water Quality. Algal bloom mapping in Shelburne Pond and St. Albans Bay with the Vermont Department of Health and the Vermont Agency of Natural Resources. Color infrared imagery acquired using UAS was shown to be able to map algae and aquatic vegetation with greater detail than any other remote sensing technology.
  - d. Vulnerability Assessment. Erosion mapping in Barre, VT to support the Central Vermont Regional Planning Agency (CVRPC). The UAS data was used by CVRPC to apply obtain funding to make improvements to the area to reduce the

risk of unstable slopes. A video was generated for this project - <https://youtu.be/SJThRjBFTsE>.

- **West VirginiaView** attempted to standardize Landsat 4, 5, 7 and 8 reflectance data for time series analysis, as well as characterizing the uncertainty of such analyses. This required data acquired at the same time by different sensors. Unfortunately, although the Landsat 7 and 8 simultaneous acquisitions were released by the USGS, the Landsat 5 and 7 acquisitions were not. Therefore, alternative projects were developed that met the same broad goal of fostering a collaboration between Alderson Broaddus University (ABU) and West Virginia University, (building on the GY2013 seed grant for the development of a remote sensing laboratory at ABU). In the first project, the wetland probability was mapped in the state of West Virginia using a statewide digital elevation model (DEM) available from the National Elevation Dataset (NED) and random forest machine learning. In the second project, lidar and National Agricultural Imagery Program (NAIP) data to map landcover over Preston County, West Virginia using object-based methods at a high spatial resolution.
- Developed software to support distribution of satellite, airborne, and geospatial data (3 activities by GA, IN and MI). Summaries of 2 HIAs follow:
  - **GeorgiaView** developed an application that allows scientists to calculate the sun's position parameters at any pixel of Landsat imagery, which will promote applications in climate research, topographic correction and atmospheric correction. The end product is available at <http://avuniv.org/download/>, and published in a research paper, titled "Sun Position Calculator (SPC) for Landsat Imagery with Geodetic Latitudes" at *Computers & Geosciences* 85 (2015) pp. 68-74.
  - **IndianaView** completed additional changes to MultiSpec. The changes made during this grant period include adding ability to handle image data with very small and very large ranges, GeoTIFF image with tie points defined with longitudes from 0 to 360 degrees in addition to -180 to 180 degrees and some bug fixes. Another change includes the capability to allow only the menu options for basic capabilities to be available to users. This feature is in response to a request from K-12 sector for the ability to have fewer menu options for students to try out. Another significant product during the time period (with additional support from a NSF funded project name Geospatial Data Analysis Building Blocks) has been a web-enabled version of MultiSpec. As of the end of this reporting period, this version included display and unsupervised classification features. Additional features are being added periodically. There were over 7,800 downloads of the MultiSpec software <https://engineering.purdue.edu/~biehl/MultiSpec/> between September 16, 2014 and June 30, 2015. Many emails with questions and testimonials on how MultiSpec has been helpful were received during this time period. Also as of June 30, 13 users had tried the web-enabled version 300 times; the initial version was formally released in May 2015.

- Posted methodologies or tools for other StateViews to use or test (1 activity by NH)

### Benefits of Applied Research Activity

During GY 2014, the work on applied research, whether as an HIA or other activity, was heavily supported by the StateViews. Applied research, using remote sensing in a university environment has multiple beneficiaries. It builds upon the taxpayer investments in remote sensing imagery by practicably using the Landsat collections. These projects helped to move satellite data into the hands of government, industry, and university partners as well as raise public awareness about the effective use of this asset. These efforts reduced some past inefficiencies, offered alternative solutions to other costly approaches leveraged limited funding resources, and resulted in improved productivity by AV consortium members. Technology transfer of methodologies, developed or nurtured in the academic sector, to the public and commercial sector demonstrated approaches to strengthen the nation's economy and productivity with actual observations, information and analysis. Furthermore, by occurring within the university environment, students had the opportunity to learn, use, and improve techniques that better prepare them for their positions in the future workforce. That point will be discussed further in the Objective 3 section.



*Landsat 5 image acquired October 29, 2011. Lake Buchanan, an artificial reservoir located in central Texas, was more than 5 meters below the historic average for the month, due to a long-term drought affecting all of Texas. TexasView helps bring this information to decision makers.*

### **Objective 3 – Undergraduate and Graduate Research**

*AV will use its strength as a consortium whose StateView members are each lead by a university, and whose StateView consortia include over 180 colleges and universities, to provide meaningful research opportunities for undergraduate and graduate students. AV members' proven success at generating research grant dollars will enable this objective to be highly leveraged. These student-involved research activities will increase, both quantitatively and qualitatively, the ability of the nation's future workforce to successfully incorporate remote sensing technologies as a basic aspect of our nation's infrastructure.*

#### AV National Workplan– Student Engagement

*GY 2013-16: AV will encourage presentations by StateView PIs that highlight remote sensing and other geospatial careers to encourage more high school and college students to consider these careers.*

- One hallmark activity for AV has been the annual Earth Observations Day (EOD) celebrated by various StateViews, usually in April. The report for GY 2014 can be read in Appendix C. GY 2014 brought AV to a milestone decision to align EOD with the American Geosciences Institute's (AGI) Earth Science Week, with a small pilot activity prepared for Fall 2015. The potential to expand the StateView PIs influence to more high school and college students, who might be interested in a remote sensing career, is a powerful incentive.
- Several StateViews ensured that their students were given opportunity to make presentations during visits to K-12 schools, at professional meetings, at state-sponsored GIS events, and for oral class reports. Some examples include:
  - HawaiiView continued its hands-on workshop at the annual Onizuka Science day, which reaches over 1000 students from middle through high school.
  - GeorgiaView had undergraduate students produce posters, quantifying land cover change dynamics, for presentation at the Southeastern Division of AAG.
  - KentuckyView used its Earth Day/ Earth Observation Day event to highlight student work and to connect its students with potential employers. <https://youtu.be/9Fk76MPBou0>

*GY 2013-16: AV will promote research publications by students, including introducing AV-funded students to AV's Research Publication Library described in the workplan for Objective 2.*

AV StateViews used multiple approaches to reinforce work completed by students in research activities. Some were awarded competitive grants; others benefitted from student employment. (See the summary of youth employed by AV provided near the end of this section under the Overview of AV's Undergraduate and Graduate Research Accomplishments.) Throughout this grant period, many were mentored to complete posters and presentations for meetings and conferences. Students were included in publications by AV PIs. These publications were included at the AV portal. Since the planned AV's Research Publication Library was not operational during this grant period, AV could not identify students, as students, on the AV portal.

*GY 2013-16: AV will support interdisciplinary research projects that would involve AV college students.*

- KansasView began collaboration with KU Advance Computing Facility (ACF) to explore scalability of flood inundation library development and other geospatial processing workflows in a High Performance Computing (HPC) environment. This collaboration seeks to build capacity for HPC-based geospatial research opportunities and to foster

interdisciplinary research, with a focus establishing partnerships between the Computer Science program and the Department of Geography

- North DakotaView, in GY 2014, expanded its interdisciplinary collaborative project is to deliver geospatial resources and workshops to the students, staff, and faculty at the Fort Berthold Community College, as well as to tribal government employees and other community members of the Fort Berthold Indian Reservation in western North Dakota. A spatial database based upon Landsat imagery along with other raster and vector spatial layers that represent physical, administrative, socio-demographic, economic, industrial and other aspects of life on the reservation. One undergraduate and one graduate student at UND employed by NDView continued to assemble a spatial database for the Fort Berthold Community. Other NDView students worked to update map layers, add information about oil and brine spills associated with oil extraction, to improve the digital maps cartographically, and to improve the user interface. The students also moved the spatial database to our online NDViewer server.

*GY 2014-16: AV will endeavor to measure the impact (i.e., increased numbers and visibility of graduating students with R.S. skills) through methods such as: (1) obtaining testimonials/feedback from entities providing internships; (2) monitoring DOI online initiatives for tracking students (labor market statistics), tracking alumni; (3) tracking number of students funded by AV that take the “next step” (undergraduate students entering graduate school); (4) tracking number of internships established by StateViews; and (5) tracking the number of publications and presentations by AV funded students.*

- Feedback on Internships was provided in StateView annual reporting on testimonials but the range of intern opportunities is illustrated by these activities:
  - ArkansasView provided geospatial support and participated in a workshop to develop a Communities Unlimited geospatial internship that successfully began in January 2015. Benjamin Tracy, a geologist with Fugro Limited (Hong Kong) accepted the position and began contributing a variety of geospatial-related skills to CU's team. CU joined the ArkansasView consortium in late 2014, and a new HIA was developed in conjunction with CU.
  - An invasive species modeling and prediction project was carried out by two student interns supported by ColoradoView. The interns were mentored by Dr. Sunil Kumar, a well-known invasive species modeler at the Natural Resource Ecology Laboratory at CSU. The students stated that they learned much through their experience. The Colorado Geospatial Centroid at CSU was instrumental in providing facilities, guidance, and opportunities for interaction with other interns and students.

- LAView offered 2 undergraduate internships and one graduate research scholarship during this grant period. Each of these provided students to work alongside remote sensing specialist and industry leaders in the state
- Two graduate student interns were hired during this project period. One graduate student was hired to work in the Geospatial Support Center (GSC) on campus. This project is reported more in one of the NHView high impact activities. A second graduate student intern was hired for the summer period to work on a mapping project using Landsat imagery to assess damage to Assateague Island as a result of Hurricane Sandy.
- AV reported quarterly to the DOI, as requested, on the number of student employment hours supported by the grant during this grant period.
- The “tracking” items 3, 4, and 5 identified in the workplan received only minor attention during this grant period. A methodology for capturing and extracting this detailed information will require evaluation. Some details can be found within the AV portal.

*GY 2014-16: AV will inquire about the USGS’s interest in strengthening AV’s student interaction with USGS scientists through exploring: (1) the identification of USGS research priorities that might result in meaningful student research projects, (2) the creation of podcasts or other instructional media to introduce USGS research to students, potentially to be distributed via AmericaView University, and (3) the creation of electronic “classrooms” in which AV advanced remote sensing students could interact with USGS scientists and other AV graduate students.*

During this grant period, this workplan effort made only minor progress.

- The identification of one USGS research priority was the phenology camera summer study project, report, and poster that involved students from NebraskaView and North DakotaView, who worked with North Central Climate Science Center lead researchers. This would be an exemplar for similar student interaction with other USGS scientists.
- Some students attended the FTM and WBM, as student guests, and had the opportunity to engage informally with the USGS scientists and researchers who join those meetings.
- OhioView partnered with the Air Force Research Lab (AFRL) / Discovery Lab to incorporate remote sensing and geospatial technologies for both research and education using the AFRL 'virtual world' environment. In July and August 2014, OhioView Director, Dr. Bradley Shellito, conducted a 6 class short course using the 'virtual world' environment based around applications of geospatial technologies and remote sensing. Topics included aerial photography, satellite imagery, 3D visualization, GPS, and using cloud-based geospatial resources. This could be considered an approach to be used with the USGS scientists and researchers.

## Overview of AV's Undergraduate and Graduate Research Accomplishments

A majority of AV's research projects, including those that were discussed above in the Objective 2 section, support undergraduate or graduate students' education and professional preparation. Through these efforts, students gained valuable work skills, improved their theoretical understanding of the field of remote sensing, and learned the value of putting theory into practice against thorny issues.

Five StateViews reported hiring 5 students during GY 2014 (from 1<sup>st</sup> quarter (start: Oct. 1, 2014) through 3<sup>rd</sup> federal quarter (end: June 30, 2015) of federal FY 2015). AV completed required reporting for the DOI Youth Hired by Partners Program; to meet the Secretarial priority *Engaging the Next Generation* aligned under that Order's "Work" goal to provide 100,000 work and training opportunities to young people and veterans. Accomplishments were accordingly reported quarterly to the USGS who forwarded the reports to the Deputy Secretary at the Department of Interior.

- **Hawai'iView:** One female graduate assistant developed plans to use HawaiiView science kits at local family science night events. As an electrical engineer, she is benefiting from developing educational materials, which are related to the application of material she encountered as an undergraduate.
- **VermontView:** One female student prepared USGS LiDAR datasets for analysis. She and other participants received training in and employed cutting-edge technology to derive information from USGS funded data.
- **IdahoView:** One female graduate student assisted with pilot testing innovative remote sensing curriculum developed by IdahoView.
- **IowaView:** One undergraduate student assisted with collecting and managing an archive of Landsat imagery and derivative products. This benefited the student in gaining familiarity and knowledge of sources of remote sensing data to be used in their planned future career as a field archeologist.
- **KentuckyView:** One African American male undergraduate student assisted with downloading, importing and data management for state-wide Kentucky imagery. This gave the student experience with Landsat data and image processing software.

Presentations at state, regional and national conferences, summarized under Objective 2, typically involved StateView-sponsored graduate student research or research accomplished by the PIs and their graduate students. Academic merit accrued to the StateView PIs and their students. AV and USGS, as sponsor, received public acknowledgement from the larger and more diverse national geospatial community in attendance, with recognition for the critically important task of developing the future US work force.

## A Metric Perspective and Summaries of AV's Undergraduate and Graduate Research

In GY 2014, StateViews engaged in 13 activities that aligned research efforts with educational opportunities to motivate or excite remote sensing and GIS interest among university students. Those include:

- Awarding scholarships to students to promote remote sensing research, including students in under-represented groups (women, ethnic minorities and first generation college students) (5 activities by GA, IA, MS, ND, WY)
- Promoting use of StateView archived or easily-accessed remote sensing data in classroom, laboratory, and field research term projects, affording students an opportunity given the availability of free data (2 activities by AL and WV)
- Supporting student publications or presentations in university forums (3 activities by MS, UT, WY). These publications assisted in advancing the science of remote sensing analysis, applications, and the usage of public and emerging remote sensing imagery.
- Encouraging research competitions (1 activity by IN)
- Serving on MS/PhD committees or otherwise advising, guiding, and encouraging students to use remote sensing approaches, all professional support responsibilities that enable AV's Pls to introduce the utilization of remote sensing technologies to diverse disciplines throughout their universities. (5 activities by AL, AR, LA, NY, ID)

## Benefits of AV's Undergraduate and Graduate Research Activity

Each StateView's annual report, related to Objective 3, reinforced the commitment of the participating universities to advance the STEM state and national Earth science goals. Many invested effort to include traditionally under-represented groups in those fields and cultivated the interest and talents of the next generation of remote sensing scientists and decision makers. Properly trained and prepared, they will protect our national interests into the future. Prospects for related careers in the remote sensing disciplines for university students has been enhanced by identifying interning opportunities with private business and government agencies, as they are identified. Announcements are distributed to AV members for their use within the state universities. Some StateViews, like OhioView work closely with agencies, companies, and job development organizations to find these intern openings.

## **Objective 4 – Education and Training, Technology Transfer, and Outreach**

In the NLRSEORA proposal for GY 2013, Objective 4 was split into three sub-objectives. This section of this report follows that approach:

- 4.a - Education and Training
- 4.b - Technology Transfer
- 4.c - Outreach

### **Sub-Objective 4.a Education and Training**

*AV will seek to increase the remote sensing competency of the nation's current and future workforce. Quantifiable objectives include supporting remote sensing science instruction in K-12<sup>th</sup> grades to improve STEM education and to strengthen national science education standards; utilizing AV's academic university network to improve the quality of instruction at the university and college level; and increasing the employability and effectiveness of workers by introducing remote sensing skills into the existing workforce.*

Sub-Objective 4.a (Education and Training) at the AV national level has four categories of effort:

1. Serve the future workforce (including K-12 and college level) with a focus on EOD
2. Support K-12 (and 13+) through the AVRSCP
3. Support college education through focusing on AV University
4. Serve the current workforce (with a specific focus on veterans)

#### **4.a.1. AV National Workplan– Future Workforce (pre college) and Earth Observation Day**

*The AV Education Committee will focus on the following activities:*

*GY 2013-16: AV will work with the SATELLITES and GLOBE programs over the next five years to identify joint curriculum development and train-the-trainer opportunities with/for StateViews and partners.*

- A team of StateViews collaborated on a plan to advance Earth sciences education with an approach that replicated an important concept integral to the SATELLITES (Students And Teachers Evaluating Local Landscapes to Interpret The Earth from Space) program. This is an established program that engages teachers and students in inquiry-based research projects using GLOBE observation protocols and geospatial technologies. In the collaborative approach the emphasis was upon the exchange between the learner and the teacher so that each would profit from the experience. One of OhioView's consortium members was awarded a NASA grant for an adaptation of that concept.
- New MexicoView provided remote sensing education to secondary students in a predominantly Hispanic school, introducing the "Adopt a pixel" program. That program was aligned with GLOBE and New MexicoView agreed to be a curriculum tester once the revised applications are delivered.

*GY 2014: Corporate sponsors for EOD will be cultivated so that the scope and effectiveness of the event can eventually be extended nationwide. The evaluation form for all EOD activities will be expanded and electronic implementation of the evaluation process will be evaluated.*

- Although not corporate, the partnership between AGI and AV for future Earth Science Week collaboration was established and will open opportunities to discuss possible corporate partnerships.
- Similarly, the working relationships with the US Geospatial Intelligence Forum and the American Society for Photogrammetry and Remote Sensing (ASPRS) were very active during GY 2014 as opportunities for some corporate support to EOD from among their business members were investigated.
- As described earlier, Chandana Mitra from AlabamaView used mini-grant funds to develop valuation questionnaires for EOD participants, including eight to twenty-one questions each for six different populations: elementary students, middle school students, high school students, undergraduates, teachers, and the general public. Evaluation questions were based on a 5 point Likert-type scale and designed to be an assessment of participants’ prior knowledge, perceptions, attitudes, future use and career choices, and beliefs about the use of geospatial technologies.

**4.a.2. AV National Workplan– K-12 – Online AV Remote Sensing Curriculum Portal (AVRSCP)**



In GY11 the AV Education Committee inventoried more than 200 educational resources produced by AV over the prior ten years. In GY12, Dr. John McGee, Virginia View Co-Investigator, established a beta web site for AV’s Remote Sensing Curriculum Portal (AVRSCP) and uploaded over 90 educational resources with multiple search functions. The AV Educational Resource Web Portal at <http://www.americaview.org/resources/> completed beta testing in GY 2013 and was launched publicly in October 2014.

The Portal lists 80+ AV educational materials. These resources are searchable by target audience, software requirements, type of imagery (e.g., Landsat, MODIS, or NAIP), and type of resource (e.g., lab exercise, video, or lecture).

***GY 2014-16:*** AVRSCP will be promoted through state educational systems, science teacher organizations, college-level educator’s networks, and K-12 / higher education conference presentations. Members and partners will be actively encouraged to develop curriculum to fill gaps and explore mechanisms for funding additions to AVRSCP.

*Suggestions received from educators to improve curricula will be incorporated, as appropriate.*

***Metrics:** The number of educators utilizing AVRSCP will be compiled and reported. A summary of participant educator's feedback and ratings of educational resources will be compiled and transmitted to the USGS.*

Each month at the AV Education Committee, reports were distributed that tracked the use of the AVRSCP, including international users.

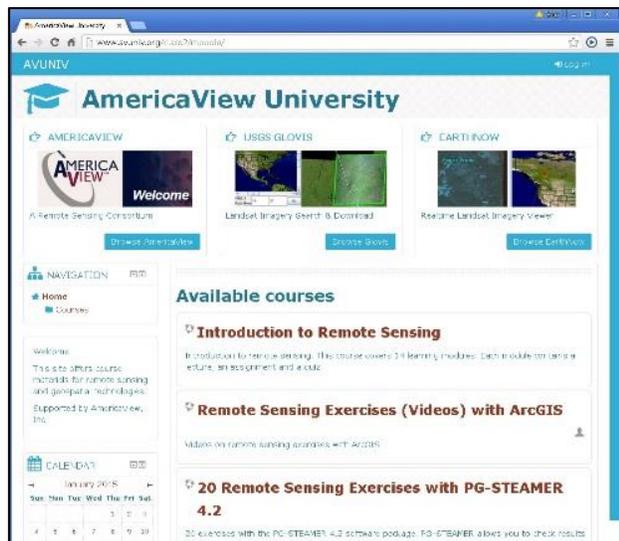
#### 4.a.3. AV National Workplan – College Level – Improving Online Remote Sensing Education through AV University

AmericaView University was developed in November of 2008 by funding from CalView to GeorgiaView and launched in 2009 after initial development by Drs. Jeong Seong and Rebecca Dodge. In GY14, VAView contributed its recently developed online lessons for ArcGIS, and other AV instructors contributed materials. Over the years, visitors have included many instructors who downloaded instructional materials to improve the content of their remote sensing courses.

***GY 2014-16:** Additional StateViews will contribute lab exercises to the updated AV University using more accessible (from a financial aspect) software packages to increase accessibility by community, tribal, and smaller colleges.*

The online remote sensing course for AV University <http://avuniv.org> was revised in GY14 with the following features:

1. Assignments were revised. Now, they are in the multiple choice format, and they use various internet resources.
2. Voice recordings were removed from the PPT presentations. Instead, students may read script notes.
3. AV instructors for the materials in this revision include: Larry Biehl, Kevin Czajkowski, Rebecca Dodge, Tom Mueller, and Mohammed Mehdi.
4. PG-Steamer exercises were replaced with ArcGIS exercises using VirginiaView's *Remote Sensing in an ArcMap Environment*, Amazon Kindle eBook (\$2.99) by Tammy Parece, Jim Campbell, and John McGee.



<http://www.amazon.com/Remote-Sensing-Analysis-ArcMap-Environment-ebook/dp/B00VGE0464>

5. Flexibility was added for instructors to use contents selectively.

*Metrics: The number of educators/students accessing and utilizing AV University curriculum will be compiled and reported.*

Because of the revisions that were made during GY14 to AV University, metrics for usage are not available for this grant year.

#### 4.a.4. AV National Workplan – Current Workforce – Geospatial Education for Veterans

*GY 2013-16: AV will undertake a new collaborative initiative, supported by several StateViews, to recruit and train veterans for tomorrow's geospatial workforce. AV will build upon its expertise in offering remote sensing certificate programs (CalView), educating veterans at the undergraduate and graduate level (MontanaView), and advising veterans who are just commencing their undergraduate programs (VermontView). AV will seek to partner with external organizations to advance this particular initiative.*

- Within this grant period, the AV Executive Director continued discussions with Dr. Osa Brand, Director of Project Development, National Council for Geographic Education, to learn more about her varied initiatives to help veterans transition to a civilian career. She was invited to join the AV WBM and provide an overview of her NSF-funded Integrated Geospatial Education and Technology Training (iGETT) program. At the time, AV anticipated that the WBM session could identify how AV consortium members might become involved in her efforts, which would also more actively involve the StateViews with nearby community colleges. The two-year programs, whether certificate or associate degree focused, attract veterans who can move into an expanding workforce sector needing geospatial skills.
- The iGETT project subsequently moved to the National Geospatial Technology Center of Excellence (GeoTech Center), as the grant monies were realigned. Discussion with Vince DiNoto, the GeoTech Center Director, was initiated. Subsequent contact was made with Rodney Jackson, who was tasked to “cross walk” military geospatial training elements to community college curriculum requirements for transitioning military. That work continues and is expected to help AV curricula builders.
- As described in the grant year highlights above, one of the GY 14 mini-grants allowed MIView to develop materials for a SAR curriculum that is expected to be evaluated during GY 2015. MichiganView kept in touch with Mr. Jackson during work on the project.

## Additional comments on AV's Education and Training Accomplishments

AmericaView's education activities have been central to the organization's mission, which should not be surprising given the consortium members leadership. All funded StateViews supported formal education activities of various types, including K-12, higher education, or professional development. Fewer formal education or training efforts are found among the diverse Outreach activities. AV members have leveraged existing education and outreach programs to expand remote sensing research at the collegiate level, utilized their expertise to develop new programs for K-16 students that include basic STEM education through advanced remote sensing and allied geospatial technology education, and facilitated long-term and current workforce development.

StateViews continued to train numerous sectors of the current and future workforce.

- University students and faculty
- K-12 teachers and students
- Tribal college students and faculty
- Community college students and faculty
- National Guard personnel
- U.S. Forest Service and Bureau of Land Management staff
- State natural resource managers
- State extensions agents
- Urban planners
- City managers

Training and teaching mechanisms utilized during the grant period include:

- Research mini-grants
- Online remote sensing tutorials and curriculum
- Earth Observation Day activities
- Students And Teachers Exploring Local Landscapes to Interpret The Earth from Space (SATELLITES) Conference and Program in Ohio
- Seminars and workshops
- Art Gallery Exhibits of the USGS Earth as Art Imagery in Louisiana

## A Metric Perspective and Summaries of StateViews' Education and Training

In GY 2014, StateViews engaged in 17 activities that improved STEM education and geospatial technologies in K-12 schools:

- Preparing and delivering guest lectures or demonstrations to highlight remote sensing applications (4 activities by GA, ID, NM, WY)
- Developing education workshops (2 activities by CA, HI)

- Supporting state educational standards (2 activities by TX, VA)
- Organizing activities targeting 4-H, Boy/Girl Scouts, related youth organizations (1 activity by SD)
- Providing training for teachers during summer months to enable them to incorporate one or two RS lesson plans in their classroom during the school year (2 activities by AL and OH)
- Developing lesson plans for remote sensing classes or modules or to incorporate remote sensing in other disciplines (Geography, Botany etc.) (6 activities by ID, MI, PA (2), SD, UT)



*Fourth-grade students using an ArcGIS Online web application and Landsat imagery to learn about South Dakota lakes at the 2015 Big Sioux Water Festival*

For that same grant period, StateViews completed 11 activities that strengthened general remote sensing university education:

- Sharing licenses for image processing software (3 activities by ND, OH, UT)
- Sharing course materials developed at one university with other universities (1 activity by KS)
- Encouraging/enabling use of data from the StateView archive for teaching purposes (2 activities by CO and TX)
- Funding short courses in some aspect of remote sensing (2 activities by VT and VA)
- Delivering guest lectures in other disciplines to promote the utility of remote sensing (3 activities by IA, MN, NH)

StateViews also supported 8 activities that provided training programs, anticipating the future workforce, for students in universities and colleges:

- Offering hands-on training opportunities for students in government agencies, the private sector, or other educational institutions (2 activities by NE, KS)
- Funding stipends to encourage students to pursue a remote sensing component of their education (4 activities by IN, MT, SD, WV)
- Developing training programs that address topical ideas tailored for specific state and discipline needs (2 activities by AR and NH)

In addition to classroom or special event education and training, StateViews completed 10 activities in GY 2014 that trained current workforce in the use of remote sensing data and applications:

- Preparing and delivering short courses for government agencies, private companies, extension agents, private citizens and students (7 activities by AR, LA, NM, TX, VT, VA and WY).
- Developing web-based tutorials, FAQs and 'how-to' materials (3 activities by CT, MN and VA)

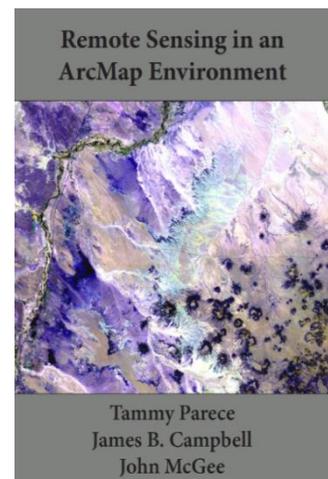


*Attendees at VirginiaView's June 2015, workshop held at J. Sergeant Reynolds Community College, near Richmond. Instructors assist participants in use of specialized software necessary to acquire and analyze Landsat imagery distributed by the US Geological Survey's EROS Center.*

## Benefits of Education and Training Activity

The highlighted activities selected for this report give only a condensed version of the extensive efforts AV's professional educators.

- As Dr. Congalton, New HampshireView, discovered, today's technology cascades the impact of preparing and delivering a lecture to an in-person classroom. By capturing an academic presentation on video, he was able to share his knowledge with an audience hundreds of times larger than his physically present audience. In addition, the reach of his lecture reached thousands of underserved, but interested learners. Moreover, for the difficult concepts, the student could return to the entire presentation or a subsection easily and repeatedly. Nor was the audience limited by age, professional career, or prerequisites.
- Guest lectures and "train-the-trainers" programs have reached out to K-16 educators and school administrators, informing the audience about the benefits of remote sensing education, why it is relevant to students, and how it can assist teachers with meeting education standards, especially those related to the Next Generation Science Standards.
- VirginiaView has used its published *Remote Sensing in an ArcMap Environment* (mentioned previously) as a manual for workshops directed business and community leaders, enabling them as a type of cadre to learn the value of remote sensing data and GIS tools for merchandizing site selections and prudent city planning.



- Teacher workshops, offered during GY 14, facilitate use of remote sensing and related geospatial technologies in the classroom by helping teachers understand and more confidently use hardware and software. The summer workshops or outdoor camps designed by AV PIs and some graduate students remain one of the most effective ways to reach teachers, students, and sometimes the combination in less stressful learning environments.

### **Sub- Objective 4.b Technology Transfer**

*AV will seek to improve the utilization of remote sensing technologies and data through the targeted transfer of techniques and data products to end users. Measurable objectives include data product and tool transfers from AV members to end users, such as providing data to first responders and post-analysis maps to decision makers in communities facing emergencies; providing remote sensing data-based products in easily used formats to end users; working with public land managers in analyzing land status and change; and assisting private land owners/managers with information to assist in such areas as farm and ranch management, water availability and supply, and forest health.*

Sub-Objective 4.b (Technology Transfer) at the AV national level has two categories of effort.

1. Enable the current workforce by supporting disaster analysis
2. Implement the AmericaView MultiState data Server (AVMSS)

#### **4.b.1. AV National Workplan– Disaster Analysis**

*GY 2013-16: AV members will continue to share their expertise in disaster analysis with others via AV telecons, the AV listserv, AV annual meetings, and in regional/national conferences. The shared information will include training opportunities offered by the USGS, suggestions for how to manage data flow and data provision to first responders, research results, and approaches to post disaster land and water cover analysis.*

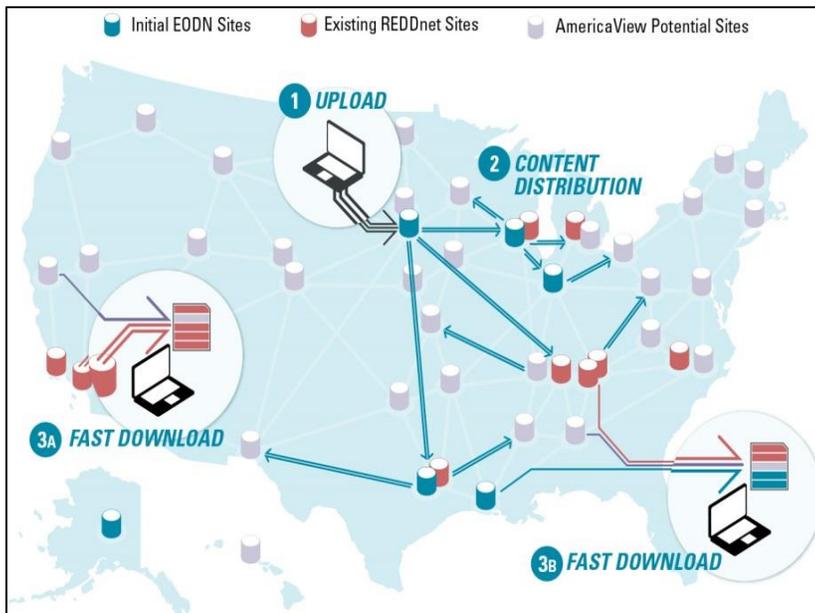
Brenda Jones (USGS Disaster Response Coordinator) invited AV to expand its communication with International Charter participants after our joint session at the 2015 FTM. On the AV side, creation of a Natural and Manmade Disasters Working Group would assist with our internal communication.

#### **4.b.2. AV National Workplan– AmericaView MultiState data Server (AVMSS)**

*GY 2013-16: Many AV states maintain state-specific archives of airborne and space-borne remote sensing imagery designed to support the needs of state and local governmental agencies, environmental and agricultural consulting firms, emergency managers, and many others. In 2010, ten StateViews pooled financial resources and technical expertise to develop a shared web-based data visualization and distribution system based on AlaskaView's successful efforts and hosted by TexasView called the AmericaView Multi-State data Server (AVMSS). The workplan for the AV*

Technology Committee for the next five years is as follows: (a) establish a simple protocol and documentation for StateViews to upload collections and utilize visualizations in education, (b) publish NAIIP aerial photography collections and selected Landsat 8 scenes as WMS data services for GIS access and use, and (c) provide novice users with the ability to subset and download imagery directly from the viewer.

- The AVMSS graphic to the right illustrates the original approach for the shared web-based data visualization and distribution system.
- As technology advanced, the objectives of this AVMSS concept were improved and AV developers introduced the Earth Observation Depot Network (EODN), which is scalable with high performance. EODN is a network of discrete storage resources or depots distributed around the country, and potentially around the world, working together to provide the best possible access to the most current and valuable remote sensing data. The concept of “data logistics” – the intelligent movement and staging of data -- built into EODN ensures that data are available whenever and wherever needed.
- The key technical aspects of the EODN content distribution network were discussed in Section II. This advanced working concept addresses the workplan objectives listed above: protocol has been improved and StateViews – as well as many other users – can readily use the data.



Steps 3a and 3b illustrate multi-stream downloads by individual users. 3a is pulling blocks or slices of a given data object from several locations, and 3b illustrates the facility of a local “cache” EODN. 3a illustrates the use of a local cache depot to ensure that most of the data slices are drawn from the local resource, resulting in better performance.

## A Metric Perspective and Summaries of StateViews' Technology Transfer

In GY 14, three StateViews (IN, TX, and UT) received, processed, and distributed satellite imagery, including real-time collection and distribution of data in collaboration with emergency responders and field operations. MODIS and Landsat imagery predominated, but other data continued to become more widely available as partner-operated reception and processing infrastructure increased in demand.

In GY 14, StateViews engaged in 31 additional activities that improved ease of access to geospatial imagery (such as Landsat, ASTER, MODIS, and various aerial datasets including LiDAR and orthophotography) by end users through activities such as:

- Making remote sensing imagery publicly available at low or no cost on StateView websites (20 activities by AL (2), CO, CT (2), GA, IN, IA, KY, MI, MN, MS, NY, ND (2), OH, PA, TX (2), and WV)
- Making the processing, distribution, and user interfaces easier so more residents and data users could access data (2 activities by NY and WI)
- Structuring data sharing arrangements within or among StateViews or StateView partners (2 activities by NE and ND)
- Hosting data sets for StateView partners (e.g., NAIP for USDA-FSA), and brokering or otherwise encouraging data acquisition for a research or education project (4 activities by AL, MI, TX and WI)

### Benefits of Technology Transfer Activity

The disaster analysis support, when conducting workshops for emergency responders, assisting with the oversight of restoration efforts, or developing tools to predict and plan for flooding events demonstrate priceless applications of remote sensing and GIS expertise that this grant has enabled.

Of benefit to both the disaster support and day-to-day applications that require agile access to remote sensing images and products, EODN's advantages over traditional data distribution methodologies are:

- Open and free access to everyone
- Reduced latency – faster collection to desktop
- *FAST* downloads – multiple streams from many depots
- Large capacity – 30TB and growing
- Automated workflows – scriptable access
- Redundancy – multiple copies of all data
- Self-healing – eliminates single points of failure
- Pre-caching – data stored close by
- Automated routing – data moved where needed
- Scalable – grows with additional depots

- Robustness – handles increasing demand
- Integration – ties into existing data discovery tools
- User owned – stakeholders own depots
- User operated – stakeholders set policy
- Distribution – push value-added data to community
- Volume users – offloads network traffic
- Large file transfer – back-end data movement

#### **Sub-Objective 4.c Outreach**

*AV will continue its decade-long efforts to increase United States' citizens understanding, awareness, and utilization of remote sensing data and products, and the agencies that produce that data. Measurable objectives include conducting annual educational outreach with local, state, and national decision makers; creating and posting displays in public venues and community events; and through StateViews' continuing efforts to include satellite data in member states' geospatial consortia and data libraries.*

#### **AV National Workplan - outreach with decision makers and general public**

*GY 2013-2016: In February of each grant year, AV's Outreach Committee and AV staff will compile handouts and key talking points explaining the many uses of remote sensing science in the context of geospatial skills at the national level. The USGS will be requested to provide any updated fact sheets or program information that can be publicly shared. Each year, each StateView will produce "fact sheets" that describe their research, educational, and outreach activities. These handouts will be used in educational visits made by AV to decision makers during the upcoming year.*

- In GY 14, AmericaView members met with more than 100 decision makers (or their staff persons) to conduct educational visits to share the importance of remote sensing imagery and products to the residents of their states.
- AV requested USGS's most current Bureau fact sheets to incorporate in materials used for K-12 visits, community events, and educational outreach at the local, state, and national levels.
- Fact sheets prepared by the AmericaView StateViews for GY 2014 are found in Appendix H and will be used for various GY 2015 educational visits and meeting fora.
- In GY 14, the AV Outreach Committee provided oversight to the development of an eight-page brochure which was designed and produced by LouisianaView students under the supervision of Brent Yantis. This high-quality publication was distributed to members during the WBM and were used with the factsheets during visits to decision-makers.
- In GY14, preliminary discussion began for the design of an inexpensive flyer that could be used for large events. Similar discussions continued about finalizing a PowerPoint template for AV

presentations. Information for standard AV content in such a presentation replicate what the Outreach Committee approved for the brochure.

*GY 2013-2016: AV will maintain and update its website and blog.*

*GY 2014 Addition: This includes existing High Impact Activity fact sheets, Annual Reports/accomplishments, new compelling imagery (including Landsat mosaics and time series), research endeavors, partners, recent news, and program area achievements. Once content is augmented and updated, the website will be re-designed to attract its visitors for longer and more frequent visits. An appealing website that is more easily read and conveys the dynamism of the organization and its activities will be an effective outreach tool for AV. AV will also maintain the currency and accuracy of its blog.*

- AV's website design was last updated in 2009-2010. New content was periodically posted during GY 2014 but the website remained incomplete and not current for many activities.
- StateView (including membership map) and Board information was updated, an Accomplishments tab was created and populated (Annual Reports include HIA fact sheets), and the current brochure was linked.
- A mini-grant was awarded in GY14 to WisconsinView (Dr. Sam Batzli, PI) to update the underlying architecture, design, and content of website. This effort will continue into GY15.
- With the combined StateView's web sites, along with the AV web site and blog, AmericaView hosted more than 79,982 visitors and more than 259,418 page views during GY14. The information provided via AV's electronic venues enhanced the ability of decision makers, educators, scientists, and the general public to utilize remote sensing data and analytical tools.
- AV has maintained its blog site since 2010. In GY 2014, AV's blog hosted 16,884 page views. MichiganView (Michael Battaglia) hosts the blog site and Jarlath O'Neil- Dunne (VermontView PI) is a major contributor to the site.

*GY 2014-16: AV will link to social media resources and promote national level material created by two of its StateView members: a) Dr. Ramesh Sivanpillai (WyomingView) will share his [Facebook page](#) and [Google+ page](#), and b) Dr. Sam Batzli (WisconsinView) will retweet WisconsinView's [tweets](#) via AV's webpage. He attended the Landsat 8 launch in May 2013 and tweeted throughout. He also posted a summary article about the launch of Landsat 8 (for Facebook, Twitter, and Google+ also) for the Wisconsin Space Science & Engineering Center at: <https://twitter.com/uwssec>*

*Metrics: Visitor statistics for AV's website and social media sites will be compiled and reported.*

- **WyomingView** has an active social media presence:  
Facebook: <https://www.facebook.com/pages/WyomingView/314286598583916> has 280 followers

- Google+: <https://plus.google.com/b/114860802366070461656/114860802366070461656/posts> has 44 followers
- Blogspot: <http://wyomingview.blogspot.com/> has > 4100 unique lifetime page views
- **WisconsinView** is active on Twitter at <https://twitter.com/uwssec> with 756 tweets and 816 followers.
- Tom Mueller, PennsylvaniaView, established an **AmericaView Facebook** page for EOD at <https://www.facebook.com/search/top/?q=americaview%20earth%20observation%20day>. The Facebook page has been established with 44 posts and over 102 likes since its beginning in September, 2014. The Twitter account has been established and has 80 followers. The account has tweeted or retweeted 508 times.
- Debbie Deagen, AV Program Director, created an **AV Organization Facebook** page at <https://www.facebook.com/AmericaView/?fref=ts> with 65 likes since its beginning in April 2015
- **Twitter and Facebook** “windows” are being set up with new AV website hosted by WIView.

### A Metric Perspective and Summaries of StateViews’ Outreach

In GY 2014, StateViews increased the public’s awareness of remote sensing imagery and technologies with ten activities:

- Promoted understanding of geospatial data among public through activities such as Earth Observation Day (12 activities by IA, KS, KY, LA, MS, NE, NH, NY, PA, RI, VA, and WI)
  - Participated and used remote sensing imagery in museum and other public venue displays (1 activity by LA)
  - Utilized social media, updated SV websites, initiated mass mailings, created posters, StateView screen savers, etc. (8 activities by CO, OK, PA, SD, UT, VT, WI and WY)



*Left: Display at the James Devin Moncus Theater as part of the Lafayette, Louisiana exhibit for business and technology, Spring 2015.*

## Benefits of Outreach Activity

The public is often overlooked as an audience for informal educational programs on remote sensing, but many members of the public are interested, and given the right “hook” can often become fascinated by this area of science. Displays can be expensive and may require significant effort (and partnerships), but have the potential to reach a large number of people in an environment that is non-technical and conducive to learning. Public venues have the potential to: reach larger and more diverse audiences, and in some cases to reach a “captive” audience. The LouisianaView example above ties remote sensing into the art genre that could interest a broader sector of our citizenry. Images capture imagination and satellite images intrigue viewers, who always want to see their own homes, but those images also illustrate the value of the wider view and perhaps awaken awareness of the broad contributions that remote sensing science makes to many facets of everyday life. Presentations made by AV members to service organizations are usually very effective because the “messenger” is a trusted member of the community.

## Appendix A – List of StateViews and Principal Investigators

As of June 30, 2015, AmericaView had 40 StateView members: 33 Full Members\*, no Associate Members and six Affiliates. AV’s StateView members were:

### FULL MEMBERS\*

\* AlaskaView and MarylandView were not funded in GY14

<p><b>AlabamaView</b>  <a href="http://www.alabamaview.org">http://www.alabamaview.org</a>            Dr. Luke Marzen            Department of Geography            Auburn University</p>	<p><u>Co-I</u>            Dr. Chandana Mitra            Auburn University</p>
<p><b>AlaskaView</b>  <a href="http://portal.gina.alaska.edu/projects/alaska-view">http://portal.gina.alaska.edu/projects/alaska-view</a>            Ms. Lisa Wirth            Geospatial Data Manager, GINA Program            University of Alaska Fairbanks</p>	
<p><b>ArkansasView</b>  <a href="http://www.cast.uark.edu/cast/arkansas_view">http://www.cast.uark.edu/cast/arkansas_view</a>            Dr. Jason Tullis            Center for Advanced Spatial Technologies (CAST)            University of Arkansas</p>	
<p><b>CaliforniaView</b>  <a href="http://cstars.metro.ucdavis.edu/education-and-outreach/californiaview">http://cstars.metro.ucdavis.edu/education-and-outreach/californiaview</a>            Dr. Susan Ustin            Center for Spatial Technologies and Remote Sensing (CSTARS)            University of California at Davis</p>	<p><u>State Coordinator</u>            Ms. Pia van Benthem            Department of Land, Air and Water Resources            University of California at Davis</p>
<p><b>ColoradoView</b>  <a href="http://coloradoview.org/">http://coloradoview.org/</a>            Dr. Wei Gao            USDA UV-B Monitoring and Research Program            Colorado State University</p>	<p><u>State Coordinator</u>            Dr. Michael Coughenour            USDA UV-B Monitoring and Research Program            and the Natural Resource Ecology Laboratory            Colorado State University</p>

<p><b>GeorgiaView</b>  <a href="http://gis.westga.edu/gaview/">http://gis.westga.edu/gaview/</a>  Dr. J.C. Seong  Department of Geosciences  University of West Georgia</p>	<p>Dr. Mark Patterson  Geographic Information Science Service Center  Kennesaw State University</p>
<p><b>HawaiiView</b>  <a href="http://hawaiiview.higp.hawaii.edu/">http://hawaiiview.higp.hawaii.edu/</a>  Dr. Robert Wright  School of Ocean and Earth Science and Technology  University of Hawaii</p>	
<p><b>IdahoView</b>  <a href="http://www.idahoview.org/">http://www.idahoview.org/</a>  Dr. Jan U.H. Eitel  Geospatial Laboratory for Environmental Dynamics  University of Idaho</p>	
<p><b>IndianaView</b>  <a href="http://www.indianaview.org/">http://www.indianaview.org/</a>  Mr. Larry Biehl  Purdue Terrestrial Observatory  Purdue University</p>	
<p><b>IowaView</b>  <a href="http://www.iowaview.org/">http://www.iowaview.org/</a>  Dr. Kevin Kane  College of Design  Iowa State University</p>	<p><u>Co-I</u>  Ms. Robin McNeely  Iowa State University  ISU GIS Facility Program Manager</p>
<p><b>KansasView</b>  <a href="http://www.ksview.org/">http://www.ksview.org/</a>  Dr. Steve Egbert  Kansas Applied Remote Sensing Program (KARS)  University of Kansas</p>	<p><u>State Coordinator</u>  Mr. Kevin Dobbs  Kansas Applied Remote Sensing Program (KARS)  University of Kansas</p>
<p><b>KentuckyView</b>  <a href="http://www.kentuckyview.org/">http://www.kentuckyview.org/</a>  Dr. Haluk Cetin  Director, Hyperspectral Laboratory  Murray State University</p>	

<p><b>LouisianaView</b>  <a href="http://www.rac.louisiana.edu/">http://www.rac.louisiana.edu/</a>  Mr. Brent Yantis  Regional Application Center  University of Louisiana</p>	
<p><b>MarylandView</b>  <a href="http://marylandview.towson.edu/">http://marylandview.towson.edu/</a>  Dr. Todd Moore  Dept. of Geography and Environmental Planning  Towson University</p>	
<p><b>MichiganView</b>  <a href="http://wiki.americaview.org/display/miview/Home">http://wiki.americaview.org/display/miview/Home</a>  Dr. Nancy French  Michigan Tech Research Institute (MTRI)  Michigan Technological University</p>	<p><u>State Coordinator</u>  Mr. Michael Battaglia  Michigan Tech Research Institute (MTRI)  Michigan Technological University</p>
<p><b>MinnesotaView</b>  <a href="http://minnesotaview.umn.edu/">http://minnesotaview.umn.edu/</a>  Dr. Marvin Bauer  Department of Forest Resources  University of Minnesota</p>	<p>Dr. Joseph Knight  Department of Forest Resources  University of Minnesota</p>
<p><b>MississippiView</b>  (Website under revision)  Dr. Greg Easson  Enterprise for Innovative Geospatial Solutions  University of Mississippi</p>	
<p><b>MontanaView</b>  <a href="http://www.montanaview.org/">http://www.montanaview.org/</a>  Dr. Rick Lawrence  Land Resources/Environmental Science Dept.  Montana State University</p>	
<p><b>NebraskaView</b>  <a href="http://nebraskaview.unl.edu/">http://nebraskaview.unl.edu/</a>  Dr. Brian Wardlow  Center for Advanced Land Management IT(CALMIT)  University of Nebraska-Lincoln</p>	<p><u>State Coordinator</u>  Ms. Milda Vaitkus  (CALMIT)  University of Nebraska-Lincoln</p>

<p><b>New HampshireView</b>  <a href="http://www.nhview.unh.edu/">http://www.nhview.unh.edu/</a>  Dr. Russ Congalton  Department of Natural Resources and the Environment  University of New Hampshire</p>	
<p><b>New MexicoView</b>  <a href="http://Newmexicoview.Nmsu.edu">http://Newmexicoview.Nmsu.edu</a>  Dr. Ken Boykin  Center for Applied Spatial Ecology  New Mexico State University</p>	
<p><b>New YorkView</b>  <a href="http://www.esf.edu/nyview">www.esf.edu/nyview</a>  Dr. Lindi Quackenbush  Department of Environmental Resources Engineering  State University of New York</p>	
<p><b>North CarolinaView</b>  <a href="http://www.ecu.edu/cs-cas/geog/ncview/">http://www.ecu.edu/cs-cas/geog/ncview/</a>  Dr. Yong Wang  Department of Geography  East Carolina University</p>	
<p><b>North DakotaView</b>  <a href="http://www.und.nodak.edu/org/ndview/">http://www.und.nodak.edu/org/ndview/</a>  Dr. Brad Rundquist  Department of Geography  University of North Dakota</p>	
<p><b>OhioView</b>  <a href="http://www.ohioview.org/">http://www.ohioview.org/</a>  Dr. Anita Simic  School of Earth, Environment and Society  Bowling Green State University</p>	<p><u>State Coordinator:</u>  Teresa Benko</p>

<p><b>PennsylvaniaView</b>  <a href="http://www.paview.psu.edu/">http://www.paview.psu.edu/</a>  Dr. Tom Mueller  Department of Earth Science  California University of Pennsylvania</p>	
<p><b>South DakotaView</b>  <a href="http://sdview.sdstate.edu/">http://sdview.sdstate.edu/</a>  Ms. Mary O'Neill  Water Resources Institute  South Dakota State University</p>	
<p><b>TexasView</b>  (Website under revision)  Dr. Rebecca Dodge  Department of Geosciences  Midwestern State University</p>	
<p><b>UtahView</b>  <a href="http://earth.gis.usu.edu/">http://earth.gis.usu.edu/</a>  Dr. Douglas Ramsey  Department of Wildland Resources  Utah State University</p>	<p><u>State Coordinator</u>  Mr. Christopher McGinty  Associate Director  Remote Sensing/GIS Laboratory  Utah State University</p>
<p><b>VermontView</b>  <a href="http://www.uvm.edu/vermontview/">http://www.uvm.edu/vermontview/</a>  Mr. Jarlath O'Neil-Dunne  Spatial Analysis Laboratory  University of Vermont</p>	
<p><b>VirginiaView</b>  <a href="http://virginiaview.cnre.vt.edu/">http://virginiaview.cnre.vt.edu/</a>  Dr. James Campbell  Department of Geography  Virginia Tech</p>	<p><u>State Coordinator</u>  Dr. John McGee  Department of Forest Resources and  Environmental Conservation  Virginia Tech</p>
<p><b>West VirginiaView</b>  <a href="http://www.wvview.org/">http://www.wvview.org/</a>  Dr. Tim Warner  Department of Geology and Geography  West Virginia University</p>	

<p><b>WisconsinView</b>  <a href="http://www.wisconsinview.org/">http://www.wisconsinview.org/</a>          Dr. Sam Batzli          Environmental Remote Sensing Center (ERSC)          University of Wisconsin</p>	
<p><b>WyomingView</b>  <a href="http://www.uwyo.edu/wyview/">http://www.uwyo.edu/wyview/</a>          Dr. Ramesh Sivanpillai          Wyoming Geographic Information Science Center          University of Wyoming</p>	
<p><b>AFFILIATES</b></p>	
<p><b>ConnecticutView</b>  <a href="http://ctview.uconn.edu">http://ctview.uconn.edu</a>          Mr. James Hurd          Center for Landuse Education and Research (CLEAR)          University of Connecticut</p>	<p>Dr. Daniel Civco          Director of CLEAR          University of Connecticut</p>
<p><b>NevadaView (inactive)</b>          Mr. Ronald H. Hess (contact person)          Nevada Bureau of Mines and Geology          University of Nevada at Reno</p>	
<p><b>OklahomaView</b>  <a href="http://okview.org/">http://okview.org/</a>          Dr. Xiangming Xiao          Department of Microbiology and Plant Biology          University of Oklahoma</p>	<p><u>Co-I</u>          Dr. Saleh Taghvaeian          Assistant Extension Specialist          Biosystems &amp; Agricultural Engineering Dept.          Oklahoma State University</p>
<p><b>OregonView</b>  <a href="http://research.engr.oregonstate.edu/parrish/oregonview">http://research.engr.oregonstate.edu/parrish/oregonview</a>          Dr. Christopher Parrish          School of Civil and Construction Engineering          Oregon State University Oregon State University</p>	

<p><b>Rhode IslandView</b>  <a href="http://riview.uri.edu">http://riview.uri.edu</a>  Dr. Y.Q. Wang  Dept. of Natural Resources Science  University of Rhode Island</p>	<p><u>State Coordinator</u>  Mr. Greg Bonyng  Dept. of Natural Resources Science  University of Rhode Island</p>
<p><b>WashingtonView (inactive)</b>  Dr. Mark Swanson  Department of Natural Resources  Washington State University</p>	

## **Appendix B: AV Board of Directors during GY 2014**

### **AmericaView Board of Directors February 2014 - February 2015**

AmericaView is a national consortium comprised of individual state consortia. The national consortium is governed by a Board of Directors, elected to staggered multi-year terms of office by the membership. Board members serve on a voluntary basis and receive no compensation beyond travel support.

#### **Chair:**

Dr. Russell G. Congalton  
Professor of Remote Sensing and GIS  
MS Graduate Program Coordinator  
Department of Natural Resources & the Environment  
114 James Hall, 56 College Rd  
University of New Hampshire  
Durham, NH 03824  
Webpage: [www.nre.unh.edu/faculty/congalton](http://www.nre.unh.edu/faculty/congalton)

#### **Vice Chair:**

Dr. Rebecca Dodge  
Associate Professor  
The Department of Geosciences  
Midwestern State University  
3410 Taft Blvd  
Wichita Falls, Texas 76308

#### **Secretary: Kevin Dobbs and other Board members also assumed this position through the year**

Mr. R. Brent Yantis  
University of Louisiana at Lafayette  
Abdalla Hall  
635 Cajundome Blvd.  
Lafayette, Louisiana, 70506

#### **Treasurer:**

Mr. Jarlath O'Neil-Dunne  
Geospatial Analyst  
University of Vermont  
Spatial Analysis Laboratory  
[Webpage](#)

#### **Director:**

Ms. Milda Vaitkus  
Center for Advanced Land Management Information Technologies (CALMIT)  
School of Natural Resources  
University of Nebraska-Lincoln

3310 Holdrege, 319 Hardin Hall  
Lincoln, NE 68583-0973

**Director:**

Dr. Rick Lawrence  
Professor  
Land Resources and Environmental Sciences Department  
Director, Spatial Sciences Center  
Montana State University  
PO Box 1733490  
Bozeman MT 59717-3490

**Director:**

Ms. Mary O'Neill  
Water Resources Institute  
South Dakota State University  
211 Agricultural Engineering  
Brookings, SD 57007

**Director:**

Ms. Pia van Benthem  
Outreach Program Coordinator Center for Spatial Technologies and Remote Sensing (CSTARS)  
Program Coordinator for UCD CA Space Grant Consortium  
The University of California, Davis  
Department of Land, Air and Water Resources  
137 Veihmeyer Hall  
One Shields Avenue  
Davis, CA 95616

**Director:**

Mr. Kevin Dobbs  
Kansas Applied Remote Sensing Program  
Kansas Biological Survey  
The University of Kansas  
2101 Constant Ave.  
Lawrence, KS 66047

## **Appendix C – Summary of Earth Observation Day Activities for GY14**

### **Executive Summary for Earth Observation Day – Spring 2015**

The spring 2015 Earth Observation Day (EOD) was supported by nearly one-third of the StateViews with a variety of events. This report captures the input from each of those participants.

After informally evaluating the impact, Tom Mueller, Pennsylvania PI and lead for EOD assessed that AV could expand on the event's impact by aligning with similar efforts that were more established, had a vibrant marketing approach, and were anticipated by teachers each year. In GY2013, Tom has introduced the EOD Facebook page and the EOD Twitter account but participation did not grow as he had hoped. He summarized his thoughts with the AV Educational Committee, which discussed options during the June meeting. That committee recommended that the Board consider moving Earth Observation Day in spring to Earth Science Week in fall. Tom was requested to open discussion with the American Geosciences Institute (AGI), which sponsors that event and see how to integrate AV approach. He was directed to the AGI coordinator, Mr. Geoff Camphire, who enthusiastically encouraged cooperation in Earth Science Week. Tom learned that each summer, AGI distributes approximately 16,000 packets of educational preparation materials to teachers across the country.

In fall 2015, AmericaView will support a pilot activity for Earth Science Week. There are no plans that AV will include material for this pilot in the packets.

### **I. StateView Participants' Reports**

- **CaliforniaView**

- We hosted an Earth Observation Day Celebration for a group of undergraduate students (freshmen to seniors), staff, faculty and professionals. We used the remote sensing online memory game, ate a cake with the CA Landsat Image printed on it and talked about Landsat Satellite capabilities and applications.
- We played a Remote Sensing Jeopardy game during a remote sensing seminar series at UC Davis.

- **GeorgiaView**

- GeorgiaView, directed by Dr. Seong in the Department of Geosciences, University of West Georgia, hosted the 2015 Earth Observation Day and MapGive event on March 26, 2015. Two teachers and twenty-four high school juniors and seniors from Coweta Performance Learning Center participated in the event.
- The event's theme was "Scientists Engaged" that focused on participatory geography with crowd-sourcing. Students learned why maps are important, how maps contribute humanitarian efforts, and how scientists and the public can help create maps. Particularly, students participated in the online MapGive initiative organized by the U.S. Department of State (<http://MapGive.state.gov/>). Students helped create maps on Canaan, Haiti, using high resolution air photos from drones that show the aftermath of devastating earthquakes

in 2010. Students also helped mapping land cover mapping by participating in the Field Photo initiative (<http://www.eomf.ou.edu/photos/>) using their GPS-enabled cell phone cameras.

- **IdahoView**

- First, I told the kids that it was the AmericaView Earth Observation day and then I explained what AmericaView is. I then explained to the students what remote sensing is and gave them some examples of remotely sensed imagery and the types of platforms that the imagery can be taken from. I explained the difference between active and passive remote sensing. I included sonar, and radar in the description of active remote sensing. I then explained what LiDAR is and how I will use it for my Masters project.
- I told the students that they would be doing an activity in which they will learn more about remote sensing and remotely sensed imagery. The activity begins with the students reading a story about a bat named Echo. The story teaches the students about bat biology and explains how they use echolocation to see in the dark and find their insect prey and how that is a type of remote sensing. The story talks about different ways organisms can sense their environment and explains how the sense of sight is passive and echolocation is an active sense. The story also explains how small wavelengths of sound are heard as high-pitched noises which bats can use to detect small objects and the larger wavelengths are heard as deeper noises which all them to detect larger objects. The story contains examples of remotely sensed imagery such as a satellite photo, which depicts the bat's migration route, one that showed forest fire burn scars as seen from space. The story explains how wildlife biologists can utilize remote sensing by placing tags on animals to learn about migration routes.
- Next, the students complete an activity in which they are required to find Echo the Bat using various types of remotely sensed imagery. They must interpret what they are seeing from above in satellite photos and they must compare what they are seeing in satellite photos to maps of the same landscape. The activity explains why water looks black in a satellite image. The activity explains how satellites collect the imagery using a sensor, which scans the Earth's surface measuring the amount of reflected light. The activity also explains how infrared light is used to detect healthy vegetation and students practice identifying vegetated area.
- Once the students completed the activity online I asked them what they had learned from the activity and made sure that the concepts were clear. I then showed them a diagram of the electromagnetic spectrum and explained a bit more about visible light and the other wavelengths that we cannot see but that we can sense using remote sensing. I showed students some photos of different platforms that remotely sensed imagery could be taken

from such as UAVs, aircraft and satellites. I finished the lesson by answering any questions that the students had.

- **IndianaView**

- The 60 freshman to senior students were from Northview (near Terra Haute) and Pike (near Indianapolis) high schools. The students traveled to Purdue University. The activities for the day included: - A representative from the Purdue Admissions office spoke about education opportunities related to different areas of interest at Purdue and other Indiana universities/colleges. - Larry Biehl introduced them to remote sensing and provided some Landsat & aerial images from their locations for them to interpret. - Kathy Kozenski of GENI directed groups of students in a hands-on activity called Zombie Apocalypse planning where small groups used maps available from IndianaMap on smart boards to develop a disaster plan for a selected geographic area to mitigate the Zombie attack. - The students participated in an Earth cache data collecting activity led by Steve Smith from the Earth, Atmospheric and Planetary Sciences department. - A balloon launch was planned such that they would be able to track where the balloon was located but was cancelled because of weather conditions. Davin Huston, professor in engineering technology, instead, spoke about what the data from the balloons were used for and illustrated paths of previous of balloon launches. - The teachers and students completed a short assessment form at the end.
- Larry Biehl visited Vincennes University to make a presentation at a Geospatial seminar at the request of Professor Diane Dickey. Her request was to tell her geospatial students about IndianaView/AmericaView, remote sensing, potential jobs in the field and geospatial research I have been involved in. Larry Biehl presented an overview of remote sensing including spectral, spatial and temporal variations that are observable with remote sensing images. He also gave a quick demo of MultiSpec and gave them the opportunity to interpret some Landsat images of their county. He then discussed AmericaView/IndianaView and the information that was available to them through this program including the new IndianaView scholarship program. The presentation ended with a discussion on geospatial careers. After the seminar was over, Prof. Dickey's students then made brief presentations to me about the geospatial projects that they developed posters for. I was impressed with the work that they had accomplished and the posters that they had created.

- **KentuckyView**

- Earth Day and Earth Observation Day celebrations were held at the Curris Center of Murray State University (MSU) on April 7, 2015. The event started at 10:00AM with a presentation of the Keynote speaker, Dr. Stewart Walker, Director, Product Initiatives, BAE Systems, San

Diego, California, U.S.A. and ASPRS President. His presentation title was Trends in commercial software for photogrammetry.

- Between 11:00am and 12:00PM, one graduate student, two Directed Studies class undergraduate students, and six Introductions to Remote Sensing class undergraduate students of Dr. Cetin presented their Term-projects.
- Between 12:00 and 4:00 PM, there were poster presentations: 35 MSU students presented their posters (five graduate and 30 undergraduate posters).

- **New MexicoView**

- A MapGive mapping event: Worked with two 9th grade Earth Science classes (39 total students). Event was 4/15-16. Curriculum included satellite and aerial photo interpretation, adopt-a-pixel protocol with a concluding session doing MapGive.
- We worked with two classes of 9th grade earth science students. We worked with both classes for two consecutive days. Curriculum included sessions with Adopt-a-Pixel, the augmented reality sandbox and satellite interpretation using Landsat.

- **OhioView**

- On Earth Observation Day (EOD) OhioView hosted the annual SATELLITES student research conference. Students presented their inquiry-based research projects using observations and geospatial technologies. Dr. Claudia Alexander from the Jet Propulsion Laboratory gave the keynote address on the Rosetta mission.

- **PennsylvaniaView**

- PAView held an ArcGIS Online workshop for three teachers and then teachers created one lesson each. These lessons are currently on the PA View website.
- 200 students completed the LandUse and LandCover exercise.

- **TexasView**

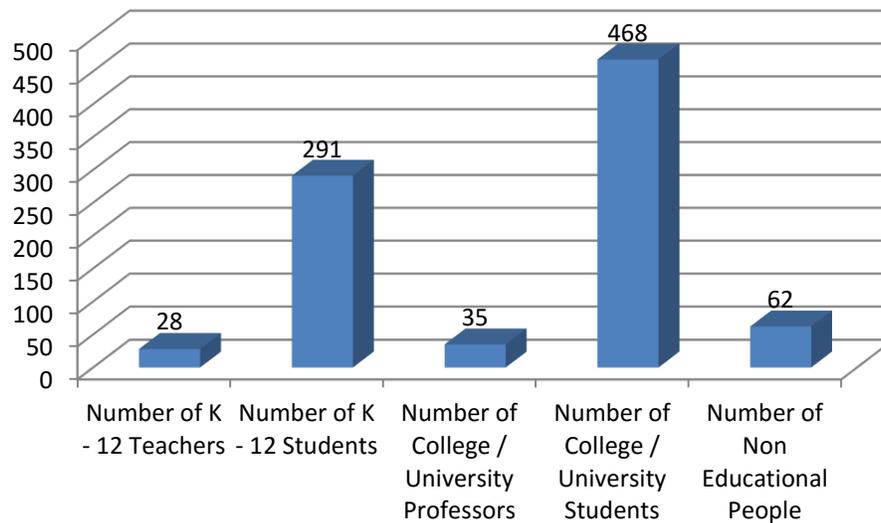
- Students in the Geosciences senior-level course "Natural Hazards and Disasters" received a lecture focused on applications of Landsat and other remote-sensing data, including Lidar, to the study of natural disasters. Special focus was given to flooding, including flooding associated with hurricane storm surge as well as flooding associated with levee breaks and dam failures. These applications have been a theme throughout the course. On the day following EODay, student gave a public presentation of posters on several historic natural

disasters; several posters featured satellite imagery applications. Departmental faculty and students were invited to the poster presentations.

- **VermontView**
  - Our effort included students who participated in Current Humanitarian Open Street Map operations.
- **VirginiaView**
  - We organized a 5 hour GIS and Remote Sensing symposium. This symposium was attended by faculty, students, representatives from the private sector, and local government and state agency employees. The symposium was partially funded by VirginiaView. The common theme for the symposium was Unmanned Aircraft Systems (UAS). We had speakers representing the private sector, the research side, as well as the regulatory side (the FAA). We provided a student poster session and social, with cash prizes for both the undergraduate and graduate poster winners. In addition, we organized a terrific social towards the end of the symposium.
- **WyomingView**
  - Second graders in the Indian Paintbrush Elementary School (Laramie, WY) saw how satellites collect data about Earth from space and how those data are used for monitoring water bodies such as lakes and reservoirs.

## II. Statistics

Each state provided metric information about the participation for its sponsored events. The graph below has summarized that input.



## Appendix D: AV Fall Technical Meeting Agenda 10/20/2014

Location	Working Breakfast @ Hallmark Inn Hotel (110 F St., Davis, CA 95616)	
	Sequoia Room	Manzanita Room
7:30-8:30	Research Committee Chris McGinty (UtahView)	Technology Committee Sam Batzli (WisconsinView)
8:30-8:45	Walk to Campus	
Location	UC Davis, Plant and Environmental Sciences Building (PES) Room 3001	
8:45-9:00	Welcome & Orientation Susan Ustin & Pia van Benthem (CalView)	
9:00-9:15	Welcome & Meeting Overview Russ Congalton, AmericaView Board Chair (New HampshireView)	
9:15-10:05	Keynote Presentation Sustaining Earth Observations: Continuing the Landsat Legacy Jennifer Lacey, Observing Systems Branch Chief (USGS EROS)	
10:05-10:35	Coffee Break	
Location	Concurrent Sessions	
	PES 2005	PES 3001
	Sensors, Collectors & Research	Education & Outreach
10:35-12:00	Removal of Thin-cloud Removal in Landsat 8 Imagery using Cirrus and QA Bands Yong Wang (North CarolinaView)	Outreach Tools Chris McGinty (UtahView)
	The Future of Imaging Spectroscopy for Land Cover Mapping Susan Ustin (CalView)	The Matrix Arrived Late: Teaching Remote Sensing & Geospatial Technologies in a Virtual World Bradley Shellito & Teri Benko (OhioView)
	Data Fusion Approaches to High-Resolution Land Cover Mapping Jarlath O'Neil-Dunne (VermontView)	Leveraging Social Media for StateView Outreach Activities Sam Batzli (WisconsinView) & Ramesh Sivanpillai (WyomingView)
Location	Lunch Presentations (sandwiches for grabs are outside of PES 3001)	
	PES 2005	
12:00-1:15	Update on AmericaView Russ Congalton, AmericaView Board Chair (New HampshireView)	
	And, Four Months in the Job Bobbi Lenczowski (AmericaView Executive Director)	
Location	PES 3001	
1:15-2:30	UAS Research and Applications Panel Discussion Jim Campbell & John McGee (VirginiaView), Michael Wing (OregonView), JB Sharma (GeorgiaView), Leo Liu (UC Davis)	
Location	PES 2nd and 3rd Floor Hallway	
2:30-2:40	Group Picture	
2:40-3:00	Coffee Break (MapGive workshop attendees need to walk to Hunt Hall (5 min walk) )	
Location	253 Hunt Hall	PES 2005
	Concurrent Workshops	
3:00-5:00	MapGive Kevin Dobbs (KansasView)	International Charter, Space and Major Disasters Brenda Jones (Disaster Response Coordinator, USGS EROS Center)
Location	Indian Restaurant Preethi, 712 2nd Street, Davis, CA 95616	
	Networking Dinner with Discussions over Coffee and Dessert	
6:00-8:00	Gathering User Requirements for Remote Sensing Ramesh Sivanpillai (WyomingView)	

Location	Working Breakfast @ Hallmark Inn Hotel (110 F St., Davis, CA 95616)	
	Sequoia Room	Manzanita Room
7:30-8:30	Education Committee Larry Biehl (IndianaView)	Outreach Committee Mary O'Neill (South DakotaView)
8:30-8:45	Walk to Campus	
Location	UC Davis, Plant and Environmental Sciences Building (PES), Room 3001	
8:45-10:05	AmericaView Research, Technology, Education and Outreach Committee Reports Larry Biehl (IndianaView), Mary O'Neill (South DakotaView), Sam Batzli (WisconsinView), Chris McGinty (UtahView)	
Location	2nd and 3rd Floor Hallways in PES	
10:05-10:35	Coffee Break & Poster Session	
Location	Concurrent Sessions	
	PES 3001	PES 2005
10:35-12:00	Education	Applications
	Resources for Landsat Workforce Development, Education and Citizen Science Jeannie Allen (NASA)	The Earth Observation Depot Network (EODN) Sam Batzli (WisconsinView), P. R. Blackwell (TexasView), Nancy French (MichiganView), Martin Swany (Indiana University Bloomington) remotely
	The AmericaView Educational Resource Portal John McGee (VirginiaView)	
	Bringing Global Climate Change Education (GCCE) to Alabama Classrooms Chandana Mitra (AlabamaView)	
Location	PES 2004	
12:00-1:15	Lunch Presentations: High School Drone Debate Project UC Davis Senior High School Students Progress and Ideas on AmericaView Outreach Materials Mary O'Neill (South DakotaView) & Brent Yantis (LouisianaView)	
Location	Concurrent Workshops	
	253 Hunt Hall	PES 1137
1:15-2:30	Use of R for Image Analysis (Part I) Rick Lawrence (MontanaView)	Google Earth Engine Tyler Erickson (Google)
2:30-3:00	Coffee Break	
Location	253 Hunt Hall	PES 1137
3:00-5:00	Use of R for Image Analysis (Part II) Rick Lawrence (MontanaView)	Object-based Data Fusion Approaches to Feature Extraction using eCognition Jarlath O'Neil-Dunne (VermontView)
Location	Dinner on your own	

## Presentation and Workshop Abstracts

MONDAY, 10/20/14

### Keynote Address:

**\*Jennifer Lacey**, (USGS EROS Center)

**Title:** "Sustaining Earth Observations: Continuing the Landsat Legacy"

**Abstract:** The Landsat missions have been flown since 1972, with a goal to collect and archive remotely sensed land data over the entire Earth that can be used for global change research and a multitude of other applications. To better align the scheduling, acquisition, and collection of Landsat data to user requirements, the U.S. Geological Survey (USGS) assumed operational responsibility of the Landsat program just prior to the launch of Landsat 7 in 1999. In 2008, the change in the Landsat data policy provided the user community with access to data at no cost and stimulated a revolution in land remote sensing research and applications. The ability for the USGS to understand scientific user needs and translate them into imagery requirements has allowed the Landsat missions to be flown as a constellation, with acquisitions maximized to satisfy the greatest amount of users.

Currently, the USGS is operating the Landsat 7 and Landsat 8 missions and is working closely with NASA to develop a plan for Landsat continuity for 20 years, starting in 2018. While the basic system requirement is the continuation of global Landsat-like data, the priorities for the USGS are to maintain 8-day repeat data collection, reduce the risk of a gap in data collection, and ensure a reliable solution. In addition, to augment data from future Landsat missions and ensure timely repeat imagery collections, the USGS is also collaborating with the European Space Agency and the European Commission to host an inventory of Sentinel-2 Multispectral Imager data. Given the anticipated user demand, tremendous data volumes are anticipated from these collections, therefore the USGS is interested in investigating the Earth Observation Depot Network (EODN) as an opportunity to supplement existing systems and provide additional avenues to distribute remotely sensed data to large data volume consumers.

### Session 1, Sensors, Collectors and Research

**\*Yong Wang**, (North CarolinaView)

**Title:** "Removal of Thin-cloud Removal in Landsat 8 imagery using Cirrus and QA Bands"

**Abstract:** After atmospheric correction, an algorithm for the removal of thin cirro- and alto-clouds or thin clouds within visible and near infrared bands (Bands 1–5) of Landsat 8 was developed. In the algorithm, cirrus clouds using Band 9 and remaining thin clouds using quality assurance (QA) band were sequentially removed. The algorithm was evaluated using Landsat 8 images of 14/35 (North Carolina, USA) and 129/39 (Sichuan, China). Promising results have been obtained.

**\*Susan Ustin**, (CalView)

**Title:** "The Future of Imaging Spectroscopy for Land Cover Mapping"

**Abstract:** The first near-infrared and shortwave-infrared (NIR, SWIR) imaging spectrometer (the "Airborne Imaging Spectrometer", AIS) was flown by the Jet Propulsion Lab in 1984 and the first full wavelength (that is, from 400nm to 2500nm) imaging spectrometer (IS), the Airborne Visible Infrared Imaging Spectrometer (AVIRIS), has been flown continuously since 1987. This technology has potential to advance the accuracy of land cover mapping using "spectral fingerprinting" methods. Today there are a number of companies that make imaging spectrometers. The technologies are considered mature in terms of flight readiness, for example IS have mapped much of the moon and Mars, are being flown on a variety of platforms

routinely, including drones, in many countries. Currently the only IS satellites are the Hyperion on the EO-1 and the Compact High Resolution Imaging Spectrometer (CHRIS) instrument on Proba, a miniature cube-sat European Space Agency platform. However, Germany, Italy, Japan, India, and China have plans to build and launch IS satellites in the 2017 time frame. Several of these countries have committed to the NASA policy of “free and open access to data”. The EROS Data Center is evaluating incorporating some of these data, along with the ESA’s Sentinel instruments. The U.S. currently plans an IS-multiband thermal imager, termed the HypSPRI program, although they have no assigned flight date yet. Earlier this year, NASA released a “Request for Information” related to the possibility of flying an imaging spectrometer for a future Landsat instrument. I plan to review some of these plans and preparation for its use in terms of analytical methods.

**\*Jarlath O’Neil-Dunne**, (VermontView)

**Title:** Data Fusion Approaches to High-resolution Land Cover Mapping

**Abstract:** We are awash in data, from imagery to vector data to LiDAR point clouds. This presentation will provide an overview of VermontView’s efforts to map high-resolution land cover by integrating existing vector data, statewide orthophotos, and USGS funded LiDAR. Using an object-based approach the data can be fused to a common model, the object, which breaks down the barriers of existing data models. The object-based, data fusion approach is a cost effective and efficient approach for generating high-resolution land cover datasets.

#### **Session 2, Education and Outreach:**

**\*Mr. Chris McGinty**, (UtahView)

**Title:** Outreach Tools

**Abstract:** This presentation and demonstration will provide information on the use of Dropbox and Evernote as methods for StateView submission, storage, search, and retrieval. Additionally, information will be given, and comments solicited, regarding the development of an AmericaView newsletter and changes to the AV website.

**\*Bradley Shellito and Terri Benko**, (OhioView)

**Title:** “The Matrix Arrived Late: Teaching Remote Sensing and Geospatial Technologies in a Virtual World.”

**Abstract:** The Air Force Discovery Labs in Dayton, OH, offers a summer internship series entitled “Summer at the Edge” which utilizes a virtual world interface for student learning. In summer 2014, Dr. Brad Shellito of OhioView was the first professor to teach about geospatial technologies and remote sensing in this virtual world environment. This presentation discusses the teaching methods involved with the virtual world, as well as the setup, logistics, advantages, and disadvantages of geospatial teaching in this environment. A tour of the virtual world and the different virtual classrooms and environments is also part of the presentation.

**\*Ramesh Sivanpilia**, (WyomingView) and **Sam Batzli** (WisconsinView)

**Title:** “Leveraging Social Media for StateView Outreach Activities”

**Abstract:** Social media sites are valuable tools for StateViews to promote remote sensing science and applications in their own states and elsewhere. However given the multitude of choices and purpose it can be overwhelming for StateViews to select a suitable social media application. This presentation will provide an overview of few popular social media sites such as Blog, Facebook, Google+, Twitter and Pin It, along with their advantages and disadvantages.

### **UAS Research and Applications Panel**

**\*John McGee, (VirginiaView)**

**Abstract:** Over the past year, VirginiaView has been working to acquire a UAS to support program outreach efforts and research support for faculty at Virginia Tech. This discussion will provide an overview of our approach to generate buy-in among colleagues at Virginia Tech and will summarize some lessons learned along the way.

**\*JB Sharma, (GeorgiaView)**

**Abstract:** The University of North Georgia is experimenting with an eBee Sensefly UAS, to quantify its capabilities and to figure out how to best integrate it into research and teaching. This includes calibrating the eBee derived orthoimagery and DSM's by comparison with NAIP aerial imagery and aerial LiDAR. This also includes understanding the FAA regulatory environment and developing activities that can be integrated into the undergraduate curriculum and research.

**\*Jim Campbell, (VirginiaView)**

**Abstract:** A brief discussion on Virginia Tech's mission as part of its function as a UAS Test Site Operator— its formal mission, current status, and look forward. This will include the role of the test site range, and staffing.

**\*Michael Wing, (OregonView)**

**Abstract:** Coincident with the growth of Oregon's wineries are recent technological breakthroughs that allow the flight of low-cost unmanned aerial systems (UAS) that can provide high-resolution color and infrared imagery of vineyards from above. This high-resolution imagery can provide important insights into the growth and health patterns of vineyards.

**\*Xiaoguang Leo Liu, (UC Davis)**

**Abstract:** Traditional radar remote sensing relies on space- or airborne radar systems. While such platforms can cover large areas in a short amount of time, they often don't provide high temporal or spatial resolution. Low-cost and low-flying UAVs can provide the much desired high-resolution if they can be equipped with high-precision radar sensors. Based on his work in low-power and short-range radar systems, Dr. Liu is interested in exploring radar-based situation awareness, synthetic aperture imaging, and cognitive clutter rejection techniques on small UAV platforms.

### **Workshop 1:**

**\*Brenda K. Jones, (USGS EROS Center)**

**Title:** "International Charter, Space and Major Disasters"

**Abstract:** This workshop will provide an overview of the Charter, roles and functions of the Project Manager, partner agencies and their assets, and a quick tour of the Charter tools including the Charter Geographic Tool (CGT), Hazards Data Distribution System (HDDS), and the new Charter Operational System-2 (COS-2).

**Workshop 2:**

**\*Kevin Dobbs, (KansasView)**

**Title: "MapGive"**

**Abstract:** A how-to workshop on a hosting a humanitarian open data MapGive mapathon for EOD/GIS Day or integration into RS/GIS labs. In this workshop I will go over the logistical and practical considerations for hosting a mapathon with a humanitarian focus. We will review the iD and JOSM editors for Open Street Map. We will examine recent cooperative efforts by the American Red Cross, US State Department, and others centered on the Ebola outbreak in West Africa. The second half will be hands-on mapping of a current MapGive task by workshop participants (most likely for Ebola).

**Dinner Discussion**

**Ramesh Sivanpillia (WyomingView)**

**Title: "Gathering User Requirements for Remote Sensing"**

**Abstract:** Attendees will participate in discussions stimulated by (1) Ramesh's summary of the panel exchange during the ASPRS Louisville meeting, (2) by an update on his Future Landsat Needs Survey within AmericaView, (3) background on the forthcoming call from OSTP for user needs to be included in the next OSTP National Plan for Civil Earth Observations, and (4) Jenn Lacey's comments on the USGS efforts.

## Presentation and Workshop Abstracts

TUESDAY, 10/21/14

### Session 1, Education:

**\*Jeannie Allen, (NASA)**

**Title:** "Resources for Landsat Workforce Development, Education and Citizen Science"

**Abstract:** A representative from NASA Landsat's Communications and Public Engagement team at Goddard Space Flight Center will share learning and teaching resources for informal and formal venues, and will describe some developments in federal guidelines for the entry level geospatial workforce.

**\*John McGee (VirginiaView)**

**Title:** "The AmericaView Educational Resource Portal"

**Abstract:** The AmericaView Educational Resource Portal was established to facilitate the sharing of resources between AmericaView consortium members, as well as with stakeholders outside of the AV consortium. This presentation will provide a general overview of the AV Educational Resource Portal.

**\*Chandana Mitra, (AlabamaView)**

**Title:** "Bringing Global Climate Change Education (GCCE) to Alabama Classrooms"

**Abstract:** Auburn University has launched a statewide Global Climate Change Education (GCCE) Program that aims at improving high schools and middle schools in climate change science. The overarching goal is to generate a better-informed public that understands the consequences of climate change and can contribute to sound decision-making on related issues. We have developed new educational modules that can be incorporated into the existing course of study for 6-12 Grade sciences classes. Teachers have been trained through partnership with Alabama Science in Motion (ASIM) and AMSTI, which provides an equal opportunity for hands-on use of state-of-the-art equipment that many Alabama students would never experience. It has the potential to reach over 200,000 students when the modules are fully implemented in every school in the state of Alabama.

### Session 2, Applications:

**\*Sam Batzli (WisconsinView), P. R. Blackwell (TexasView), Nancy French (MinnesotaView), Martin Swany (Illinois University Bloomington) (remote) PARTICIPANTS:** Members of the DLT team via audio conference bridge

**TITLE:** "The Earth Observation Depot Network"

**ABSTRACT:** The Earth Observation Depot Workshop (EODN) is a community owned, distributed cloud content distribution system for remote sensing data. AmericaView is partnering with USGS EROS Center and the NSF-funded Data Logistics Toolkit project team to develop EODN as a global resource for the timely distribution of remote sensing data. The presentation will include an explanation of the technical underpinnings of EODN, demonstrations of its advantages and practical use, a presentation on building an EODN Depot using the Data Logistics Toolkit, and an open discussion about the present and future EODN opportunities for AmericaView.

### **Lunch Presentations:**

**\*Davis Senior High School**

**Title:** "Short Debate on UAS"

**Abstract:** A team of high school students is working on a project to launch a nationwide online drone debate platform. The students will introduce the project briefly and give a short debate demonstration.

**\*Mary O'Neill (South DakotaView) and Brent Yantis (LouisianaView)**

**Title:** "Outreach Committee Demonstrations"

**Abstract:** Progress/ideas on the brochure/folder template, the fact sheet app, the PowerPoint template, and the Correspondence template"

### **Workshop 3:**

**\*Rick Lawrence, (MontanaView)**

**Title:** "Use of R for Image Analysis"

**Abstract:** Modern image processing programs are often hampered by the use of outdated statistical algorithms. The R statistical program contains perhaps the best collection of predictive models for both categorical and continuous data modeling (classification, for example), but has historically been hampered by inability to handle large datasets and a steep learning curve. In this workshop, I will introduce tools for handling large raster datasets in R and teach some R code that can be used for classification and other statistical analysis of remotely sensed data; the example used will be classification using RandomForest, but it will be demonstrated how this code can be adapted to other algorithms.

### **Workshop 4:**

**\*Tyler Erickson, (Google)**

**Title:** "Google Earth Engine"

**Abstract:** Google Earth Engine is a cloud-based platform for geospatial data analysis, and has been designed for large-scale image analysis of satellite imagery. It allows users to write short algorithms that can be applied to petabytes of Landsat, MODIS, and other imagery. It is being used by academia, government, and non-profits for research (example: Annual Global Forest Change), operational websites (example: Global Forest Watch) and teaching (example: Nick Clinton labs).

### **Workshop 5:**

**\*Jarlath O'Neil-Dunne, (VermontView)**

**Title:** "Object-based Data Fusion Approaches to Feature Extraction using eCognition"

**Abstract:** This workshop will introduce attendees to the principals and practices of using object-based techniques to integrate raster, vector and point cloud datasets into a seamless feature extraction workflow within the Cognition software environment. An example tutorial will walk through an example in which land cover is mapped from a variety of source data. Some experience with eCognition is recommended, but not required.

## **Poster Abstracts**

**Presenter: Pia van Benthem** (CaliforniaView)

**Title:** "A Satellite's View of California's Drought"

**Abstract:** Visualization of the impact of drought in Northern California using Landsat 5 and Landsat 8 imagery to observe land cover changes.

**Presenter: Ryan Darling** (Davis Senior High School)

**Title:** "The Online Drone Debate Project"

**Abstract:** This poster is a summary of the online public debate on some of the controversial facets of drone technology.

**Presenter: Ryan Darling** (Davis Senior High School)

**Title:** "Field And Laboratory Work To Produce Information To Help Calibrate TheHyspIRI Sensor"

**Presenter: Jared S. Ogle**, (GeorgiaView)

**Title:** "Comparing Majority Filter Algorithms to Remove Noise in the Cropscape Dataset"

**Abstract:** The USDA has used remotely sensed images since the 1970s to estimate crop cover for various states and has for a while now done so on a nation-wide basis. The ability to segment crop coverage from multispectral remote sensed images is just one of the many uses of the Landsat continuity mission's applications. A major problem was noise throughout the Cropscape dataset creating a salt and pepper pixel pattern. The aim of this project was to improve the accuracy of the Cropscape dataset by minimizing the salt and pepper effect.

Here pecan was taken as a test crop and the data from Turner County, Georgia, was analyzed and processed in an attempt to create a more accurate dataset with less noise. Using contemporaneous multispectral imagery from Landsat 8 from which an NDVI layer was created, high resolution data from Google Earth, and the Cropscape dataset, a highly accurate digitized layer outlining pecan cropland was created and rasterized.

Various majority filters were tested, as they often are on land cover datasets, to minimize isolated pixels. Various window sizes were used, as well as, varying reclassification order. The results produced through the process of using majority filters of varying sizes effectively removed many isolated singular pixels with varying user and producer accuracies.

All algorithms ran when compared to the validation dataset were superior in user, producer, and overall accuracy. The 5x5 majority filter using a majority threshold processed in Erdas produced the best results. It heavily reduced the salt and pepper effect, while retaining relatively high accuracy. Using majority filtering on the Cropscape dataset can produce a higher quality product with fewer aberrant pixels.

**Presenter: Haluk Cetin**, (KentuckyView)

**Title:** "Soil Moisture Research: Field Studies and Lab Analysis to Support Imagery-based Soil Moisture Mapping"

**Presenter: Michael Battaglia, (MichiganView)**

**Title: "MichiganView"**

**Abstract:** An overview of MichiganView's 2014 activities.

**Presenter: Michael Battaglia, (MichiganView)**

**Title: "Great Lakes Coastal Wetland Mapping"**

**Abstract:** Landsat and L-band SAR were fused to classify wetlands and adjacent land within 10km of the Great Lakes shoreline. The results provide a baseline map for monitoring and managing the coastal wetlands of the binational Great Lakes region.

**Presenter: Nishan Bhattarai, (New YorkView)**

**Title: "Utilizing Landsat Images and Single-Source Energy Balance Models to estimate Daily Evapotranspiration in the Humid Subtropical US Conditions"**

**Abstract:** A number of models have been proposed to estimate evapotranspiration (ET) from Landsat images, but there is not always clear guidance on which models are preferable in different conditions. To evaluate the single-source energy balance model most appropriate for use in the humid southwestern US, we utilized 99 near cloud-free Landsat 5 Thematic mapper (TM) and Enhanced Thematic Mapper Plus (ETM<sup>+</sup>) images acquired over the period of 2000-2010. We evaluated five models-the Surface Energy Balance Algorithm for Land (SEBAL), the Mapping ET at high Resolution with Internalized Calibration (METRIC), the Simplified Surface Energy Balance Index (S-SEBI), Surface Energy Balance System (SEBS), and the locally calibrated operational Simplified Surface Energy Balance (SSEBop)-and compared model output with measured fluxes from six Eddy Covariance towers in Florida. In these models, net surface radiative flux is computed first and then partitioned into sensible and latent heat fluxes, using evaporative (or relative ET) fraction. While the daily net surface radiative flux estimates showed good correlation with the measured data, sizable difference were observed in daily ET fluxes, due to difference in derived evaporative fractions, which requires a unique approach in each model to define wet and dry conditions within the image. Overall, our study suggests that all single-source energy balance models with an exception of SSEBop have good potential to be applied in estimating daily surface energy fluxes in the humid southeastern US.

**Presenter Rebecca Dodge: (TexasView)**

**Title: "TexasView Earth Observation Day Educational Resource Development and Dissemination for Middle School and High School Science Courses"**

**Abstract:** TexasView has funded the author to develop digital lesson plans and activities that use satellite imagery covering the State of Texas, for use in 6-12 classrooms. This project modeled after The Canadian Centre for Remote Sensing-developed *Watching over our Planet from Space*; which is designed to provide hands-on activities for young people on monitoring the Earth's environment using remote sensing. This poster introduces satellite images showing diverse impacts and issues throughout the state, including

- Coastlines
- Urbanization
- Wildfires
- Hurricanes
- Snowstorms
- Resource development
- Drought
- Flooding
- Dust Storms
- Borders

This resource will introduce students to earth observations and applications, with links to NASA's Earth Observatory, which is the source for all of the images. The reverse side of the poster will include an introduction to remote sensing and will include further information about each image as well as correlations to the appropriate Middle and High School courses and required Texas essential Knowledge and Skills (TEKS) standards.

**Presenter:** P. R. Blackwell (TexasView)

**Title:** "EODN and USGS Inventory Service M2M"

**Abstract:** The Earth Observation Depot Network (EODN) is a community-owned, distributed cloud content distribution system for remote sensing data. AmericaView is partnering with the USGS EROS Center and the Data Logistics Toolkit Team to construct a prototype EODN using recent Landsat8 data. The USGS Inventory Service Machine to Machine (M2M) Simple Object Access Protocol (SOAP) interface allows programmatic access to data stored in the EROS Long Term Archive (LTA) via web services. The poster documents work done by TexasView to automate discovery and acquisition of Landsat 8 data from the LTA using M2M. The program, known as *Harvest*, suggests other potential applications of M2M.

## Appendix E: Winter Business Meeting



### WINTER BUSINESS MEETING AGENDA

February 22–26, 2015

#### AMERICAVIEW: INCREASING OUR EFFECTIVENESS AND SUSTAINABILITY

Goals for the meeting:

1. Advance the collaborative endeavors of StateViews and committees, and create partnerships that will allow us to more effectively complete the objectives of the NLRSEORA proposal
2. Connect AV applied research and education capabilities with partners and collaborators in the USGS Mission areas, to enable leveraging of similar interests, resources, technologies, and expertise
3. Continue our discussions with USGS LRS leadership regarding how AV and the USGS can continue to strengthen our working relationship and serve our state's geospatial needs better
4. Identify ways to increase the sustainability of AmericaView for at least the next decade
5. Discuss, with decision-makers, our member states' need for the temporal continuity and sensor -quality Landsat "type" imagery collection/delivery on an operational basis

#### Sunday February 22, 2015

9:00 am – 5:00 pm

**AV Board Meeting**

6:00 pm – 8:00 pm

**AV Member Welcome Reception**

#### Monday February 23, 2015

8:30 am

**Security Check-in** at USGS headquarters

9:00 am

**Welcome and Introductions**

USGS and Russ Congalton, AV Board Chair

9:05 am

**USGS Briefing**

Sarah Ryker USGS Deputy Associate Director, Climate & Land Use Change  
Timothy Newman, USGS Program Coordinator Land Remote Sensing  
*Land Remote Sensing Program, Landsat 8 and Landsat Continuity, Landsat Applications Survey, Sustainable Land Imaging Architecture Study, support for Citizen Science efforts, and other issues that will be of interest to AV members and our elected officials.*

Followed by question and answer period

10:25 am

**AmericaView and its Accomplishments**

Bobbi Lenczowski, AV Executive Director – Moderator

*StateView pre-queued power point presentations, two minutes per member for 34 Full Members and Affiliates*

- 11:30 am **Poster Session** with USGS staff invited  
 Rebecca Dodge (TXView) – Coordinator  
See attached list of posters
- 12:30 pm – 1:35 pm **Lunch**
- 12:45 pm – 1:35 pm **Overview of U.S. Geological Survey (USGS) Climate Science Centers (CSCs)  
 Update on Phenology Camera Pilot Project with NC CSC**  
 Jeff Morisette, Director, DOI North Central Climate Science Center (via Webex)  
 Brian Miller, Program Manager, North Central Climate Science Center  
*Five StateViews (Kansas, Montana, Nebraska, North Dakota, South Dakota currently have sub awards for the pilot project. Iowa will soon join. Other StateViews may want to learn more about the importance of phenology applied research.*
- 1:45 pm – 2:00 pm **AmericaView and its Accomplishments**  
*Complete what may be remaining StateView presentations*
- 2:00 pm – 3:00 pm **CONCURRENT SESSIONS**
- 1) Raising Awareness with Educational**  
 Holli Riebeck, SSAI, Education and outreach specialist at NASA GSFC  
*NASA Landsat Communications and Public Engagement, SSA.*  
 Emily Cloyd, USGCRP Public Participation and Engagement Coordinator  
*Supporting Citizen Science efforts*
- 2) Strengthening AV's Outreach**  
 Chris Trent, USGS Public Affairs,
- 3) Advancing AV's Technology with UAS**  
 Jacqueline R Jackson, Manager, Tactical Operations Section, FAA  
 Mark Jordan, JMA Solutions, supporting Unmanned Aircraft Systems  
 Integration Office, University/College Liaison for FAA  
*Briefing on Regulations and Application Processes*  
 Jim Campbell, VirginiaView, AV UAS Working Group Chair  
 Bruce Quirk, UAS Liaison, USGS  
Q&A session will run until 3:30
- 3:30 pm - 4:30 pm **CONCURRENT SESSIONS**
- 1) Aligning StateView Interests with the USGS Science Mission Areas**  
 Greg Snyder, Commercial Satellite Imagery Coordinator, USGS National Mapping  
*Overview of current Land Remote Sensing Program science projects*

AV Members

*Overview of Research Projects by AV members (10 min.)*

John Jones, Research Geographer, Eastern Geographic Science Center

*Land Cover, ECVs and Phenology (5 min.)*

Dean Hively

*Nutrients, land cover, agriculture, water (5 min.)*

Peter Claggett

*Chesapeake Bay water / land cover issues (5 min.)*

Session offered to enable research and applications that leverage similar interests, resources, technologies, and expertise.

**2) Update on Landsat 8**

Tom Loveland, Senior Scientist, EROS Center

*Among the topics for this discussion are: QC band for the full archive; surface reflectance; land surface temperature; NLCD plans; and Sentinel through USGS.*

Tom will join us via Webex

**3) Overview of iGETT and GeoTech Programs**

Mike Krimmer, Assistant Director / Senior Team, GeoTech Center

Osa Brand, Director of Project Development, National Council for Geographic Education

Session will encourage discussion of beneficial collaborations to address members' intent to improve community college geospatial educational support and to serve veterans' geospatial education and training needs.

4:30 pm – 5:00 pm

**Wrap up**

(Opportunity for sidebar sessions as needed)

6:00 pm – 8:00 pm

**AV Business and Awards Dinner**

*Earth Observation Day*

AV Outstanding Service Awards

Larry Biehl

Russ Congalton, Presenter

**Tuesday February 24, 2015**

7:00 am – 8:00 am

**Committee Meetings**

8:15 am

**Welcome and Logistics**

Russ Congalton, AV staff

8:30 am

**Review of Monday Highlights**

Russ Congalton, AV Board Chair

Debbie Deagen, AV Program Director

Bobbi Lenczowski, AV Executive Director

- *Brief report out from concurrent sessions from USGS meeting on Monday*
- *Any new initiatives/ideas from our discussion yesterday that we wish to incorporate into our SV or national work plans for next year*

9:00 am – 10:00am	<p><b>Discussion of Strategic Partnerships and “Clustering” for Proposals</b>          Bobbi Lenczowski, AmericaView Executive Director          (Models for expansion; StateView as the catalyst; Resource availability)</p>
10:30 am – noon	<p><b>The National Plan for Civil Earth Observations and U.S. Group on Earth Observations (Presentations, followed by panel session and Q&amp;A)</b>          Timothy Stryker, Director, U.S. Group on Earth Observations Program,          White House Office of Science and Technology Policy (OSTP)          Greg Snyder, Lead, Earth Observation Requirements, Land Remote Sensing Program, U.S. Geological Survey (USGS)          Ramesh Sivanpillai, Principal Investigator, WyomingView, (Research Scientist at University of Wyoming)</p> <p>This session will include a discussion of Earth observation assessment activities at the USGEO, USGS and StateView levels.</p>
12:00 pm – 1:10 pm	<p><b>Working Lunch</b>          Terri Benko (OhioView)          Nancy French (MichiganView)  <i>Discussion on Formation of AmericaView Water Quality Working Group</i></p>
1:15 pm – 2:00 pm	<p><b>Board Elections</b>          Milda Vaitkus, AV Board Secretary</p>
2:00 pm – 3:00 pm	<p><b>Summary of Committee Activities for Upcoming Year</b>          AV Committee chairs (15 minutes per committee)  <i>Reports from Committee Meetings Held Today</i></p>
3:00 pm – 3:15 pm	<p><b>Break</b></p>
3:15 pm – 4:00 pm	<p><b>AV Board Meeting – Election of Officers</b></p>
3:15 pm – 4:00 pm	<p><b>Topics from the AV Board Meeting for Discussion</b>          Russ Congalton, Bobbi Lenczowski, Debbie Deagen</p>
4:00 pm	<p><b>AV Congressional Educational Outreach: Guidelines and Rules</b>          Mary O’Neill, Bobbi Lenczowski, Debbie Deagen  <i>AV’s Message and Key Points</i>  <i>Hints from prior visits</i>  <i>Sharing of “Master Schedule”</i>  <i>Arrangement of Mentor/Mentee schedules</i></p>
5:00 pm	<p><b>Adjourn</b></p>

**Wednesday through Friday, February 25–27, 2015**

- Congressional educational visits by StateViews
  - Wednesday, February 25, meet in hotel lobby at 5:30 p.m. to discuss outcomes of educational visit

**Thursday, February 26, 2015**

9:00 am – noon

**AV Board and Staff meeting with NASA Goddard Leadership**

Discussion on Joint Educational and Outreach Efforts for the Landsat Program

James R. Irons, Ph.D.

(301) 614-6657

Deputy Director of Earth Sciences & Landsat 8 Project Scientist

Code 610.9 / Earth Sciences Division

NASA Goddard Space Flight Center

Greenbelt, MD 20771

## **AmericaView Poster Session**

*February 23, 2015*

### **ColoradoView – Activities for 2014–2015, Mike Coughenour**

Our poster provides an overview of new ColoradoView activities for the current year. In particular, it describes three high impact areas: Colorado's grazing lands, invasive species, and UV-B radiation monitoring and impacts.

### **CaliforniaView –Remote Sensing Outreach and Education, Pia van Benthem**

California View is reaching out to the general public in the State of California to educate about the benefits and applications of remote sensing imagery. The information provided helps the public to make better-informed decisions on pressing environmental issues like, for instance, the drought in California.

### **CaliforniaView – The Great California Drone Debate, Mui Lay**

Davis Senior High School is leading a project to develop an online platform to provide information on unmanned aerial vehicles (UAVs). The online forum will enable the public in virtual discussions on issues in regards to UAVs, their applications and its impact on society.

### **IdahoView – Helping to Advance Remote Sensing Research and Education in Idaho, Jan Eitel**

Poster will highlight IdahoView efforts to advance remote sensing research and education in Idaho.

### **IndianaView – Geospatial Technologies for Middle & High School Students: Lessons, Tutorials and Inter-Actives,**

Larry Biehl

The poster summarizes the work done via a partnership between IndianaView and the Geography Educators' Network of Indiana (GENI) to develop introductory geospatial educational material for middle and high school students.

### **KentuckyView – Soil Moisture and Water Quality Studies in Kentucky, Haluk Cetin**

Current research lead by KentuckyView is presented. The poster will focus on Soil Moisture and Water Quality studies in Kentucky.

### **NebraskaView – VegDRI Drought Monitoring, Milda Vaitkus**

The Vegetation Drought Response Index (VegDRI) integrates MODIS-based observations of vegetation conditions with climate and biophysical (land cover and soils) information to produce 1-km<sup>2</sup> spatial resolution maps that monitor the impact of drought stress on vegetation. NebraskaView is actively working to increase the use of this satellite-based drought monitoring tool among major stakeholders in Nebraska through various outreach activities that raise awareness of this tool within the state

### **North CarolinaView – Mapping Submerged Aquatic Vegetation in Pamlico Sound, NC using Landsat 8 data,**

Yong Wang As one of most valuable and vulnerable resources in coastal aquatic ecosystems, submerged aquatic vegetation (SAV) and its state have received more and more attention [1, 2]. The availability of repetitive coverage of satellite images allows coastal managers and researches to monitor and assess spatial and temporal distributions of the SAV rapidly. Fine spatial resolution satellite images have been proved to map the distributions efficiently and effectively [3]. Unfortunately, because of high coast, the use of high resolution images is not suitable for the SAV mapping in a large-scale spatial extent and multiple temporal observations. Landsat 8 satellite, successfully launched in February of 2013 not only inherits the advantages of previous Landsat satellites, but also has additional new bands, improved signal-to-noise ratio, and 10-bit quantization levels. With the improvements, this study uses Operational Land Imager (OLI) band data of Landsat 8 to explore the bands' capability of depicting the SAV distributions in part of the Core Sound, Pamlico Sound, North Carolina, USA during the growing periods of the SAV in 2013.

### **North DakotaView – Development of North Dakota Viewer for Bakken Oil Boom Data Brad Rundquist**

Summarizes recent efforts to develop a web-enabled GIS to serve data about landscape changes on the Fort Berthold reservation in North Dakota

**OhioView – OhioView's High Impact Activities 2013–2014** Bradley Shellito and/or Terri Benko

Partnership with AFRL Discovery Lab to creatively address the educational needs of Ohio by using geospatial technologies in a cutting-edge, virtual world platform.

During the spring and summer of 2014, OhioView partnered with the NASA Glenn Research Center, NOAA–Great Lakes Environmental Research Lab, Naval Research Lab, MichiganView, and multiple State agencies to monitor the Harmful Algal Blooms in Lake Erie as a collective team.

The OhioView SATELLITES (Students and Teachers Exploring Local Landscapes to Interpret the Earth from Space) Program continued to provide K-12 teachers and students with hands-on, inquiry-based science, and STEM education using geospatial technologies

**OklahomaView – Promoting Remote Sensing Research and Outreach in Oklahoma,** Saleh Taghvaeian

The poster will provide brief information about the activities conducted by the recently-formed OklahomaView during the last year. In addition, the results of a pilot research project on monitoring the impact of drought will be presented.

**TexasView – Earth Observation Day Educational Resource Development and Dissemination,** Rebecca Dodge

TexasView has developed educational resources designed to demonstrate remote sensing applications using Texas-centric examples and case histories. The hard-copy format makes these resources flexible for teachers to use across a range of middle and high school courses, including Environmental Systems and Earth and Space Science.

**TexasView - The Earth Observation Depot Network,** PR Blackwell

The proposed Earth Observation Depot Network is a user owned and operated, distributed cloud content distribution system for remote sensing data. The poster depicts recent developments in the project such as UNIS integration and the addition of GENI storage resources.

**VirginiaView – Designing a Remote Sensing Exhibit at the New River Valley Children's Museum,** John McGee and Jim Campbell

VirginiaView was approached to by the New River Valley Children's Museum to establish a permanent exhibit in their new facility. This poster will provide an overview of the design process associated with the exhibit

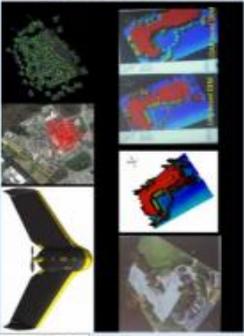
**WyomingView – Promoting the Value of Landsat Data and Applications,** Ramesh Sivanpillai

WyomingView has been conducting activities to promote the value of Landsat data and its applications. This poster will highlight accomplishments from outreach, workforce training, and applied research activities.

# A View of AmericaView's UAS Scene, 2015 highlights from across the nation



Dr. Russell G. Congalton, Director of New Hampshire View and professor of remote sensing and GIS in the Department of Natural Resources and Environment at the University of New Hampshire is conducting UAS research with his students in two areas: (1) Forest edges, and (2) Reference data collection for accuracy assessment. Congalton's team has both a DJI Phantom 2 and Aeronavics SkyZib X4 TI QR UAS system.



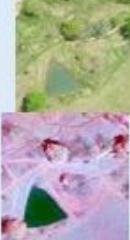
Sensefly's eBee, used for ultra-high resolution orthophoto collection and ancillary derivative data development – (a) eBee UAV; (b) Simulated flight path; (c) aerial orthophotos by the UAV over UNH-Gainesville campus; (d) mosaicked 2D orthophotos of the Science Bldg; (e) Image drape over photogrammetrically-based 3D point cloud; and (f) Comparison of DEMs developed through UAS (eBee) and LIDAR technology.



5 October, 2015: VermontView and MinnesotaView were conducting joint Unmanned Aircraft Systems (UAS) training in Vermont when they responded to an emergency request from the state to gather overhead imagery of a train the derailed near Northfield, VT. Within 45 minutes of the request the joint UAS team immediately established a launch site, conducted flight operations, and then provided imagery to the incident commander on site.



The Great Brook, in Central Vermont, flows through the town of Plainfield. Every few years major storms move large amounts of woody debris downstream, clogging bridges, resulting in flooding and costly damage. The amount of woody debris in the stream at any given time and how much moves during a storm has been poorly understood, hampering the ability of local officials to deal with issue. VermontView used UAS to monitor the Great Brook during the spring of 2015 and conducted a rapid response mission after storms caused extensive damage in July 2015. These data provided not only the first comprehensive accounting of woody debris pre- and post-storm, but also helped in the response and recovery effort.



VAView, in partnership with Virginia Tech's Conservation Management Institute, holds a COA and FAA Section 333 exemption for its eBee, approved for 400 ft. Through this COA, VAView holds a 'nationwide blanket COA' to fly below 400 feet AGL. In addition, VAView currently supports a VT staff member (with a pilot's license) to facilitate integration of its eBee to support instruction and research across the College of Natural Resources and Environment. VAView also participates in Virginia Cooperative Extension's UAS committee.

In August, VAView members attended a UAS workshop provided by the Virginia Tech's FAA Test Center (Mid-Atlantic Aviation Partnership [MAAP]). In September, we conducted additional test flights. We are organizing a faculty UAS Symposium and demonstration and are working with Virginia Cooperative Extension to provide UAS education for the Extension community and other stakeholders. NPR's *Pulse of the Planet* interviewed Dr. McGee concerning UAS applications to support Natural Resource management, a feature now scheduled to air in December. We have submitted proposals to support UAS educational efforts through the National GeoTech Center and to develop UAS Operations Technician Education educational models for community colleges through the Geospatial Education Technician (GeoTED) project.



MichiganView uses a variety of UAVs to monitor, survey, and capture variability in coastal wetlands and waters around the Great Lakes, most notably to understand the spread of invasive species. Hexacopter flights to find and map colonies of invasive Eurasian watermilfoil (*Myriophyllum spicatum*), including monitoring results of control efforts. Quadcopter flights examine treated and untreated *Phragmites* (*Phragmites australis*) to juxtapose density and growth, & support field work.



Quadcopter flights of treated and untreated *Phragmites* (*Phragmites australis*) to juxtapose density and growth, & support field work.



Hexacopter UAV ready to deploy spectroradiometer sensor from boat platform



Collecting spectral profile data from a Bergen hexacopter platform to map aquatic plants



OregonView's Chris Parrish is currently conducting research into bridge and tower inspection using unmanned aerial systems (UAS), along with Oregon State University (OSU) colleague, Dan Gillins. Chris also teaches a graduate-level class in kinematic positioning and navigation, in which students work with UAS.



Prepared from AV contributions, Sept 2015  
J.B. Campbell, J. McGee

## Appendix G

### Publications entered in AV Portal for GY14

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**[Alabama]** [CITATION] Li, X., C. Mitra, L. Marzen, and Q. Yang. (Accepted). Spatial and Temporal Patterns of Wetland Cover changes in East Kolkata Wetlands, India from 1972 to 2011. *International Journal of Applied Geospatial Research*. ; [AV acknowledged] No; [USGS acknowledged] Yes; [ABSTRACT] Rapid population growth is a main driver for recent landuse/landcover (LULC) dynamics, especially in developing countries where the pressure of accommodating swelling populations and food production has led to intensive conversions of wetlands to built-up area and agricultural land use types. Urban expansion can greatly increase built-up area and impervious surfaces and thereby lead to changes in water cycling, biodiversity and regional climate. To better understand land conversions in the East Kolkata Wetlands (EKW) in India, we analyzed four Landsat images through an object-based classification and a post-classification method from 1972 to 2011. In this study, wetland cover was assumed to include two parts - water body and adjacent vegetation areas. The overall accuracies for four images ranged from 81.3% to 89.9%, which indicate the object based method had reasonable representation of land use changes in the EKW region. Result suggests that wetland area decreased by 17.9% while built-up areas increased 183.6% from 1972 to 2011. About 38.6 km<sup>2</sup> of wetlands were converted to build-up areas in the west parts of the study area and higher wetland conversion rates were observed in recent two decade than in the period from 1972 to 1990. Besides build-up areas, large areas of wetlands were also replaced by agricultural land in eastern and southern parts of the study area. ;

**[Alabama]** [CITATION] Jones, Tyler W., Luke Marzen, and Art Chappelka. "Horizontal Accuracy Assessment of Global Positioning System Data from Common Smartphones." *Papers in Applied Geography* 1, no. 1 (2015): 59-64.; [AV acknowledged] No; [USGS acknowledged] No; [ABSTRACT] The objective of this study is to generate some preliminary results that quantify the horizontal accuracy of commonly available smartphones in real world scenarios. According to Strategy Analytics, a global research and consulting firm, there were an estimated 1.038 billion smartphones in use by October 2012 (MobiThinking, 2014). That is up from the estimated 708 million smartphones in use at the end of 2011 which is a staggering growth of 46.6 percent. The widespread availability of these devices and their potential for contribution to both academic and commercial endeavors make determining their relative accuracy an important goal. Currently, many developers and researchers are unaware of the real-world spatial accuracy of the devices they already possess. Providing this data could give these individuals the knowledge that expensive stand-alone equipment is not necessary when doing field work, but that the smartphones in their pockets will suffice just fine. ;

**[Alabama]** [CITATION] Lee, M.-K., Mitra, C., Thomas, A., Lucy, T., Hickman, E., Cox, J., Rodger, C., 2015, Bringing global climate change education to middle-school classrooms - an example from Alabama, *Handbook for Climate Change Mitigation and Adaptation*, 2nd edition. Springer, pp 1-17; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] A NASA-funded Innovations in Climate Education (NICE) Program has been launched in Alabama to improve high school and middle school education in climate change science. The overarching goal is to generate a better informed public that understands the consequences of climate change and can contribute to sound decision making on related issues. Inquiry based NICE modules have been incorporated into the existing course of

study for 9-12 grade biology, chemistry, and physics classes. In addition, new modules in three major content areas (earth and space science, physical science, and biological science) have been introduced to selected 6-8 grade science teachers in the summer of 2013. The NICE modules employ five E's of the learning cycle: Engage, Explore, Explain, Extend and Evaluate. Modules learning activities include field data collection, laboratory measurements, and data visualization and interpretation. Teachers are trained in the use of these modules for their classroom through unique partnership with Alabama Science in Motion (ASIM) and the Alabama Math Science Technology Initiative (AMSTI). Certified AMSTI teachers attend summer professional development workshops taught by ASIM and AMSTI specialists to learn to use NICE modules. During the school year, the specialists in turn deliver the needed equipment to conduct NICE classroom exercises and serve as an in-classroom resource for teachers and their students. Scientists are partnered with learning and teaching specialists and lead teachers to implement and test efficacy of instructional materials, models, and NASA data used in classroom. The assessment by professional evaluators after the development of the modules and the training of teachers indicates that the modules are complete, clear, and user-friendly. The overall teacher satisfaction from the teacher training was 4.88/5.00. After completing the module teacher training, the teachers reported a strong agreement that the content developed in the NICE modules should be included in the Alabama secondary curriculum. Eventually, the NICE program has the potential to reach over 200,000 students when the modules are fully implemented in every school in the state of Alabama. The project can give these students access to expertise and equipment, thereby strengthening the connections between the universities, state education administrators, and the community.;

**[Colorado]** [CITATION] Stohlgren, Thomas and Wei Gao. 1016. A Review of UVB and Multiple Stressors to Mountain Ecosystems in the Western United States. submitted. ; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Assessing the vulnerability of mountain ecosystems to UVB and climate change requires an integrated understanding of ecosystem components and processes, multiple stresses, and their interactions. Managers of mountain ecosystems in the western U.S. might be concerned with legacy issues such as past predator control or fire suppression, or they might be bombarded by many immediate issues such as the safety of an increasing number of visitors, or rapid urbanization and land use change at their borders, or the effects of newly invading alien plants, animals, and diseases. Still, long-term, subtle, chronic stresses like increasing UVB and greenhouse gases in the atmosphere cannot be ignored. ;

**[Colorado]** [CITATION] Coughenour, M.B. Invasive Plant Species Models with Ecological Processes. submitted. ; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] A wide variety of models have been developed to predict actual and potential distributions of invasive species, particularly niche models, bioclimatic envelope models, species distribution models (SDMs), and habitat suitability models. Predictions of SDM

**[Georgia]** [CITATION] Jeong C. Seong. Sun Position Calculator (SPC) for Landsat Imagery with Geodetic Latitudes. Computers & Geosciences 85 (2015) pp. 68-74.; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Landsat imagery comes with sun position information such as azimuth and sun elevation, but they are available only at the center of a scene. To aid in the use of Landsat imagery for various solar radiation applications such as topographic correction, solar power, urban heat island, agriculture, climate and vegetation, it is necessary to calculate the sun position information at every pixel. This research developed a PC application that creates sun position data layers in ArcGIS at every pixel in a Landsat scene. The SPC program is composed of two major routines - converting universal transverse Mercator (UTM) projection coordinates to

geographic longitudes and latitudes, and calculating sun position information based on the Meeus' routine. For the latter, an innovative method was also implemented to account for the Earth's flattening on an ellipsoid. The Meeus routine implemented in this research showed about 0.2' of mean absolute difference from the National Renewable Energy Laboratory (NREL) Solar Position Algorithm (SPA) routine when solar zenith and azimuth angles were tested with every 30 min data at four city locations (Fairbanks, Atlanta, Sydney and Rio Grande) on June 30, 2014. The Meeus routine was about ten times faster than the SPA routine. Professionals who need the Sun's position information for Landsat imagery will benefit from the SPC application. ;

**[Idaho]** [CITATION] Parsons, R., Eitel, J.U.H., Whitney, B., Eitel, K.B., Magney, T.S., Vierling, L.A. 2015. Connecting the Dots: Lasers Link Students to their 3-D World. *Science Scope*. 39 (2) , 28-35.; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Light Detection And Ranging (LiDAR) is a rapidly emerging technology that researchers and professionals around the world are using in a variety of contexts applicable to many school subjects. With impressively precise 3- dimensional mapping capabilities, LiDAR can be used to teach forestry, visualization and gaming, urban planning, civil engineering, and architecture, just to name a few. However, the high cost (> \$50000) associated with LiDAR instruments inhibits the use of LiDAR technology in K- 12 classrooms. To give K-12 students the opportunity to work with LiDAR technology, IdahoView designed a low-cost (\$300-400) LiDAR instrument. It is the intention that this affordable LiDAR unit will be used in providing a new and exciting lens when engaging students in Science, Technology, Engineering, and Mathematics (STEM) education. ;

**[New Hampshire]** [CITATION] Ledoux, Lindsay, 2015. Evaluating Landsat 8 Satellite Sensor Data for Improved Vegetation Mapping Accuracy of the New Hampshire Coastal Watershed Area. MS Thesis. University of New Hampshire. 97 p.; [AV acknowledged] Yes; [USGS acknowledged] No; [ABSTRACT] This MS Thesis looked at the use of Landsat 8 imagery for mapping improved vegetation mapping in the Coastal Watershed of NH. It compared Landsat 5 and Landsat 8 imagery and also compared pixel-based vs. object-based classification approaches using a quantitative accuracy assessment. The results showed that no significant improvements in map accuracy resulted from using object-based classification over pixel- based classification nor did using Landsat 8 data improve map accuracy over Landsat 5. The major reason for these conclusions is that the level of detail in the vegetation classes used in the study could be sufficiently mapped with either imagery or classification approach. ;

**[North Carolina]** [CITATION] Yang Shen, Yong Wang, Haitao Lv, and Jiang Qian, 2015. Removal of thin clouds in Landsat-8 OLI data with independent component analysis. *Remote Sensing*. 7, 11481-11500. <http://dx.doi.org/10.3390/rs70911481>.; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] An approach to remove clouds in Landsat-8 operational land imager (OLI) data was developed with independent component analysis (ICA). Within cloud-covered areas, histograms were derived to quantify changes of the reflectance values before and after the use of the algorithm. Referred to a cloud-free image, changes of histogram curves validated the algorithm. Scatterplots were generated and linear regression performed for the reflectance values of each band before and after the algorithm, and compared to those of the reference image. Band-by-band, results in cloud removal were acceptable. The algorithm had little effect on pixels in cloud-free areas after the analyses of histograms, scatterplots, and linear regression equations. Finally, the algorithm was applied to various land use and land cover types and cloud conditions, and to a full Landsat-8 scene yielding satisfactory results efficiently.;

**[North Carolina]** [CITATION] Yang Shen, Yong Wang, and Haitao Lv, 2015. Thin cloud removal for Landsat 8 OLI data using independent component analysis. The Proceedings of the International Geoscience and Remote Sensing Symposium, 2015 (IGARSS)

**[North Carolina]** [CITATION] Yang Shen, Yong Wang, Haitao Lv, and Hong Li, 2015. Removal of thin clouds using cirrus and QA bands of Landsat-8. Photogrammetric Engineering & Remote Sensing. 81(9), 721

**[North Carolina]** [CITATION] Haitao Lv, Yong Wang, and Yang Shen, 2015. Removal of thin clouds in visible bands using spectrum characteristics of the visible bands. The Proceedings of the International Geoscience and Remote Sensing Symposium, 2015 (IGARSS)

**[Ohio]** [CITATION] SIMIC MILAS A. 2015. Variability in the fraction of intercepted photosynthetically active radiation: Effects of irradiance conditions and temporal scales. *Journal of Global Ecology and Environment*, 2, (3), 140-154. ; [AV acknowledged] No; [USGS acknowledged] No; [ABSTRACT] Light interception by plant canopies is one of the main drivers of biomass production. Quantifying spatiotemporal patterns of the fraction of intercepted photosynthetically active radiation (FIPAR) is essential in quantifying the CO<sub>2</sub> assimilation at the landscape level, in ecosystem process modeling and for the interpretation of remote sensing data. To adequately characterize FIPAR, one important issue is temporal scale, as FIPAR is temporally dynamic and it is constantly changing under different irradiance conditions. Using ground measurements of FIPAR over various landscape ecosystems, this study addresses the impact of irradiance conditions and temporal scales on variability of FIPAR. This research examines 1) the variability of FIPAR based on hourly, daily, 10- and 30- daily integrated data, and 2) the impact of irradiance conditions on FIPAR as a function of solar zenith angle (SZA), weather conditions and seasonality. The goal is to examine the most optimal time and temporally integrated steps in generating FIPAR for better landscape characterization. Both the instantaneous and integrated FIPAR values for over 78 ecological sampling units (ESU) worldwide were generated and compared for different irradiance conditions and temporal periods. The findings suggest that diurnal time and solar zenith angle (SZA) of illumination are more important than weather condition and integration time when the instantaneous and integrated FIPAR values are compared. The instantaneous in-situ measurements serve as a good estimator of the integrated values when acquired in the morning or afternoon as a function of SZA. Both, non- linearity and high variability in the relationship between instantaneous and integrated FIPAR are observed at low SZA diminishing when instantaneous measurements are collected at around 9:30 or 14:30.;

**[Ohio]** [CITATION] SIMIC MILAS A, RUPASINGHE P, BALENOVIC I, GORSEVSKI P. 2015. Assessment of Forest Damage in the mountainous area of Croatia using Landsat-8. *SEEFOR*, 6(2), e1-e11. DOI: <http://dx.doi.org/10.15177/seefor.15-14.>; [AV acknowledged] No; [USGS acknowledged] No; [ABSTRACT] Rapid assessments of forest damage caused by natural disasters such as ice-break, wind, flooding, hurricane, or forest fires are necessary for mitigation and forest management. Forest damage directly impacts carbon uptake and biogeochemical cycles, and thus, has an impact on climate change. It intensifies erosion and flooding, and influences socio-economic well-being of population. Quantification of forest cover change represents a challenge for the scientific community as damaged areas are often in the mountainous and remote regions. Forested area in the western Croatia was considerably damaged by ice-breaking and flooding in 2014. Satellite remote sensing technology has opened up new possibilities for detecting and quantifying forest damage. Several remote sensing tools are available for rapid assessment of forest damage. These

include aerial photographic interpretation, and airborne and satellite imagery. This study evaluates the capability of Landsat-8 optical data and a vegetation index for mapping forest damage in Croatia that occurred during the winter of 2014. ;

**[Ohio]** [CITATION] SIMIC A, FERNANDES R, WANG S. 2014. Assessing the impact of leaf area index on evapotranspiration and groundwater recharge across a shallow water region for diverse land cover and soil properties. *Journal of Water Resources and Hydraulic Engineering*, 3, (4), 60-73.; [AV acknowledged] No; [USGS acknowledged] No; [ABSTRACT] Climate and land cover changes impact groundwater resources primarily through changes in net surface recharge. Actual evapotranspiration and the partitioning between runoff and groundwater infiltration govern the rate of aquifer recharge. Remote sensing technology opens up new possibilities for groundwater recharge modeling through a rapid method of acquiring up-to-date information at high spatial resolution over a large geographical area. Using the Ecological Assimilation of Climate and Land Observations (EALCO) model, we assess the importance of remote sensing derived land cover, leaf area index (LAI) and soil texture in estimating evapotranspiration and groundwater recharge within the Oak Ridges Moraine (ORM), a complex groundwater recharge area and major aquifer in south-central Ontario, Canada. We explore temporal and spatial dynamics of hydrological variables of the ORM and perform sensitivity analyses based on remote sensing derived inputs to EALCO. The results indicate that LAI is a critical variable of evapotranspiration calculations for the ORM. Soil texture does not have as significant an impact on evapotranspiration as LAI; it is generally found to be a more efficient moderator of recharge and runoff, especially for the soil texture of very fine sand. Based on our results, afforestation of the ORM region would result in the reduction of annual groundwater recharge at the current average precipitation due to increased evapotranspiration. It would also reduce the runoff within the area due to increased evapotranspiration and infiltration.;

**[Ohio]** [CITATION] James K. Lein (2014) *Toward a Remote Sensing Solution for Regional Sustainability Assessment and Monitoring*, *Sustainability*, 6, 2067-2086 ; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Regional sustainability encourages a re-examination of development programs in the context of environmental, social and economic policies and practices. However, sustainability remains a broadly defined concept that has been applied to mean everything from environmental protection, social cohesion, economic growth, neighborhood design, alternative energy, and green building design. To guide sustainability initiatives and assess progress toward more sustainable development patterns, a need exists to place this concept into a functional decision-centric context where change can be evaluated and the exploitation of resources better understood. Accepting the premise that sustainable development defines a set of conditions and trends in a given system that can continue indefinitely without contributing to environmental degradation, answers to four critical questions that direct sustainability over the long-term must be addressed: (1) What is the present state of the environmental system, (2) Is that pattern sustainable, (3) Are there indications that the environmental system is degrading, and (4) Can that information be incorporated into policy decisions to guide the future? Answers to these questions hinge on the development of tractable indices that can be employed to support the long-term monitoring required to assess sustainability goals and a means to measure those indices. In this paper, a solution based on the application of remote sensing technology is introduced focused on the development of land use intensity indices derived from earth- observation satellite data. Placed into a monitoring design, this approach is evaluated in a change detection role at the watershed scale.;

**[Ohio]** [CITATION] 1. Umesh K. Haritashya, Mark Pleasants, Katlyn Voss, Alexandre Bevington, Marten Geertsema, Andy Kaab, Dan Shugar, Jeffrey Kargel and Gregory Leonard

(2015) Landsat shows new hazards arising in Manaslu/Langtang region of Nepal. Scientific analysis done post April 25, 2015 Nepal earthquake was published on NASA website for public dissemination <http://www.nasa.gov/jpl/landsat-shows-new-hazards-arising-in-manaslulangtang-region-of-nepal> ; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] n/a;

**[Ohio]** [CITATION] Walter W. Immerzeel, Philip Kraaijenbrink, Dorothea Stumm, Joseph Shea, Inka Koch, Sharad Joshi, David Breashears, Umesh K. Haritashya, Dan Shugar, Alexandre Bevington, Marten Geertsema, Thomas Painter, Giovanni Kappenberger, J

**[Ohio]** [CITATION] Shellito, Bradley. 2014. Discovering GIS and ArcGIS. (1st edition). New York: Macmillan Education, 574 pp. ; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] n/a;

**[Virginia]** [CITATION] Parece, T. E., McGee, J, Campbell, J.B., and Wynne, R.H. 2015. Virginia

**[West Virginia]** [CITATION] DeWitt, JD, T.A. Warner, and J.F. Conley, 2015. Comparison of DEMs derived from USGS DLG, SRTM, a statewide photogrammetry program, ASTER GDEM and lidar. *GIScience & Remote Sensing* 52(2):179-197. DOI: 10.1080/15481603.2015.1019708; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Many digital elevation models (DEMs) now exist, enabling quantitative assessments of topographic change through DEM subtraction. However, many of these DEMs are inherently different

**[West Virginia]** [CITATION] Maxwell, A.E., and T.A. Warner, 2015. Differentiating mine-reclaimed grasslands from spectrally similar land cover using terrain variables and object-based machine learning classification. *International Journal of Remote Sensing* 36(17): 4384-4410. DOI: 10.1080/01431161.2015.1083632.; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] Incorporating ancillary, non-spectral data may improve the separability of land use/land cover (LULC) classes. This study investigates the use of multi-temporal digital terrain data combined with aerial National Agriculture Imagery Program (NAIP) imagery for differentiating mine-reclaimed grasslands from non-mining grasslands across a broad region (6085 km<sup>2</sup>). The terrain data were derived from historical digital hypsography and a recent light detection and ranging (LiDAR) data set. A geographic object-based image analysis (GEOBIA) approach, combined with machine learning algorithms, random forests (RF) and support vector machines (SVM), was used because these methods facilitate the use of ancillary data in classification. The results suggest that mine-reclaimed grasslands can be mapped accurately, with user's and producer's accuracies above 80%, due to a distinctive topographic signature in comparison to other spectrally similar grasslands within this landscape. The use of multi-temporal digital elevation model (DEM) data and pre-mining terrain data only generally provided statistically significant increased classification accuracy in comparison to post-mining terrain data. Elevation change data were of value, and terrain shape variables generally improved the classification. GEOBIA and machine learning algorithms were useful in exploiting this non-spectral data, as data gridded at variable cell sizes can be summarized at the scale of image objects, allowing complex interactions between predictor variables to be characterised. ;

**[West Virginia]** [CITATION] Maxwell, A.E., T.A. Warner, M.P. Strager, J.F. Conley and A.L. Sharp, 2015. Assessing machine learning algorithms and image- and LiDAR-derived variables for GEOBIA classification of mining and mine reclamation. *International Journal of Remote Sensing* 36(4): 954--978. DOI: 10.1080/01431161.2014.1001086.; [AV

acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] This study investigates machine learning algorithms and measures derived from RapidEye satellite imagery and light detection and ranging (LiDAR) data for geographic object-based image analysis (GEOBIA) classification of mining and mine reclamation. Support vector machines (SVM), random forests (RF), and boosted classification and regression trees (CART) classification algorithms were assessed and compared to the k-nearest neighbor (k-NN) classifier. For GEOBIA classification of mine landscapes, the use of disparate data (i.e. LiDAR data) improved overall accuracy whereas the use of complex, object-oriented variables such as object geometry measures, first-order texture, and second-order texture from the grey level co-occurrence matrix (GLCM) decreased or did not improve the classification accuracy. SVM generally outperformed k-NN and the ensemble tree classifiers when only using the band means. With the incorporation of LiDAR-descriptive statistics, all four algorithms provided statistically comparable accuracies. K-NN suffered reduced classification accuracy with high dimensional feature spaces, suggesting that more complex machine learning algorithm may be more appropriate when a large number of predictor variables are used. ;

**[Wyoming]** [CITATION] Sivanpillai R., 2015. Integrating Landsat-based Earth Observation in Sixth Grade Science Curricula. *Photogrammetric Engineering & Remote Sensing*. 81(6): 425-431. DOI: 10.14358/PERS.81.6.425; [AV acknowledged] Yes; [USGS acknowledged] Yes; [ABSTRACT] This was a highlight article without abstract. Information about the DOI/USGS grant to AV (grant Number G14AP00002) was included in the acknowledged.;

**There are 24 publications.**

**Appendix H – StateView Fact Sheets for GY2014 (in alphabetical order)**

These fact sheets cover the period September 16, 2014 through December 31, 2015.



# ALABAMAVIEW CONSORTIUM OVERVIEW 2014 - 2015

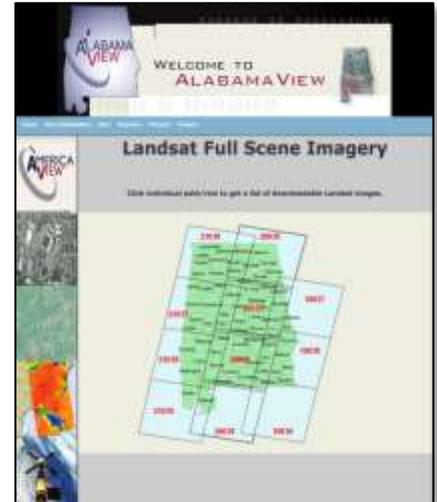


## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN ALABAMA

AlabamaView 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. AlabamaView benefits state economic development by using satellite, aircraft and ground-based remote sensing information, technologies, and applications for pressing issues within the state.

The long-term goals of AlabamaView are:

- Collaborate with Auburn University's developing Research Park to provide businesses with expertise in remote sensing and other geospatial technologies.
- Build a more useful and appealing website by using open source GIS technology, and increasing the amount of satellite and other remote sensing data by several orders of magnitude.
- Establish this website as a clearinghouse for Alabama spatial data, working with state agencies and other data providers to provide links to their holdings. To accomplish this, the AlabamaView website is advertised at topical conferences, and through media that have access to potential users.
- Develop new products from satellite and other remote sensing data that are important to the citizens of the state such as: digital elevation models (DEM) from lidar data for analysis in the Gulf Coast area; crop yield estimates for farmers; water quality analyses; invasive species detection, products for tourism, and working with Park Services.
- Reach a large fraction of Alabama youth through partnering with schools and 4-H, giving K-12 students a taste for geospatial information technologies and their practical impact on our lives.
- Develop courses and curricula at partner universities and colleges that provide a large fraction of the student population with improved geospatial literacy.



## CONSORTIUM MEMBERSHIP



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# ALABAMAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## URBAN HEAT ISLAND EDUCATIONAL MODULES

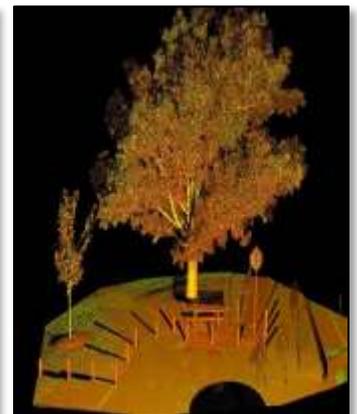


*Summer workshop with middle school teachers who are using infrared light sensors and hygrometers to understand temperature variations between different surfaces*

AlabamaView compared satellite-collected global temperature data to corresponding data collected on the ground acquired from a combination of automated sensors and manual measurements. This comparison was used for developing materials and curricula programs, workshops, meetings, and seminars conducted by a number of educational and training organizations. This effort ultimately promotes technology transfer and outreach activities, and becomes the basis for education modules for middle and high school students that introduce using remote sensing for understanding temperature differences on the Earth, encouraging awareness of the environment. Of the three components of this educational module, two rely upon Landsat 8 OLI (Operational Land Imager) and TIRS (Thermal Infrared Sensor) data to show relationships between land cover and land surface temperatures. Infrared (IR) imagery taken with a hand-held IR camera, compared with a similar scale visible image, shows relationships at micro scale between varying land surface cover and temperatures. A new module component, from NASA's Earth Observations website, <http://neo.sci.gsfc.nasa.gov>, guides comparison at a global scale. Students benefit by learning about the usefulness of remotely sensed images in earth science applications.

## URBAN TREE COVER USING LIDAR & GEOBIA

AlabamaView continued to build on efforts from previous years regarding the processing of statewide airborne LiDAR (light distance and ranging) products. Those products from previous years were incorporated into a follow-on project in partnership with the Southern Research Station of the US Forest Service. Together, the process of mapping urban tree canopy in Alabama began, which is to be incorporated into a new product that Forest Service employees will utilize and share for promoting and maintaining urban forests. This multi-year effort is critical to the state of Alabama as urban trees and forests provide essential ecological, economic, and social benefits to a large part of the population. A graduate student, partially funded by AlabamaView, used these LiDAR and CIR (color infrared) data to map urban tree cover using Geographic Object Based Image Analysis (GeOBIA) methods. This, in combination with Landsat 8 leaf-off imagery, distinguished and separated deciduous and coniferous tree cover. The end product will be GIS datasets of Alabama forest trees and canopy, then made available to the public and Forest Service users alike. These databases and derivative products will provide urban foresters and city managers with estimates of urban canopy cover using existing and usually publically available data.



*Shown above is an example of an urban tree canopy (left) dataset generated using both LiDAR and GeOBIA methods. Also shown is a rendering of a typical urban tree (right) using ground-based LiDAR laser scanning technology. These data are used in conjunction with airborne data for urban tree canopy identification and mapping.*

AlabamaView 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 Website:

[www.AmericaView.org](http://www.AmericaView.org)

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## BENEFITS TO ALABAMAVIEW

- Training workshops held, and classroom lessons prepared and delivered, with evaluations completed by participants and/or teachers. Participants in these programs then train other teachers.
- Creating methodologies for mapping urban tree landscapes.
- Distributing urban tree canopy data, which are used by local managers in decision-making for ecological, economical, and social benefits.
- Involving graduate and undergraduate students in examining new and traditional remote sensing techniques.
- Developing modules for grades 6-8 in earth sciences for better understanding climatology.
- Using the “Five E’s: Engage, Explore, Explain, Extend, Evaluate,” procedures for effectively training students
- Aligning modules with Course of Study and National Science Education Standards



*Auburn University undergraduate students taking measurements of urban tree study specimens with an Auburn University researcher (Credit: Art Chappelka)*

## ALABAMAVIEW CONSORTIUM MEMBERSHIP



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

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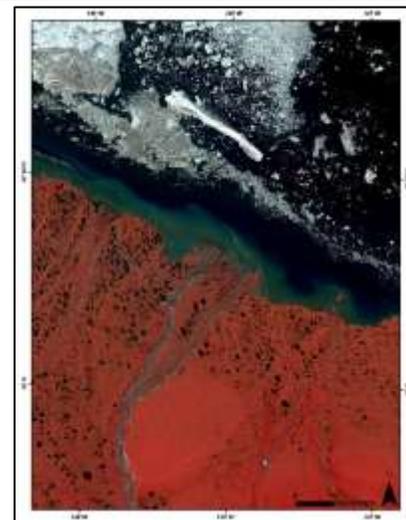
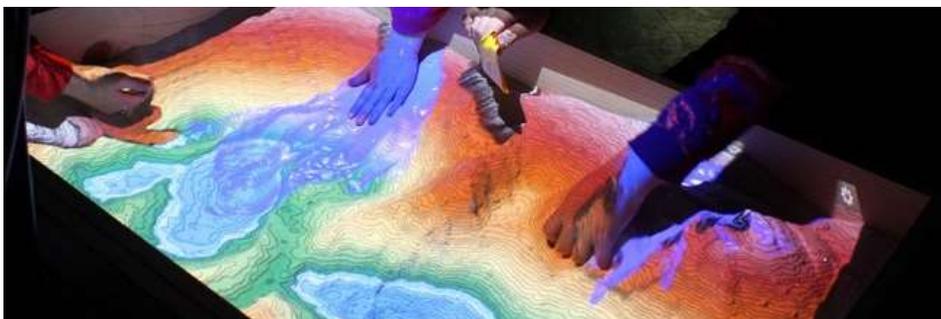
# ALASKA VIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN ALASKA

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.

AlaskaView is encouraging the understanding and use of remote sensing and geospatial technology through education and outreach at the K-12, undergraduate, and graduate levels. Specifically, AlaskaView teaches a variety of earth science concepts through deployment of the Augmented Reality Sandbox (shown below). This 3D environment allows all age groups to become engaged and excited about STEM fields.



Landsat 8 image acquired on July 10, 2014 of the Prudhoe Bay Oil Field on Alaska's Arctic coast. This is a color infra-red image, used to show vegetation health. Plant-covered land appears red.

## CONSORTIUM MEMBERSHIP



Association of Alaska Native Regional Corporation: <http://ancsaregional.com/>  
Federal consortium members identified above do not receive funding from AmericaView.

AlaskaView Principal Investigator:

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# ARKANSASVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN ARKANSAS



Graduate and undergraduate students in Principles of Remote Sensing at University of Arkansas. ArkansasView funds augment the remote sensing learning environment for K-12 through PhD studies, and for both on-campus and off-campus students.

Arkansas seeking to apply remote sensing in their research (e.g., <http://asa.cast.uark.edu/hazmap>), and c) advances in geospatial provenance (the ability to understand and replicate remote sensing workflows) as featured in *Remote Sensing Handbook* (CRC Press; <https://goo.gl/rPsvig>) published in late 2015.

Through a new 2014-2015 partnership with Communities Unlimited (<https://communitiesu.org>), a nonprofit organization serving communities in Arkansas and six neighboring states, ArkansasView is sponsoring a geospatial internship for developing remote sensing-assisted workflows that address persistently poor rural communities' access to basic water infrastructure. Through partnerships of this nature and related University-led activities, ArkansasView is enhancing remote sensing education, research, and geospatial applications in Arkansas and America.

ArkansasView 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.

Established in 2002 by University of Arkansas' internationally recognized Center for Advanced Spatial Technologies (CAST), ArkansasView has been a strong supporter of remote sensing within the Center, the campus community, and throughout the state. Recent efforts have focused on a) the development of new degree and certificate programs including PhD Geosciences, MS Geography, and online certificates (e.g., <https://goo.gl/QU1g2W>) in geospatial technologies more closely aligned with remote sensing, b) collaboration with faculty and graduate students in

## CONSORTIUM MEMBERSHIP



ArkansasView activities are led by Dr. Jason Tullis and Dr. Mohamed Aly from the Center for Advanced Spatial Technologies (CAST) at University of Arkansas. The Center is under the direction of Dr. Jack Cothren. Since 2002, a number of organizations and individuals have contributed directly to realizing ArkansasView goals and initiatives. For example, the Arkansas GIS Office provides access to statewide remote sensor data, the EAST Initiative trains high school students in remote sensing techniques, and Communities Unlimited trains remote sensing students in applications that directly benefit underbuilt communities in Arkansas and six other states. In 2015, Dr. Lu Liang from University of Arkansas at Monticello began contributing new remote sensing expertise to ArkansasView.

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# ARKANSASVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## GEOSPATIAL INTERNSHIP FOR UNDERBUILT COMMUNITY DECISION SUPPORT

Communities Unlimited (CU; <https://www.communitiesu.org>), formerly Community Resource Group, Inc., is a 501(c)(3) nonprofit organization based in Fayetteville, AR, with activities in seven states. CU works to ensure that underbuilt rural communities receive critical water system infrastructure. In summer 2014 ArkansasView set a goal to partner with CU to develop a framework for a funded geospatial internship.

CU joined ArkansasView in late 2014 with a key goal of providing support for a new internship that would build geospatial and remote sensing capacity within CU (and its on-the-ground team working with underbuilt rural communities). CU contributed a "Geospatial Internship for Underbuilt Community Decision Support" and Benjamin Tracy, a geologist from Fugro (Hong Kong) Limited joined ArkansasView as CU's first geospatial intern beginning in January 2015. As a result of the internship and additional CU capacity-building activities supported by Dr. Jason Tullis and Adam Barnes from the Center for Advanced Spatial Technologies (CAST; ArkansasView's host organization), a strong partnership developed to expand the impact of ArkansasView in areas such as remote sensing-assisted dual cropping with biofuels, rural community water system mapping, and geospatial capacity for small business entrepreneurship. This partnership also helped leverage collaborative proposal activities within several other AmericaView states in which CU operates (Texas, New Mexico, Oklahoma, and Louisiana).



Benjamin Tracy, ArkansasView-sponsored graduate student and geospatial intern at Communities Unlimited, assisting farmers with dual cropping strategies for camelina (used for biofuel) and regular crops such as soybean in the Arkansas Delta.

## OBJECT-BASED IMAGE ANALYSIS TRAINING



MS Geography student Weston Murch participating in Bruce Gorham's object-based image analysis (OBIA) workshop held in late Apr 2015 in Fayetteville, AR.

For more than a decade, ArkansasView's Bruce Gorham (from CAST) developed an expertise in object-based image analysis (OBIA), a relatively new image processing paradigm especially applicable to high spatial resolution imagery from aircraft including small unmanned aircraft systems (sUAS). In April 2015, Bruce Gorham conducted a

workshop on intermediate OBIA concepts that incorporated high density airborne light detection and ranging (LIDAR) data and high resolution aerial photography. A focus of the workshop was on strategies for extracting valuable forest life cycle information (including "old growth" areas) difficult to identify with traditional remote sensing techniques.

## BENEFITS TO ARKANSAS

According to the Department of Labor's Employment and Training Administration (ETA), while overall geospatial technology (including remote sensing) is growing very rapidly, there is a real deficit of skills and training, and there are misconceptions about what skills are required.

ArkansasView's 2014-2015 a) geospatial internship through CU, and b) OBIA workshop, provided innovative training to graduate students at University of Arkansas and non-profit employees working throughout the state. The following are key benefits from these efforts:

- Increased management effectiveness of persistently poor rural community water systems through application of geospatial mapping tools
- Helped farmers in the Arkansas Delta more effectively combine camelina (used for biofuel) with existing crops such as soybean
- Trained graduate students in image processing techniques directly applicable to the emerging field of sUAS, an important growth area for Arkansas

ArkansasView 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.



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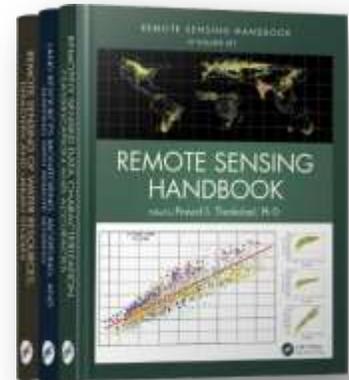
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## ADDITIONAL ARKANSASVIEW ACTIVITIES

With support from AmericaView, ArkansasView's Dr. Jason Tullis presented "The Integrated Geoprocessing, Workflows, and Provenance Cycle" at the ASPRS annual conference (Imaging & Geospatial Technology Forum or IGTF) in Tampa, FL, in May 2015. The topic presented was of interest to members of the Open Geospatial Consortium, an organization responsible for standards and specifications that advance remote sensing nationally and beyond. A chapter related to this talk was later published in the three-volume new *Remote Sensing Handbook* in November 2015 (see right).

A variety of other 2014-2015 activities included a) extra remote sensing collaboration with faculty in Biological Sciences, Geosciences, and Civil Engineering, b) development of a proposal for a graduate certificate in geospatial technologies (to complement the current undergraduate certificate), and c) extra graduate committee support for 15 MS and PhD students, each with a remote sensing research component.

*"AmericaView has supported so many students and the strength of the curriculum at the University of Arkansas. Remote sensing, [global navigation satellite systems (GNSS)], and geospatial technologies classes provide valuable skills that make our undergraduate and graduate students highly sought after in the industry. Companies like ESRI and organizations like FEMA recognize the knowledge and experience that AmericaView cultivates at the University of Arkansas. Students find jobs and internships at these and many other prestigious organizations across the country. Students also have the opportunity through AmericaView's donations to visit and present at conferences that foster geospatial technologies and services. I am so grateful for this continued guidance from AmericaView."* (17 December 2015 letter from Weston Murch, MS Geography student trained with support from ArkansasView. In summer 2015, Weston completed a competitive ESRI internship in Redlands, California.)



Tullis, J.A., J.D. Cothren, D.P. Lanter, X. Shi, W.F. Limp, R.F. Linck, S.G. Young and T. Alsumaiti, 2015, "Geoprocessing, Workflows, and Provenance," in *Remote Sensing Handbook: Remotely Sensed Data Characterization, Classification, and Accuracies*, edited by P. Thenkabail, 401-421, Vol. 1., Boca Raton, FL: CRC Press.

## ARKANSASVIEW CONSORTIUM MEMBERSHIP



COMMUNITIES  
... Unlimited



ARKANSAS  
GIS OFFICE

EAST initiative



ArkansasView activities are led by Dr. Jason Tullis and Dr. Mohamed Aly from the Center for Advanced Spatial Technologies (CAST) at University of Arkansas. The Center is under the direction of Dr. Jack Cothren. Since 2002, a number of organizations and individuals have contributed directly to realizing ArkansasView goals and initiatives. For example, the Arkansas GIS Office provides access to statewide remote sensor data; the EAST Initiative trains high school students in remote sensing techniques; and Communities Unlimited trains remote sensing students in applications that directly benefit underbuilt communities in Arkansas and six other states. In 2015, Dr. Lu Liang from University of Arkansas at Monticello (UAM) and Arkansas Forest Resource Center (AFRC) began contributing new remote sensing expertise to ArkansasView.



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# CALIFORNIAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN CALIFORNIA

CaliforniaView (CalView) is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and collaborators that share the vision of promoting and supporting the use of remote sensing data and technology within each state.

CalView has been associated with AmericaView since 2003 and became a full member of the consortium in 2006.

CalView's goal is to reach out to and inform the general public, educators and professionals within its state about the accessibility and potential applications of geospatial data sets and remote sensing imagery.

With its growing numbers of consortium members CalView is able to disseminate acquired geospatial information and imagery to a broader audience supporting better informed decision-making on pressing environmental issues such as the drought in California,



*Landsat mosaic of California created from a combination of Landsat 7 data acquired during the period of July 1999 to September 2002 and the National Elevation Dataset*

## CONSORTIUM MEMBERSHIP

CalView is housed at the University of California Davis, and is part of the Center for Spatial Technologies & Remote Sensing (CSTARS), promoting the use of Landsat data for public education, outreach and research projects.



*Any federal consortium members identified above do not receive funding from AmericaView.*

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# CALIFORNIAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## PROMOTING REMOTE SENSING RESOURCES

CaliforniaView (CalView) outreach activities were displayed at the annual University of California Davis Open House (**Picnic Day**) in April 2015. More than 75,000 visitors attended the event. CalView offered a variety of hands-on activities such as a US travel geospatial game. Participants matched Landsat 5 image scenes of famous US landmarks to a physical map, derived from USGS Global Multi-Resolution Terrain Elevation Data 2010 (GMTED2010).



*The geospatial 'play area' on the University campus*



Visitors (left) trying to match the satellite image of a famous landmark (right) with its correct location

Visitors could visualize the extent of the state's drought by comparing two Landsat images of Folsom Lake, CA. The picture below on the left is a Landsat 5 image acquired on April 7, 2004. The picture on the right shows a Landsat 8 image acquired on March 18, 2014, of this famous northern California water reservoir and recreation site. It shows how much the water has receded in the past 10 years.



## PROVIDING REMOTE SENSING EDUCATION

A teacher-training workshop introduced Earth Observation Day lesson plans to middle school teachers and educators from California. The workshop was hosted at the California Science Teacher Association Conference held in southern California in December 2014. More than 15 teachers actively participated in the workshop. The teachers were shown the step-by-step process of overlaying a Google Earth map with data from the USGS Cumulus Portal.

8.3 When you click on the layer, it will be highlighted. Click the button in the corner of the screen to edit the layer of the 'Selected Layers' frame. Your screen should look like this.



Figure 4. Overview of the Cumulus Web Maps.

A screenshot of a small section of the 'Viewing Land Cover Data Sets' lesson plan for 6th-8th grade students.



Co-presenter Mr. Spencer, science teacher at Rio Americano High School in Sacramento, (above left), and Mrs. Van Benthem, the CalView coordinator, (above right), demonstrating four Google Earth lesson plans to middle school teachers. Mr. Spencer is working closely with CalView to align the workshop materials with the next generation science standards.

CalView 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.



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## BENEFITS TO CALIFORNIA

California grows nearly half of the nation's fruit, nuts and vegetables, making it one of the nation's top agricultural states. Environmental disasters, however, such as annual wild fires and the ongoing water scarcity, threaten its economy.

CalView's goal is to support California's economy by:

- Providing imagery and geospatial tools to the workforce for damage assessment and disaster preparedness
- Relaying necessary information to legislators to support better informed decision-making on pressing environmental issues such as drought and wildfires which affect landowners and managers, forestry personnel, health professionals, and others
- Educating and exciting the general public and educators about the benefits and applications of remote sensing imagery
- Training educators and students on the accessibility of free Landsat data
- Providing lesson plans guiding teachers on the implementation of remote sensing into their classroom curricula



Landsat mosaic of California created from a combination of Landsat 7 data acquired during the period of July 1999 to September 2002 and the National Elevation Dataset

## CALIFORNIAVIEW CONSORTIUM MEMBERSHIP

CalView is housed at the University of California Davis and is part of the Center for Spatial Technologies & Remote Sensing (CSTARS). Its mission is to promote the use of freely available Landsat datasets for public education, outreach and research.

During the past grant year, CalView expanded its consortium to include members of the California GIS Council Working Group, as well as local industry and government partners.



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

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# COLORADOVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN COLORADO

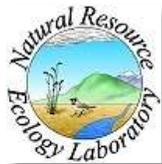
ColoradoView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state.

ColoradoView works to foster communication with partners and consortia members who are current or potential end users of Landsat and other remote sensing data. These currently include educators and researchers at Colorado State University: the UV-B Monitoring and Research Program, the Natural Resource Ecology Laboratory, and the Colorado Geospatial Centroid. Our USGS partners carry out research on grazing lands and invasive species in the western USA. Our USDA partners carry out research on grazing lands in Colorado and Wyoming. The ColoradoView consortium also includes the USGS Northern Central Climate Science Center and the National Institute of Invasive Species Science. We aim to expand the consortium to include other agencies concerned with natural resources in Colorado.



Colorado shaded relief map.

## CONSORTIUM MEMBERSHIP



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

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## Using Remote Sensing Data in Invasive Species Modeling and Prediction

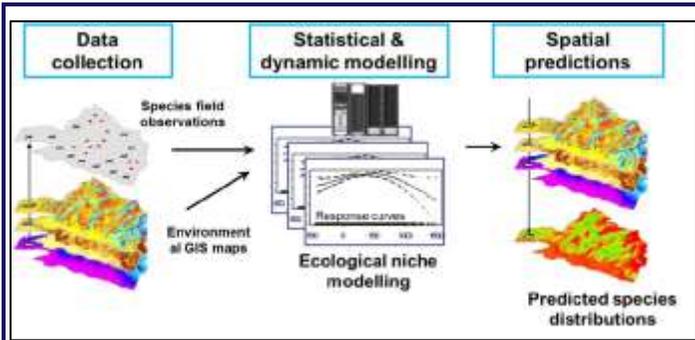


Figure 1. Remote sensing data are used as inputs to the MaxEnt software to predict invasive species distributions

Invasive plants are a pervasive and often times serious threat to ecosystem services, with economic impacts on agriculture, biodiversity, and threatened and endangered species. Resource managers, conservationists, and agriculturalists all need improved tools for understanding, predicting, managing, and mitigating potential impacts of invasive plant species, which requires models of present and future distributions and abundances of such species. Remote sensing data can be used to improve invasive species models.

In 2015 ColoradoView used remote sensing and GIS data as input layers for to predict the distribution of wheat stem sawfly, an invasive species distribution that causes damage to winter wheat. Data from the MODIS satellite were used, particularly Normalized Difference Vegetation Index (NDVI), which is a measure of greenness of vegetation, and Enhanced Vegetation Index (EVI) which is an improvement of NDVI that is more sensitive to densely vegetated areas as well as having a better correction for atmospheric haze. This imagery was combined with additional environmental data and presence data for the wheat stem sawfly. These data layers were used as inputs to MaxEnt, software that produces a model of the species range. The model successfully predicted the potential range for wheat stem sawfly, and MODIS data improved model predictive ability. The project was carried out by student interns under the direction of Dr. Sunil Kumar. The Colorado Geospatial Centroid at CSU provided facilities, guidance, and educational opportunities for the interns.

## USING REMOTE SENSING DATA TO MAP UVB RADIATION OVER THE USA

The USDA established the UV-B Monitoring and Research Program (UVMRP) at Colorado State University to monitor UV-B levels across the United States. High-energy ultraviolet solar radiation (UV-B) can significantly damage plants, crops, animals, and ecosystems, alone or in combination with other environmental stress factors such as temperature and moisture. UV-B radiation is the principle cause of sunburn and skin cancer.

In 2015 ColoradoView developed an approach to improve maps of UV-B radiation that are derived from data from the UVMRP. A statistical model of the UV-B skin damage index was constructed based upon the incidence of UV-B radiation in the wavebands that cause skin damage. Data from the Ozone Monitoring Instrument (OMI) on the NASA Aura satellite were fit to data from the UVMRP using co-kriging. The model was then used to extrapolate over the USA. The best fit statistical model for the UV skin damage index data from the UVMRP included OMI-based ozone column thickness, elevation, UV-B in 2 bands, cloud fraction, and cloud thickness.

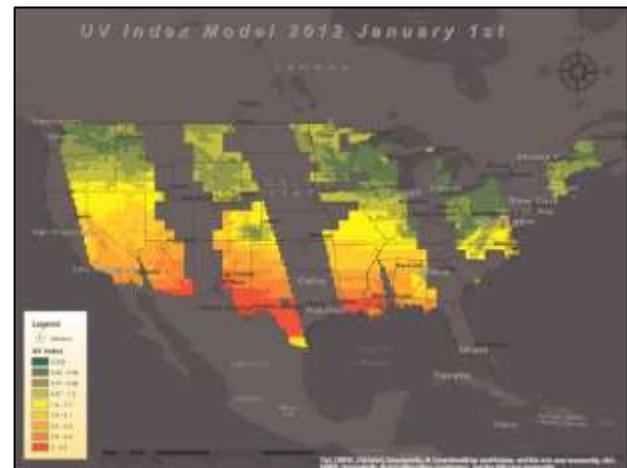


Figure 2. A map of UV skin damage index for a single day, developing using data from the ozone monitoring instrument (OMI) on the Aura satellite, and data from the UV-B Monitoring and Research Program at CSU

## BENEFITS TO COLORADO

- ColoradoView (CV) is working with researchers who are experts on predicting the potential distributions of harmful invasive species in Colorado. Distribution models are improved through the use of remote sensing data.
- CV is working with the UV-B Monitoring and Research Program to use remote sensing data to produce improved maps of UV-B radiation. For Colorado, the improved maps will be combined with crop cover maps to estimate UV-B impacts on agriculture.
- CV is working with USDA and USGS, carrying out research using remote sensing data to map and assess the distribution and productivity of Colorado's grazing lands. In Colorado, grass/pasture lands is a widespread land cover used both by domestic livestock and wildlife (see Figure 3).
- CV provides opportunities for students at Colorado State University to learn how to use remote sensing in research on agriculture and natural resources in Colorado.

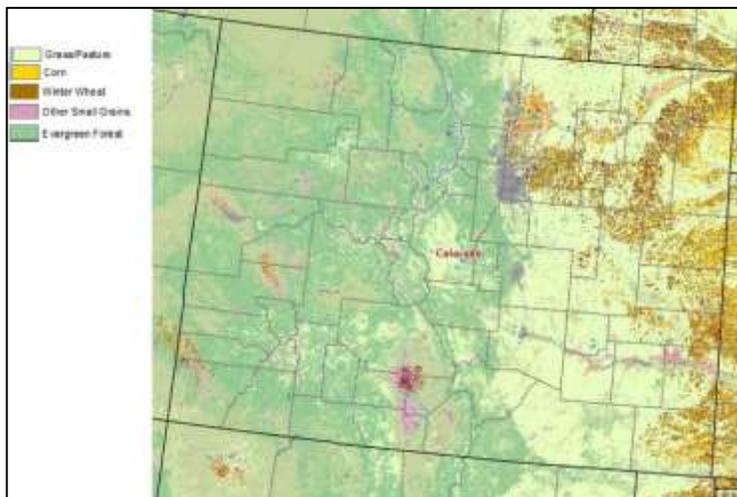


Figure 3. Colorado vegetation and crop cover map (CROPSCAPE) for Colorado, developed by the USDA using Landsat data. Note the extent of winter wheat, grass pasture (grazing land), and corn.

## COLORADOVIEW CONSORTIUM MEMBERSHIP



ColoradoView works to foster communication with partners and consortia members who are current or potential end users of Landsat and other remote sensing data. These currently include educators and researchers at Colorado State University: the UV-B Monitoring and Research Program, the Natural Resource Ecology Laboratory, and the Colorado Geospatial Centroid. Our USGS partners carry out research on grazing lands and invasive species in the western USA. Our USDA partners carry out research on grazing lands in Colorado and Wyoming. The ColoradoView consortium also includes the USGS Northern Central Climate Science Center and the National Institute of Invasive Species Science.

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

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# CONNECTICUTVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN CONNECTICUT

ConnecticutView 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.

ConnecticutView was accepted as an Affiliate Member of AmericaView in 2010 through a mini-grant opportunity provided by AmericaView. Further development-funding for ConnecticutView was provided in 2014, followed by Full Member status in 2015, which has allowed for continued development of remote sensing-related educational, research, and outreach activities to support ConnecticutView's goal of promoting awareness and the use of remote sensing technology, from space-borne sensors to ground-based systems, within the state of Connecticut.

Current activities of ConnecticutView include:

- the development of a ConnecticutView website (<http://ctview.uconn.edu>),
- creating and serving image mosaics of Landsat satellite imagery of Connecticut,
- developing and delivering webinars on remote sensing-related subjects,
- providing basic remote sensing presentations to K-12 students with image content focused on specific geographical areas being studied,
- providing scholarships to undergraduate students based on completion of a student conceived project that uses remote sensing technology and is focused on the Connecticut geographical area.



*Landsat 8 OLI image of the University of Connecticut main campus in Storrs, CT captured on April 29, 2015 and displayed as a true color composite image (blue, green, and red bands).*

## CONSORTIUM MEMBERSHIP

ConnecticutView is led by Dr. Daniel Civco and Mr. James Hurd from the Department of Natural Resources and the Environment in the College of Agriculture, Health and Natural Resources at the University of Connecticut. A ConnecticutView Consortium is currently being established. The vision for this Consortium is that it will be comprised by individual partners involved in using remote sensing technology in Connecticut and represent various organizations and agencies within Connecticut including Centers and Organizations within the University of Connecticut, other academic institutions for higher learning throughout Connecticut, federal and state agencies working within the state, non-profit organizations, and private companies. The purpose of the Consortium is twofold. First, the Consortium will provide guidance regarding future directions of ConnecticutView and development of High Impact Activities. Second, Consortium partners will be encouraged to become actively involved and participate in some aspect of the educational, research, and outreach activities of ConnecticutView. Current Consortium partners include:



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# DELAWAREVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN THE STATE OF DELAWARE

DelawareView (DEView) 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. In August 2015, AmericaView approved affiliate membership for the DEView consortium, which currently comprises the University of Delaware (UD), Delaware State University (DSU), Delaware Geological Survey (DGS) and Delaware Environmental Monitoring and Analysis Center (DEMAC).

DEView met for the first time at Delaware Environmental Analysis Center (DEMAC) on October 5, 2015 in Newark. Current members are pictured at right: Christina Callahan (left), John Callahan, Tracy DeLiberty (Co-investigator), Byungyun Yang (Principal Investigator) and Mathew Shatley (right). During this meeting, discussion topics included future activities such as inviting new members, developing a DEView website and initiating an Earth Observation Day event.



First DelawareView meeting at DEMAC.

In November, the University of Delaware's *UDaily* featured an article, "Improving geospatial knowledge," on this new initiative.

"Over the last three decades, scientists have used digital maps created by remotely sensed data to understand places and spaces on the Earth's surface. As technology has advanced, so has our ability to capture and use this geographic information to solve global environmental problems. With DelawareView, we will be able to share the remotely sensed data and geospatial data with students, researchers and the general public," said Yang, principal investigator and UD assistant professor of geography.

"Take Hurricane Sandy, it was just too big to see the magnitude of the entire event from the ground. But if we take a snapshot from before Sandy and compare it with images from after Sandy using remote sensing techniques, in many cases, it becomes easier to identify where damage occurred and where personal ground truth work should be done," said DeLiberty, associate professor and director of the Graduate GIS Certificate program, and co-principal investigator on the project.

<http://www.udel.edu/udaily/2016/nov/delawareview-111815.html>

## DELAWAREVIEW VISION AND GOALS

The vision of the DE View is to act as a facilitator to support the successful acquisition and the use of remotely sensed data for training, education, and applied research in Delaware's higher education institutions. DEView provides remote sensing education and an outreach program, promoting use of accessible data. The objectives of DE View are to provide the Delawarean and the public with spatial data and geographic knowledge about space, place and time that are derived from remote sensing and GIS technologies. These goals will enhance and promote K-16 education, applied research, workforce development, and technology transfer activities to advance earth science appreciation through the DelawareView consortium.

### Delaware View Principal Investigator:

Byungyun Yang, Ph.D.  
Department of Geography  
University of Delaware  
Newark, DE. 19716



### AmericaView Website:

[www.AmericaView.org](http://www.AmericaView.org)

### Roberta Lenczowski, Executive Director:

[roberta.lenczowski@sbcglobal.net](mailto:roberta.lenczowski@sbcglobal.net)

### Debbie Deagen, Program Manager:

[debbie.deagen@montana.edu](mailto:debbie.deagen@montana.edu)

### Russell Congalton, Board Chair:

## DELAWAREVIEW CONSORTIUM MEMBERSHIP

The DEView consortium comprises four members: the University of Delaware (UD), Delaware State University (DSU), Delaware Geological Survey (DGS) and Delaware Environmental Monitoring and Analysis Center (DEMAC). Individuals working on the current program of work include: Byungyun Yang, UD, assistant professor; Tracy DeLiberty, UD, associate professor; John A. Callahan, DGS associate scientist; Hacene Boukari, DSU associate professor; Christina Callahan, DEMAC Lead Scientist; and Matt Shatley, computer research specialist in UD's College of Earth, Ocean, and Environment.



## DEVIEW WEBSITE AND OTHER ACTIVITIES



The image to the left shows the website of DEView.

The website features four main components:

- Research
- Education and Outreach
- Data Archive
- Events

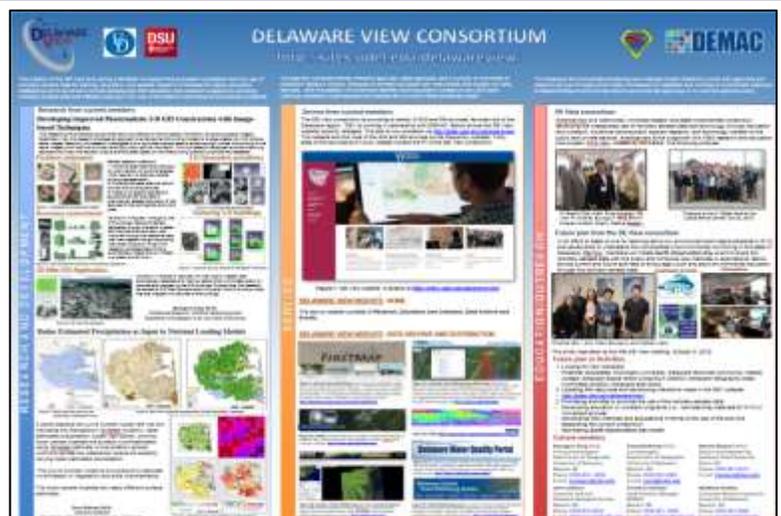
Delaware View website:  
<http://sites.udel.edu/delawareview/>

### Building the Consortium

In 2016, DEView will continue to develop relationships and add new partners throughout the State of Delaware. All partners will be committed to the use of remote sensing and geospatial technology in Delaware.

Invitations to prospective candidates will be extended to: Wilmington University, Wesley College, Delaware Technical Community, Delaware Space Grant Consortium (DSGC), Delaware Geographic Data Committee (DGDC), and Delaware Sea Grant.

Poster Presentation at the 2015 AV fall technical meeting





# GEORGIAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN GEORGIA



*Celebrating the 2015 Earth Observation Day with Coweta County Performance Learning Center Students*

Founded in 2003, the GeorgiaView Consortium 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. GeorgiaView's vision is to develop a collaborative geospatial user community in the state of Georgia, within which remote sensing datasets are practical sources for applications and research. GeorgiaView members have significantly impacted the State of Georgia through education, remote sensing and geospatial data sharing, research projects, and outreach efforts. GeorgiaView's mission will continue to prepare the future workforce for the dynamic geospatial technology fields by supporting K-12 STEM (science, technology, engineering and math) education, by addressing regional environmental challenges, and by developing collaborative outreach efforts.

## CONSORTIUM MEMBERSHIP

The GeorgiaView Consortium is open to the public, governments, institutions, universities and industries. The current GeorgiaView Consortium members are:

- Kennesaw State University
- Georgia State University
- Georgia Southern University
- The University of Georgia
- Atlanta Regional Commission
- University of North Georgia
- Rotorworks LLC
- Georgia College
- Skidaway Institute of Oceanography, and
- University of West Georgia.

GeorgiaView envisions expanding consortium membership to include more industries and K-12 institutions.



GeorgiaView Principal Investigator:

DR. JEONG C. SEONG

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<http://gis.westga.edu/gaview>

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# GEORGIAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## EDUCATION – REMOTE SENSING AND STEM



High school students applying scientific technology skills for the humanitarian MapGive Project at the University of West Georgia on March 26, 2015



Undergraduate students presenting research at a regional conference at the University of Georgia on November 23-25, 2014



Professor Andrew Thomas teaching science at West Jackson Middle School (Mr. Will Dodd's 6<sup>th</sup> grade Physical Science classes) in Jackson County, GA, in spring 2015.

GeorgiaView promoted the importance and value of science via remote sensing and geospatial technologies to 175 students and four teachers at K-12 institutions. Dr. Seong hosted the 2015 Earth Observation Day event at the University of West Georgia. Dr. Andrew Thomas visited West Jackson Middle School and demonstrated satellite data and its connection to middle school curricular topics such as deforestation, urbanization, and regional water usage issues. Dr. Mark Patterson also gave lectures on remote sensing and science at Woodstock and River Ridge High Schools.

Dr. Doug Oetter at Georgia College and Dr. J.B. Sharma at the University of North Georgia also trained fourteen undergraduate students in land cover change assessment using archived aerial photographs and satellite imagery. Landsat datasets were critical in the students' projects, which were presented at a regional conference.

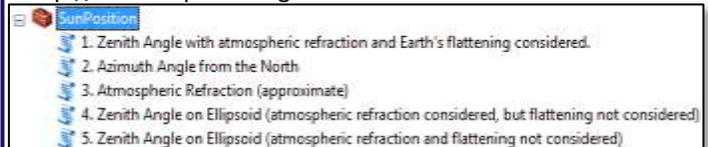
Remote sensing proved to be a very effective tool for enhancing education for K-16 students in various STEM (science, technology, engineering and math) fields and engaging them in scientific methods for real-world problem solving.

## RESEARCH – SUPPORTING SUSTAINABLE GEORGIA

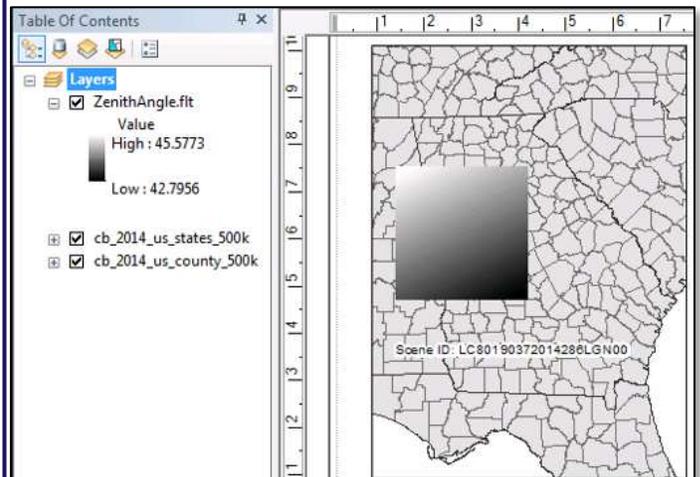
The Sun is the source of energy for living organisms on the Earth. Its position affects the Earth's climate, vegetation and seasons. In remote sensing, most sensors detect solar energy reflected from the Earth; therefore, knowing the Sun's position is critical for accurate analysis of remote sensing imagery.

In order to support Sustainable Georgia (particularly the initiatives that are solar-related such as green energy, urban heat islands, agriculture and forestry), GeorgiaView developed a computer application that allows scientists and engineers to compute solar zenith angles and sun azimuths that would match any satellite imagery such as Landsat images.

Dr. Seong published a research paper describing the application, which was titled "Sun Position Calculator (SPC) for Landsat Imagery with Geodetic Latitudes," in *Computers & Geosciences* 85 (2015) pp. 68-74. The application was also presented at the AmericaView 2015 Fall Technical meeting at the USGS EROS Center. The application is downloadable from <http://www.avportal.org>.



Sun position calculator that was implemented in ArcGIS™, the most popular geographic information system software package



An example of solar zenith angles for a Landsat 8 image that was acquired on October 13, 2014. Higher solar zenith angles indicate lower sun elevations.

GeorgiaView 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.



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[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)

## BENEFITS TO GEORGIA

- Remote sensing is a very important component of geographic information science (GIScience) and is critical for urban and environmental planning/management for the State of Georgia, now and in the future.
- Workforce development for STEM disciplines such as GIScience and remote sensing is critical to the economic and environmental well-being of Georgia.
- Because remote sensing technology is experiencing rapid development and deployment, this dynamically changing field has the potential to create significant economic opportunity in the near future for a growing State like Georgia.
- GeorgiaView consortium members are skilled educators and learned scientists who are enthusiastic and collaborative in support of solutions to the demanding challenges in the State of Georgia.
- In summary, GeorgiaView projects significantly benefit Georgia by improving planning methods, promoting safety and preparedness, educating its workforce, and facilitating information delivery.



*GeorgiaView helps K-16 students understand the important role of remote sensing in science and technology. This image shows Coweta County PLC high school juniors participating in an Earth Observation Day event in Carrollton, Georgia, on March 26, 2015.*

## GEORGIAVIEW CONSORTIUM MEMBERSHIP

The GeorgiaView Consortium is open to the public, government agencies, institutions, universities and industrial partners. The current GeorgiaView Consortium members are shown below:

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*GeorgiaView Consortium Member Institutions*

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<http://gis.westga.edu/gaview>



# HAWAI'IVIEW REMOTE SENSING ACTIVITIES 2014 - 2015

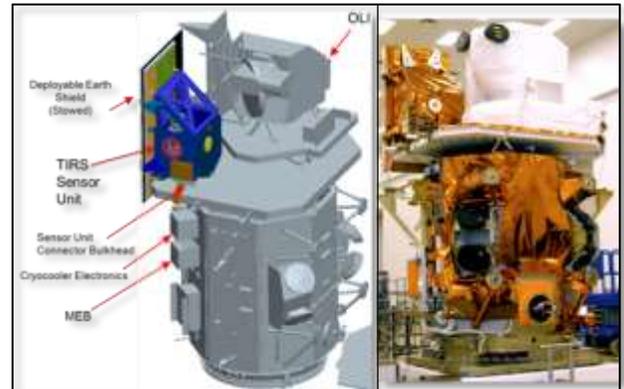


## BRINGING LANDSAT INTO THE CLASSROOM

### “Landsat in a Box” for All Grades

The reliable performance of the 2013-launched Landsat 8 satellite continues the over four-decade program of monitoring the Earth from space. To encourage understanding of the impact of the data and the science and technology behind the mission among students, Hawai'iView developed self-contained “Landsat 8 Science Kits”. The general topics handled are satellites, remote sensing, heat, and light.

OLI is a push-broom sensor with a four-mirror telescope and 12-bit quantization. OLI collects data for visible, near infrared, and short wave infrared spectral bands as well as a panchromatic band. The Thermal Infrared Sensor (TIRS) was added to the Landsat 8 payload to continue thermal imaging and to support emerging applications such as evapotranspiration rate measurements for water management.

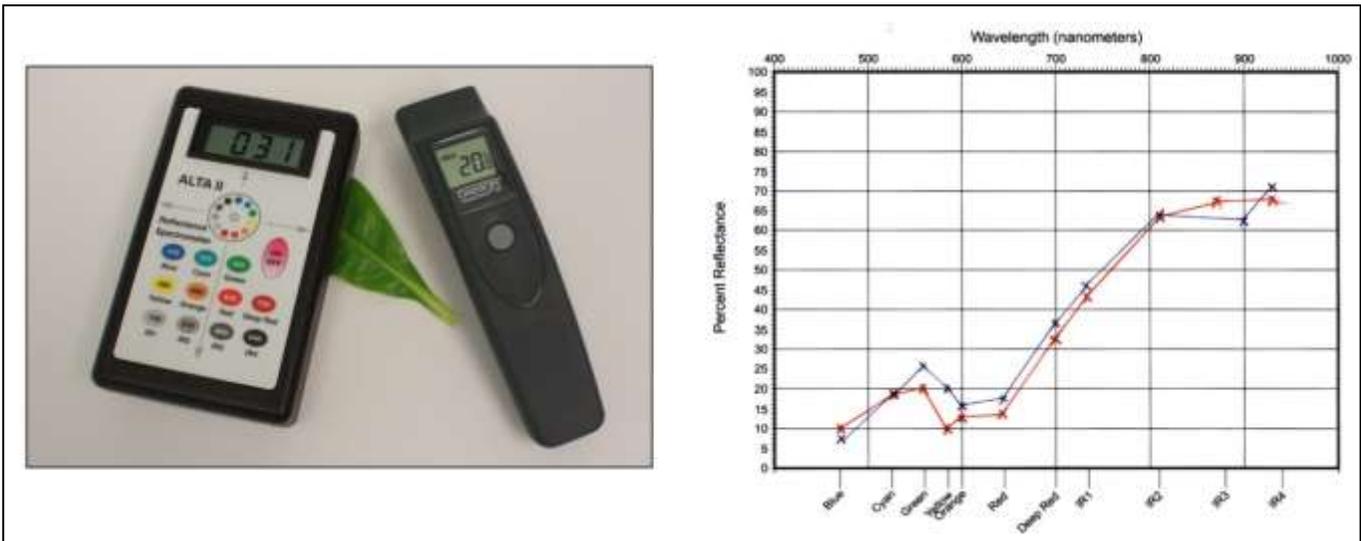


The Landsat 8 spacecraft design graphic of the satellite elements (left) and prior to launch (right)

Information obtained from <http://landsat.gsfc.nasa.gov>

### Replicating OLI and TIRS on the Desktop

Although the OLI and TIRS instruments orbit at an altitude of 705 kilometers above the Earth’s surface, with a velocity of 7.5 kilometers per second, students can replicate the sensors’ measurements in their classroom using a low cost instrument set. While having fun, they also more easily grasp the underlying sensor technology principles deployed on a sophisticated space-durable satellite system. Each of the Hawai'iView Science Kits contains a handheld reflectance spectrometer and a handheld infrared radiometer. Students make measurements using these instruments and plot the data themselves.



Left: The reflectance spectrometer and infrared radiometer included in the science kits to replicate the measurements made by the Landsat 8 spacecraft. Right: examples of leaf spectra made by a student during one of Hawai'iView's workshops

Hawai'iView 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.



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[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)

## FUN LEARNING WITH THE SELF-CONTAINED EDUCATIONAL RESOURCE

The Hawai'iView Landsat 8 science kits contain everything needed to conduct the experiments, including stationery that changes color using the heat from your hands. Landsat 8 makes measurements of the amount of light and heat reflected and emitted from Earth's surface. Heat sensitive pencils, rulers, and diffraction glasses promote learning under the guise of play. In workshops, designed by Hawai'iView to explain how these instruments work, participants are introduced to concepts of light and heat using some simple experiments and professional instruments like the Alta II Reflectance Spectrometer and IR Temperature Sensor.



## BENEFITS TO HAWAI'I

Providing students with the hands-on experience of making remote sensing measurements in the classroom is beyond the budget of the majority of classroom teachers. The Landsat 8 Science kits are available free of charge, and in 2015, Hawai'iView took the kits into the classroom to introduce 192 students (grades 4 through 12, with girls making up 54% of participants), 11 teachers, and 26 parents to the Landsat 8 mission.



*Above and upper right:* Students at Stevenson Middle School making spectral reflectance measurements and learning about how diffraction allows us to split white light into its component wavelengths *Lower right:* A teacher and her class learning about Landsat 8

## EARTH OBSERVATION DAY

To support this AmericaView program, Hawai'iView worked on plans to debut an EarthFEST (Families Enjoying Science Together) night, a hands-on-science event for 50-60 parents and their elementary-aged students at a public school on the island of O'ahu for Earth Observation Day.

## ABOUT HAWAI'I VIEW

Hawai'iView is based within the Hawai'i Institute of Geophysics and Planetology, at the University of Hawai'i at Mānoa. Mrs. Amber Imai-Hong (amber@hsfl.hawaii.edu) is the Hawai'iView outreach specialist, collaborating with the NASA Hawai'i Space Grant Consortium. The vision is to increase public appreciation for the contribution that Earth observation makes to our nation's ability to monitor its natural resources, by hosting exciting, hands-on educational workshops for school children, their teachers, and their parents.

Hawai'iView Principal Investigator:

Robert Wright

University of Hawai'i at Manoa

808 956 9194

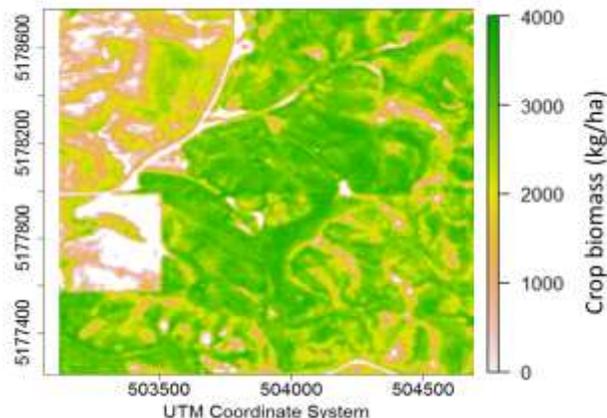
wright@higp.hawaii.edu



<http://hawaiiview.higp.hawaii.edu>

## IMPROVING REMOTE SENSING PRODUCTS

- The ability to accurately monitor crop biomass is of great importance for growers throughout the State of Idaho and beyond.
- IdahoView conducted a study to assess the suitability of a low-cost, autonomously operating terrestrial laser scanner (ATLS) to i) monitor crop growth dynamics, and ii) calibrate satellite imagery for estimating crop biomass.
- Findings from the study suggest that physically based biomass estimates derived from ATLS data and ATLS-calibrated satellite data constitute important progress in an attempt to obtain reliable crop biomass estimates for both agricultural decision-making and research applications.



*Satellite-based crop biomass estimates calibrated with autonomously operating terrestrial laser scanner (ATLS) data captured the variability in wheat biomass throughout a commercial farm field near Moscow, Idaho.*

## PROVIDING REMOTE SENSING EDUCATION



*K-12 students and instructors engaged in field work during a remote sensing class*

One of the overarching objectives of IdahoView is to increase interest in science, technology, engineering and mathematics (STEM) fields by students of all ages through the use of remote sensing technology.

To reach this goal during 2014-2015, IdahoView:

- Offered a “Drones for Forestry” workshop in Coeur D’Alene, Idaho, serving 37 professionals
- Provided remote sensing education to more than 270 K-12 students
- Developed and pilot-tested an innovative remote sensing lesson plan

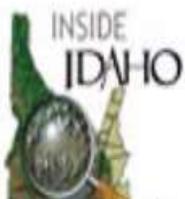
## BENEFITS TO IDAHO

- **Improve Natural Resources Management**  
IdahoView research promotes the development of novel tools and techniques that allow translating remotely sensed data into information that is meaningful for decision makers in natural resources and beyond.
- **Engage Students in STEM**  
It is vital to Idaho's economy to educate a qualified workforce in science, technology, education, and mathematics (STEM) professions. Industries that require STEM expertise are expected to increase in Idaho and across the nation, yet there appears to be a decreasing student interest in STEM fields. Hands-on remote sensing education is very effective for promoting STEM interest and learning.



Participants in the "Drones for Forestry" workshop held on Feb 27, 2015, in Coeur D'Alene, Idaho

## IDAHOVIEW VIEW CONSORTIUM MEMBERSHIP



### IdahoView partners:

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

### IdahoView Principal Investigator:

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# INDIANAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN INDIANA

IndianaView 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.

IndianaView is a state-wide consortium of 15 universities and institutions in Indiana. The vision for IndianaView is to facilitate and promote the sharing and use of public domain remotely sensed image data (from both satellite and aerial platforms) by Indiana universities, four-year colleges, community colleges, K-12 institutions, libraries, museums, government agencies and the private sector. IndianaView was accepted to the national AmericaView consortium in 2004 with Purdue University as the lead institution. The AmericaView consortium is funded through the USGS Land Remote Sensing Program.

### Accomplishments:

- Mini-grants have been provided for 23 projects conducted in 7 institutions which promote the use of remote sensing image data in K-16 education, facilitate the use of remote sensing data to monitor state wide issues such as urban development and provide easier access to remote sensing

image data. Fact sheets for these projects are available at: [www.indianaview.org/fact\\_sheets.html](http://www.indianaview.org/fact_sheets.html).

- Interactive class lessons for geospatial skills for high school ([www.iupui.edu/~geni](http://www.iupui.edu/~geni)) were developed as result of a partnership with Geography Educators' Network of Indiana (GENI).
- Freeware applications and tutorials are available for analyzing remote sensing images (MultiSpec: [engineering.purdue.edu/~biehl/MultiSpec](http://engineering.purdue.edu/~biehl/MultiSpec)) and determining long-term impacts of a change in land use (L-THIA: [engineering.purdue.edu/mapserve/LTHIA7](http://engineering.purdue.edu/mapserve/LTHIA7)).
- A web portal ([www.indianaview.org/glovis/index.html](http://www.indianaview.org/glovis/index.html)) based on the USGS GloVis software was created to provide access to Landsat Thematic Mapper, Landsat MSS & Corona image data and the USDA-NASS Indiana Cropland Data in easily readable file formats. A link is also provided to the Indiana University Spatial Data Portal that contains more than 30 terabytes of 6-inch to 1-meter orthographic image data for Indiana.
- Real-time image data and products (MODIS and AVHRR) are available from the Purdue Terrestrial Observatory ([www.itap.purdue.edu/pto](http://www.itap.purdue.edu/pto)).

## CONSORTIUM MEMBERSHIP



BALL STATE  
UNIVERSITY



### Others:

- Indiana University – South Bend
- Consortium of Universities for Spatial Information Science
- Indiana Space Grant Consortium

IndianaView Principal Investigator:

LARRY BIEHL

PURDUE UNIVERSITY

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# INDIANAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015

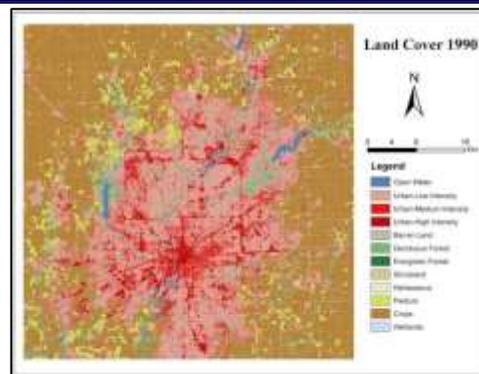


## MINI-GRANT: LONG-TERM RECONSTRUCTION OF URBAN EXPANSION IN INDIANAPOLIS, 1984-2015

Mini-grants are used to fund projects conducted by the consortium partners to promote the use of remote sensing image data. The most recent mini-grant funded a research project conducted by Prof. Qihao Weng of Indiana State University. 501 Landsat images from 1984 to 2015 were used to generate a time series classification and change detection algorithm for continuous land cover mapping in the Indianapolis Metropolitan region during this time period.

The land cover change maps are being used in further research by Prof. Weng and his students to address the drivers for urban growth in the Indianapolis region. In the near term, the maps will be used in weather research forecast models to simulate the land surface and air temperatures to evaluate the impact of future urban growth on the thermal environment and assess heat related risks. These results will be helpful for future urban planning and management.

A fact sheet about the project is available on the IndianaView web site at: [www.indianaview.org/pdf/IndianaView\\_FS\\_Indianapolis\\_Urban\\_Expansion\\_15.pdf](http://www.indianaview.org/pdf/IndianaView_FS_Indianapolis_Urban_Expansion_15.pdf).

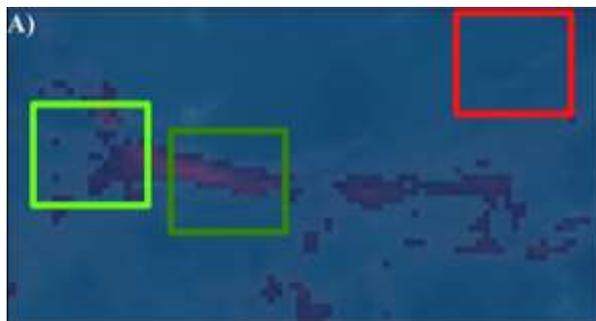


Land cover map of Indianapolis for 1990. The identified land covers include water, urban-low intensity, urban-medium intensity, urban-high intensity, barren, deciduous forest, evergreen forest, shrub land, herbaceous, pasture, crops and wetlands.

## GEOSPATIAL SCHOLARSHIPS FOR STUDENTS

The scholarship program provided opportunities for undergraduate and graduate students to participate in remote sensing projects that are relevant to the state and/or their community. Seven scholarships were provided to students representing four of the educational institutions in the IndianaView consortium.

Each of the students provided a testimonial about how the scholarship helped them. Examples of activities that the students completed include: a summer project titled "Improving Global Models of Remotely Sensed Aquatic Chlorophyll Content ...", research on developing soil property and landscape feature maps from crop production fields, and attendance at geospatial conferences such as Kentucky's GIS Conference and the Association of American Geographers Annual Meeting. The students also completed a 1-page fact sheet about the activities completed with the scholarship funds.



Three classes of algal blooms in the Landsat 8 RGB image of a portion of the Eagle Creek Reservoir. Scholarship awardee, Igor Ogashawara, Indiana University – Purdue University at Indianapolis

## BENEFITS TO INDIANA

The urban expansion maps, derived from the 30-year time series of Landsat remote sensing data for the Indianapolis region, as a result of the mini-grant have direct applications to urban management and planning.

The scholarship program provided several students with remote sensing application experiences such as conducting their research, presenting research results at conferences and interfacing with remote sensing experts.

The MultiSpec remote sensing desktop software application and tutorials that are available on the MultiSpec web site benefits students within and outside of Indiana. There were several thousand downloads of the application and tutorials in 2014-15 from throughout the world.

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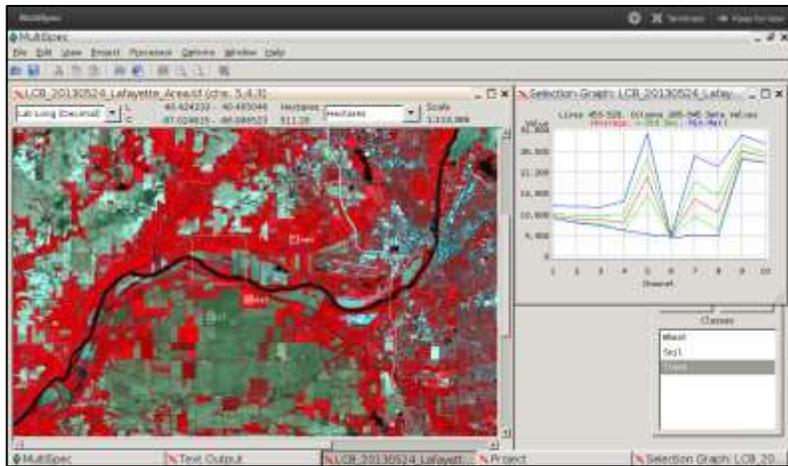
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## ADDITIONAL INDIANAVIEW ACTIVITIES

**MultiSpec** ([engineering.purdue.edu/~biehl/MultiSpec](http://engineering.purdue.edu/~biehl/MultiSpec)) is a free remote sensing software application that is used for education and research. A recently added feature is the ability to allow only the menu options for basic capabilities to be available to users. This feature is in response to a request from the K-12 sector for the ability to have fewer menu options for their students. Another significant product during 2014-15 (with additional support from a NSF funded project name Geospatial Data Analysis Building Blocks) has been a web-enabled version of MultiSpec ([mygeohub.org/tools/multispec](http://mygeohub.org/tools/multispec)). The current version includes the ability to display multispectral/hyperspectral images and conduct unsupervised classifications. Additional features continue to be added.



MultiSpec session from within a web browser illustrating a color infrared Landsat 8 image of the greater Lafayette area and a graph of response of a selected area.

### Earth Observation Day (EOD) activities:



High School students use IndianaMap to work on 'Zombie Apocalypse' activity during Purdue's 2014 GIS Day.



Vincennes University students describe their geospatial class project after IndianaView PI, Larry Biehl, gave a remote sensing presentation at EOD activity.

## INDIANAVIEW CONSORTIUM MEMBERSHIP



### Others:

- Indiana University – South Bend
- Consortium of Universities for Spatial Information

Researchers and educators at partner institutions Indiana State University, Indiana University, Indiana University - Purdue University at Indianapolis, Martin University, University of Notre Dame, Geography Educators' Network of Indiana, Indiana Geographic Information Council and the Indiana Space Grant program have participated in the IndianaView mini-grant and scholarship programs with projects involving K-12 education, general public outreach, research studies and educational lab development. Fact sheets are available at:

[www.indianaview.org/fact\\_sheets.html](http://www.indianaview.org/fact_sheets.html)

Partners have used and provided the Landsat data available on the IndianaView GloVis portal.

IndianaView Principal Investigator:

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# IOWAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN IOWA

IowaView 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.

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, including the Iowa Geospatial Infrastructure (IGI), Iowa's contribution to the National Spatial Data Infrastructure (NSDI).

IowaView moved to Iowa State University (ISU) in 2013 from its previous home at the University of Northern Iowa GeoTREE Center where it first received funding in 2007. ISU IowaView staff are housed at the GIS Facility, working with campus collaborators from several departments across campus. Working with remote sensing professionals in different departments helps broaden the impact of remote sensing products across Iowa through the collaborative funded projects of consortium members. Education and outreach have been the primary focus of IowaView in the last two years and will continue in the coming years.



2010 spring color infrared imagery (bottom) and NDVI 5/4/2010 from Landsat 7 (top) near Charles City, Iowa. Green growing crop fields are evident along with the riparian forest. Many fields are still dormant as shown by the reddish low NDVI values.

## CONSORTIUM MEMBERSHIP



[www.gis.iastate.edu](http://www.gis.iastate.edu)\GISF



<http://www.iowadnr.gov/Conservation/Geology/Mapping-GIS>



<http://www.iowagis.org/>



<http://www.extension.iastate.edu/communities/gis/>

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IowaView Principal Investigator:

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# IOWAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## REMOTE SENSING EDUCATION - MAPGIVE EVENTS

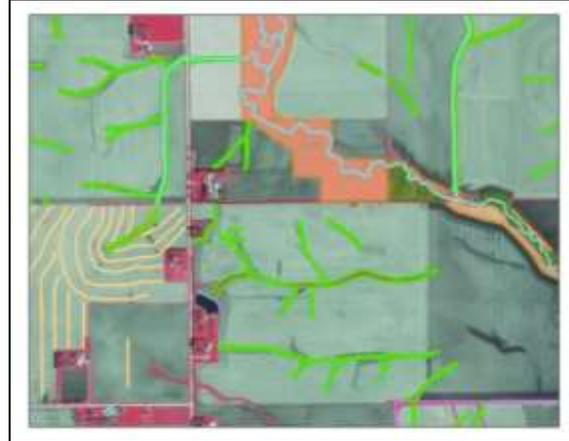
Four workshops were held in 2015 to train more than 80 participants of various audiences and age groups on using remotely sensed imagery to create GIS data for local and international areas without existing or easily accessible GIS data. These workshops are a high priority for Iowa since students and many adults have little exposure to remote sensing or GIS and are not offered many opportunities to learn and give back their time to help others, both in Iowa and globally.

IowaView is using OpenStreetMap and MapGive tools to engage varied audiences about the value and use of remote sensing and other geospatial technologies. IowaView hosts two-hour events that begin with training using TeachOSM to introduce the OSM ID mapping tool; buildings and other features are mapped for a small Iowa town to give attendees practice with a local connection. Later, the group is introduced to the MapGive task manager and mapping for humanitarian projects across the world.



*Top left: An image from an event in July 2015 at the Iowa 4-H youth summer conference, "Dare to Discover." Top Right: View over a participant's shoulder at the MLK Jr. Day of Service, January 2015. Bottom Image: Afternoon session of MLK Jr. Service Day event, January 2015.*

## INVENTORY OF NUTRIENT MANAGEMENT PRACTICES



*An example of the conservation practices being collected: grassed waterways (neon green), terraces (yellow), grassed riparian area (orange), forested riparian area (dark green); color infrared base photo*

There is a critical need for the development of tools and data to inventory nutrient management practices in the upper Midwest. Many corn-belt states have been required by the US EPA to develop nutrient reduction plans to reduce the amount of agricultural fertilizers reaching the Gulf of Mexico via the Mississippi River Basin. The Iowa Nutrient Research Center at Iowa State University funds a project to develop technologies to inventory and monitor conservation practices that could potentially meet nutrient reduction targets for watersheds. The Iowa Department of Natural Resources also funds a related project inventorying an expanded set of conservation practices. IowaView staff members are coordinating portions of both projects at the Iowa State University GIS Facility. AmericaView funded a student's time to digitize these conservation practices using aerial imagery and elevation data.

During the period of February to June 2015, IowaView staff members created file geodatabases to store data for six conservation practice data types (grassed waterways, terraces, water and sediment control basins, pond dams, stripcropping, contour buffer strips). Students digitized conservation practices in a total of 40 HUC-12 watersheds. Staff prepared watersheds for work, monitored student progress, performed visual quality control on data results, generated metadata and distributed final datasets to both Iowa and federal agencies.

IowaView 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.



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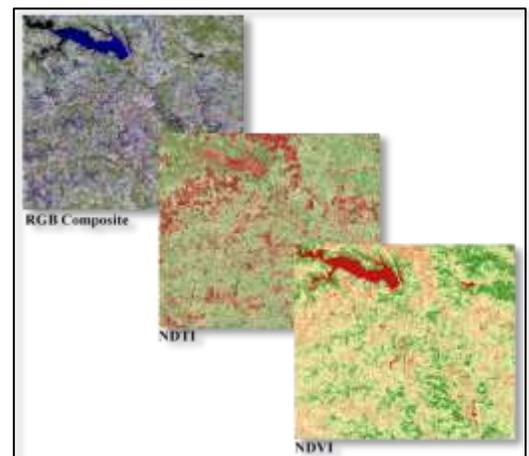
## MAINTAIN DATA ARCHIVE



IowaView supports the development and maintenance of a publicly available remote sensing data archive for the state. In 2014-2015, IowaView staff maintained and supported the Iowa Geographic Map Server (aka the Orthoserver, <http://ortho.gis.iastate.edu/>) and its collection of web services. The 2014 National Agriculture Imagery Program (NAIP) color and color infrared imagery is now part of the Orthoserver collection. IowaView staff created services for 2014 natural color and color infrared summer imagery, available to the public via WMS ([http://ortho.gis.iastate.edu/IGMS\\_WMS.html](http://ortho.gis.iastate.edu/IGMS_WMS.html)) or ArcGIS REST services on the GIS Facility website. The archive contains an almost complete set of Landsat 7 and 8 imagery acquired from 2000 to 2014, as well as value-added products such as NDVI, NDTI, and an RGB composite image, for each Iowa scene.

## BENEFITS TO IOWA

- **Remote Sensing Education via MapGive Events** - This is a high priority for Iowa since students and many adults have little exposure to remote sensing or GIS. These events give participants a gentle introduction to remote sensing/GIS and provide a hands-on service learning project to reinforce and demonstrate what they have learned.
- **Inventory of Nutrient Management Practices** - This project is a priority in Iowa and other upper Mississippi River Basin states because the 2008 Gulf Hypoxia Action Plan has a goal of reducing nutrient loads to the Gulf by 45%. This has the potential of impacting every agricultural producer in the state; the ability to inventory and monitor changes on the land will be critical to measuring the success of the overall conservation program.
- **Maintain Data Archive** - The Orthoserver has become a dependable resource for statewide imagery, elevation data, and related remotely sensed datasets. Users from the ISU campus, public agencies, private companies and individuals access the data for many reasons and the use grows each year. Keeping the data accessible and adding new datasets is important to enable continued research, analysis, discovery and education for Iowans.



*IowaView collaborators created a Python/ArcGIS tool to batch process Landsat .gz and .tar files to calculate the Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Tillage Index (NDTI) and create an RGB composite raster.*

## 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, including the Iowa Geospatial Infrastructure (IGI), Iowa's contribution to the National Spatial Data Infrastructure (NSDI).



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# KANSASVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN KANSAS

KansasView 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.

KansasView is a consortium of Universities and Federal, State, and local government and non-government partners in the State of Kansas working cooperatively to advance the availability, timely distribution, and widespread use of remote sensing data and geospatial technologies to support the needs of the state's public agencies, research and education communities, tribal colleges, and the general public.

The goal of KansasView is to provide data and information about the Kansas landscape that are derived from remote sensing and GIS technologies for education, research and local government applications. The availability of data and the mechanisms by which they are delivered and utilized are constantly evolving. KansasView strives to stay at the forefront of these developments so that consortium members and stakeholders can be supported with an understanding of the latest data and tools.

Recent activities include supporting data quality assessments of lidar data in Kansas, student initiatives using Unmanned Aerial Systems for imagery collection and analysis, crowdsourced data generation for humanitarian disaster relief, and unique professional development opportunities like the trip to the USGS EROS Center (right).



*Remote sensing students from The University of Kansas visit the USGS Earth Resources Observation and Science (EROS) Center in Sioux Falls, SD (April 2015).*

## CONSORTIUM MEMBERSHIP

KansasView consortium membership is strengthened by involvement in a number of collaborative efforts throughout the year that facilitate the sharing of information and resources of KansasView. Regular interactions with the Kansas GIS Policy Board, whose members are appointed by the Governor to represent Federal, state, and local stakeholders from across Kansas, offers an effective way to share expertise on the use of range of remote sensing data for a variety of applications, including lidar, historical aerial photography, and satellite imagery.

The State of Kansas Data Access and Support Center (DASC), the state's geospatial data clearinghouse, is also a key consortium member and data development and distribution partner on projects. By collaborating with DASC the longevity of the distribution of archived data can be ensured.

KansasView also participates in activities of the Kansas Hazard Mitigation Team (KHMT), which is coordinated through the Kansas Division of Emergency Management from the Adjutant General's Department. Activities of the KHMT include making periodic updates to the Kansas Hazard Mitigation Plan and providing input on Federal Emergency Management Agency's Hazard Mitigation Grant Program funds.

Support of educational partnerships is also a key part of KansasView activities. In November of every year the GIS Day activities at the University of Kansas are supported through sponsorship, logistical support, and through a remote sensing booth at the career fair. There is also support for the teaching of introductory remote sensing courses at the Haskell Indian Nations University.



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# KANSAS VIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## KANSAS FLOOD DASHBOARD



*This project leverages the NASA Flood Dashboard development by incorporating modeled data to create a comprehensive decision support system for flood disaster response in Kansas. The above map represents a range of flood scenarios that can be quickly calibrated to represent an actual flood to support response needs. (Montgomery Co., KS)*

Researchers at the NASA Goddard Space Flight Center have developed a decision support system that provides a web-based tool to support flood disaster response and recovery with satellite data. This decision support tool, called the Flood Dashboard, continues to be supported by NASA and is being implemented in an increasing number of areas, including southern Africa, Central America, the Caribbean, and Southeast Asia.

Over the past three years KansasView has developed and maintained an ongoing collaboration with partners from the NASA's Goddard Space Flight Center. Much of the focus of this collaboration has been to explore ways of integrating remotely sensed data (satellite imagery) and other event-specific inputs with modeled inundation libraries to produce expedited and improved inundation map products to support flood disaster response. The culmination of this effort is a cooperative effort between NASA and Kansas to bring two forward-thinking technologies together, the NASA Flood Dashboard and the modeled flood libraries produced at KU. This activity serves as an example for integration of observed satellite and in-situ data with modeled flood libraries.

## HUMANITARIAN CROWDSOURCED MAPPING

In cooperation with ShelterBox, the Kansas Division of Emergency Management, and the US State Department, KansasView coordinated a humanitarian mapping event as part of Humanitarian Games event held in Kansas City in 2014. This MapGive Mapathon focused on key areas in West Africa that were affected by the Ebola outbreak. MapGive is an initiative coordinated through the US State Department's Humanitarian Information Unit (HIU). It leverages the United States Government's NextView license agreement with commercial satellite imagery suppliers to provide and use high-resolution imagery through a Humanitarian OpenStreetMap Team (H.O.T.) interface, available to volunteer mappers globally. It facilitates obtaining critical information that can be traced from the imagery (roads, building, streams, etc.). These data are then uploaded to the free and open source global OpenStreetMap (OSM) database.

The success of this and other similar activities by KansasView and other AmericaView (AV) stateviews cascades to a similar effort with the US Agency for International Development's (USAID) and USGS Volcano Disaster Assistance Program (VDAP), which establishes priority areas for volcano disaster preparedness and resilience. AV stateviews collaboratively augment needed support during disasters. Remote sensing data, like Landsat, is used in conjunction with crowdsourced data to rapidly produce damage maps and impact assessments.



*These photos show the turnout from a 2014 event. The skills gained during this and other Mapathons can be applied to local data during future disaster events within the State. The mobile Public Information / Geographic Information vehicle pictured on the right is deployed by the Kansas Division of Emergency Management during disasters within the state, and is deployed for other regional events as needed. KDEMs participation at two mapping events offered a unique opportunity for students and members of the public to tour and utilize this unique GIS asset.*

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## BENEFITS TO KANSAS

### Kansas Flood Dashboard

- Supports the needs of emergency response
- Leverages existing modeled flood data
- Leverages NASA technologies
- Can incorporate Landsat data during disasters
- Can incorporate data from the International Charter
- Can incorporate crowdsourced data

### Humanitarian Crowdsourced Mapping

- Builds skills in students and public that can be applied locally
- Promotes a sense of global citizenship
- Introduces remote sensing and GIS to nontraditional participants
- Builds confidence in broad use of OSM data
- Promotes the generation and use of free and open data



This January 1, 2016 Landsat 7 satellite image of Midwest flooding illustrates that flooding can occur outside of the more typically flood-prone months of spring and summer, with wide area impacts. <http://eros.usgs.gov/>

## KANSASVIEW CONSORTIUM MEMBERSHIP

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*Federal partners mentioned in any text above do not receive funding from AmericaView.*

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# KENTUCKYVIEW REMOTE SENSING ACTIVITIES 2014 - 2015

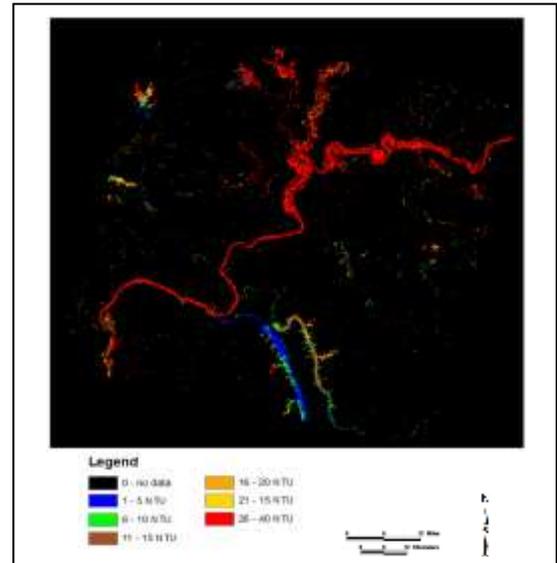


## INLAND WATER QUALITY MONITORING PROGRAM

KentuckyView has been involved with Kentucky Lake water quality mapping projects to establish a methodology for mapping water quality parameters. Factors included total suspended solids (TSS) concentrations, turbidity and Chlorophyll-a (an indicator of phytoplankton biomass) using Landsat-5, 7, and 8, as well as hyperspectral sensors. For this high-impact study, named the "Inland Water Quality Monitoring Project," Landsat-8 imagery was utilized to develop the needed methodology. This activity is the first key step in establishing a state-wide water quality monitoring program in support of environmental planning and modeling activities.

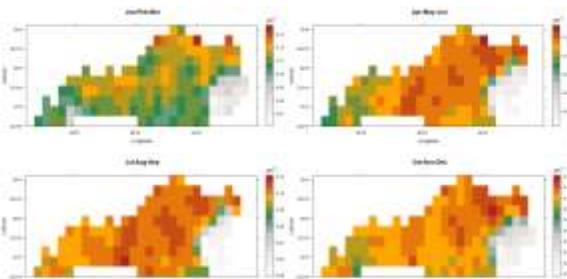
Some of the lake areas in Kentucky are unique coastal landforms, which occur where rivers and lakes mix in shallow wetlands located near the mouth of a river. Several communities have developed adjacent to large lakes. These lakes provide important fish and wildlife habitat, require water quality protection and flood control, and offer a number of economic benefits, becoming important sources of water, navigation and food. Results of the monitoring program are presented at local to regional meetings, to draw community attention to climate change impacts and adaptation. This project encourages continuing and new collaborations among institutions in Kentucky and surrounding states.

Contact: Dr. Haluk Cetin, [hccetin@murraystate.edu](mailto:hccetin@murraystate.edu)

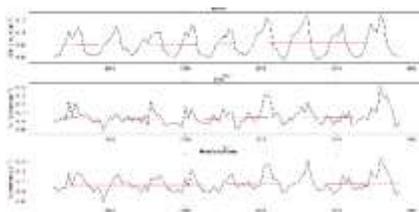


Classified image of Landsat 8 with turbidity values (NTU, Nephelometric Turbidity Units) for each water pixel

## KENTUCKYVIEW SOIL MOISTURE MONITORING PROGRAM



Spatial Variability in Kentucky Soil Moisture



Soil moisture for the Major Kentucky biomes

Contact: Dr. Bassil El Masri, [belmasri@murraystate.edu](mailto:belmasri@murraystate.edu)

KentuckyView developed a methodology to estimate soil moisture based on spectral measurements and imagery. The main objective of the project was investigating the spatial and temporal variability in remote sensing soil moisture for the State of Kentucky. Observed trends in satellite soil moisture estimates were analyzed for different Kentucky biome types. To accomplish this task, soil moisture data from the Advanced Microwave Scanning Radiometer EOS (AMSR-E) for years 2002-2011 were used. Daily AMSR-E data were averaged to produce monthly estimates. Moderate Resolution Imaging Spectroradiometer (MODIS) land cover data were used to subset the AMSR-E data for the major Kentucky biomes: forest and cropland. Results showed that the spatial variability of soil moisture is related to vegetation type. AMSR-E soil moisture data show an apparent decreasing trend in Kentucky soil moisture during the vegetation growing season. This trend was consistent with observed decreases in precipitation duration during the growing season in Kentucky, particularly from July to September. In conclusion, AMSR-E soil moisture data were capable of detecting the spatial and temporal variability in soil moisture for Kentucky biomes. Evaluating satellite soil moisture products is important for improving our understanding of the spatial variability in vegetation carbon/water cycles.

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## BENEFITS TO KENTUCKYVIEW

The primary focus of KentuckyView is the use of images collected from spaceborne and airborne sensors, as well as other geospatial technologies, to support K-16 education, applied research, and public outreach. The Soil Moisture Monitoring Program and Inland Water Quality Monitoring Program have improved understanding of environmental conditions, allowing Kentucky to manage agricultural and water resources more efficiently. Remote sensing education and outreach activities, such as 2015 Earth Observation Day presentations, helped inform and educate teachers, students and the public.

### The 2015 Earth Observation Day

Date of Event: April 7, 2015

Title of Event: Earth Observation Day Meeting

Organizer: Dr. Haluk Cetin

Number of Teachers: 9

Number of Students: 39

Number of Visitors (Public): 2

Earth Observation Day celebrations were held at the Curris Center of Murray State University (MSU) on April 7, 2015. The event started at 10:00AM with a presentation by the keynote speaker, ASPRS President Dr. Stewart Walker, who is the Director of Product Initiatives at BAE Systems based in San Diego, California. Dr. Walker's presentation entitled "Trends in Commercial Software for Photogrammetry" was well received. Prior to the lunch break, one graduate student, two Directed Studies class undergraduate students, and six Introduction to Remote Sensing class undergraduate students of Dr. Cetin presented their term project results. An afternoon four-hour poster session was held: 35 MSU students presented their posters (five graduate and 30 undergraduate posters).



2015 Earth Observation Day at Murray State University



## KENTUCKYVIEW CONSORTIUM MEMBERSHIP



- Morehead State University - Institute for Regional Analysis and Public Policy
- Kentucky Division of Geographic Information
- Kentucky Geological Survey
- Eastern Kentucky University - Department of Geography
- Jefferson Community and Technical College
- Kentucky State University
- Murray State University - Mid-America Remote Sensing Center and the Department of Geosciences (official member of record)
- 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

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# LOUISIANAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN LOUISIANA

**LouisianaView** 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.

The goal of the LouisianaView program, since its establishment in 2002, has been promoting the use of remotely sensed and GIS data by creating a consortium in the state, which has facilitated research, data dissemination, education, outreach, and technology transfer in ways that have leveraged federal and private investment in remote sensing instruments and data.

### LouisianaView activities have been designed to:

- 1) Strengthen a Louisiana-wide consortium of geospatial data users,
- 2) Actively work with consortium members to build an archive of multi-sensor satellite imagery, aerial photography, etc., with a user-friendly dissemination mechanism,
- 3) Provide educational opportunities at the institutions of higher education and for public end users,
- 4) Provide technological support and technology transfer to data users, and
- 5) Collaborate in statewide, regional and national remote sensing research and training.



*LouisianaView consortium members met in Lafayette, Louisiana for the 15<sup>th</sup> Annual Remote Sensing Emergency Response Workshop in June 2015*

## CONSORTIUM MEMBERSHIP



UL Lafayette Regional Application Center, Program Lead  
 Louisiana Army National Guard – Geospatial Center  
 Louisiana Department of Environmental Quality  
 USGS Louisiana Mapping Partnership Office  
 USGS National Wetlands Research Center  
 Corp of Engineers – New Orleans District  
 Louisiana State University  
 Louisiana Coastal Community Resiliency Studio  
 USDA Natural Resources Conservation Service–LA  
 Louisiana Department of Transportation  
 Louisiana Department of Agriculture  
 Louisiana State GIS Council  
 Louisiana GOHSEP Geospatial Data Division



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

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# LOUISIANAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## PROMOTING THE BENEFITS OF REMOTE SENSING SCIENCE AND APPLICATIONS

### Louisiana Hurricane Season Geospatial Data Mining Workshop

This annual workshop, held in early June each year, is now entering its sixteenth year. Through the cooperation of LouisianaView consortium members and co-sponsorship of local USGS representatives, this workshop is offered free to anyone in Louisiana and surrounding states, who might be interested in current and reliable information on data availability for the geospatial emergency responder. Forty-five Geospatial First Responders attended this Workshop, which was conducted June 4, 2015 at the Regional Application Center in Lafayette, Louisiana. Feedback from participants is used for the session in the following year.



Registration desk for the June 4, 2015 Natural Disaster/ Emergency Response Workshop (above).

Engaged workshop participants (left).

## BENEFITS TO LOUISIANA



Brenda Jones (USGS) presenting on the International Charter



Lunch provided by LouisianaView assists with developing relationships

During the time for the 2015 Workshop, serious flooding was occurring on the Upper Red River near Shreveport, Louisiana, and the state was discussing how to coordinate a response to the immediate disaster. Representatives of the International Charter were on hand to respond to requests for imagery by geospatial first responders of the state agencies responding to the event, and to coordinate imagery and data acquisition and dissemination to aid with disaster response. <https://www.disasterscharter.org>

LouisianaView consortium members attending the Workshop included: The Louisiana National Guard, Louisiana Governor's Office for Homeland Security and Emergency Preparedness, Corp of Engineers, Louisiana Governor's Office on Oil Spills, Louisiana Department of Transportation, Department of Environmental Quality, and federal agencies including USGS, NOAA, and USDA.

This opportunity, which allowed a planned workshop event to become a beneficial work initiative, underscores the value of meeting face to face with counterparts in state and federal response agencies, and afforded an exceptional medium for cementing trustworthy alliances and establishing credentialed contacts before future disasters strike. This workshop has confirmed the positive outcome from fifteen years of joint learning that a cohesive network of geospatial data responders can support local communities and their residents, protecting the economic base of the state of Louisiana as it responds to natural disasters and emergency events.

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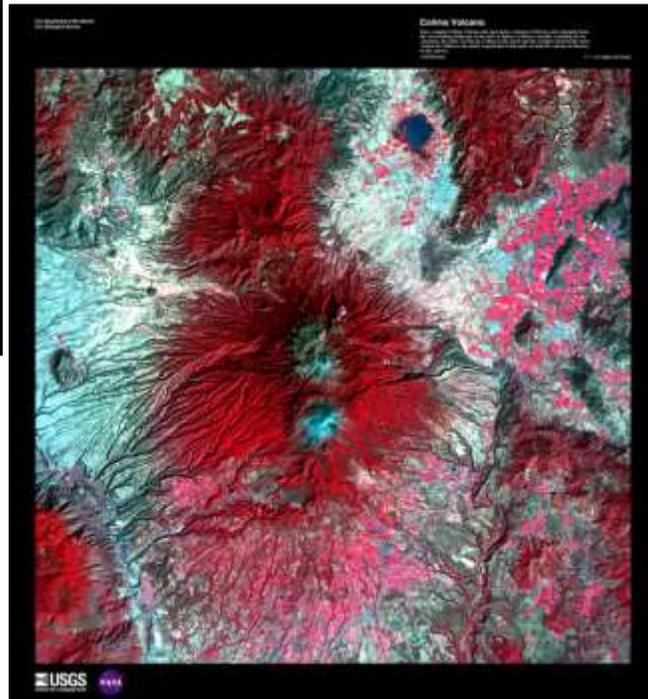
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## Intimate Science – Intersection of Science, Art and Technology



In much of the impacting work scientists, researchers, and educators do, images from satellites play a large role in the way they individually study climate change, weather patterns, natural and man-made disasters, timber stand health, and mankind's development and use of the Earth's resources. In studying these images, whether intently or casually, the keen observer also appreciates many of the fundamental elements of fine art such as tonal quality, image composition, and balance.

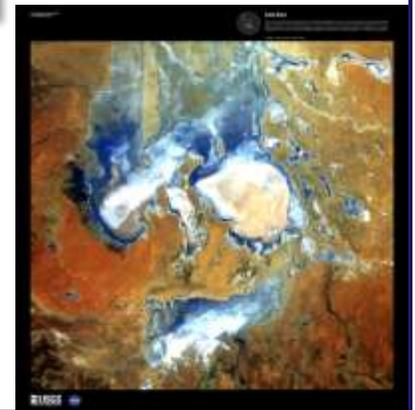


In a LouisianaView sponsored exhibition, at the James Devin Moncus Theater in Lafayette, working with the USGS "Earth As Art" program, and utilizing NASA Landsat satellite imagery, the sponsors staged images to excite the imagination and cultivate creative fancies. Over 30 images from satellite systems were displayed for multiple gala events and school visitations during 2014 and 2015. The events entertained a wide demographic range of guests with images that depict the science of the region and invoke the art of the Earth's natural landscape.

*All anyone had to do was bring along their imagination!*



*Display at the James Devin Moncus Theater as part of the downtown exhibit for business and technology, Spring 2015.*



## LOUISIANA CONTINUES EARTH AS ART EDUCATION AND OUTREACH

**Earth As Art** has been a theme for the LouisianaView program over the course of 2014–2015, visiting many areas across the state of Louisiana, and bringing science and art together for the viewing public. The exhibit was featured **in-on** Earth Observation Day, a 4<sup>th</sup> grade "Earth" Christmas Ornament Contest, science festivals and the Louisiana Remote Sensing Conference. The art collection was also part of a program to raise funds for the UL Lafayette Army ROTC Cadets, raising over six hundred dollars.



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# MARYLANDVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN MARYLAND

MarylandView 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. The mission of the MarylandView Consortium is to ensure that government agencies, non-government organizations, colleges and universities, K-12 teachers, and businesses in Maryland make the fullest use of remotely sensed imagery and other digital geospatial data and technologies. MarylandView is actively seeking to grow and diversify our state's consortium, to engage K-12, college, and university students with remote sensing technologies and research, and to develop and distribute remote sensing data and educational activities.

Current MarylandView activities include:

- working with undergraduate and graduate students at Towson University to analyze Baltimore City's urban heat island with Landsat imagery,
- continued development of a Landsat-based application to monitor land cover changes in Maryland conservations easements for the Maryland Environmental Trust.
- continued development of the online mapping application MarylandViewer.



*Landsat mosaic of Maryland.*

*This image, along with other Landsat state mosaics, are produced and distributed by the USGS EROS Center. Images may be downloaded at:*

<http://eros.usgs.gov/imagegallery/landsat-state-mosaics>

## CONSORTIUM MEMBERSHIP

MarylandView is a consortium of government agencies, non-government organizations, K-12 teachers, and businesses in Maryland. Consortium members include the Maryland Space Grant Consortium, the Maryland State Geographic Information Committee, Towson University Department of Geography and Environmental Planning, Towson University Center for Geographic Information Science, and the Maryland Geographic Alliance.



**TOWSON  
UNIVERSITY**



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# MICHIGANVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## PROVIDING REMOTE SENSING EDUCATION TO K-12 CLASSROOMS

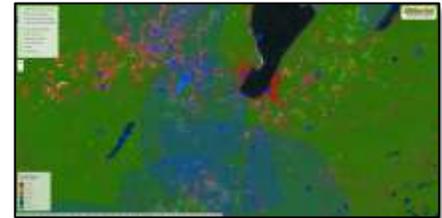
One of MichiganView's primary goals is to promote the use of remote sensing technology. Remote sensing education is well established in colleges and universities, but it is often absent from K-12 curriculum. MichiganView has worked to develop an outreach program that serves to introduce young students to basic remote sensing principles, focusing on ways to engage elementary school students with hands-on remote sensing related projects.

MichiganView recently formed a partnership with the Ann Arbor Public School's Science, Technology, Engineering, Art, and Math (A2STEAM) program. A2STEAM, located in the Northside School in Ann Arbor, employs project-based learning techniques to provide students with the skills necessary for succeeding in the science fields. This project-based approach has proven to be an exceptional environment for incorporating remote sensing education.

MichiganView's first project with A2STEAM was a 3<sup>rd</sup> grade project focused on Michigan's grey wolf population. Students were taught how to identify various types of habitat using remote sensing imagery and learned how that information could be used to identify potential areas of conflict with farmers and livestock. They were provided with an interactive map accessed through tablet computers which they used as a tool to develop a plan for peaceful human and wolf coexistence, which they presented at a community expo to their parents, teachers, and other community members.



*MichiganView Co-I Mike Battaglia speaks to a 3<sup>rd</sup> grade class about how to identify wolf habitat using remote sensing imagery*



*Screenshot of the interactive map developed for A2STEAM 3<sup>rd</sup> graders for their wolf habitat project*

## SUPPORTING THE EARTH OBSERVATION DEPOT NETWORK

MichiganView has partnered with TexasView and WisconsinView to spearhead the implementation of the Earth Observation Depot Network (EODN). The EODN is a nationwide remote sensing data distribution system that employs cutting edge technology in data logistics to deliver imagery to end users. Michigan Tech Research Institute's 1TB servers act as one of many data depots located throughout the country. The goal of the EODN project is to leverage the power of the Data Logistics Toolbox to achieve a pair of breakthrough objectives:



*Dr. Nancy French (PI, MIVIEW; left) with Dr. Sam Batzli (PI, WIVIEW; center) and Dr. Martin Swany (U Indiana; right), at EODN facilities at UI.*

- *To empower EODN as a scalable and automated content distribution network that offers high performance access to high value remote sensing data to a larger user community, and*
- *To dramatically accelerate remote sensing workflows by putting this unique software infrastructure underneath the computing tools already used by a diverse collection of users.*

## BENEFITS TO MICHIGAN

- Collaborative opportunities for remote sensing students and professionals
- Access to Michigan satellite imagery and derived data from a newly revised web portal
- Development of educational remote sensing materials for K-12 students
- Remote sensing software tools and training to students and non-expert professionals
- A conduit between Michigan's government representatives and the remote sensing community



MichiganView 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 Website:

[www.AmericaView.org](http://www.AmericaView.org)

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## ADDITIONAL MICHIGANVIEW ACTIVITIES

### Data Archives

MichiganView maintains a large archive of imagery available for download. Current archived data holdings include:

- USGS Landsat 5, 7, and 8 data with links to select cloud-free images
- Statewide NAIP imagery for 2005, 2006, 2009, 2010, 2012, and 2014
- MODIS Clear Sky Archive - cloud free MODIS images of the entire state
- Great Lakes Border Flight imagery – high-resolution airphotos of Michigan’s coastal areas

MichiganView also maintains a page of interactive web maps developed through several research projects focused on the Great Lakes, including a Lake Michigan Cladophora map, Great Lakes Coastal Wetland map, *Phragmites Australis* map, and Great Lakes Water Quality maps.



MODIS, Michigan, Mar. 27, 2011



Landsat 7, SE Michigan, Nov. 2007



Great Lakes Border Flight Imagery  
Downtown Detroit, MI, July 2009

### Geospatial Tools and Software

MichiganView develops and distributes useful geospatial tools based on free and open-source software. Recently developed tools include a variety of web-based maps, code for geospatial image format conversion and manipulation, and a tool built to extract the sun angle from USGS Landsat imagery.

### Consortium Building

MichiganView has been working to build its membership by reaching out to researchers and other potential partners at colleges and universities around the state. A redesign of the MichiganView website was recently undertaken to better serve consortium members and public users.

## MICHIGANVIEW CONSORTIUM MEMBERSHIP

MichiganView is a statewide consortium of academic member institutions. As a state member of the USGS-sponsored AmericaView program, its mission is to promote the use and further the science of remote sensing technologies in Michigan schools, governments, and industries.

**Michigan Tech**  
Create the Future

**M** UNIVERSITY OF MICHIGAN



**Michigan Tech**  
Michigan Technological University  
Department of Geological/Mining  
Engineering & Sciences

NATURAL RESOURCES  
AND ENVIRONMENT  
UNIVERSITY OF MICHIGAN



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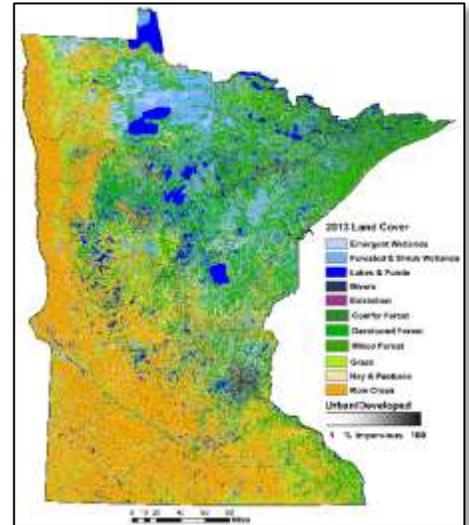
# MINNESOTAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN MINNESOTA

MinnesotaView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state. Its goals are to:

1. Support the development, distribution and application of geospatial information derived from remote sensing data for mapping and monitoring land and water resources in Minnesota.
2. Enhance understanding of the characteristics and uses of remote sensing data and increase access to and application of remote sensing data and results by agencies, schools and colleges, and citizens.
3. Contribute to remote sensing education, particularly by hosting and updating the Remote Sensing Core Curriculum website ([minnesotaview.umn.edu](http://minnesotaview.umn.edu)).
4. Develop improved linkages between remote sensing and GIS to make the best use of geospatial data.



*Statewide 2013 land cover classification of multi-temporal Landsat and lidar data at 15-meter spatial resolution and overall accuracy of 96 percent.*

## CONSORTIUM MEMBERSHIP

MinnesotaView was established in 2008 and is working with state agencies and universities in Minnesota to advance remote sensing research and application, education and outreach. The Consortium is led by the University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory ([rsl.gis.umn.edu](http://rsl.gis.umn.edu)), and includes the Minnesota Geospatial Information Office (<http://www.mngeo.state.mn.us/>) and Minnesota Department of Natural Resources ([dnr.state.mn.us](http://dnr.state.mn.us)).



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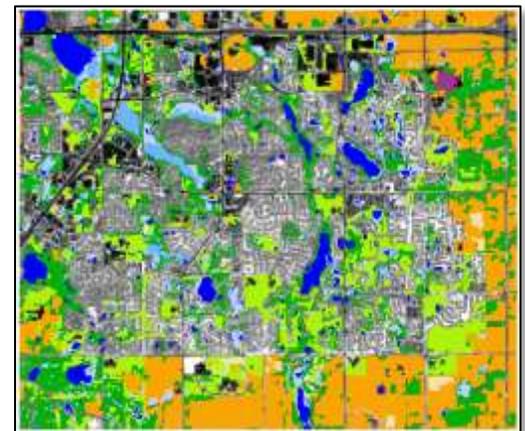
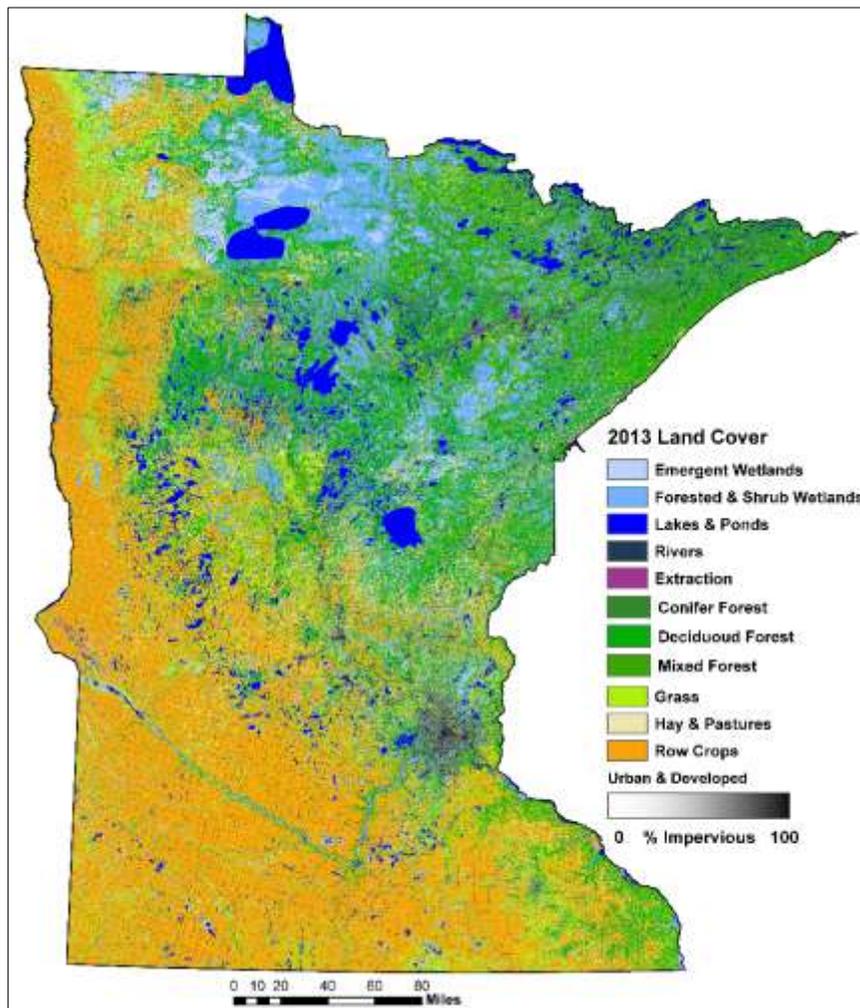
# MINNESOTAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



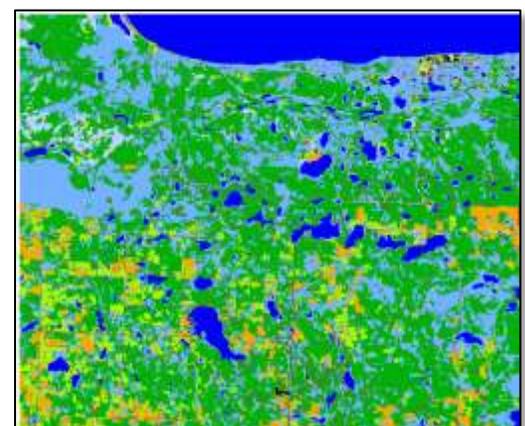
## DEVELOPMENT OF SATELLITE REMOTE SENSING FOR MAPPING AND MONITORING MINNESOTA LAND AND WATER

In collaboration with Minnesota agencies, the University of Minnesota is actively involved with research and development of applications of satellite remote sensing, particularly Landsat, for mapping land cover and monitoring water quality. A major accomplishment this year was to generate a new (2013) statewide land cover classification.

The classification used a combination of multitemporal Landsat 8 and LiDAR data by Object-based image analysis. Landsat data was resampled to 15-meter resolution. By using objects instead of pixels we were able to utilize multispectral data along with spatial and contextual information of objects such as shape, size, texture and LiDAR-derived metrics to distinguish different land cover types. While OBIA has become the standard procedure for classification of high resolution imagery we found that it works equally well with Landsat imagery. For the objects classified as urban or developed, a regression model relating the Landsat greenness variable to percent impervious was developed to estimate and map the percent impervious surface area at the pixel level. The overall accuracy for 11 classes, level 2 was 96 percent.



*Woodbury, a suburb of St. Paul, with a mixture of land cover and uses.*



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

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



AmericaView Website:

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## BENEFITS TO MINNESOTA

MinnesotaView supports the development, distribution and application of geospatial information derived from remote sensing data for mapping, monitoring and analysis of land and water resources in Minnesota. Classifications of land cover, impervious surface area and lake water clarity are being used for management and planning by Minnesota agencies at state and local levels.

A long term scientist with the Minnesota Pollution Control Agency wrote in a user testimony, "...remote sensing efforts have paid huge dividends for the advancement of improved lake and river basin management in Minnesota. A recent example is the recently updated land cover for the entire watershed of Lake of the Woods, an international waterbody of considerable significance. We are making substantial progress using the latest remote sensing land cover products in hydrologic models to quantify cumulative impacts from demographic growth, land use, land conversions and climate variability. While it is difficult to quantify the economic impacts of having updated land cover products, watershed restoration and protection projects are mounting into the hundreds of millions of dollars per year expended by various agencies, cities and other governmental units to achieve swimmable and fishable goals. We simply need to have the best remote sensing products to be able to most effectively target implementation actions across the landscape. The University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory and the MinnesotaView project have enhanced and facilitated land and water management in Minnesota with the land cover and water quality maps and statistics they have provided. I can provide numerous examples of how the University of Minnesota's Remote Sensing and Geospatial Analysis Laboratory has provided products to diverse public entities that are being routinely used in watershed management projects. The State of Minnesota has benefited greatly as a result."

## ADDITIONAL MINNESOTAVIEW ACTIVITIES

### Data Archival and Dissemination

An important part of the mission of the UMN Remote Sensing and Geospatial Analysis Laboratory and MinnesotaView is to archive and disseminate geospatial data, particularly maps, statistics and analyses that have been derived from remote sensing. Examples of the holdings, which draw interest from Minnesota agencies and citizens, include land cover data and periodic lake water clarity assessments. Data and project results are posted on the RSGAL website, [rsl.gis.umn.edu](http://rsl.gis.umn.edu) as well as at [land.umn.edu](http://land.umn.edu) and [water.umn.edu](http://water.umn.edu). In FY14 the land website had more than 4,000 unique visitors and the water and lakes websites had 74,000.

This year AmericaView support enabled creation of a new geospatial portal [portal.gis.umn.edu](http://portal.gis.umn.edu) for viewing and downloading land cover and lake clarity maps and data.

### Providing Remote Sensing Education and Information

The goal of the Remote Sensing Core Curriculum hosted by the University of Minnesota is to provide resources to support a state-of-the-practice educational experience. The RSCC is composed of contributions from authors from academia, government, and industry. It provides a knowledge base of theory and techniques to advance the understanding and use of remote sensing and geospatial science.

The primary activity this year was creation of new in-class exercises, incorporation of YouTube videos into lessons, preparation for expanded/improved lecture content, and solicitation of new contributors for the Remote Sensing Core Curriculum. The RSCC website, [r-s-c-c.org](http://r-s-c-c.org), has more than 15,000 visits each month.

## MINNESOTAVIEW CONSORTIUM MEMBERSHIP

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

**University of Minnesota**

**Minnesota Geospatial Information Office**

**Minnesota Department of Natural Resources**

MinnesotaView Principal Investigator:

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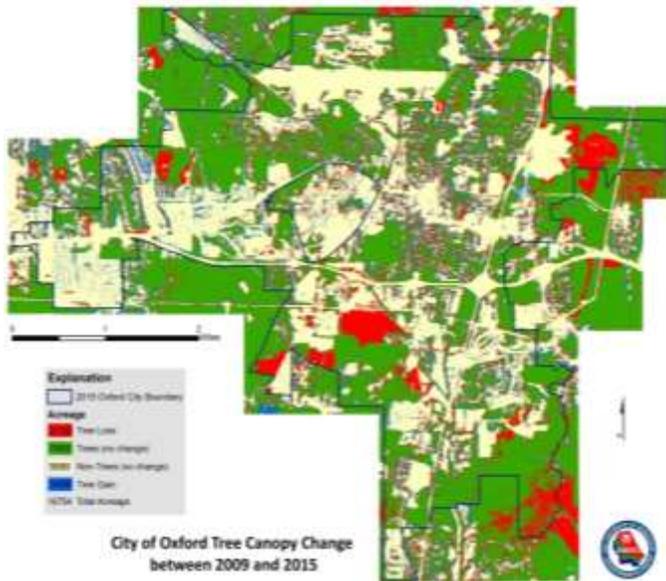
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[minnesotaview.umn.edu](http://minnesotaview.umn.edu)

## Mapping Changes in Tree Canopy within the City of Oxford, MS

The MississippiView team, in partnership with the City of Oxford's Tree Board used remote sensing to analyze and quantify the changes in tree canopy cover within the City of Oxford and portions of Lafayette County, MS. The study updated a previous mapping effort and provided the City Planner with the rate of tree loss due to development, the extent of the tree canopy cover, and the regions of most change. The Tree Board and the Planning Department will use these data and the analysis to update the Oxford comprehensive plan for the city, to understand the loss in tree canopy, and to determine if new regulations are needed.



## BENEFITS TO MISSISSIPPI

Both of these High Impact Activities demonstrate the application of remotely sensed data as tools for practical analysis of issues affecting the state of Mississippi. The land use and land cover changes found in the Oxford canopy study show that there has been a significant loss of trees which raised concern in the Mayor's office. The significance of the soil moisture study to a heavily agricultural state like Mississippi cannot be overstated.

## Demonstrating the Effectiveness of Monitoring Tree Cover with Remote Sensing

Monitoring loss and gain in tree cover in an urban environment is challenging. High spatial resolution imagery is required to be able to quantify the small losses, individual lot clearing, that add up to a significant loss of trees. The City of Oxford is proud of its heritage as a 'Tree City'; a significant loss of tree cover lessens the importance of this designation.

Two sets of imagery were used for this comparison. 2009 and 2015 QuickBird imagery for the City of Oxford were classified as trees, asphalt, water, grass, and other. The classes were further simplified into two classes: trees or non-trees. A process was used to remove classified areas (polygons) that were smaller than a few pixels in size. Manipulation of the polygons was minimal due to time constraints, but obvious errors in classification were manually corrected.

2009-2015 Tree Canopy Study				
	Acres		Sq. Miles	
Tree Loss	2139.0		3.3	
Trees (no change)	7492.6		11.7	
Non-Trees (no change)	5685.8		8.9	
Tree Gain	1436.2		2.2	
	Trees (acres)	Non-Trees (acres)	Trees (sq. miles)	Non-Trees (sq. miles)
2009	9631.8	7120.8	15.0	11.1
2015	8929.2	7825.1	14.0	12.2
	Change (acres)		Change (sq. miles)	
2009-2015	-702.6	704.3	-1.0	1.1
	negative values indicated a "loss" of reported area			
	Area Sum (acres)		Area Sum (sq. miles)	
2009	16752.6		26.2	
2015	16754.3		26.2	
	Error (acres)		Error (sq. miles)	
2009-2015	1.7		0.0	
	Trees %	Non-Trees %		
2009	57.49	42.51		
2015	53.29	46.71		
Change	-4.20%			

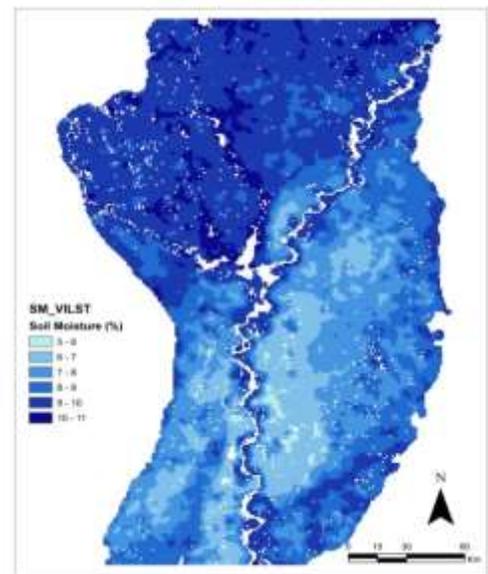
## Soil Moisture Estimation using Optical and Microwave Remote Sensing

Soil moisture in the upper layer of the soil is an important variable in a wide range of applications. In recent years, many different studies have employed remotely sensed data to quantitatively estimate soil moisture in areas with limited vegetative cover. During the plant-growing season, agricultural fields are covered with different heights and densities of vegetation canopy. Accurate information about the soil water content can be used for effective irrigation planning which will lead to optimized water consumption. The Advanced Microwave Scanning Radiometer (AMSR-E) sensor onboard the Aqua satellite gathered global soil moisture data before the automatic shutdown in October 2011. Global soil moisture data were acquired daily but had a coarse resolution of 25-km, which is not suitable for local-scale applications.

Study Area in the Mississippi Delta



In this study, triangle scatterplots of normalized difference vegetation index (NDVI) and land surface temperature (LST) from MODIS are used to downscale AMSR-E data to the moderate resolution of 1-km over an agricultural areas in Mississippi delta. This data fusion technique has been completed using four sets of data collected from Jan 2010 to Feb 2011 to study the effectiveness of the downscaling for studying soil moisture under vegetation canopies from emergence to full growth to senescence. In-situ soil moisture data measured at 15 stations of the National Resources Conservation Service (NRCS) in the delta are used to assess the accuracy of downscaled soil moisture data.



## MISSISSIPPIVIEW VISION AND GOALS

### MSView Vision:

Build partnerships to promote the application of Geospatial Information Science and Technology (GIS&T) and remote sensing to natural resources problems of local, state and national importance.

### MSView Long-Term Goals:

- Build partnerships with state and local government entities that promote the utility of remote sensing data products for practical applications
- Facilitate access to remote sensing data for Mississippi
- Expand the knowledge and utilization of remote sensing via courses, workshops and other educational opportunities for K-12 educators, university students and the existing workforce
- Support remote sensing research through access to data and, as funding becomes available, through grants and contracts

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# MONTANAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN MONTANA

MontanaView 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.

The vision for the MontanaView Program is to identify and seek to address the most pressing remote sensing needs in Montana for management of agriculture, range, forest, wild lands, and urban landscapes. MontanaView became a member of AmericaView in 2005. The MontanaView consortium includes a wide range of organizations involved in remote sensing in the State of Montana, including universities and colleges, state and federal governmental agencies, and non-profits. MontanaView regularly uses this wide range of expertise to evaluate the current pressing needs of Montana citizens that relate to or can be addressed with remote sensing technologies.

The consortium has been involved in education at the K-12 and higher education levels. Workshops and institutes have been held to train K-12 teachers in how remote sensing can be incorporated into their classrooms and used to meet educational needs and requirements. Undergraduate and graduate students have been supported, adding critical members to Montana's workforce with expertise in the most modern geospatial tools. Another priority for MontanaView has been to train Montana's current workforce, and especially agency personnel, in the most recent developments. Researcher members of MontanaView have used their expertise to address some of the most pressing natural resource issues facing Montana in the past decade. For example, MontanaView is currently leveraging its resources with support from the U.S. Department of Agriculture to address the impacts of bark beetles on the Montana's forest resources.

## CONSORTIUM MEMBERSHIP



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

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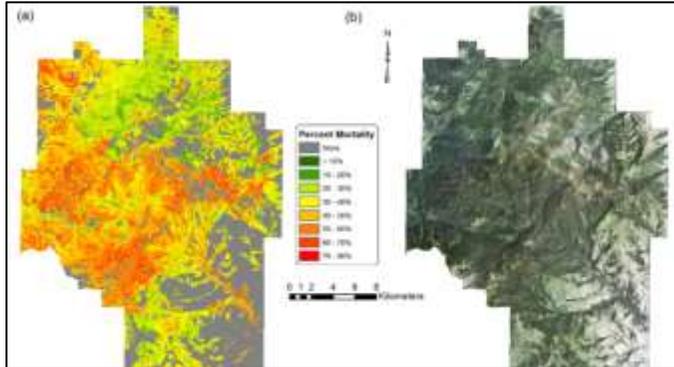
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# MONTANAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## MAPPING BARK BEETLE INFESTATIONS IN MONTANA'S FORESTS



(a) Map of the estimated percent mortality in the Helena National Forest made using a Landsat-8 image from July 18, 2013, and (b) high-resolution aerial imagery for the same area. The central and west-central regions of the study area tend to have the highest levels of mortality, whereas the northern and north-eastern portions are characterized by low-density mortality.

Bark beetles have ravaged large swaths of Montana's forests, and accurately mapping the presence and spread of the resulting mortality is critical for effective forest management. Previous practice used by management agencies using aerial surveys, however, has suffered from (1) coarse detail, (2) poor locational accuracy, and (3) failure to specify the percent of mortality, and thus the severity of damage.

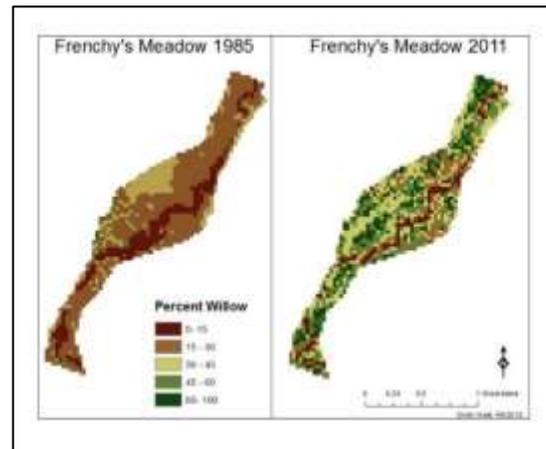
Researchers at Montana State University, with support from AmericaView and the U.S. Department of Agriculture, developed an approach to overcome these shortcomings and tested the approach on a portion of the Helena National Forest at the northern end of the Elkhorn Mountains. The approach used the OLI instrument on Landsat 8 and approximately 400 reference sites across the region. A two-step modeling approach was implemented, where first a series of statistical algorithms were evaluated to determine the presence of mortality, and a second analysis was used to measure percent mortality where it was present.

Results were excellent, with the average difference between modeled and observed mortality for independent validation data ranging from 0.1% to 2.4% (depending on the statistical methods used). 95% confidence intervals were similarly impressive, ranging from 3.6% to 9.0%

## SUPPORTING STUDENT SERVICE LEARNING

Service learning is an important educational tool where students conduct real-world projects for agencies, non-profit organizations, and others. MontanaView supported students conducting service learning projects at Montana State University, Montana Tech, Salish Kootenai College, and the University of Montana.

Dionne Zoanni, a Native American student at Montana State University, completed a project for the Fort Peck Indian Reservation entitled "A Study of the Effect of the Reintroduction of Bison to Grazing Unit Vegetative Heterogeneity on Fort Peck Reservation using NDVI". Smith Wells at Montana State University completed a study for the U.S. Forest Service, "Willow Response to Beaver Reintroduction in the Absaroka-Beartooth Wilderness". Bryan Dupuis at Salish Kootenai College conducted a "Remote Sensing and Land Use Study of Flathead Lake" for the Flathead Lakers non-profit. Annalisa Ingegno at the University of Montana conducted her study on "Estimating Detection Probability for *Botrychium* sp. in Lincoln County, MT", while Hannah Kuehl at the University of Montana completed "An Analysis of Socioeconomic Influences on Health Care Seeking Behavior in Humla, Nepal", using remote sensing to analyze transportation routes for mobile medical units.



Smith Wells, a student at Montana State University, worked with Dan Tyers at the USGS Northern Rockies Science Center, to map changes in willow coverage in an area north of Yellowstone National Park. Landsat imagery for 1985 and 2011 was used to demonstrate how the reintroduction of beaver has coincided with significant willow response.



## BENEFITS TO MONTANA

Traditional approaches to mapping bark-beetle infestations have limited utility for site-specific forest management, because they lack sufficient specificity with respect to intensity of the mortality. Mapping percent mortality using freely available Landsat data will enable improved forest management, and on-going research is applying these maps to specific issues facing Montana, including:

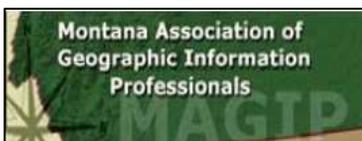
- Accurately mapping endangered Canada lynx habitat; and
- Evaluating the potential for converting beetle-killed trees to biofuels.

MontanaView's education efforts are fulfilling a critical goal for remote sensing in Montana. Last year, five students at three institutions had the opportunity to complete real-life remote sensing projects with tangible results for government agencies and non-profit organizations. As a result, Montana is gaining an experienced, well-prepared workforce.



*Bark beetles have ravaged large areas of Montana's forests. All stages of bark-beetle attack can be seen in this scene of the East Garnet Range of Montana. Photo: Peter Kolb, Montana State University Extension Forestry.*

## MONTANAVIEW CONSORTIUM MEMBERSHIP



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

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# NEBRASKAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NEBRASKA

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

### NebraskaView:

- conducts training & educational outreach,
- provides assistance in applications development,
- fosters technology transfer, and
- investigates and evaluates geospatial data sources for specific user applications.



Public Outreach activities – Family Weatherfest Event (Left) at the University of Nebraska-Lincoln and Geospatial Technologies Exhibit (Right) at the Nebraska State Office Building in Lincoln, NE. These informal settings allow NebraskaView to engage and educate the citizens of Nebraska about the various ways in which geospatial technologies are used in the state, especially in the areas of land and water resource management.

## CONSORTIUM MEMBERSHIP

NebraskaView works closely with the Nebraska GIS Council (<http://nitc.nebraska.gov/gisc/>) and its member agencies (comprised of representatives of all levels of government, local through federal), as well as several Nebraska universities, to coordinate the development and application of geospatial information technologies in Nebraska.



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

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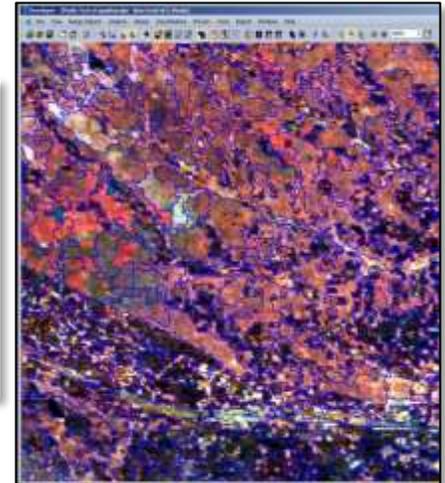


# NEBRASKAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



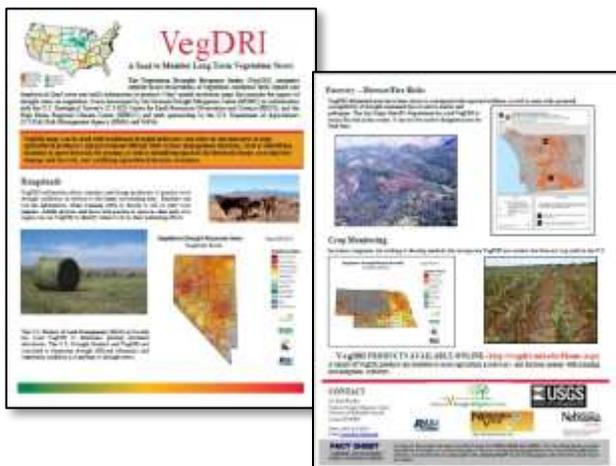
## NEBRASKAVIEW STUDENT INTERNSHIP

NebraskaView (NEView) funded an undergraduate student during the summer to work on a project focused on developing analytical techniques to distinguish between irrigated and non-irrigated cropland in Nebraska. This project was part of a larger state-wide classification of land use in Nebraska conducted for the Nebraska Department of Natural Resources (NDNR). The student acquired and analyzed Landsat, MODIS and NAIP imagery for use in object-oriented land use classification and contributed to the development of processes to classify this imagery. The separation of irrigated vs. rain-fed agricultural crops will allow the NDNR to more closely monitor water usage during periods of drought and also plan for future water appropriation in the state. This activity allowed the student to develop skills in processing remotely sensed satellite imagery and also exposed him to real-world applications of geospatial technologies.



*NEView student intern (left) uses object-based analytical techniques (right) to determine agricultural land use in Nebraska for a project with the Nebraska Department of Natural Resources*

## TECHNOLOGY TRANSFER



*NEView-developed Fact Sheet used to promote practical applications of the VegDRI satellite-based drought-monitoring tool*

NebraskaView, in conjunction with University of Nebraska-Lincoln and National Drought Mitigation Center (NDMC) researchers, developed a new Fact Sheet focused on specific applications of the Vegetation Drought Response Index (VegDRI). VegDRI integrates biophysical (land cover and soils) information to produce 1-km<sup>2</sup> spatial resolution maps that monitor the impact of drought stress on vegetation. It was developed by the NDMC in collaboration with the U.S. Geological Survey's (USGS) Center for Earth Resources Observation and Science (EROS), and the High Plains Regional Climate Center (HPRCC) with sponsorship by the U.S. Department of Agriculture's (USDA) Risk Management Agency (RMA), NASA, and USGS. The Fact Sheet presents a number of examples of how this tool for monitoring seasonal vegetation stress can be used by land managers for drought-related planning and response in rangeland management, forest disease and fire risk assessment, and crop monitoring. The Fact Sheet was sent to more than 50 identified stakeholders in Nebraska. Feedback is being solicited to understand how the information might be used in decision-making activities and identify specific applications within the state to demonstrate VegDRI's utility.

NebraskaView 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.



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## BENEFITS TO NEBRASKA

These NEView activities benefited the citizens of Nebraska in several ways. NEView provided an educational opportunity for an undergraduate student that otherwise would not have been available to him. Providing specific examples to stakeholders of the utility of a drought-monitoring tool is especially relevant in a predominately agricultural state such as Nebraska.

Other benefits include:

- Fostering collaboration with university research teams to provide technology transfer from research to users in the field
- Using an outreach activity to solicit feedback that can be used to improve a technology tool to maximize its usability in Nebraska
- Providing taxpayers with examples of how federally funded data acquisitions are being used to their benefit
- Promoting research and remote sensing experience at the university undergraduate level to increase numbers and visibility of graduating students with employment skills in remote sensing
- Job training for Veterans (student formerly served with the U.S. Marine Corps)



*NEView strives to familiarize Nebraskans with the many ways in which satellite imagery is used to monitor and manage natural resources in the state. (NE State Office Building display, November 2014)*

## NEBRASKAVIEW CONSORTIUM MEMBERSHIP



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

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# NEW HAMPSHIREVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NEW HAMPSHIRE

New HampshireView 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.

New HampshireView is based at the University of New Hampshire and provides a means to bring many groups that use remotely sensed imagery and other geospatial data together in a formal way to aid communication and sharing of resources. The consortium provides a single point of access for anyone in the state needing imagery or wishing to learn more about geospatial technology resources within New Hampshire. It provides networking and collaboration infrastructure, educational support, and outreach for all members. Specifically, the consortium provides:

- Education/Outreach through: guest lectures and webinars; presentations at technical meetings/conferences; workshops; and the GeoSpatial Services Center
- Applied Research through: support for undergraduate and graduate student research internships; and software tools for evaluating the accuracy of thematic maps and fragmentation on the NHView website
- Data Provision/Support through: sharing of software licenses and equipment (survey-grade GPS and others); and geospatial data and remotely sensed imagery archived by our partners



Landsat 8 mosaic of New Hampshire.

## 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
- **Civil Technology Program, UNH**  
The Thompson School of Applied Sciences provides a 2-year Associates Degree in the geospatial technologies.
- **Diamond Library, UNH**  
The library maintains an extensive map and aerial photo collection for NH and houses the GeoSpatial Services Center.
- **Forest Watch, UNH**  
A New England environmental education activity using field, lab, and satellite data analysis methods for assessing the state-of-health of local forest stands
- **Cooperative Extension, UNH**  
Offers short courses in geospatial technologies including GIS, GPS, and field mapping.
- **Dartmouth College**
- **NH Planning Commissions**
- **NH GIS Conservation Collaborative**
- **NH Fish and Game Department**



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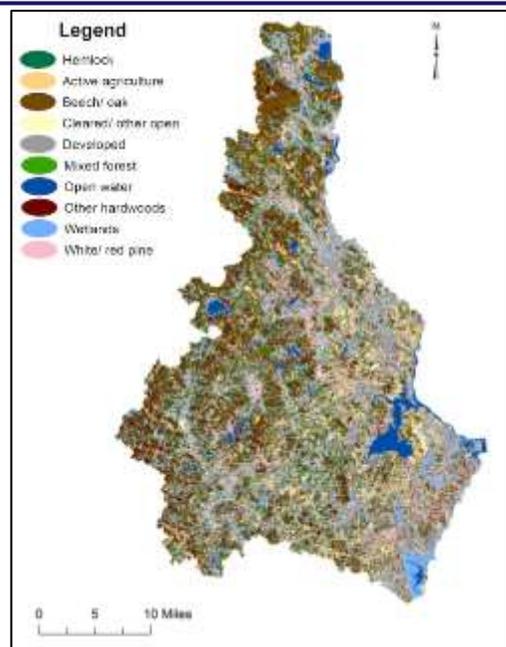


# NEW HAMPSHIREVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## EVALUATING LANDSAT 8 FOR LAND COVER AND FOREST COVER MAPPING

An analysis was conducted using Landsat 8 imagery for mapping forest and other land cover in the New Hampshire Coastal Watershed. The work was performed by a graduate student in the Department of Natural Resources & the Environment at the University of New Hampshire (UNH) under the direction of the New HampshireView (NHView) Director. Forest and other land cover maps were generated from Landsat 8 (L8) and Landsat 5 (L5) imagery using pixel-based and object-based analysis approaches. The results of the object-based analysis on the L8 imagery are shown in the figure at the right. Quantitative accuracy assessment was conducted by generating error matrices for each map. The results of the accuracy assessment showed that the maps were accurate with overall accuracies ranging from 78 to 82 percent. A Kappa analysis was used to test for statistical significance between mapping approaches and using L5 vs. L8. The results showed that there was no significant difference between using the pixel-based approach compared to the object-based approach. Some studies using object-based analysis for moderate resolution imagery have shown improvements using this approach while others, such as this one, have not. Certainly, the object-based approach does not have the same benefit here as it does with high-resolution imagery. In addition, there was no significant difference between using L5 or L8 imagery. This result is not a reflection of the improvements in L8 imagery, but rather shows that there is sufficient information in L5 to produce accurate maps.



## CREATION OF MINI-TRAINING PRESENTATIONS

Mini-training presentations were created by the NHView Director on various aspects of remote sensing as shown in the table below. These presentations were then given as webinars through the NH Cooperative Extension and the Vermont Center for Geographic Information (VCGI). The webinars were recorded and are available on YouTube as well as the VCGI and NHView websites. These webinars were extremely successful with a large number of views.

Mini-Training Title	Date Presented	Attended Live	Viewed Online
Remote Sensing Basics	10/16/14	51	17,125
Selecting the Best Imagery	11/6/14	38	2686
Accuracy Assessment of Remotely Sensed Data	12/4/14	48	1624
The Power of NIR for Mapping	2/19/15	48	428

Table showing the title, date presented, attendance for the live webinar, and number who have viewed the recorded webinar online through 12/15/15

## BENEFITS TO NEW HAMPSHIREVIEW

There are many benefits from the work of NHView to the people of New Hampshire. They include:

- New Hampshire is more than 80 percent forested. Therefore, any developments in remote sensing technology that allow for better mapping of forest and other land cover in the state is of great benefit. Tourism is an important component of New Hampshire's economy and mapping/monitoring the state is vital to continued tourism.
- The creation of mini-training presentations on remote sensing provides many of the New Hampshire State Agencies and others with information to which they might not otherwise have access. Many GIS experts need more knowledge of remote sensing; these presentations are recorded and are readily available to anyone (in NH or not) to watch and learn.
- The GeoSpatial Services Center (GSC) on the UNH Campus raises awareness and provides consulting to everyone interested in learning more about geospatial technologies.

NewHampshireView 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.



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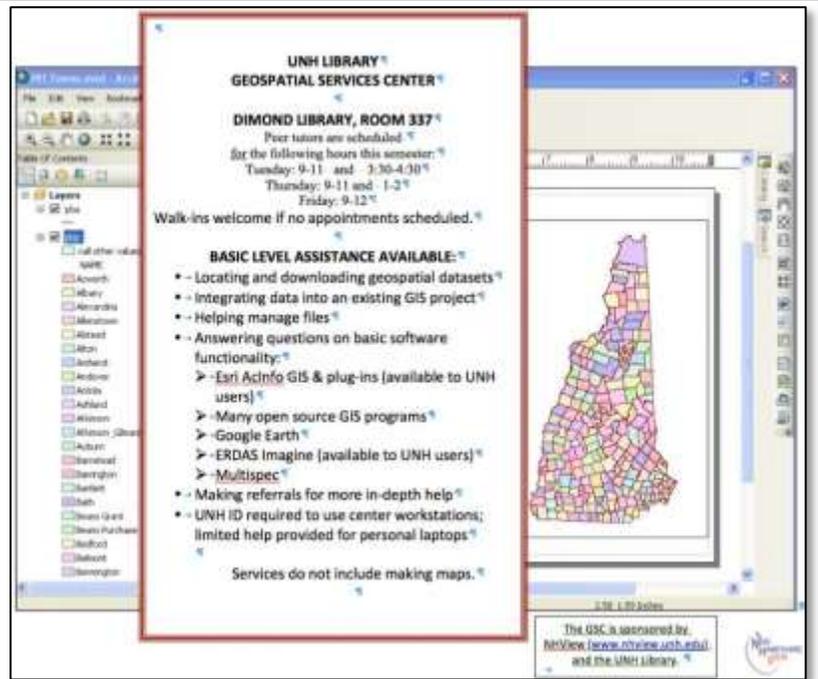
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## FORMALIZE A GEOSPATIAL SERVICES CENTER ON THE UNIVERSITY OF NEW HAMPSHIRE CAMPUS

As a result of a needs assessment conducted by the NHView Consortium, a GeoSpatial Services Center (GSC) was established on the UNH Campus in the Fall of 2013. After a successful pilot study year, the GSC was continued during the Fall of 2014 and Spring of 2015 semesters. The GSC is funded by support from the UNH Library, NHView, and other NHView partners. Two consultants (graduate student or advanced undergraduate interns) maintain regular hours in the GSC (see poster). Consulting is available to faculty, staff, and students as well as members of the surrounding community that come into the library. The GSC has two high-end PC-based computers that run a variety of geospatial analysis software packages including ArcGIS and ERDAS Imagine (image analysis software). In addition, a number of public-domain software packages are available including QGIS, Google Earth, and MultiSpec. Information about the GSC is posted around campus and online (see poster).



## NEWHAMPSHIREVIEW 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 database serving the information needs of state, regional, and local decision-makers.

### Civil Technology Program, UNH

The Thompson School of Applied Sciences provides a 2-year Associates Degree in the geospatial technologies.

### Diamond Library, UNH

The library maintains an extensive map and aerial photo collection for NH.

### Forest Watch, UNH

A New England environmental education activity using field, lab, and satellite data analysis methods for assessing the state-of-health of local forest stands

### Cooperative Extension, UNH

Offers short courses in geospatial technologies including GIS, GPS, and field mapping

### Dartmouth College

### NH Planning Commissions

### NH GIS Conservation Collaborative

### NH Fish and Game Department



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# NEW MEXICOVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NEW MEXICO

New MexicoView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state.

New MexicoView (NMView) seeks to advance the use of remotely sensed data through education, research, outreach, and technology transfer to the public and private sectors in New Mexico. NMView funding has provided training to current and future land and natural resource managers in remote sensing basics and use of satellite imagery. This includes presentations and demonstrations at two New Mexico High Schools.

Remotely sensed data are widely used in New Mexico by state and federal agencies, universities, private entities, and non-profit organizations. Some of these uses are natural resource management activities (fire and range management), and conservation of species and biodiversity. A challenge for the New Mexico remote sensing community is to get mapping and monitoring applications developed by USGS, USDA, and NMView partners into the hands of managers in a useful format. The NMView consortium is working on methods to bring the research and management communities together in New Mexico.

An example of community building is the collaboration of NMView with The Wildlife Society (Southwest Section and New Mexico Chapter) to create a geospatial advisory team to provide expert assistance to managers seeking to address ecological questions with remotely sensed data and geospatial technologies.



*Students from Early College High School in Las Cruces, New Mexico, working in the augmented reality sandbox.*

## CONSORTIUM MEMBERSHIP

NMView has been building a consortium of public, private, and non-profit organizations that are promoting remote sensing in New Mexico through sharing of resources, developing an infrastructure and supporting research and education in the state. Collaboration with the New Mexico Geographic Alliance, New Mexico Geographic Information Council, and NASA provide the foundation for education and outreach opportunities across the state.

NMView partners develop, leverage, and disseminate remote sensing resources, applications, and research. NMView's programs, supported by other AmericaView members, have the capacity for national reach.



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# NEW MEXICOVIEW REMOTE SENSING ACTIVITIES 2014 - 2015

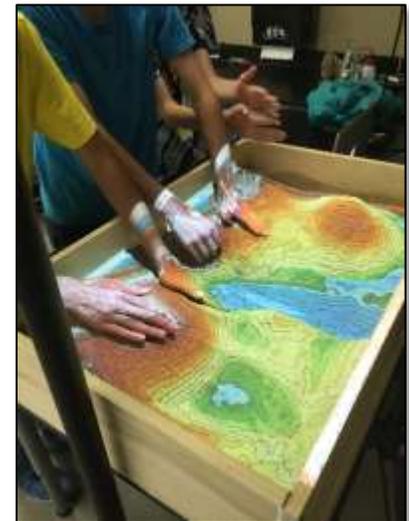


## EDUCATION - EARTH OBSERVATION DAY AND ADOPT A PIXEL

New MexicoView (NMView) collaborated with Sigma Corp. and NASA's Landsat Missions in the education of New Mexico students at the elementary, secondary, and higher education levels and in support of AmericaView's Earth Observation Day. Earth Observation Day is a STEM educational outreach event of AmericaView and partners. NMView provided remote sensing education to secondary students in the Las Cruces Public Schools and incorporated NASA's "Adopt a Pixel" program in a Las Cruces high school. NMView is using student feedback to understand how best to implement the program and incorporate it into more AmericaView states.

"Adopt a Pixel" is a program that provides students with the link between remote sensing and ground control points. Students use smartphone apps to identify land cover and take photographs of land cover points that can then be used in classification or accuracy assessment of remotely sensed efforts. Combined with other remotely sensed demonstrations, NMView links the importance of remotely sensed data and field efforts to scientific research.

This year, NMView presented the "Adopt a Pixel" program to Early College High School in Las Cruces, NM. Other demonstrations included an overview of remote sensing, satellite and aerial photo interpretation, and use of the augmented reality sandbox. The augmented reality sandbox is a hands-on sandbox with a virtual three dimensional visualization environment (see photo to right).



*Students from Early College High School in Las Cruces, New Mexico working in the augmented reality sandbox*

## OUTREACH – THE WILDLIFE SOCIETY GEOSPATIAL ADVISORY COMMITTEE



*Opening Screen for Webinar sponsored by NMView*



*Field photo smart phone app presented during 1<sup>st</sup> webinar*

Federal agencies, tribal, state and local governments, nongovernmental organizations, and private entities are seeking experts to assist their conservation management. The Southwest Section of The Wildlife Society (TWS) and NMView have created a committee for the TWS membership and the conservation community as a whole. TWS is an international professional society focused on wildlife management and conservation.

The Southwest Section Geospatial Advisory Committee (GAC) of The Wildlife Society and the associated state chapters (AZ, NM, and TX) are a functioning committee working on providing outreach and education to TWS members. NMView sponsored one webinar for wildlife professionals in 2015 (attended by 30+ individuals) to introduce the committee and specific sponsors including NMView. Participants on the committee represent the Arizona, New Mexico, and Texas state chapters of The Wildlife Society and the Southwest Section of The Wildlife Society. This includes members from university research teams, K-12 schools, federal agencies, tribal, state and local governments, nongovernmental organizations, and commercial enterprises. Additional webinars are planned for the next fiscal year as well as publications and fact sheets.

This NMView activity assisted in identifying the data and information requirements of TWS members, established partnerships with personnel in a variety of agencies and organizations, and provided education and training of professional wildlife biologists. The goal of the effort is to establish a long-term geospatial committee that will provide expertise and documentation on using remote sensing data in wildlife management.

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## BENEFITS TO NEW MEXICO

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

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



*Imagery of the Mesilla Valley, New Mexico used to demonstrate aerial and satellite imagery interpretation at Early College High School in Las Cruces, New Mexico*

## NEW MEXICOVIEW CONSORTIUM MEMBERSHIP

NMView has built a consortium of public, private, and non-profit organizations that are promoting remote sensing in New Mexico through sharing of resources, developing infrastructure and supporting research and education in the state. Collaboration with the New Mexico Geographic Alliance and NASA provide the foundation for education and outreach opportunities across the state.

NMView partners develop, leverage, and disseminate remote sensing resources, applications, and research. NMView's programs, supported by other AmericaView members, have the capacity for national reach.



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[@NewMexicoView](https://twitter.com/NewMexicoView)



# NEW YORKVIEW CONSORTIUM OVERVIEW 2014 – 2015

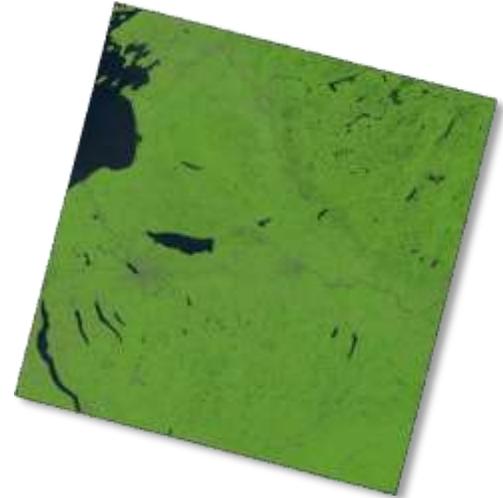


## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NEW YORK

New YorkView 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.

Remotely sensed imagery is used for a wide range of applications in New York State including analyzing land use and land cover change, characterizing vegetation dynamics, planning or monitoring urban growth, and supporting response to a wide range of emergency situations. The New YorkView (NYView) consortium seeks to facilitate the application of remote sensing data and products in order to solve challenges faced by New York State citizens.

When NYView became an Associate Member of AmericaView in 2009, the intent was to focus on two major activities: 1) facilitating access to diverse remote sensing data/products, and 2) supporting collaborative research, teaching, and outreach among the members of the consortium. After becoming a full member in 2014, this broad focus continues to frame the overarching priorities for NYView. Current efforts focus on consortium building to engage existing members and connect with new members from various sectors throughout the state. Beyond this, NYView seeks to determine priorities for applications of remote sensing data within New York State, and understand the barriers to the potential success of such endeavors.



*Landsat 8 image of Central New York, acquired July 16<sup>th</sup>, 2015*

## CONSORTIUM MEMBERSHIP

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



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# NEW YORKVIEW REMOTE SENSING ACTIVITIES 2014 – 2015



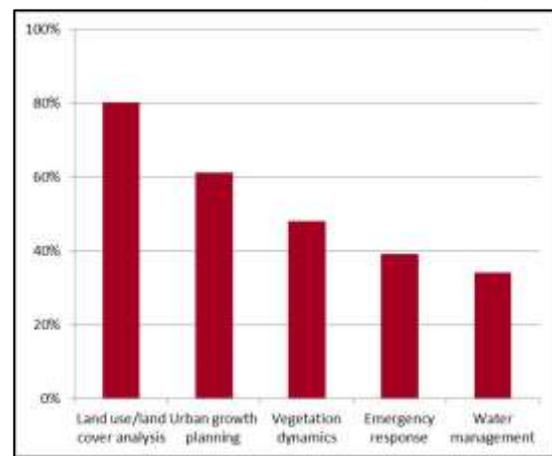
## UNDERSTANDING REMOTE SENSING APPLICATIONS IN NEW YORK STATE

Remote sensing provides an extraordinary tool for helping scientists and non-scientists alike understand and characterize the condition and change of the natural and built environment. With access to imagery archives dating back decades, researchers have significant opportunities to explore New York State (NYS) from this birds-eye view.

New YorkView (NYView) became a member of the AmericaView Consortium in 2014. One of the first activities completed by NYView was a survey to understand current applications of remote sensing data within NYS. This project was important to identify applications that remote sensing tools and data can support and determine any limiting factors that analysts have in using remotely sensed imagery. The survey particularly aimed at better understanding user needs within the state and defining the ongoing focus of the NYView consortium. The survey also sought to identify opportunities to establish partnerships to support state needs.

The survey was prepared by a NYView-funded graduate student working at the State University of New York (SUNY) College of Environmental Science and Forestry. The student developed a Qualtrics survey and reached out to existing consortium members and other remote sensing users throughout the state. The majority of the 44 survey respondents came from academia (66%), with a smaller portion coming from private sector (16%), government (14%) or non-profit organizations (5%).

The survey showed that 61% of respondents used remotely sensed data in education and 59% of respondents performed applied research using remote sensing data sources. The figure below shows the top five application areas reported.



Top five remote sensing-focused application areas for researchers in New York State.



Natural color Landsat 5 Thematic Mapper (TM) image acquired on October 10, 1992 (top) and Landsat 8 Operational Land Imager (OLI) image acquired on September 18, 2015 (bottom). The TM image shows algal blooms in Oneida Lake, in Central New York State.

Land cover and land use inventory or change analysis, urban growth planning, vegetation dynamics, and emergency response drew significant attention. However, respondents also reported interest in a broad range of applications including ecology, geology, geography, phenology, education, forestry, and agriculture. Survey respondents also identified key remotely sensed data sources: NYS orthoimagery (84%), Landsat (75%), USGS/USDA high spatial resolution imagery (66%), commercial high spatial resolution imagery (34%), and MODIS (30%). Of the respondents, 89% downloaded data from the NYS GIS Clearinghouse (gis.ny.gov), 66% downloaded data from Earth Explorer (earthexplorer.usgs.gov), and 43% used the Global Visualization Viewer (glovis.usgs.gov).

New YorkView 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.



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## BENEFITS TO NEW YORK STATE

Completion of the survey was important to identify researchers, educators, and scientists working with remote sensing data within NYS and define critical state needs that remote sensing tools and data can support. The survey also sought to identify challenges that might limit the application of remote sensing imagery.

Survey respondents identified issues related to three primary areas: data, website access, and analysis. In addition to challenges with management of data volume, people expressed concern about the availability of data and suitable supporting metadata. They wanted to find clear and complete metadata with descriptions to support and guide suitable data applications. Several respondents expressed frustration with the constantly changing web interfaces of many data distributors. They sought a website with a stable interface that best supported frequent data updates. Most researchers preferred preprocessed imagery, particularly in terms of rectification and atmospheric correction, to balance challenges associated with the time needed to perform both data preprocessing and analysis. Survey respondents also mentioned challenges associated with data distribution and inconsistent availability of key datasets such as lidar.

Study sites varied in scale from local to global; however, the majority of survey respondents were working within New York State. Researchers are using imagery to solve issues faced within the state and develop new methods to improve efficiency.



*Natural color Landsat 5 TM image acquired on April 4, 2010 (left) and Landsat 8 OLI image acquired on April 2, 2015 (right) showing several of the Finger Lakes and southeastern Lake Ontario. With the colder spring in 2015, much of the region—over land and water—is still ice-covered and there is little sign of plant growth.*

## NEW YORKVIEW CONSORTIUM MEMBERSHIP

Current NYView consortium members include: the State University of New York (SUNY) College of Environmental Science and Forestry (ESF), the Institute for Resource Information Sciences (IRIS) at Cornell University, SUNY Fredonia, and SUNY Plattsburgh.

NYView aims to continue to add consortium members to support collaboration and enhance remote sensing activities across the state. Interested researchers and users of remote sensing data should visit the NYView webpage ([www.esf.edu/nyview](http://www.esf.edu/nyview)) or contact the NYView Principal Investigator for more information.



Cornell University



New YorkView Principal Investigator:

Lindi Quackenbush

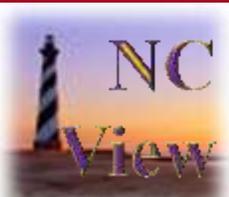
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# NORTH CAROLINA VIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NORTH CAROLINA

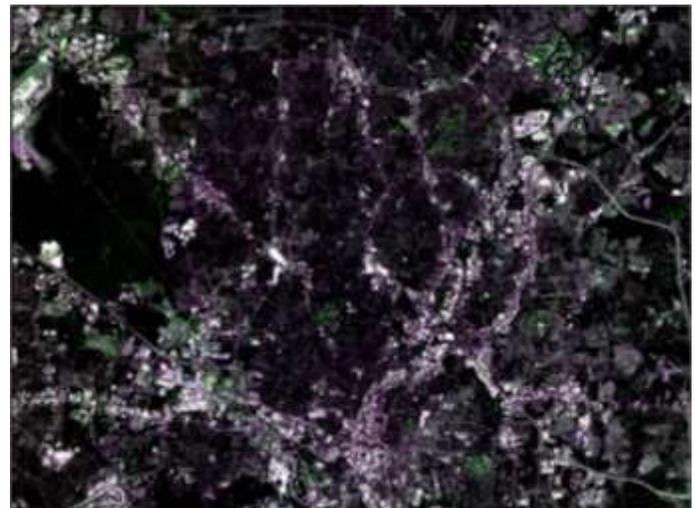
### Overview of the North Carolina View (NCView) Consortium

NCView 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.

Since the inception in 2009, the NCView consortium has been a network of North Carolina remote sensing users made up of universities, community colleges, and local governments. The primary goal of the NCView consortium is to foster and promote the uses of remotely sensed technologies and datasets in educational institutes, state, county, and local governmental agencies, and the private sectors.

### NCView Objectives

- To enhance remote sensing educational opportunities in North Carolina,
- To develop and enhance collaborative relationships of academic, federal, state, county, city, and public and private sector users,
- To locate, access, and retrieve existing and future remotely sensed data and applications statewide, and
- To further the use of remote sensing in North Carolina and to address critical issues the State faces.



An urban view of Landsat-8 image near Raleigh, North Carolina. The RDU (Raleigh-Durham-Union) airport is near the northwestern corner. The original cloud-covered image is on the left. The image after cloud removal is on the right.

## CONSORTIUM MEMBERSHIP

- East Carolina University (Lead Institution)
- Appalachian State University
- University of North Carolina at Chapel Hill
- University of North Carolina at Pembroke
- University of North Carolina at Wilmington
- Central Piedmont Community College
- Davidson County Community College
- Information Technology Services of the City of Wilson, NC
- Pitt County Management Information Systems, Pitt County, NC

NCView Principal Investigator:

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# NORTH CAROLINA VIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## ASSESSING SUBMERGED AQUATIC VEGETATION (SAV) UNDER COASTAL WATERS OF NORTH CAROLINA USING LANDSAT-8 DATA



*A ground photo showing densely and well developed submerged aquatic vegetation in coastal water.*

This activity continues NCView's submerged aquatic vegetation (SAV) assessment. In previous funding periods, spectrum and spatial characteristics of the SAV were studied using principal component analysis (PCA) and an iterative self-organized data analysis unsupervised classification method, coupled with Landsat-8 satellite images in Core Sound, North Carolina. In the delineation of spatial distribution of the SAV, the PCA helped separate the SAV from background noise (caused by land/beach, and water turbidity and ocean waves). The accuracy level was satisfactory when Landsat-8 image acquired in August 2013 was used. In this funding period, high-resolution SONAR (sound detection and ranging) data are added to valid the finding using operational Landsat-8 datasets. Next, the spatial-temporal patterns of the SAV will be assessed using multi-temporal Landsat-8 data.

## ALGORITHM DEVELOPMENT FOR THIN-CLOUD REMOVAL IN SATELLITE IMAGES ACQUIRED BY LANDSAT-8

Cloud removal techniques improve use of remotely-sensed optical satellite imagery in the study of the surficial processes of the Earth. In the previous funding period, the cloud removal in Bands 1–5 of Landsat-8 were accomplished using Band 9 (1360–1390nm, the cirrus cloud band) and the quality assessment (QA) band of Landsat-8. In this funding period, the cloud removal in Bands 1–7 of Landsat-8 was studied using the independent component analysis and Band 9. The QA-band, derived partially from the thermal infrared sensor (TIR) bands of Landsat-8 was not used. Two improvements to the techniques are made during this grant period. There is no need for the QA band in the removal algorithm. In addition, the thin clouds in Bands 6 and 7 are removed.



*A Landsat-8 image acquired on 1 April 2014 is shown as a color composite (Band-4 as red, Band-3 as green, and Band-2 as blue). Thin clouds are noticeable. The area is near Hobucken, eastern NC.*



*The Landsat-8 image is viewed after the cloud removal. Thin clouds disappear. Cloud-covered features are revealed.*

NCView 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



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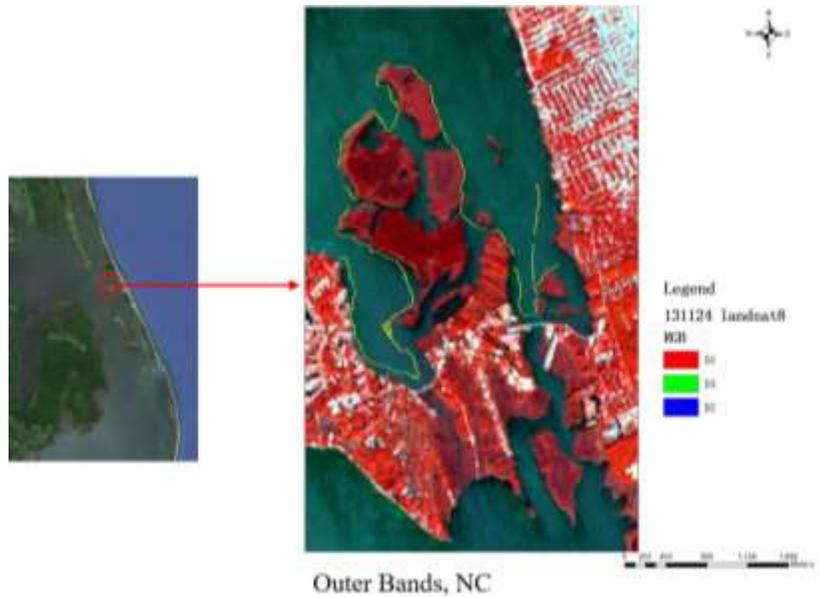
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## BENEFITS TO NORTH CAROLINA

The value of SAV habitat to the coastal environment is recognized statewide. SAV beds play a vital role in the underwater ecosystem. They serve as near shore nurseries for juvenile marine life as they provide protection from predators during early life development. Additionally, they are essential in providing oxygen for the water column, lowering water turbidity by knocking down or filtering out suspended particles, trapping, cycling, and consuming excess nutrients, as well as providing a source of food for SAV grazers. Thus, the State of North Carolina has regulations through the Coastal Area Management Act (CAMA) to control human induced impacts on SAV beds (15A NCAC 07H .0209 (d)(4)). The State is interested in identifying the location and extent of SAV beds within the State's estuaries. Therefore, the HIA (high impact activity) of the coastal SAV mapping allows the state, coastal managers, and researchers as well as concerned citizens to assess spatial and temporal distributions of the SAV rapidly using the repetitive coverage of satellite images that are freely available and are of a large-scale spatial extent.



Left: A Landsat-8 image of northeastern North Carolina (with Band-4 as red, Band-3 as green, and Band-2 as blue)

Right: A LandSat-8 image of Kitty Hawk, Outer Banks, NC (with Band-5 as red, Band-3 as green, and Band-2 as blue) Curved yellow lines are ground tracks along which the SONAR (sound detection and ranging) data are collected in October of 2014.



A sub-image of Landsat-8 image with clouds



The sub-image after the cloud removal



The same cloud-free area imaged 16 days later

**Benefit:** An additional cloud-free image can be used.

## NORTH CAROLINAVIEW CONSORTIUM MEMBERSHIP

- East Carolina University (Lead Institution)
- Appalachian State University
- University of North Carolina at Chapel Hill
- University of North Carolina at Pembroke
- University of North Carolina at Wilmington
- Central Piedmont Community College
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- Information Technology Services of the City of Wilson, NC
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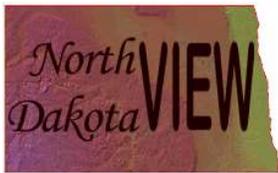
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# NORTH DAKOTA VIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN NORTH DAKOTA

North DakotaView (NDView) 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.

Led by the Department of Geography & Geographic Information Sciences at the University of North Dakota and established in 2004, NDView is dedicated to promoting remote sensing and geospatial technologies within North Dakota. NDView engages in the development of education and training curricula within colleges and universities throughout the state and enhancement of technology transfer, applied research efforts, and workforce training. NDView's partners include several of the state's academic institutions.

The mission of NDView is to support the successful acquisition, distribution, and use of remotely sensed data at minimal to no cost for training, education, and applied research within North Dakota's higher education institutions, and to bring these data and technologies into the hands of the public. The consortium awards scholarships for professional development in remote sensing and geographic information systems. NDView also conducts applied remote sensing research projects that improve monitoring and understanding of landscape changes in the state related to Bakken Oil Boom impacts, Devils Lake flooding, and agricultural and conservation land-cover change.



*Oil wells with 2014 or 2015 start-up dates in the area of the Fort Berthold Indian Reservation. From an NDView web GIS at <http://undgeography.und.edu/flex/fortberthold/>*

## CONSORTIUM MEMBERSHIP

NDView's partners work together to improve remote sensing and geospatial technology education at all levels within the State of North Dakota. NDView seeks to effectively educate students for the geospatial workforce of the future. The consortium also works on outreach and applied research projects that benefit the citizenry of the state.



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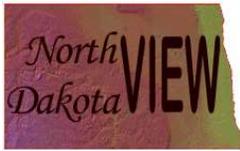
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# NORTH DAKOTA VIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## BAKKEN OIL SHALE PLAY WEB-ENABLED GIS

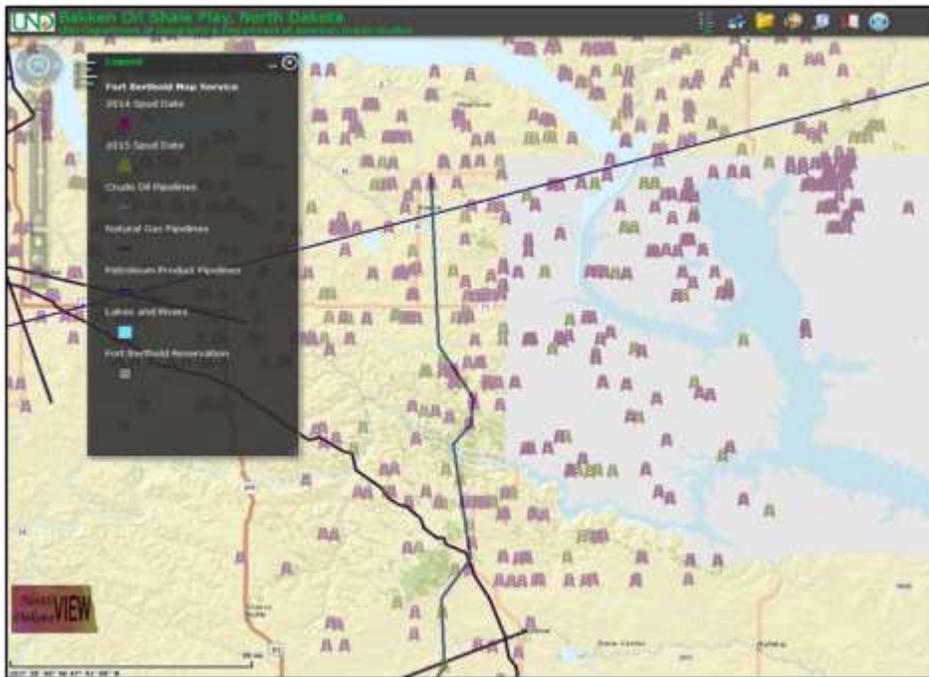
The objective of this North DakotaView (NDView) project was to deliver geospatial resources to people living in the vicinity of the Fort Berthold Indian Reservation, a region of the State of North Dakota that is highly impacted by the Bakken Oil Boom. The goal is to provide geospatial data through the creation of a database built upon Landsat satellite imagery along with other raster and vector spatial layers that represent physical, administrative, socio-demographic, economic, industrial and other aspects of life in the area. The idea was to provide residents of the region with easy access to the data through a simple web-browser; this is especially important given the ongoing activities of the Bakken Oil Shale Play, which is changing the landscape of the region rapidly.

The web GIS is accessed at <http://undgeography.und.edu/flex/fortberthold/>. NDView continues to develop and update the site as the situation on the ground evolves and as data become available. The goal is to maintain the site with up-to-date data on oil development activities and other landscape changes.

NDView considers this effort to be a springboard to the development of a community mapping center on the UND campus that will include participation from partner academic institutions and organizations. The community mapping center will work to provide geospatial data and cartographic products and services that address the wide-ranging needs of communities and non-governmental organizations in North Dakota.



An example of land-cover change associated with the Bakken Oil Boom. The top image was acquired in 2003 and the bottom in 2014, showing the development of several oil well pads. Source: USDA NAIP



Web GIS layout showing oil wells drilled in 2014 and 2015, as well as pipelines, in the vicinity of the Fort Berthold Indian Reservation (shaded area) in west-central North Dakota.

The Bakken Oil Boom web GIS is just one of the outreach projects in which NDView is involved. Others include making presentations about remote sensing in general, and NDView and the USGS Landsat program in particular, to undergraduate and graduate students, K-12 teachers, and special interest groups.

North DakotaView 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.



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## BENEFITS TO NORTH DAKOTA

NDView works to raise awareness about how remote sensing can contribute to solutions to the complex environmental challenges facing the citizens of North Dakota.

For example, NDView has developed tools to put Landsat and other data related to pervasive flooding in the Devils Lake Basin into the hands of the public through the development of web-enabled GIS. In addition, the group is engaged in monitoring interactions between prairie vegetation and weather, gathering important baseline data for environmental change research.

The NDView consortium reaches its goals by providing formal and informal education and training opportunities, developing new tools for data dissemination, conducting and supporting applied research, and promoting the professional development of students with interests in geospatial technologies, including the award of four \$500 scholarships to undergraduate or graduate students from partner institutions every year.



Recent winners of NDView scholarships. From left, Andrew Barnas, UND Biology MS student, working with UAS data; Rebecca Kludt, UND Biology MS Student, studying land-cover change impacts on sharp-tailed grouse; Jacqueline Amor, UND Geography MS student, studying how elk use agricultural landscapes; and Eric Torgerson, UND Geography MS Student, looking at Bakken Oil Boom impacts on rural landscapes

## NORTH DAKOTAVIEW CONSORTIUM MEMBERSHIP

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[http://arts-sciences.und.edu/geography/nd-view/phenocam\\_project.cfm](http://arts-sciences.und.edu/geography/nd-view/phenocam_project.cfm)



# OHIOVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN OHIO

OhioView 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. OhioView was formed in 1995 to improve distribution and access to data acquired from U.S. Government civilian satellites. Begun as a partnership between the Miami University Libraries and the Department of Geology, the consortium quickly grew to include Bowling Green State University, Ohio University, University of Cincinnati, Kent State University, and The Ohio State University. Organized around a Memorandum of Agreement between member universities, the consortium's mission is to promote the low-cost distribution of U.S. government civilian satellite data for public use to achieve the following goals:

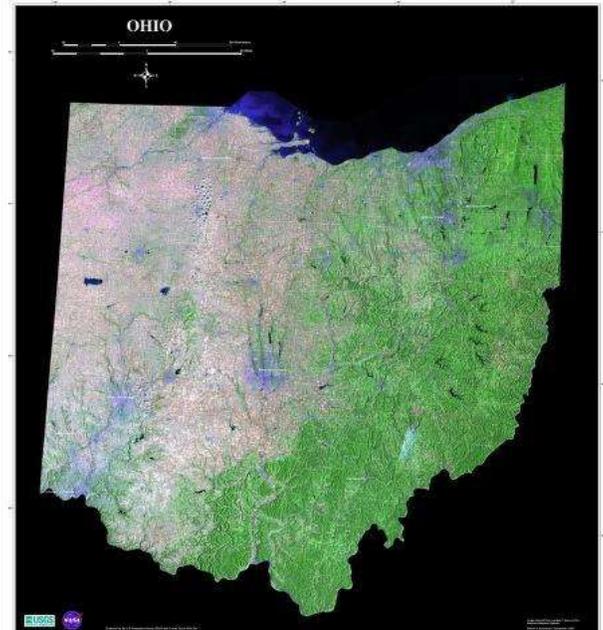
- Create a prototype of a national public access system for geospatial data from the U.S. Government
- Promote the use of satellite and geospatial data in education
- Facilitate the use of satellite data to monitor a wide variety of environmental issues, such as flood risk, crop health, urban sprawl, and loss of wetlands
- Facilitate cooperation between education and state and local governments in remote sensing and digital mapping through cost sharing.



## CONSORTIUM MEMBERSHIP

The OhioView consortium is comprised of 14 university partners that cover the far corners of the state. As of GY- 2014 membership in the consortium included:

Bowling Green State University	Dr. Anita Simic
The University of Toledo	Dr. Kevin Czajkowski
Miami University	Dr. Mary Henry
University of Cincinnati	Dr. Hongxing Liu
University of Dayton	Dr. Umesh Haritashya
Wright State University	Dr. Doyle Watts,
Central State University	Dr. Xiaofang Wei
Ohio State University	Dr. Desheng Liu
Ohio University	Dr. James Lein
Kent State University	Dr. Mandy Munro-Stasiuk
Cleveland State University	Dr. W.B. Clapham
University of Akron	Dr. Linda Barrett
Youngstown State University	Dr. Bradley Shellito
Lakeland Community College	Mark Guizlo



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## OhioView Education and Outreach

### Geospatial Technologies Conference 2015



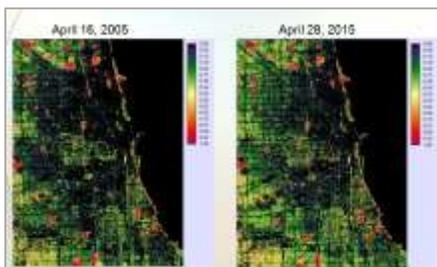
Screen captures from the Geospatial Technologies Conference where participants were avatars, communicating in a virtual environment



OhioView was instrumental in the planning and presentation of the Geospatial Technologies (VTecCon) held on April 29, 2015. Members of OhioView, together with representatives from Air Force Discovery Labs (AFDL) presented applications of geospatial technologies using the 'virtual world' environment of AFDL.

### Ohio GIS Conference 2015

OhioView was actively involved in the 2014 Ohio GIS Conference, a collaboration of the Ohio Geographically Referenced Information Program, the County Engineers Association and the Ohio chapter of URISA (Urban and Regional Information Systems Association).



## OhioView Applied Research

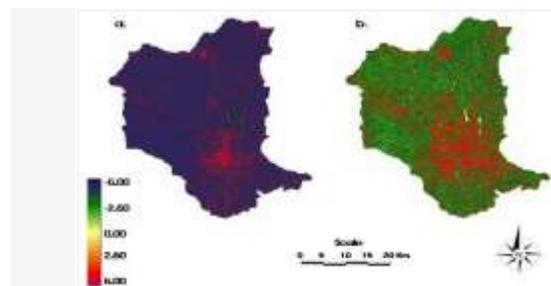
### Lake Water Quality Analysis

OhioView remained active in projects targeting and assessing impacts of shoreline modifications on nearshore fish communities and ecosystem function in the Western Basin of Lake Erie. On-going work seeks to classify vegetation using: a) remotely sensed images b) on-ground hyperspectral spectro-radiometer data c) existing (2014) and new oblique shoreline photographs, and d) aerial photographs



### Urban Sustainability Assessment

Moving the concept of sustainable development from the theoretical to the practical requires systematic temporal data collection that supports an accessible methodology. Recent work undertaken by OhioView focused on the assessment of development based on the analysis of data acquired from the **Landsat** series of Earth observation satellites. The images below show patterns of human landscape modification and the degree to which ecological services may be compromised.



Component score for development intensity: (a) 1989, (b) 2011

## BENEFITS TO OHIO

- Enhanced the assurance of public health and sustainable development programs through geospatial monitoring
- Introduced cutting-edge, virtual world platform approach to educational needs at all levels – through partnership with the Air Force Discovery Lab
- Supplied access to geospatial data - Landsat plus other imagery
- Increased K-12 teacher knowledge - in geospatial technologies and STEM
- Increased K-12 student engagement – hundreds of students given the opportunity to use geospatial technologies and present their projects
- Increased university-level remote-sensing education and student research– products of OhioView’s software pool
- Continued workforce development through workshops held at Ohio GIS conference



## VIEW CONSORTIUM MEMBERSHIP

The OhioView consortium is comprised of 14 university partners who reach to the far corners of the state. As of GY-2014 membership in the consortium included:

- |                                  |                         |
|----------------------------------|-------------------------|
| • Bowling Green State University | Dr. Anita Simic         |
| • The University of Toledo       | Dr. Kevin Czajkowski    |
| • Miami University               | Dr. Mary Henry          |
| • University of Cincinnati       | Dr. Hongxing Liu        |
| • University of Dayton           | Dr. Umesh Haritashya    |
| • Wright State University        | Dr. Doyle Watts,        |
| • Central State University       | Dr. Xiaofang Wei        |
| • Ohio State University          | Dr. Desheng Liu         |
| • Ohio University                | Dr. James Lein          |
| • Kent State University          | Dr. Mandy Munro-Stasiuk |
| • Cleveland State University     | Dr. W.B. Clapham        |
| • University of Akron            | Dr. Linda Barrett       |
| • Youngstown State University    | Dr. Bradley Shellito    |
| • Lakeland Community College     | Mark Guizlo             |



OhioView State Coordinator:

James Lein, Ph.D.

Ohio University

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<http://www.ohioview.org>



# OKLAHOMAVIEW CONSORTIUM OVERVIEW 7/1/2014 - 6/30/2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN OKLAHOMA

OklahomaView 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.

OklahomaView is a statewide consortium established in 2014 to promote the utilization of remotely sensed data and to raise awareness among Oklahomans about applications of remote sensing technology to improve their quality of life.

Oklahoma has a diverse remote sensing user community including academic, federal, state, and private sectors. OklahomaView assists the remote sensing user community in our state address current and future environmental challenges by developing and coordinating research, education, and outreach activities.



2014 Geospatial Information Science Day Expo



2014 Oklahoma Workshop on Remote Sensing Technology and Applications

## CONSORTIUM MEMBERSHIP

OklahomaView has implemented a Co-Director management structure in a cooperative effort between Dr. Xiangming Xiao of the University of Oklahoma and Dr. Saleh Taghvaeian [saleh.taghvaeian@okstate.edu](mailto:saleh.taghvaeian@okstate.edu) of Oklahoma State University. Ms. Melissa Scott of the University of Oklahoma [mescott@ou.edu](mailto:mescott@ou.edu) serves as state coordinator.



### OklahomaView Consortium Members

- USGS South-Central Climate Science Center
- USDA-ARS Grazinglands Research Laboratory
- Oklahoma Biological Survey
- Oklahoma Climatological Survey
- The Samuel Robert Noble Foundation
- OU Center for Spatial Analysis
- University of Tulsa

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

### OklahomaView Principal Investigator:

Dr. Xiangming Xiao

University of Oklahoma

(405) 325-8941

[xiangming.xiao@ou.edu](mailto:xiangming.xiao@ou.edu); <http://www.eomf.ou.edu>



### AmericaView Website:

[www.AmericaView.org](http://www.AmericaView.org)

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[roberta.lenczowski@sbcglobal.net](mailto:roberta.lenczowski@sbcglobal.net)

Debbie Deagen, Program Manager:

[debbie.deagen@montana.edu](mailto:debbie.deagen@montana.edu)

Russell Congalton, Board Chair:

[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)



# OKLAHOMAVIEW REMOTE SENSING ACTIVITIES 7/1/2014 – 6/30/2015



## Oklahoma Workshop on Remote Sensing Technology and Applications (Nov. 12, 2014)

Remote sensing technology of various platforms (in-situ, airborne and satellite) has made substantial progress over the past few decades and has been playing an increasingly important role in the observation and monitoring of the Earth. This one-day workshop provided a forum for researchers and users in Oklahoma to communicate their research and application activities, discuss collaboration, and develop networks between institutions.



*Participants in the 2014 Oklahoma Workshop*

This workshop at the University of Oklahoma brought faculty, researchers, and students together with representatives of federal, state, and tribal government agencies. Work on remote sensing data products and their uses was presented and there was open dialogue between researchers and others in the remote sensing community to enhance and further remote sensing efforts and cooperation in Oklahoma. Participants included 44 faculty, researchers, students, and government representatives. Please visit the website <http://www.eomf.ou.edu/workshops/> for more information.

## GEOSPATIAL INFORMATION SCIENCE DAY EXPO (GIS DAY: NOV. 13, 2014)



*2014 Geospatial Information Science Day*



*OklahomaView presenting at GIS Day*

Geospatial information science and technologies (remote sensing, GPS and GIS) have been evolving rapidly in recent years and play an increasing role in our society and daily life. The GIS Day Expo at the University of Oklahoma celebrated and showcased a broad spectrum of research, education, and outreach activities related to geospatial science, technology, and applications to attract and retain both undergraduate and graduate students in science, technology, engineering and mathematics, and prepare them for future employment in the geospatial sector. GIS Day provided the opportunity for researchers and students to link with and exchange ideas with the larger GIS community in Oklahoma including government agencies and private industry. A special program was presented for high school field trip visitors on career and education opportunities in geospatial information science. The event was attended by more than 200 faculty, researchers, students, exhibitors and visitors. A total of 24 exhibitors hosted booths highlighting their work and 22 student contestants presented research posters. Please visit the website <http://www.eomf.ou.edu/gisday/> for more information.

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Debbie Deagen, Program Manager:

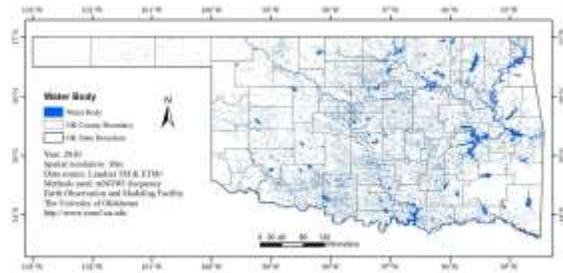
[debbie.deagen@montana.edu](mailto:debbie.deagen@montana.edu)

Russell Congalton, Board Chair:

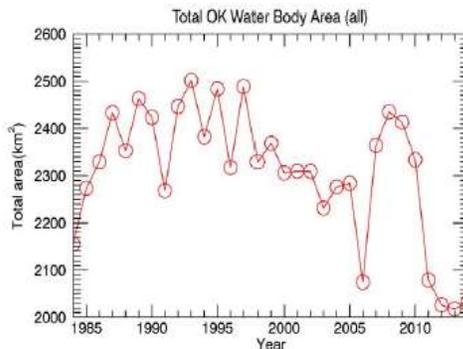
[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)

## RESEARCH ACTIVITIES – MAPPING OPEN SURFACE WATER BODIES 1984-2014

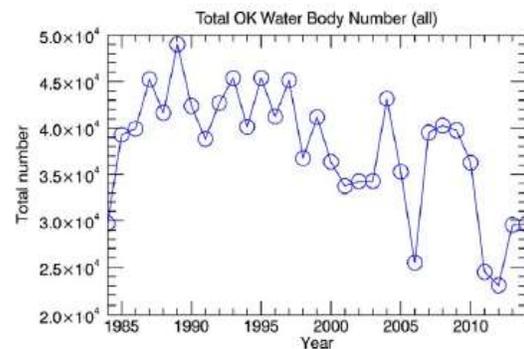
OklahomaView researchers mapped open surface water bodies across the state of Oklahoma from 1984-2014. These time series maps were derived from more than 17,000 Landsat images (30-m spatial resolution) and are used to understand the dynamics of surface water bodies in relation to climate. This dataset is useful in supporting water resource management, crop and livestock production, and conservation efforts in Oklahoma.



Map of open surface water bodies (at 900 m<sup>2</sup> and larger) in Oklahoma, 2010



Change in surface area of water bodies in Oklahoma, 1984-2014



Change in number of surface water bodies in Oklahoma, 1984-2014

## OKLAHOMAVIEW CONSORTIUM MEMBERSHIP

OklahomaView has implemented a Co-Director management structure in a cooperative effort between Dr. Xiangming Xiao of the University of Oklahoma and Dr. Saleh Taghvaeian [saleh.taghvaeian@okstate.edu](mailto:saleh.taghvaeian@okstate.edu) of Oklahoma State University. Ms. Melissa Scott [msscott@ou.edu](mailto:msscott@ou.edu) at the University of Oklahoma serves as state coordinator.



### OklahomaView Consortium Members

- USGS South-Central Climate Science Center
- USDA-ARS Grazinglands Research Laboratory
- Oklahoma Biological Survey
- Oklahoma Climatological Survey
- The Samuel Robert Noble Foundation
- OU Center for Spatial Analysis
- University of Tulsa

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

OklahomaView Principal Investigator:

Dr. Xiangming Xiao

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<http://okview.org/>

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# OREGONVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN OREGON

OregonView contributes to resource management, decision making and STEM education in Oregon through:

- Enhanced access to USGS satellite imagery and other forms of remotely sensed data
- Education initiatives
- Applications research
- Technology Transfer

OregonView 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. The mission of OregonView is to enhance the beneficial use of remotely sensed data and derived geospatial products in Oregon through:

- Partnerships extending across the government, commercial and academic sectors
- Applications research
- Education and outreach



Landsat mosaic of Oregon, adapted from USGS EROS Center Landsat State Mosaics:

<http://eros.usgs.gov/imagegallery/landsat-state-mosaics>.

## 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 (FIT), Oregon Geospatial Enterprise Office (GEO), GeoTerra, Portland State University (PSU), and Oregon State University (OSU) 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.

OregonView Principal Investigator:  
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Christopher.Parrish@oregonstate.edu



<http://research.engr.oregonstate.edu/parrish/oregonview>

AmericaView Website:  
[www.AmericaView.org](http://www.AmericaView.org)  
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# OREGONVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## OREGONVIEW CONSORTIUM DEVELOPMENT & SCOPING

As a new StateView within the AmericaView consortium, OregonView was awarded an affiliate development grant in July 2015. Since then, OregonView has worked to build its membership and establish goals and strategies for 2016 and beyond. In October 2015, new OregonView Director, Chris Parrish, participated in the AmericaView Fall Technical Meeting at USGS EROS Center and delivered a presentation on unmanned aircraft system (UAS) research at Oregon State University (OSU). On December 10, 2015, all current OregonView members participated in a scoping meeting held at the LaSells Stewart Center on the OSU campus. The majority of the meeting was devoted to a brainstorming session covering the following topics: 1) high-impact activities for 2016 and subsequent years, 2) collaboration between member organizations, 3) STEM education opportunities and needs (e.g., lesson plan development and teacher workshops) within Oregon, and 4) data dissemination needs. Leveraging the professional contacts of current OregonView members, potential new board members have been identified within the Oregon Coastal Management Program, Oregon Explorer, and Confederated Tribes of Warm Springs.

Since OregonView is a new consortium, a primary focus in 2016 will be introducing OregonView to geospatial leaders in the state through presentations at regional conferences and workshops. OregonView consortium members are already serving on the conference committees and/or planning for participation at the 2016 GIS In Action Conference (hosted by ASPRS and URISA) and the Northwest GIS User Group Conference.

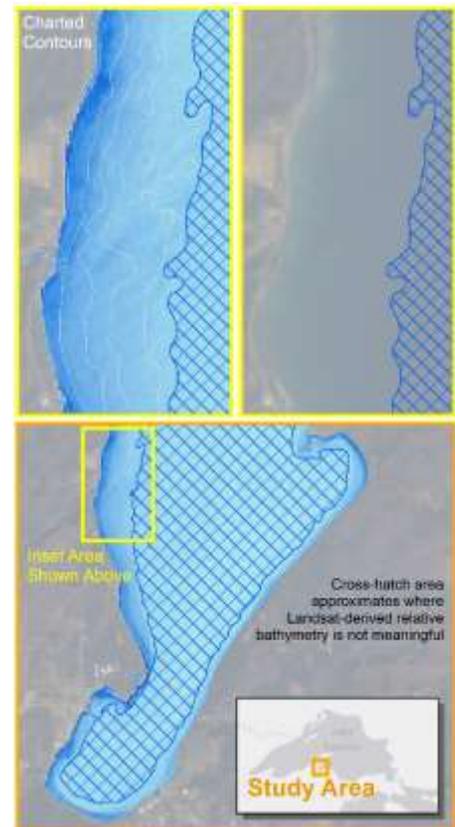
In the current year (2015–2016), OregonView’s high impact activity will entail retrieving bathymetry from Landsat 8 data to assist in coastal characterization. This work will supplement and extend a current OSU project on coastal mapping using NASA Multiple Altimeter Beam Experimental Lidar (MABEL) data. The procedures used for bathymetry retrieval will be evaluated and adapted for use in education and outreach activities.



*OregonView participation at the AmericaView Fall Technical Meeting at the USGS EROS Center in Sioux Falls, SD.*



*Brainstorming session during OregonView Scoping Meeting, held on Dec 10, 2015 at the LaSells Stewart Center at Oregon State University.*



*OregonView’s 2016 high impact activity (HIA) will entail retrieving bathymetry from Landsat 8 imagery to assist in coastal characterization.*

OregonView 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.



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## BENEFITS TO OREGON

The mission of OregonView is to enhance the beneficial use of remotely sensed data and derived geospatial products in Oregon through:

- Partnerships extending across the government, commercial and academic sectors
- Applications research
- Education and outreach

A number of OregonView's current and planned activities focus on education and outreach, including teacher workshops and lesson plan development. Research activities coordinated by OregonView will be used to develop new procedures and tools for working with remotely-sensed data, which will be disseminated through the OregonView and AmericaView websites.



Landsat mosaic of Oregon (adapted from USGS EROS Center Landsat State Mosaics).

## 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 (FIT), Oregon Geospatial Enterprise Office (GEO), GeoTerra, Portland State University (PSU), and Oregon State University (OSU) 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.

OregonView Principal Investigator:  
Christopher Parrish, Associate Professor  
Oregon State University  
(541) 737-5688  
Christopher.Parrish@oregonstate.edu



<http://research.engr.oregonstate.edu/parrish/oregonview>



# PENNSYLVANIAVIEW CONSORTIUM OVERVIEW 2014 - 2015

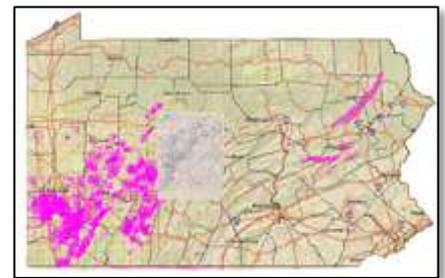


## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN PENNSYLVANIA

PAView (<http://www.paview.psu.edu>) is a collaborative effort of a consortium of members throughout the Commonwealth of Pennsylvania. PAView was established in September of 2005 and is a full member of the [AmericaView](#) program. PAView, as part of the AmericaView program, focuses on public domain remotely sensed data and technologies in support of applied research, K-16 education, workforce development, and technology transfer. PAView was developed to further one of the primary goals of the AmericaView program—educating the public about remotely sensed imagery and to provide an additional portal to data and information in a public forum.

The **goals** of PAView are:

- To build partnerships within the Commonwealth to support interests in public domain remotely sensed data
- To create resources for K-12 teachers to utilize in their classrooms to educate students about imagery
- To promote the sharing of data through connections with existing resources and acquisition of new data
- To work with undergraduate educators and institutions through the Commonwealth to enhance access to satellite data and encourage its use in their courses



*PA Mine Map Atlas  
Location of Mines Digitized*

## CONSORTIUM MEMBERSHIP

Our consortium members work on a wide variety of efforts related to remotely sensed data at their universities.



California University of Pennsylvania: Thomas Mueller, Ph.D., GISP (Co-PI)

Pennsylvania State University: Maurie Kelly, Ph.D. (Co-PI)

Clarion University of Pennsylvania

Bucknell University

Villanova University

PennsylvaniaView Co-Principal Investigator:

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[Mueller@calu.edu](mailto:Mueller@calu.edu)



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## PENNSYLVANIAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



### PENNSYLVANIAVIEW TAKES THE LEAD ON EARTH OBSERVATION DAY: SOCIAL MEDIA

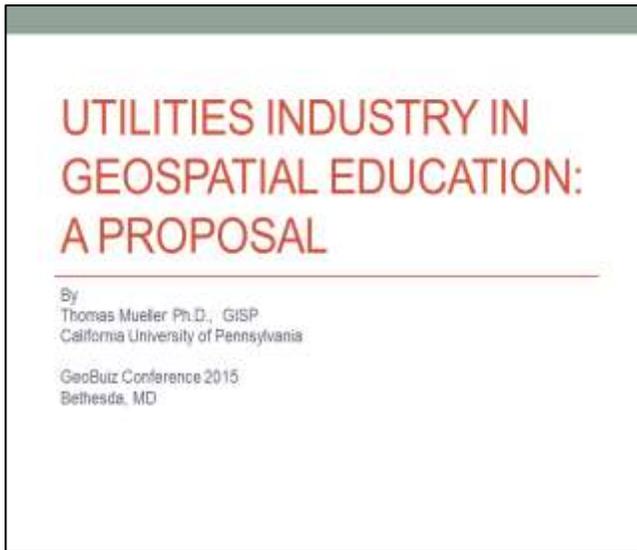
Earth Observation Day (EOD) is an AmericaView educational event to celebrate the power of remote sensing. PennsylvaniaView (PAView) has assumed leadership for this national activity over the past few years. Several StateViews participate with a variety of programs.

To generate even more public interest in Earth Observation Day, PAView created and monitors two social media outlets: a Twitter presence and a Facebook account.

EOD's Twitter account has 80 followers and has been tweeted or retweeted over 500 times. The account tweets information on Earth Observation Day, but also on a variety of remote sensing issues and educational opportunities. The EOD Facebook account is also active and has provided 44 posts and received over 100 "likes" since its beginning in February 2014. See screen capture of Facebook picture on following page.



### PENNSYLVANIAVIEW PREPARES EDUCATIONAL MATERIALS



GeoBuiz Conference Presentation

PAView provides multiple opportunities, training educators, in turn preparing a trained workforce. As one significant example, the PAView PI delivered a presentation on education at the 2015 GeoBuiz Conference in Bethesda, MD on August 10 and 11. About fifteen attended a very topical session.

The talk focused on a proposal to use imagery in coursework to prepare students for the natural gas industry. The drilling for natural gas in the Marcellus Shale region realized an increase in GIS jobs for Southwestern Pennsylvania. However, that job growth did not initially lead to a development in Oil and Gas RS/GIS educational resources. This challenging situation proved problematic since the lack of training resources hindered the development of future employees and did not afford them much formal classroom or intern opportunity to work with oil- and gas-related spatial data or understand the industry specific questions. Over the past 4 years, the lead presenter has worked to increase the educational resources in the exploration / drilling sector.

Discussion about the likelihood of new natural gas pipelines in Pennsylvania has recently emerged. So, now the need for preparing and offering educational resources on pipelines must be anticipated. The PI's presentation focused on pipeline educational resources. The presenter discussed the types of spatial questions that arise when siting pipeline routes. Then through examples of possible pipeline routes, the presenters demonstrated how the spatial data and imagery could be utilized to answer a wide variety of relevant questions. Frequently asked questions, solid answers and practical examples can be integrated into university assignments using the guidance from this presentation. Discussion about the supports and challenges to create the resources needed to build this educational program was also covered.

PennsylvaniaView 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 Website:

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[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)

## BENEFITS TO PENNSYLVANIAVIEW

The goals of PAView are:

- To build partnerships within the Commonwealth to support interests in public domain remotely sensed data
- To create resources for K-12 teachers to utilize in their classrooms to educate students about imagery
- To promote the sharing of data through connections with existing resources and acquisition of new data
- To work with undergraduate educators and institutions through the Commonwealth to enhance access to satellite data and encourage its use in their courses

The value of the PAView consortium to Pennsylvania rests with its ability to further one of the primary goals of the AmericaView program - educating the public about remotely sensed imagery and enhancing public access to data and information.



## PENNSYLVANIAVIEW CONSORTIUM MEMBERSHIP



Our consortium members work on a wide variety of efforts related to remotely sensed data at their universities.

### California University of Pennsylvania

Co – PI: Thomas Mueller, Ph.D., GISP

### Pennsylvania State University

Co – PI: Maurie Kelly, Ph.D.

### Clarion University of Pennsylvania

### Bucknell University

### Villanova University

PennsylvaniaView Co-Principal Investigator:

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<http://paview.psu.edu>



# RHODE ISLANDVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN RHODE ISLAND

Rhode IslandView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state.

Rhode IslandView (RIView) is one of the newest consortiums to join AmericaView, having been competitively awarded full AmericaView membership effective July 2015. RIView is focused on developing outreach and educational resources that feature Rhode Island's broad array of remote sensing applications and resources. Rhode Island's unique coastal ecosystems lend themselves particularly well for innovative and important applications of remote sensing data and technology.

RIView's partners represent a diverse combination of interests that range from traditional land-use and land-cover mapping, to building Landsat-based decision support systems, producing new lidar-derived data products, monitoring sea surface temperature, modeling sea level rise scenarios, and designing sensors for undersea and interplanetary exploration. With AmericaView's support, RIView is the only RI-based organization that is working to bring these shared interests together.



*Potential sea level rise scenarios for the Wickford area of North Kingstown, RI. Image features 2011 orthophotographs and lidar data coordinated by USGS.*

## CONSORTIUM MEMBERSHIP

### University of Rhode Island

Department of Natural Resources Science  
<http://web.uri.edu/nrs>

Graduate School of Oceanography  
<http://www.gso.uri.edu>

### Brown University

Department of Earth, Environmental, and  
Planetary Sciences  
<http://bit.ly/BrownEEP>

Lead Institution, NASA Rhode Island Space  
Grant Consortium  
<http://bit.ly/RISpaceGrant>

### State of Rhode Island

Division of Planning  
<http://www.planning.ri.gov>

Department of Environmental  
Management  
<http://www.dem.ri.gov>



**For more information about Rhode IslandView**, please contact the consortium's coordinator, Greg Bonyngue.  
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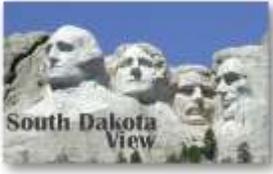
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# SOUTH DAKOTA VIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN SOUTH DAKOTA

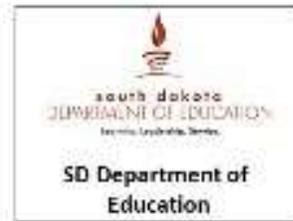
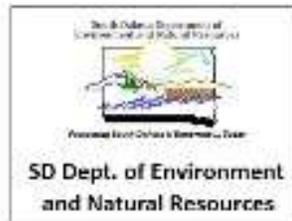
**South Dakota View (SDView) Overall Vision:** *Building partnerships and capability within South Dakota to facilitate the utilization of remote sensing data and geospatial technologies for the benefit of its citizens and the economic development of the state*

**SDView Long-Term Goals:**

1. **Develop the SDView consortium such that it meets the needs of South Dakota and participates synergistically within AmericaView, Inc.** SDView provides a mechanism for coordination and sharing of geospatial activities and data in South Dakota and provides connections via AmericaView to expertise outside of the state.
2. **Provide access to remote sensing data for South Dakota.** SDView provides a gateway to Landsat, MODIS, NAIP, and other imagery and to imagery download services such as GloVis and EarthExplorer.
3. **Expand the knowledge and utilization of remote sensing via courses, workshops and other educational opportunities for K-12 educators, university students and the existing workforce.** SDView provides workshops and course materials for K-12 educators, university students, agricultural producers, extension educators, and the general public. SDView also continues to promote the expansion of the number of courses at South Dakota universities, tribal colleges, and technical institutes that include remote sensing as all or part of the content.
4. **Support remote sensing research at research universities in South Dakota through access to data and, as funding becomes available, through grants and contracts.** SDView facilitates remote sensing research activities by providing access to remotely sensed data and by demonstrating practical applications of geospatial technologies.
5. **Build partnerships with state and local government entities that explore and test the utility of remote sensing data products for practical applications that will benefit the citizens of SD.** SDView will continue to serve as an effective mechanism for disseminating information about remote sensing data and applications to local, state and federal agency personnel in the state, as well as to private industry.

## CONSORTIUM MEMBERSHIP

The SDView mission of **expanding the utilization of remotely sensed imagery and technology for the benefit of its citizens, scientists, researchers, and educators** is accomplished via a consortium of partners from throughout the state. The entities below in addition to many universities, technical institutes, and tribal colleges in the state have worked with SDView in a variety of activities that further the vision, mission and goals of SDView.



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

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# SOUTH DAKOTA VIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## SOUTH DAKOTA LAKES – A LOOK FROM ABOVE

For the past three years, South Dakota View (SDView) has participated in the Big Sioux Water Festival, an event held annually on the campus of South Dakota State University for 4th-grade students, their teachers and chaperones. First held in 1993, this event is attended by an average of 1000 4th-graders each year.

For the 2015 event, SDView prepared an activity entitled "South Dakota Lakes - A Look from Above." This activity used ArcGIS Online to familiarize students with the location of selected lakes in eastern South Dakota using remotely sensed imagery as a background for the map. Additionally, students learned some "Fun Facts" about the lakes from the popups that appear by clicking on a lake.

Other layers available to display on the map were the state boundary, county boundaries, a latitude/longitude grid, interstate and other highways, railroads, cities and towns, major rivers, and additional lakes.

Handouts were made available for students to take home and for teachers to use in the classroom. They included an ArcGIS Online worksheet packet, a listing of geospatial websites, a Landsat mosaic of South Dakota, and a shaded relief map of South Dakota.

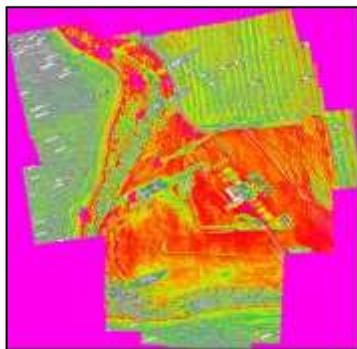


*Fourth-grade students using an ArcGIS Online web application and Landsat imagery to learn about South Dakota lakes at the 2015 Big Sioux Water Festival*

## STUDENT MINI-GRANTS

Mini-grants were awarded to two graduate students in support of their projects involving geospatial technologies and data.

An award for a project entitled "The Integration of UAS (Unmanned Aircraft Systems) Data into Geographic Education" enabled the recipient to purchase software and a lightweight digital camera for use in the development of five laboratory exercises for the Air Photo Interpretation course in the South Dakota State University Department of Geography.



*A Normalized Difference Vegetation Index (NDVI) orthomosaic created in a laboratory exercise developed by a mini-grant recipient*

The second recipient used the mini-grant funding to purchase three tiles of high-resolution imagery in support of a project entitled "Mapping and Estimation of Water Storage Capacity of Small Water Bodies in the Limpopo River Basin (Southern Africa)." The imagery was used to validate estimates of water bodies in representative areas of the study watershed obtained through the use of lower-resolution imagery and multispectral water indices. This validation provided the confidence needed to extend the water body estimates to the entire study area.

## BENEFITS TO SOUTH DAKOTA

As part of the AmericaView organization, SDView works synergistically with the other AmericaView states to **expand the utilization of remotely sensed imagery and technology for the benefit of its citizens, scientists, researchers, and educators.** Each AmericaView state has different needs and thus undertakes different projects to service those needs. **Educating the current workforce as well as the workforce of tomorrow (K-16 students) about the benefits of remote sensing and related geospatial technologies is a major area of emphasis for SDView.** This year's *South Dakota Lakes – A Look from Above* project and the Student Mini-Grant awards are two examples of those education efforts. In previous years the SDView education efforts have included workshops for K-12 teachers and 4-H educators and a statewide geospatial conference for current and potential remote sensing data users. All of these events create awareness of remote sensing products and their use for practical applications that are of benefit to the state's economy and the environment.

South Dakota View 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.



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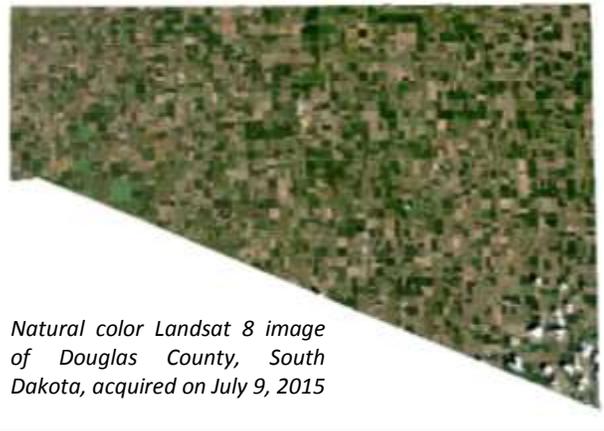
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## ADDITIONAL SOUTH DAKOTA VIEW ACTIVITIES

### Landsat Imagery of South Dakota Counties

Landsat satellite imagery acquired during the 2015 growing season was selected for each county in South Dakota based upon cloud cover and other quality factors. The multiband image files for each county are available upon request from SDView and will soon be available for downloading from the SDView website (<http://sdview.sdstate.edu>). The imagery is valuable for a variety of purposes including classroom instruction, precision agriculture, natural resource management and inventory, land cover mapping, and surface water evaluation. The images also have aesthetic appeal as wall hangings in government offices, professional buildings, and private homes. Additional information such as town names, highway identification, and lake names can be added by using geographic information system or other image processing software.



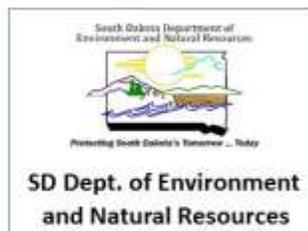
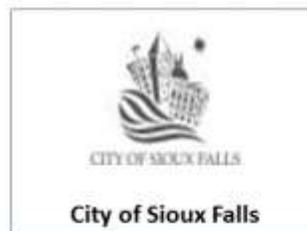
Natural color Landsat 8 image of Douglas County, South Dakota, acquired on July 9, 2015

### Extending the Reach of SDView to Developing Countries

Students, such as Fulbright Scholar Angelinah Rasoeu from the southern African country of Lesotho, often extend what they have learned in a South Dakota university classroom to the benefit of their home country. In Angelinah's case, the assistance she received from SDView enabled her to use geospatial data and methods to assess whether or not irrigation would be beneficial for Lesotho based on its topography, climate, soils, and cropping practices. Similarly, the Limpopo River Basin in southern Africa will benefit from Esther Mosase's study involving the mapping and water storage capacity of small water bodies in that basin. Esther is one of the SDView student mini-grant recipients.

## SOUTH DAKOTA VIEW CONSORTIUM MEMBERSHIP

The SDView mission of **expanding the utilization of remotely sensed imagery and technology for the benefit of its citizens, scientists, researchers, and educators** is accomplished via a consortium of partners from throughout the state. The entities listed below in addition to many universities, technical institutes, and tribal colleges in the state have worked with SDView during 2014-2015 in a variety of activities that further the mission and goals of SDView.



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

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# TEXASVIEW CONSORTIUM OVERVIEW 2014 - 2015



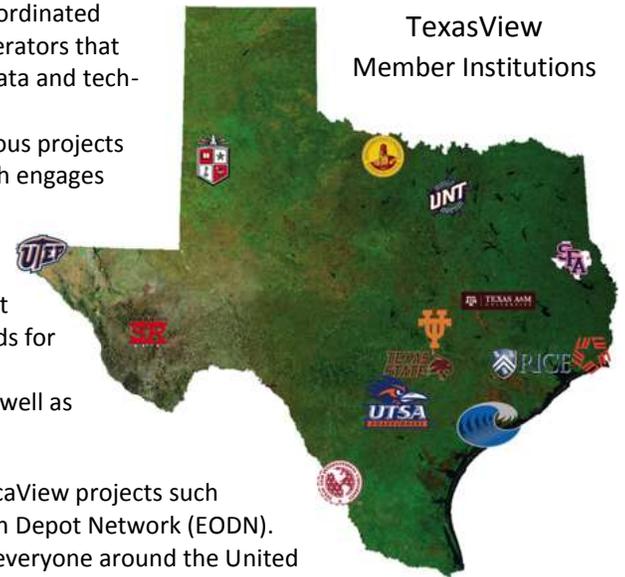
## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN TEXAS

TexasView 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.

TexasView provides educational outreach to K-16 students through various projects such as **Watching Over Texas From Space – How is Texas Changing**, which engages students and teachers in identifying landscape change using remote sensing imagery from across Texas, and **Which is Which**, asking students to match descriptions of landscape and anthropogenic features with satellite images. TexasView tailors its K-12 educational projects to support the Texas Essential Knowledge and Skills (TEKS) State Educational standards for science courses at multiple grade levels.

In addition, TexasView provides support for undergraduate research, as well as workforce training through the *TexasView Introduction to Remote Sensing Workshop*.

TexasView also plays an active role in broader, technology-based AmericaView projects such as the AmericaView Multi-State Server (AVMSS) and the Earth Observation Depot Network (EODN). These initiatives broaden and enhance access to remote sensing data for everyone around the United States and the world.



## CONSORTIUM MEMBERSHIP

Established in 2002, the TexasView Remote Sensing Consortium consists of fourteen 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.



Stephen F. Austin



The University of Texas at Austin



Midwestern State



Texas Tech



Texas A&M



The University of Texas at El Paso



Lamar



Texas A&M at Corpus Christi



Texas State University



The University of Texas at San Antonio



Sul Ross State University



Texas A&M International University



The University of North Texas



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# TEXASVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## WATCHING OVER TEXAS FROM SPACE (WOTFS) – “HOW IS TEXAS CHANGING”

**Watching over Texas from Space (WOTFS)** consists of a set of tutorials patterned after the Canadian Center for Remote Sensing's "Watching over Our Planet from Space". Development of hard-copy activities and materials is a priority because most high schools do not have access to digital image processing capabilities, making satellite imagery difficult to access within the classroom. *WOTFS* is intended to be a low-threshold mechanism to expose students to geospatial technology without requiring computers and software. Classroom activities are provided in poster and page-size (handout) formats; answer sheets and correlations to **Texas Essential Knowledge and Skills (TEKS) standards** are also provided for teachers.

**“How is Texas Changing”** engages students and teachers in identification of landscape change using examples from across the state of Texas. Examples include change related to wildfires, flooding, hurricanes, water resource management, urban development, and other resource development.

*Dallas, Texas.* Landsat imagery shows an agricultural area southeast of Dallas slated to serve as a site for a new reservoir used for drinking water, flood control, and recreation. Known as Joe Pool Lake, it began filling in 1986 and completed in 1989. Farmland was flooded, and the adjacent farmland was rapidly replaced with residential, commercial, and industrial development. The area directly adjacent to the lake remains relatively undeveloped and is home to Cedar Hill State Park.

ABOVE: Landsat 1, March 12, 1974  
BELOW: Landsat 8, March 11, 2014



## WOTFS – “WHICH IS WHICH”

**“Which is Which”** asks students to match descriptions of landscape and anthropogenic features, natural disaster impacts, and geomorphic processes with satellite images from multiple systems including Landsat, ASTER, MODIS, and EO-1 as well as astronaut photography. Classroom materials are provided in the same formats mentioned above.



*Landsat 5 image acquired October 29, 2011. Lake Buchanan, an artificial reservoir located in central Texas, was more than 5 meters below the historic average for the month, due to a long-term drought affecting all of Texas.*

## BENEFITS TO TEXAS

Satellite images are useful in teaching multiple subjects in multiple grade levels; direct correlation with **TEKS** has been accomplished for two courses taught at the high school level. Teachers benefit from materials developed by TexasView because the materials are accessible without the need to download and process satellite imagery. In particular, materials:

- Cover diverse science topics that students are specifically required to understand.
- Engage students with Texas-centric imagery and geospatial applications.
- Are provided in multiple formats for use in individual or group, hands-on activities and assignments.
- Can be captured and transformed into other formats that individual teachers require.
- Are directly linked to original sources including USGS and NASA websites that provide in-depth explanation of images (Earthshots and Earth Observatory).

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## SUPPORTING STATE EDUCATIONAL STANDARDS

High School TEKS standards for **Earth and Space Science (ESS)** explicitly require that students be able to “describe and interpret Earth surface features using a variety of methods including satellite imagery,” and to “use a wide variety of additional course apparatuses, equipment, techniques, and procedures as appropriate such as satellite imagery and other remote sensing data. **WOTFS** activities “Which is Which” and “How is Texas Changing” focus on these standards, as well as other standards related to change over a range of time scales; interactions among Earth’s subsystems; the roles of erosion and deposition in reshaping Earth’s surface; changes caused by natural disasters; effects of resource usage and of population growth; the dynamics of surface water movement.

High School-level Texas Essential Knowledge and Skills (TEKS) standards for **Environmental Systems (ES)** are also addressed by **WOTFS** activities. These standards cover water resource use and management; resource depletion; impact of urban development, natural disasters, and urbanization; habitat loss and restoration.

WOTFS activities were introduced to middle and high school teachers from several North Texas independent school districts during a full-day workshop held for 24 teachers in June 2015, in Wichita Falls, Texas. Feedback from the teachers will be incorporated in future workshops.



The rapid spread of urbanization that followed the building of Dallas/Fort Worth airport addresses TEKS standards concerning the impact of human population growth for both High School **Earth and Space Science** and **Environmental Systems** courses. Dallas, Texas, August 31<sup>st</sup>, 1984. Landsat 5 TM image.

## TEXASVIEW CONSORTIUM MEMBERSHIP



Stephen F. Austin  
State University



The University of  
Texas at Austin



Midwestern State  
University



Texas A&M at Corpus  
Christi



The University of  
Texas at San Antonio



Texas Tech  
University



Texas A&M  
University



Texas A&M International  
University



The University of  
Texas at El Paso



The University of  
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Rice University

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# UTAHVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN UTAH

UtahView 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 receives its primary funding from the U.S. Geological Survey, which in turn supports the AmericaView mission of advancement, availability, distribution, and use of remotely sensed data and technology through education, research, outreach, and technology transfer.

The primary mission of the UtahView consortium is to facilitate and promote the availability, distribution, and use of geospatial technology and data in the public and private arenas; encourage use of geospatial data in higher education and among K-12 schools; and to facilitate geospatial research and understanding at all levels.

The 2014-2015 year was extremely busy and successful for UtahView! UtahView welcomed a new member, the Utah Geographic Information Council (UGIC) to the consortium. UtahView activities and accomplishments included continued work developing K-12 geospatial curricula; education events for K-12 teachers and instructors throughout the state of Utah; development of data products for ranchers and land managers; outreach events to more than 100 ranchers and land managers; undergraduate research efforts; and, work with consortium members to develop future opportunities to support UtahView efforts.



*Summer students work with UtahView staff during a mapping and geography exercise.*

## CONSORTIUM MEMBERSHIP

Dr. R. Douglas Ramsey, Professor and Director of the Utah State University Remote Sensing/GIS Laboratory; Dr. Phoebe McNeally, Research Associate Professor and Director of the University of Utah DIGIT Laboratory; Dr. Sowmya Selvarajan, Assistant Professor of Geomatics and ASPRS Intermountain Region President; and Mr. Christopher McGinty, UtahView State Coordinator and Education Committee chair for the Utah Geographic Information Council, represent the primary UtahView consortium membership. The missions of all four organizations are unique and bring a wealth of scientific, outreach, and technical experience to urban, rural, and wildland regions of the diverse state of Utah.



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# UTAHVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## UTAHVIEW GEOSPATIAL CURRICULA DEVELOPMENT

UtahView is dedicated to improving the use of geospatial curricula in K-12 schools throughout Utah. UtahView, in cooperation with the Utah State University Remote Sensing/GIS Laboratory and the Edith Bowen Laboratory School, continued to develop introductory geospatial curriculum that supports newly adopted Common Core teaching standards. Building on work completed in previous years, UtahView was able to complete basic grade 3 and grade 4 teaching modules.

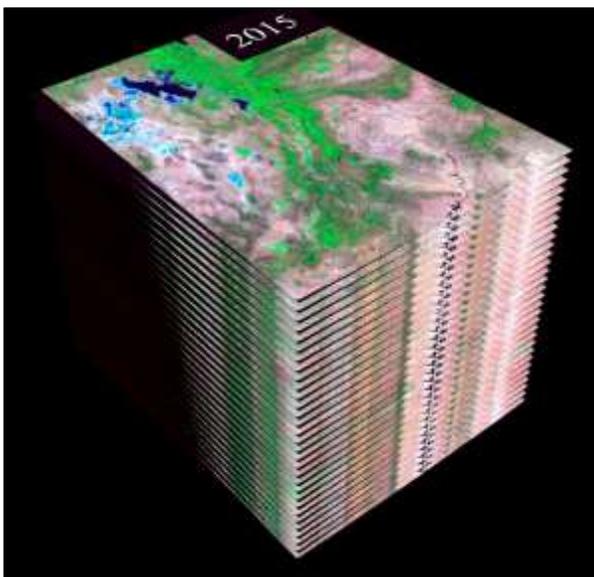
Educators throughout the state of Utah have an abundance of geospatial teaching tools and resources available for use in the classroom. One problem, however, is the lack of overall teacher or instructor knowledge regarding the best practices and use of the available tools and resources. Partnering with the Utah Geographic Information Council (UGIC), UtahView helped set up and hold a *Teach the Teacher* Educator Workshop at the 2015 UGIC Annual Meeting held in Snowbird, Utah. More than 15 educators from around the state attended, listening to lectures from Utah State University, Environmental Systems Research Institute (Esri), and UGIC staff. Teachers also had the opportunity to participate in hands-on learning modules that included the use of Google Earth and Esri StoryMaps, and ArcGIS Online. For additional information regarding the upcoming 2016 UGIC Educators Workshop, see <http://www.ugic.org>.



*Educators participate in the 2015 UGIC Educator's Workshop at Snowbird, Utah. Photos: C. McGinty.*



## LANDSAT 8, LANDSAT 7, AND LANDSAT 5, VALUE ADDED DATA DEVELOPMENT : FIRE MAPPING



*Processed USGS Landsat imagery stack. Part of the fire mapping process. Image: Dr. R. Douglas Ramsey, Utah State University.*

A key goal of the UtahView consortium is the development of satellite imagery-based products for free download and use by any interested individual. The Remote Sensing/GIS Laboratory at Utah State University, under the direction of Dr. R. Douglas Ramsey, has developed a methodology to detect and create multiple-year image composites to assess wildfire distribution and frequency using the United States Geological Survey (USGS) historic Landsat record. The goal is to support local ranchers and land managers by developing a wildfire history for more than 30 years and identifying size and other fire occurrence information that is critical to the protection and enhancement of the arid and semi-arid ecosystems of the Great Basin and Colorado Plateau.

Using more than 2,240 freely available USGS Landsat 8, Landsat 7, and Landsat 5 images spanning the last 31 years (1984 – 2015), the Remote Sensing/GIS Laboratory evaluated yearly multi-temporal imagery and generated seamless mosaics for the state of Utah. Using widely accepted remote sensing techniques including Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Fire Index (NDFI) a series of data products were developed and relevant fire information was extracted. This information is being made freely available for download through the UtahView website, [www.utahview.usu.edu](http://www.utahview.usu.edu).

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## BENEFITS TO UTAH

UtahView, through the efforts of consortium members, has capitalized on opportunities to promote and support the understanding and use of geospatial data and products throughout the state of Utah. Some of these educational, outreach, and research activities include:

- Hosting events for primary education students to learn about local geography through mapping events,
- Developing unique and beneficial undergraduate research opportunities,
- Engaging undergraduate students in volunteer mapping events,
- Conducting state-wide outreach to local ranchers, land managers, and community members explaining the benefits of remote sensing and geospatial data products and how that information is useful,
- Creating value-added data products for land managers throughout the state of Utah, and
- Instructing teachers on best practices and uses of geospatial education tools for the classroom.



*UtahView Director and Professor at Utah State University, Dr. R. Doug Ramsey, discusses the importance of geospatial data with ranchers and land managers in southern Utah. Spring, 2015.*



## UTAHVIEW CONSORTIUM MEMBERSHIP & GOALS

Dr. R. Douglas Ramsey, Professor and Director of the Utah State University Remote Sensing/GIS Laboratory; Dr. Phoebe McNeally, Research Associate Professor and Director of the University of Utah DIGIT Laboratory; Dr. Sowmya Selvarajan, Assistant Professor of Geomatics and ASPRS Intermountain Region President; and Mr. Christopher McGinty, UtahView State Coordinator and Education Committee chair for the Utah Geographic Information Council, represent the primary UtahView consortium membership. The missions of all four organizations are unique and bring a wealth of scientific, outreach, and technical experience to urban, rural, and wildland regions of the diverse state of Utah.

### UtahView Goals:

1. To foster a growing and dynamic consortium of state-wide partners that include educational institutions, state and local governments, and the general public in order to support and promote the UtahView mission and goals.
2. To establish remote sensing and geospatial curricula that are available for use by K-12 schools throughout Utah.
3. To facilitate the distribution, use, and understanding of geospatial data in Utah.
4. To provide opportunities for undergraduate students to conduct research using geospatial tools.
5. To continue to enable free, useful, value-added access to remotely sensed data and information.



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# VIRGINIAVIEW CONSORTIUM OVERVIEW 2014 - 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN VIRGINIAVIEW

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

The federal government and private sector has made targeted investments on satellite-based Earth observing systems since the early 1970's. In that time the research community has identified and developed practical applications for mapping, monitoring, and managing natural and environmental resources. Potential uses for remote sensing technology have been widely recognized for years. The implementation of real-world remote sensing applications poses challenges for local governments, regional entities, federal agencies, the private sector, and educators.

The VirginiaView consortium works to bridge the gap between the research and application communities across the Commonwealth. We work closely with other institutions of higher education, as well as precollege educators, local governments, state agencies, and others. Our consortium supports development of targeted educational resources to facilitate STEM education, workforce development initiatives, and student and community engagement opportunities, and research. Many of our activities focus upon applications of Landsat imagery, distributed without charge by the USGS.



Landsat mosaic image of the Chesapeake Bay (2011).  
Source: <http://gallery.usgs.gov>

## CONSORTIUM MEMBERSHIP

VirginiaView partners develop, leverage, and disseminate remote sensing resources and applications to stakeholders across the state. Partners also collaborate on funding proposals and research efforts. VirginiaView's programs, supported by other AmericaView members and the National Geospatial Technology Extension Network (NGTEN), have the capacity to efficiently extend resources and programming efforts nationally.



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

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# VIRGINIAVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## GEOSPATIAL WORKSHOPS FOR VIRGINIA'S EDUCATORS & LOCAL/STATE EMPLOYEES



*VirginiaView staff Katie Britt assists a participant during VirginiaView's geospatial workshop for educators. Instructors guide participants in acquisition and processing of Landsat imagery distributed by the US Geological Survey's EROS Center.*

VirginiaView's workshops for K-12 and community college instructors enhance educational capabilities by introducing teachers and students to STEM materials through hands-on learning in and outside the classroom.

For this reporting period, VirginiaView conducted, and co-sponsored three hands-on workshops:

- **Title: Introduction to Geospatial Technologies**
  - Sept. 15, 2014, Richmond, VA
  - Location: Geospatial pre-conference workshops at the 2014 VA GIS Conference
  - Audience: Approx. 150 educators & government employees
- **Title: Introduction to Geospatial Technologies**
  - June 22 – 24, 2015
  - Location: Virginia Tech, Blacksburg, VA
  - Audience: 14 K-12 & community college faculty
- **Title: Getting to Know Remote Sensing Using ArcGIS Desktop**
  - June 25 – 26, 2015
  - Location: J Sergeant Reynolds Community College, Richmond, VA
  - Audience: 24 educators, government, and private sector employees.

These workshops increase the knowledge base and hands-on skills for participants. Participants were from Virginia's K-12 and community college teaching cadre, as well as from local, regional, state, and federal government entities. With respect to the educational community, ultimately an end product will include increases in the geospatial literacy of students in participant's classes.

By offering such experiences over the years, our programs build the number and caliber of instructors throughout Virginia, and contribute to meeting future geospatial needs of Virginia's industries. By providing workforce development opportunities to local, regional, and state employees, we are working to enhance efficiency and support better decision making through an enhanced understanding of issues impacting our communities.



*VirginiaView staff instruct participants at VirginiaView's June 2015, workshop. Instructors provide practical, hands-on, instruction to develop proficiency in extracting local information from Landsat imagery distributed by the US Geological Survey's EROS Center. These skills prepare teachers to introduce these topics to their students at their home institutions.*

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



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## BENEFITS TO VIRGINIA

As a focal point for our nation's geospatial industries, VirginiaView has been actively developing a geospatially literate workforce. VirginiaView contributes to this workforce development effort by providing educational materials, and by sponsoring, co-sponsoring, and delivering hands-on workshops to:

- K-12 educators,
- Community college educators,
- Private sector employees,
- Local government staff, and
- State government employees.

VirginiaView's website (<http://virginiaview.cnre.vt.edu/>) provides on-line teaching resources suitable to support instruction and learning for all of these groups.



Attendees at VirginiaView's June 2015, workshop held at J. Sergeant Reynolds Community College, near Richmond. Instructors assist participants in use of specialized software necessary to acquire and analyze Landsat imagery distributed by the US Geological Survey's EROS Center.

## VIRGINIAVIEW CONSORTIUM MEMBERSHIP

VirginiaView partners develop, leverage, and disseminate remote sensing resources and applications to stakeholders across the Commonwealth. Partners also collaborate with the development of proposals and research efforts to maintain a statewide reach. Through its affiliation with other AmericaView consortium members, other partners, and affiliates, including the National Geospatial Technology Extension Network (NGTEN), and the Geospatial Technology Education (GeoTED) project, VirginiaView has also developed the capacity to efficiently extend resources and programming efforts nationally.



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

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### VirginiaView Co-PI

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# VERMONTVIEW CONSORTIUM OVERVIEW 2014 - 2015

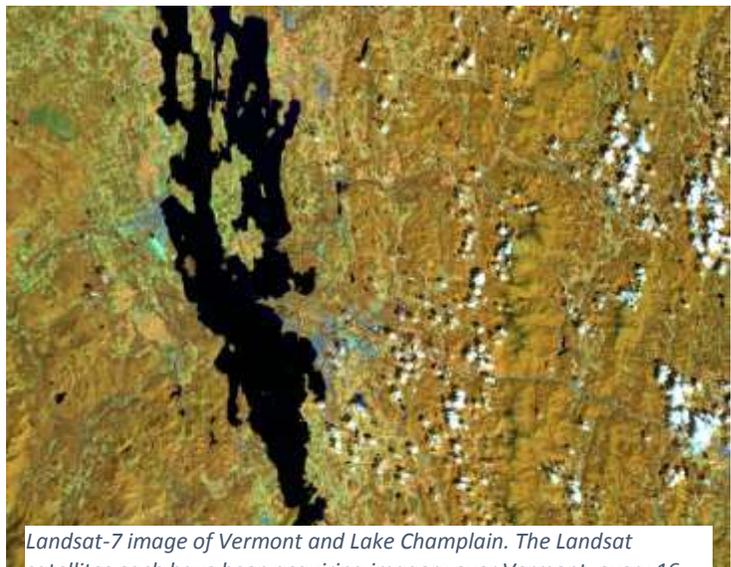


## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN VERMONT

VermontView 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.

Remotely sensed data play an important role in the Green Mountain State. High-resolution aerial photography helps communities update their property parcel maps. Civil satellites, such as the USGS Landsat program, provide an invaluable historical record that is used to quantify landscape change and monitor forest health. Detailed 3D topographic models generated from USGS funded airborne LiDAR are used to produce better flood risk models. Unmanned Aircraft Systems (UAS) are enabling emergency personnel to make better decisions, more quickly during natural disasters.

The VermontView consortium is dedicated to advancing remote sensing in Vermont through education, outreach, training, networking, and data distribution.



Landsat-7 image of Vermont and Lake Champlain. The Landsat satellites each have been acquiring imagery over Vermont, every 16 days, for decades. Revisit is more frequent with more than one operational Landsat satellite.

## CONSORTIUM MEMBERSHIP



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

VermontView Principal Investigator:

Jarlath O'Neil-Dunne

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<http://www.uvm.edu/rsenr/sal/vermontview/>

AmericaView Website:

[www.AmericaView.org](http://www.AmericaView.org)

Roberta Lenczowski, Executive Director:

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[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)



# VERMONTVIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## UNMANNED AIRCRAFT SYSTEMS

In 2010, Tropical Storm Irene caused hundreds of millions of dollars' worth of damage to Vermont. One of the great obstacles early on in the response effort was assessing the extent of the damage. Cloud cover prevented satellites from getting clear pictures and imagery from traditional aircraft could not get from airports to incident commanders fast enough due to the compromised road network. In 2014 the University of Vermont formed the Unmanned Aircraft Systems (UAS) Team, a group dedicated to providing timely, accurate, mapping-grade imagery to organizations throughout the state. Funded by AmericaView and the US Department of Transportation, the UAS Team is capable of capturing imagery in situations when satellites and manned aircraft cannot. Since its formation, the UAS team has done everything from respond to natural disasters to showcasing UAS technology to Vermont's farmers.



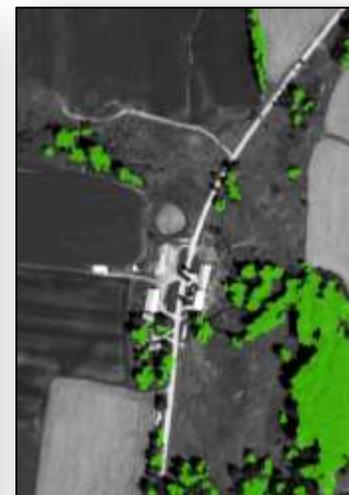
UAS Team imagery of downtown Barre showing the sediment damage that occurred during the July 19, 2015 storm event that caused flash flooding in the area.



UAS Team imagery of pre and post flood conditions in April of 2015 at the "wrong way bridge" where Route 15 crosses the Lamoille River in Cambridge.

## HIGH-RESOLUTION LAND COVER MAPPING

Federal and state agencies spend hundreds of thousands of dollars on imagery and LiDAR in the state. These datasets provide an unprecedented way of looking at Vermont's landscape, but they are just data. VermontView has been turning these data into high-resolution land cover maps that are over 900 times more detailed than the existing land cover datasets in the state. For example, trees as small as eight feet tall can be mapped. With this information, decision makers and resource managers are able to quantify features on the landscape with unprecedented accuracy and detail. From calculating the amount of impervious surfaces within a watershed to identifying gaps in riparian buffers within agricultural areas; the VermontView high-resolution land cover enables more informed decision making. Data available at [vcgi.vermont.gov](http://vcgi.vermont.gov)



LiDAR 3D model (left) and tree canopy from the VermontView high-resolution dataset (right) for a portion of the Rock River Watershed in Franklin County.

VermontView 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.



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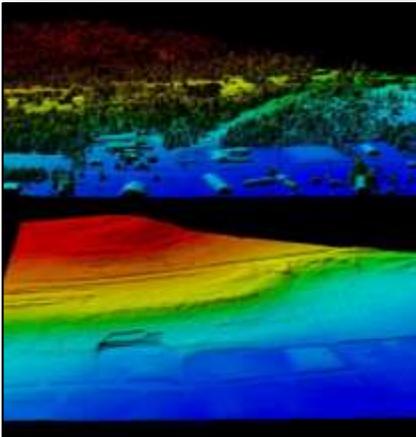
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Russell Congalton, Board Chair:

[russ.congalton@unh.edu](mailto:russ.congalton@unh.edu)

## BENEFITS TO VERMONT

Remotely sensed data from satellites and aerial systems are an invaluable resource for Vermont; from helping communities understand what structures are vulnerable to flooding to estimating the health of our forest ecosystems. VermontView works throughout the state, helping people get the most of these data, educating our workforce on the applications of cutting-edge technology, and providing actionable information to state and local government.



Turning millions of dollars' worth of LiDAR data into actionable information for our state and local governments.



Educating professionals throughout the region on UAS applications at local conferences.



Helping farmers understand how UAS technology can improve agricultural practices during the July 2015 Crop and Field Day.

## VERMONTVIEW CONSORTIUM MEMBERSHIP

The VermontView consortium is dedicated to advancing remote sensing in Vermont through education, outreach, training, networking, and data distribution.



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

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<http://letters-sal.blogspot.com/>



# WEST VIRGINIA VIEW CONSORTIUM OVERVIEW 2014 - 2015



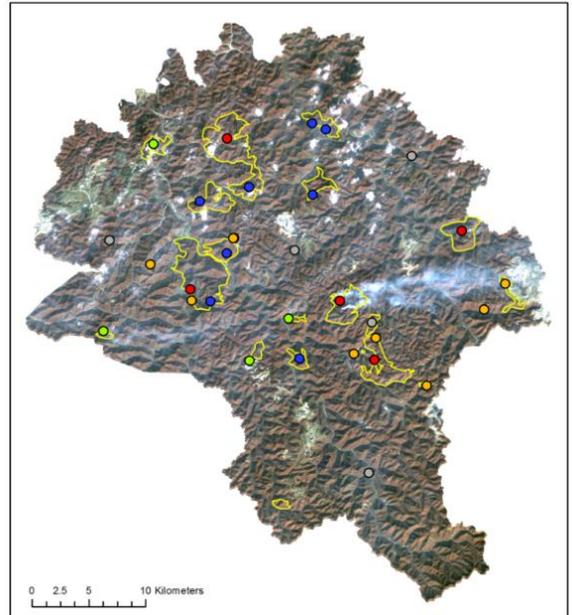
## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN WEST VIRGINIA

**West Virginia View** 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.

**West Virginia View** promotes remote sensing through:

- Theoretical and applied research of relevance to West Virginia.
- Coordination of shared resources, including state-wide purchase of remote sensing software for participating colleges and universities.
- Grants to students to enhance educational experiences, with a particular focus on undergraduate and graduate research.
- The West Virginia View website as the largest source for free imagery and lidar data in the state of West Virginia.

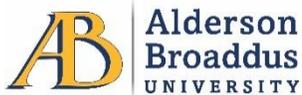
*Satellite-mapping of wildfire in West Virginia. This 14 November 1999, Landsat 5 satellite image of Boone County, shows burning fires. Note the smoke from the fire in the center of the image. White spots are clouds. Dots show locations of fires from the WV Division of Forestry, yellow outlines indicate extent of fires mapped from the satellite imagery.*



## CONSORTIUM MEMBERSHIP



USDA FOREST SERVICE



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

West Virginia View Principal Investigator:

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Wvview.org

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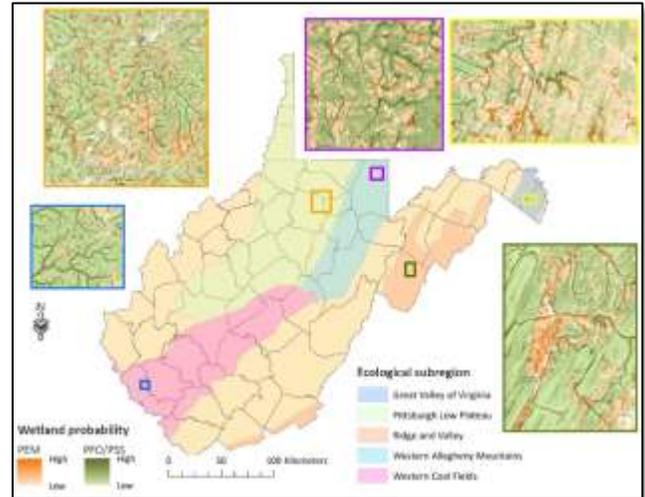
# WEST VIRGINIA VIEW REMOTE SENSING ACTIVITIES 2014 - 2015



## PREDICTING THE PROBABILITY OF WETLAND OCCURRENCE IN WEST VIRGINIA

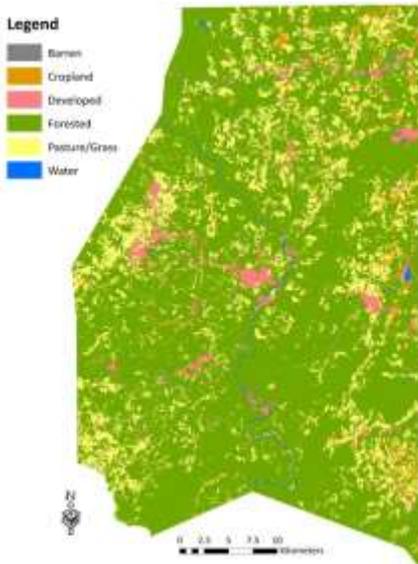
The goal of this West Virginia View project was to map the likelihood of palustrine wetland occurrence based on topographic variables derived from National Elevation Dataset (NED) digital elevation data. Random forest machine learning was used to generate the map. Palustrine wetlands are a key habitat for many species of interest to conservationists, hunters, tourists and the public at large.

The outcome of the classification was a probability surface, representing the likelihood of palustrine wetland occurrence. This data set will be of value for updating and improving the National Wetland Inventory (NWI). Although the NWI dataset is highly accurate overall, it is not an exhaustive map of every wetland, particularly in the case of palustrine wetlands. In addition, the probability surface could also be used as a screening tool to focus evaluation, refinement and updating of previously delineated wetlands. This work was conducted at Alderson Broaddus University by the Alderson Broaddus Geospatial Lab, and involved an undergraduate student. The project was completed with assistance from the West Virginia Division of Natural Resources (WVDNR).



*Example of palustrine forested/palustrine scrub shrub (PFO/PSS) and palustrine emergent (PEM) wetlands occurrence probabilities in selected regions in the state of West Virginia. (Note: inset maps are keyed to the rectangles in the main map.)*

## HIGH SPATIAL RESOLUTION LAND COVER CLASSIFICATION OF PRESTON COUNTY, WEST VIRGINIA



*Land cover classification for Preston County, WV.*

The land cover of Preston County, West Virginia was mapped using a variety of inputs including National Agriculture Imagery Program (NAIP) photography, light detection and ranging (LiDAR) data, US Census road data, and mapped manmade structures. The map was produced using object-based image analysis as implemented in the software tool eCognition and random forest machine learning using the software tool R.

This research highlighted the value of incorporating a variety of remotely sensed data types and advanced classification methods for generating a high resolution land cover map at the county level. The land cover map will be of use to state and non-profit natural resource agencies.

This work was conducted at Alderson Broaddus University by the Alderson Broaddus Geospatial Lab, and involved an undergraduate student.

West Virginia View 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.



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## BENEFITS TO WEST VIRGINIA

West Virginia View, and the projects sponsored by the consortium, provide a variety of benefits to the Mountain State, including:

- A framework for formal cooperation between the major West Virginia remote sensing organizations.
- Promotion of community outreach.
- Support for undergraduate and graduate remote sensing and geospatial education.
- Enhancement of opportunities for undergraduate and graduate research.
- Access to geospatial data via the website [wvview.org](http://wvview.org).
- Promotion of theoretical and applied research relevant to the needs of West Virginia.
- Generation of maps for the state or regions in the state, including:
  - Land cover
  - Wetlands
  - Forest type



Remote sensing and geospatial research lab (Alderson Broaddus Geospatial Lab) established at Alderson Broaddus University in Philippi, WV with support from West Virginia View.

## WEST VIRGINIA VIEW CONSORTIUM MEMBERSHIP



USDA FOREST SERVICE



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

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<http://www.wvview.org/>



# WISCONSINVIEW CONSORTIUM OVERVIEW 2014 – 2015



## ENHANCING THE UNDERSTANDING AND USE OF REMOTE SENSING IN WISCONSIN

WisconsinView 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.

WisconsinView bridges the gap between the research and user communities in Wisconsin. The federal government and private sector have invested significantly in satellite-based, earth-observing systems since the early 1970's. In that time the research community has identified and developed practical applications for mapping, monitoring, and managing natural and environmental resources. Potential uses for remote sensing technology are widely recognized; yet connecting state and local users with federal information requires local knowledge and a statewide network. WisconsinView addresses this need.

WisconsinView became an AmericaView member in 2004. Since that time, 12 institutions have joined the University of Wisconsin-Madison to form the WisconsinView Consortium and over 16,400 individuals have registered to download remote sensing imagery from the WisconsinView website. WisconsinView partners share imagery and expertise. Together they develop imagery products and educational materials and seek to improve utilization of remote sensing resources throughout the state.



Landsat 7 image of the Fox River, Green Bay, and the Door County peninsula.

## CONSORTIUM MEMBERSHIP

WisconsinView is comprised of the following 13 partner organizations:



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

WisconsinView Principal Investigator:

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<http://wisconsinview.org>

AmericaView Website:

[www.AmericaView.org](http://www.AmericaView.org)

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# WISCONSINVIEW REMOTE SENSING ACTIVITIES 2014 - 2015

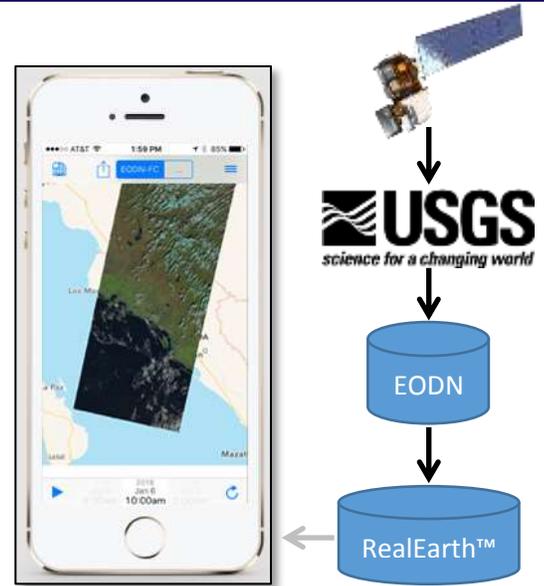


## DEVELOPING ENHANCED ACCESS TO LANDSAT 8 IMAGERY

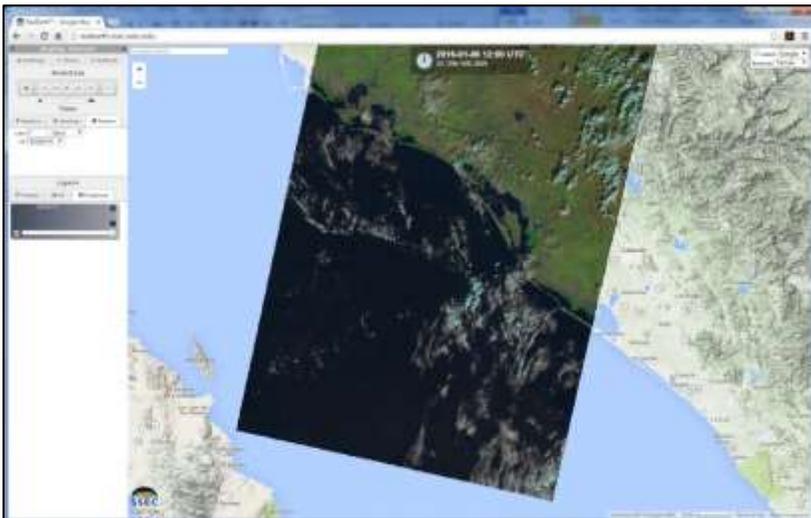
In an effort to improve and expand use of satellite imagery, WisconsinView is working with researchers and computer scientists to enhance access to Landsat 8 imagery. The goals of this effort are to:

- Introduce Landsat 8 imagery to atmospheric scientists and meteorologists within their work flows.
- Reduce the delays that exist between Landsat 8 acquiring an image and the image being available to researchers and the public – essential for atmospheric science meteorology.
- Provide mobile-ready access to near real-time imagery.

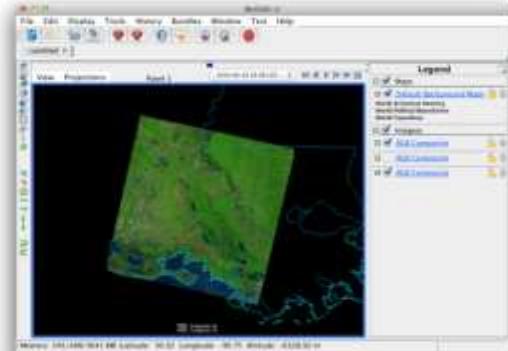
To accomplish these goals, WisconsinView and collaborators at TexasView, MichiganView, and Indiana University have arranged for direct access to Landsat 8 imagery from the Department of the Interior's US Geological Survey as soon as it has been processed. The imagery flows over the high-speed Earth Observation Depot Network (EODN) to programmers and computer scientists at the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison who then transform the imagery and data into formats that will work in the systems and software used by weather scientists. The imagery is also immediately viewable in desktop browsers and mobile devices through Wisconsin's RealEarth™ system. See: <http://re.ssec.wisc.edu/s/L8Cf8> to view the past seven days of Landsat 8 in the RealEarth™ browser.



Left: Landsat imagery viewed on an iPhone5s in the prototype "RealEarth™ App." Right: Landsat 8 flowchart from satellite to App.



This browser interface for "RealEarth™" was developed in part with support from WisconsinView. See: <http://re.ssec.wisc.edu/s/L8Cf8> to view the past seven days of Landsat 8 over the United States.



Landsat 8 color composite image viewed in McIDAS-V meteorology software. McIDAS-V is a free, open source, visualization and data analysis software package that is the fifth generation in SSEC's 40 year history of sophisticated McIDAS (Man computer Interactive Data Access System) software packages. McIDAS-V displays weather satellite (including hyperspectral) and other geophysical data in 2- and 3-dimensions, and can be used to analyze and manipulate the data with its powerful mathematical functions.

WisconsinView 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.



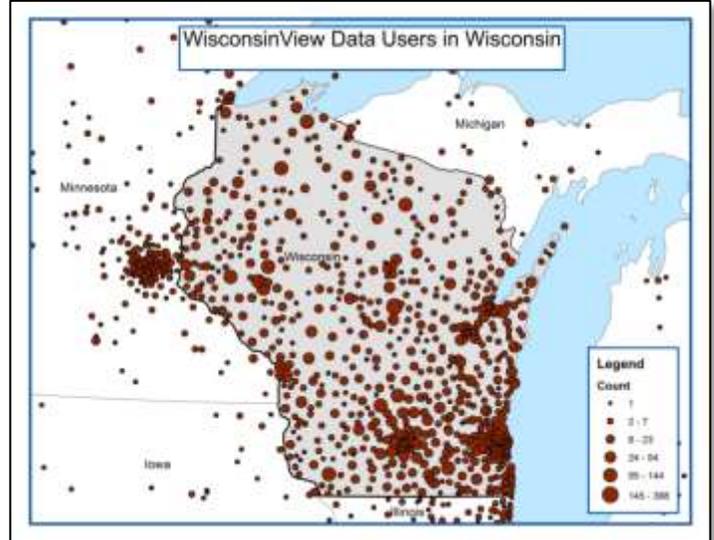
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## BENEFITS TO WISCONSIN

Landsat 8 imagery is important to Wisconsin for agricultural, forestry, and land cover mapping. Enhancing access to Landsat 8 imagery benefits all of these activities. WisconsinView also makes aerial photography and digital elevation models available online. Along with satellite imagery, these data products are used for business, education, and government. WisconsinView provides the only online source of certain statewide imagery



Many kinds of users benefit from access to WisconsinView data.



Since 2004 WisconsinView has made a variety of land remote sensing imagery available online for free public download. This map shows the location of registered WisconsinView data users.

## WISCONSINVIEW CONSORTIUM MEMBERSHIP

WisconsinView is comprised of the following 13 partner organizations:



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

WisconsinView Principal Investigator:

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<http://wisconsinview.org>



@WisconsinView

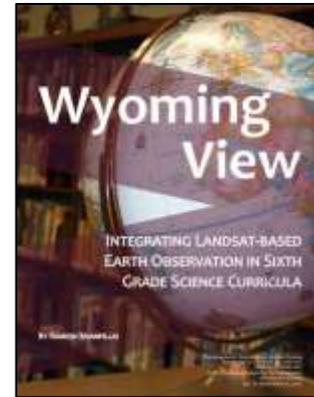


## BENEFITS TO WYOMING

The number of middle school students who are introduced to remote sensing applications and satellite images continues to grow. These images are helping the students to better understand the content in their science classes.

The WyomingView PI works with individual teachers to identify course content that is suitable for introducing remotely sensed images. Several approaches have been tried over the past several years.

Lessons learned from introducing Landsat images in sixth grade social science curricula were published as a highlight article in PE&RS. This paper also provided information on best practices for those interested in introducing Landsat or other remotely sensed data in their classrooms.



PE&RS: 81(6): 425-431  
DOI: 10.14358/PERS.81.6.425



*Six of the nine WyomingView interns (FY2014) after presenting their research at WY Undergrad Research Day*

Nine University of Wyoming students were part of the FY 2014 WyomingView internship program. Interns received training to process Landsat images and extract information to address resources management issues.

Seven interns presented their findings at the 2015 Wyoming Undergraduate Research Day.

WyomingView internships contributed to training the future work force in technology (STEM) areas.

- WyomingView interns worked with agricultural producers in the state to generate crop growth information using Landsat images.
- This information was provided to farmers who can use them for identifying problem areas that need further attention. These images will help them to better manage their fields and optimize inputs such as irrigation, fertilizers, and pesticides.
- The student projects highlight the value of multi-temporal Landsat images for crop growth monitoring in Wyoming.
- This activity is aimed at addressing the information needs in Wyoming using Landsat data and applied research.

## WYOMINGVIEW CONSORTIUM MEMBERSHIP

USDOI-Bureau of Land Management, Cheyenne, WY

USDA-Natural Resource Conservation Service, Casper, WY

USDA-Forest Service, Golden, CO

State Engineers Office, Cheyenne, WY

Wyoming Game & Fish Department, Cheyenne, WY

Wind River Environmental Quality Commission, Ft. Washakie, WY

SkyTruth Inc. Morgantown, WV

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

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WyomingView



WyomingView



## BENEFITS OF EODN

Some of the many advantages of EODN over traditional data distribution methodologies are:

- Open and free access to everyone
- Reduced latency – faster collection to desktop
- FAST downloads – multiple streams from many depots
- Large capacity – 30TB and growing
- Automated workflows – scriptable access
- Redundancy – multiple copies of all data
- Self-healing – eliminates single points of failure
- Pre-caching – data stored close by
- Automated routing – data moved where needed
- Scalable – grows with additional depots
- Robustness – handles increasing demand
- Integration – ties into existing data discovery tools
- User owned – stakeholders own depots
- User operated – stakeholders set policy
- Distribution – push value-added data to community
- Volume users – offloads network traffic
- Large file transfer – back-end data movement



The EODN/IDMS web portal (<https://dlt.crest.iu.edu/>) is the main gateway to EODN, incorporating system status (show here), depot status, depot map, eXnode browser, eXnode search, Landsat search, USGS Shopping Cart access, and download visualization.

## EODN PARTICIPATION

The Earth Observation Depot Network project is a collaboration between the NSF-funded Data Logistics Toolkit (DLT) project, AmericaView and the United States Geological Survey. Within AmericaView, TexasView, WisconsinView and MichiganView have assumed leadership roles. In GY 2014, AmericaView issued mini-grant incentives to IndianaView, LouisianaView, MichiganView, TexasView and WisconsinView to set up EODN depots. Since then, IowaView joined the project by adding a depot. Other depot projects are underway at OhioView, OklahomaView, and North DakotaView. In addition to AmericaView depot locations, the DLT project team maintains depots at Indiana University, and provides development, monitoring and support services for EODN.



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

EODN Consultant:

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EODN Portal: <https://dlt.crest.iu.edu>

DLT website: <http://www.data-logistics.org>

Depot installation: <http://goo.gl/1GTYNr>

Discussion group: [data-logistics@googlegroups.com](mailto:data-logistics@googlegroups.com)

## Comparing Landsat and Aerial Images for Monitoring Crop Growth

**Ramesh Sivanpillai**, Principal Investigator, WyomingView, (E-Mail: [sivan@uwyo.edu](mailto:sivan@uwyo.edu)); Clint Beiermann, MS Agronomy Student, University of Wyoming; **Milda Vaitkus**, NebraskaView (E-Mail: [mvaitkus1@unl.edu](mailto:mvaitkus1@unl.edu)); University of Nebraska.

**Remote Sensing and Crop Growth:** A farmer in Chase County, NE tasked an aerial imagery services company to acquire high resolution (3' x 3') images for his farm in 2014. He wanted to monitor how crop growth had responded to a fungicide treatment.

Color infrared images were acquired in July 2014 and were delivered to the farmer along with a greyscale Normalized Difference Vegetation Index (NDVI) image. NDVI measures crop vigor and higher value indicate healthier crops. It cost \$3.50/acre to obtain these images for this 124 acre farm.

**No-cost Landsat Imagery:** Approximately at the same time, sensors onboard Landsat 8 acquired imagery for this area. However, the resolution (or pixel size) of the Landsat image was much larger (100' x 100'), which meant lesser detail. Landsat images are available at no-cost through the US Geological Survey (USGS) websites.

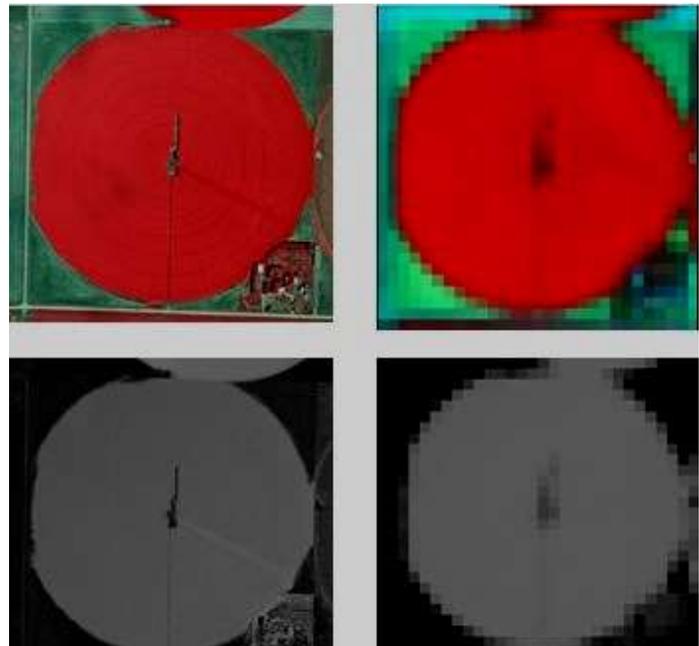
**Comparison of aerial and Landsat Images:** We assessed whether the no-cost Landsat image could provide comparable information to that provided by the high resolution aerial photo.

**Findings:** The aerial image, due to its high resolution, had a more detailed view of the field. Roads, houses, and trees were distinguishable in the aerial photo. Landsat's lower resolution resulted in a more pixelated view and, therefore, the above-mentioned features were not visible.

- Based on the high infrared and NDVI values it was evident that the crop growth was good in this field and relatively uniform.
- Despite its large pixel size, Landsat's color infrared and NDVI images were able to capture the no-growth area in the center of the field.
- Another strip of higher infrared reflectance in the southeast corner of the field was visible in the aerial image, but did not appear in the Landsat image.
- The road from the center to the southern end of the field that was evident in the aerial photo appeared as a strip of low-growth in the Landsat image (slightly darker red, which meant relatively less infrared and NDVI values).

Based on these observations, we concluded that no-cost Landsat images can provide comparable but aggregated information to that obtained from high resolution aerial photographs.

**Additional benefits:** Landsat collects images once every 16 days. Farmers can monitor their fields several times during the growing season, as long as these images are cloud-free.



Aerial photos (left column) and Landsat images (right column) acquired for a farm in Chase County, NE in 2014. Color infrared (top row) and Normalized Difference Vegetation Index, a measure of crop growth (bottom row) images shows that despite its larger pixel size (100' x 100') Landsat image can provide similar information to those provided by high resolution (3' x 3') aerial images.

"Landsat data could be useful to use on a regular basis to watch for any abnormalities, then could have justification pay for the higher resolution data on an as needed basis. This would save considerably over subscribing to a paid service on all acres."

- Steve W. Producer, Chase Co. NE

Users can download 100' x 100' (30m) resolution Landsat images that were acquired since the mid-1980s at <http://glovis.usgs.gov> OR <http://earthexplorer.usgs.gov>. These images can assist in generating information about changes in crop growth patterns as a result of past management practices.



*Dedicated to Dr. James Merchant (1947-2015)  
Former PI, NebraskaView*