



**AmericaView: A National Remote
Sensing Consortium
Grant Award Number 08HQGR0157**

**AmericaView Technical Report
for Grant Years 2008-2012**

Work completed from September 30, 2008 through September 29, 2013
(With an extension through December 31, 2013)

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

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AmericaView Technical Report for Grant Years 2008-2012

I. Introduction and Overview

Report Purpose, Format

This report summarizes the activities of AmericaView (AV) from September 30, 2008 through December 31, 2013 (Grant Years (GY) 2008 through 2012.) It meets the reporting requirements for U.S. Geological Survey Award 08HQGR0157. Progress reports for GY 2009, GY 2010, and GY 2011 are found online at the USGS Land Remote Sensing Program website at <http://remotesensing.usgs.gov/about.php>. The progress report for GY 2008 can be obtained by contacting AmericaView. This report numerically and graphically summarizes GY 2008-2012 activities and serves as the progress report for GY 2012, the last grant year of this five-year grant. A more thorough description for the completed annual activities for GY 2008-2012 are given in the progress reports mentioned above and in complete detail on the AV online portal that can be queried by any AV Board or staff member, or authorized USGS employee.

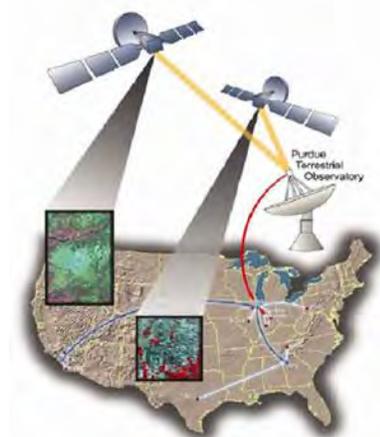
This report is organized into the following sections:

- The remainder of Section I. introduces the AV Consortium;
- Section II. presents a summary of the Grant objectives and a summary of AV's achievements in completion of grant deliverables;
- Section III. discusses numerical summaries, highlights, and benefits of AV's four program areas (Data Distribution, Consortium Development & Outreach, Research, and Education); and
- Section IV. contains annual summaries for GY 2008-2012 covering items such as funding overviews, new members, mini-grants, and annual meetings.

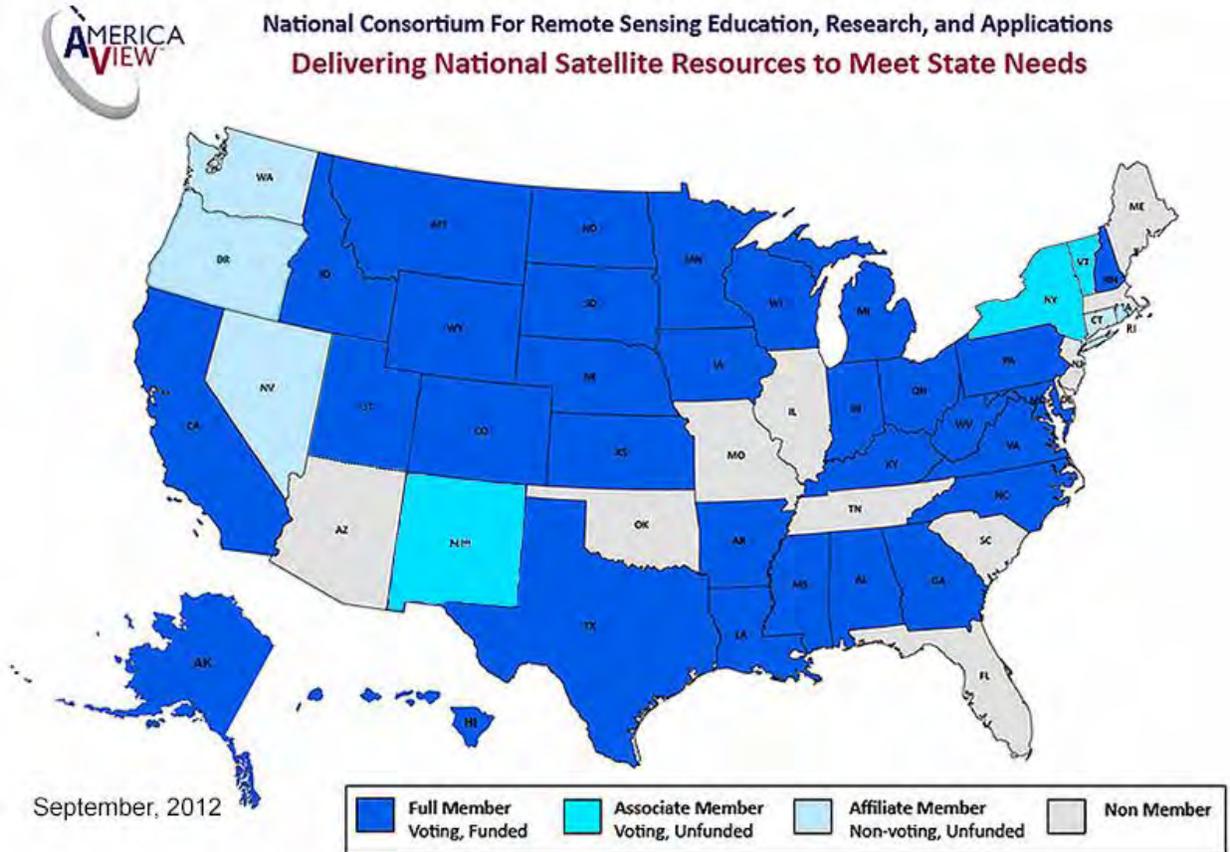
Overview of AmericaView

[AmericaView](#) (AV) is a locally controlled and nationally coordinated consortium, comprised of university-led, state-based consortia (StateViews) working together to sustain a network of state and local remote sensing scientists, educators, analysts, and technicians. Remote sensing, the process of detecting or monitoring the properties of an object without physical contact, is an essential part of 21st Century society and is used in a wide range of applications from strengthening business endeavors to managing

natural resources. AmericaView's networks, facilities, and 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, from formal and informal education, to ecosystem analysis and natural resource management, to 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)



AmericaView is a national consortium comprised (as of December 31, 2013) of 39 individual state consortia (StateViews). Each StateView is coordinated by a lead academic institution and consists of partners including academic institutions; local, state and federal agencies; non-profits; and private sector companies. AV has more than 300 StateView consortium partners across the U.S.



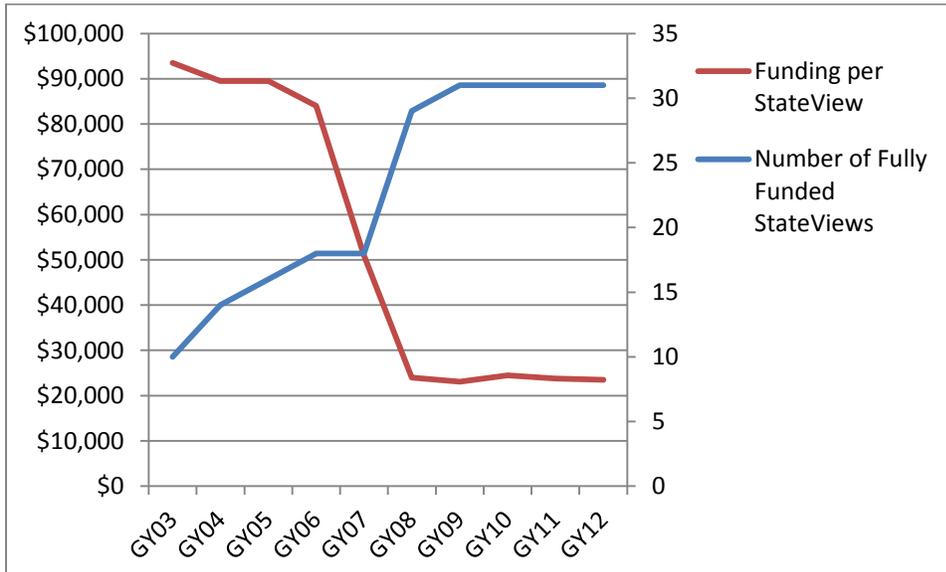
Over the past five years, StateViews worked closely with their partners at the state and national levels on a wide range of projects within AmericaView’s four program areas. Because each state has unique needs – with respect to data access, education, and research – StateViews developed their own projects, 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, often supported by AmericaView's education, outreach, technology, and research committees to maximize the leverage of AV’s funding.



AmericaView StateView representatives and staff at Fall Technical Meeting at EROS Center, September 15, 2013

AV Consortium's Growth and StateView funding levels

With the start of GY 2008, AV approved Full (funded) Member status for 11 new StateViews that had been waiting a number of years for funding. At the beginning of this reporting period (GY 2008), AmericaView consisted of 30 StateViews including 18 Full Members. By the end of the reporting period (GY 2012), AV consisted of 39 members including 31 Full Members. The following chart depicts the growth and funding levels for AV's Full (funded) Members.



From GY 2003 to GY 2008 funding per StateView fell from \$93,500 to \$24,000; from GY2008 to GY2012 it has remained relatively stagnant, with a GY 2012 funding level of \$23,500 per StateView.

Grant Year	GY 2008	GY 2009	GY 2010	GY2011	GY2012
Total Grant Amount	\$960,000	\$967,400	\$967,400	\$967,400	\$967,400
\$ per StateView	\$23,989	\$23,989	\$25,000	\$23,800	\$23,500
Funded StateViews	29	31	31	31	31
Associate StateViews (unfunded)	3	1	3	3	3
Affiliate StateViews (unfunded)	4	5	5	5	5
Total number of StateViews	36	37	39	39	39

Administration, Coordination

During the past five years, AV was governed by a Board of Directors, elected to staggered multi-year terms of office by the membership (Appendix C). Board members served on a voluntary basis and received no compensation beyond travel support. AV has been strengthened by service from Board members from 14 different StateViews. The Board of Directors consisted of 7 members from GY 2008-2011. In 2012, the Board determined that the size and scope of the organization (39 active StateViews across the entire United States), warranted an increase of Board members from 7 to 9.

The national program for AV was managed by an Executive Director (70% FTE), and a Program Manager (75% FTE). The Executive Director and Program Manager administered the program on a daily basis, and answered directly to the Board of Directors in all matters. Both the Executive Director and Program Manager were employees of their respective Universities; AmericaView had no employees.

The Executive Director 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 Program Manager was responsible for internal communications, management of day-to-day business and financial affairs, and was the contract officer for AV sub-awards.

AV's USGS Liaison for the past five years was Thomas Cecere. Tom's efforts strengthened AV's focus and effectiveness, strengthened AV's connections with USGS Land Remote Sensing staff and leadership, and helped AV tell the "story" about the importance of land remote sensing across the U.S. and the world.

II. Summary of NLRSEORP Grant and Achievements by AmericaView

Scope of Grant

AmericaView was the recipient of a competitive five-year grant entitled the National Land Remote Sensing Education Outreach and Research Program (NLRSEORP) issued by the U.S. Geological Survey's Land Remote Sensing Program. Through this 5-year grant, the goal of the USGS was to establish a program that would provide support to develop a U.S. national consortium with the capability to receive, process and archive remotely sensed data for the purpose of providing access to university and State organizations in a ready to use form, and to expand the science of remote sensing through education, research / applications development and outreach in areas such as environmental monitoring, climate change research, natural resource management and disaster analysis.

NLRSEORP Objectives

The program objectives for NLRSEORP, were to:

- 1. Define, consolidate and maintain the data and information requirements of the user communities gathered via a nationwide consortium which includes universities throughout the US.*
- 2. Place in the public domain for free inspection and access, whenever feasible, all imagery and other sensor system or geospatial data purchased using public funds as the data becomes available. Data should be tailored to maximize usability to the scientific and academic communities in the region.*
- 3. Establish strategic partnerships nationwide to develop and deploy remote sensing applications through collaborations involving university research teams, K-12 schools, Federal agencies, tribal, state and local governments, nongovernmental organizations, and commercial enterprises.*
- 4. Promote research and remote sensing experience at the university undergraduate and graduate level to increase numbers and visibility of graduating students with employment skills in remote sensing.*
- 5. Develop materials for and conduct or participate in appropriate educational and training organizations, curricula, programs, workshops, meetings, seminars, as well as technology transfer and outreach activities.*

Summary of AV's Accomplishments and Impact during Grant Years 2008-12

AV made significant progress in meeting the objectives of NLRSEORP through achievements in its four program areas: Data Distribution, Consortium Development & Outreach, Research, and Education that are discussed in the following section III.

During GY 2008-2012, AV StateViews completed 1,801 grant-funded activities in 82 activity categories organized across its four program areas. The number of completed activities is enumerated by activity

category by year in Appendix A. The activities ranged from making a presentation at a state geospatial advisory board to sharing digital image analysis labs with other consortium members to publishing research findings in a peer reviewed journal. In GY 2012, at the suggestion of its USGS Liaison, AV moved from a many-activity approach to a High Impact Activity approach. The many-activity approach was a relic from the years when StateViews had funding levels at >\$80,000+ levels (prior to GY 2007), when many had state coordinators, and were able to complete activities in each of AV's four program areas. Current funding levels per state of ~\$25,000 support the completion of 1-2 high impact activities plus the required attendance at AV's annual meeting, maintenance of StateView websites, required educational outreach and other requirements for Full Members (for whom baseline funding is provided) of AV.

Over the past five years, while meeting the four objectives of NLRSEORP, AV's activities have had a significant impact on the literacy and utilization of remote sensing skills and data across the United States. Examples of these impacts, discussed on the following pages, include when AV:

- Increased access to remote sensing data and imagery to local end users such as practitioners, natural resource managers, researchers, teachers, and students, to complete remote sensing's "last mile" in the 40 states served by AV (pp. 7-12),
- Helped first responders save lives and property (pp. 9 -11),
- Served underrepresented groups in the geospatial field (pp. 15-16),
- Assisted decision-makers and natural resource managers with the increasingly complex array of decisions that are informed by geospatial data analysis (pp. 17-18),
- Strengthened our country's applied and basic remote sensing research (pp. 22-23),
- Strengthened our workforce's geospatial skills and provided qualified employees for this high growth geospatial sector (pp. 25 & 30-31),
- Broadened the country's knowledge of the value of remote sensing data and technologies (pp. 16-17 & 33-34), and
- Inspired and prepared the next generation of scientists through conducting or providing grade-appropriate remote sensing teaching and curriculum to strengthen STEM (Science, Technology, Education, Mathematics) education in K-21+ classrooms and assisted teachers in meeting national and state educational standards for STEM education (pp. 25-29 & pp.32-33).

III. Numerical Summaries, Highlights, and Benefits of AV's Four Program Areas

Program Area 1: Data Distribution

NLRSEORP Objective 1: Define, consolidate and maintain the data and information requirements of the user communities gathered via a nationwide consortium which includes universities throughout the US.

NLRSEORP Objective 2: Place in the public domain for free inspection and access, whenever feasible, all imagery and other sensor system or geospatial data purchased using public funds as the data becomes available. Data should be tailored to maximize usability to the scientific and academic communities in the region.

Overview of AV's Data Distribution Accomplishments

AV, in cooperation with public data providers, has continued to increase access to public remote sensing imagery by making the imagery available in standard, ready-to-use formats to public agencies, educational institutions, and commercial entities in member states. Data provision has greatly

enhanced the ability of decision makers, educators, scientists, and the general public to utilize and understand remote sensing data and analytical tools.

Since 2008, AV has completed 513 activities to archive and distribute geospatial data.

AmericaView Data Delivery Activities						
	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012 [1]	GY 2008-2012
Number of Activities	132	125	105	105	46	513

[1] Goals for activities changed in GY2012 to focus on fewer, High Impact Activities.

Free and rapid access to Landsat data was identified as the most pressing data need at the state level when OhioView and subsequently AV were established. This vision, and partial funding from the AV Program, led to development of the GloVis system. A number of StateViews adopted GloVis for their state archives and helped test and popularize GloVis. At the beginning of this grant period, the creation of data archives (especially of Landsat data) was a primary focus of AV and many states grew their data archives because of the high cost per Landsat scene and the desire to facilitate the improved utilization of any image in the public domain.

- ❖ Over the past four grant years (GY 2009-2012), AV members have archived more than 117,535 GB of publicly available remote sensing imagery.
- ❖ Over the past four grant years (GY 2009-2012) AV has hosted more than 539,570 visitors at member websites. With the combined StateView’s web sites, the AmericaView web site, the AV Earth Observation website (stand alone for GY 2009), and the AV Blog, AmericaView hosted more than 565,160 visitors and more than 2,275,620 page views.

AV supported the change in data delivery focus enabled by the opening of the USGS Data archive for free public access on October 1, 2008. This action has resulted in a significant change in AV’s approach in this data archive objective over the past five years. Rather than duplicate the USGS effort, during the past several grant years, a number of StateViews have discontinued their maintenance of data archives. However, a number of states still maintain archives that are now focused on site-specific, value-added products such as fully assembled ready to use Landsat scenes in projections tailored to the needs of the States, or special data sets (e.g., NAIP imagery, ortho quads, MODIS, LiDAR) that are not being served through any other state or federal geospatial portal. Providing data in readily useable formats has remained important in many states since many resource managers may have GIS skills but are still not able to access or utilize satellite imagery. Additionally, with free data access and training by groups such as AV, more decision makers are aware of the benefits of remote sensing and thus the demand for data has risen. As a result of the opening of the Landsat archive, StateViews are experiencing the demand for large multitemporal data sets to assist with research and disaster analysis and response.

Efforts were continued to develop methods to rapidly distribute very large remotely sensed data sets with the assistance of TexasView PI, PR Blackwell. Such distribution is critical during natural disasters or to assist geographically large, multi-institutional, multi-agency, and/or multitemporal research projects. In the prior 5-year grant period (2003-2008) a remote sensing instance for AmericaView was developed within the [Research and Education Data Depot network](#) (REDDnet). The next phase of national delivery of very large data sets was discussed with EROS Center staff in May of 2013, near the project period

close of GY 2012. Options are being discussed that may utilize the next iteration of this REDDnet network, called the [Data Logistics Toolkit](#) (DLT), to assist with the distribution of Landsat (and perhaps other remote sensing) data across the U.S. Please see the Texas View fact sheet on REDDnet and DLT in Appendix F. Further development and application of the DLT technology will be explored in the NLRSEORA grant during grant years 2013-17.

The **America Multi-State Server** (AVMSS) project involved nine StateViews who pooled financial and intellectual resources to develop and host a web server that serves a "best available" image layer as a WMS and tile service based on technology developed by AlaskaView. The participating states were Alaska, Texas, Wisconsin, Indiana, Michigan, North Dakota, Virginia, Alabama, and Ohio. **In GY 2009**, the core hardware was purchased, assembled, configured, and tested. Testing of the system in Alaska was cumbersome because of the slow network link. The server was shipped to TexasView, at Stephen F. Austin State University, where it was installed for its long-term hosting location. **In GY 2010**, several members from AlaskaView, WisconsinView and TexasView worked to establish the infrastructure for the AVMSS project. AlaskaView made great strides in image-based distribution software by creating a simple, web-based, map extraction tool for WMS feeds. Testing of the server continued in anticipation of full accessibility by the membership. **In GY 2012**, TexasView worked through the data prep and loading protocols developed by AlaskaView and the Geographic Information Network of Alaska (GINA), using the 3.7 terabyte TexasView 2012 NAIP dataset. Scripts and how-to documents were developed and edited by TexasView, AlaskaView, and WisconsinView that will assist the participating AmericaView Members to enable ingesting of their data into this server and the production of various products for AV-wide and specific StateView utilization. The AVMSS project will be continued into the following grant period, perhaps utilizing the evolving REDDnet/DLT technology for ingesting large data sets such as the NAIP data sets. Please see the Texas View fact sheet on the AVMSS project in Appendix F for further information. Perhaps the greatest potential benefit of the AmericaView AVMSS project lies in making the sophisticated technology developed by GINA available to other StateViews. This is state-of-the-art, open-source web mapping service development and deployment relying heavily on the [Geographic Data Abstraction Library](#) (GDAL).

Potential uses of this technology go far beyond the current AVMSS project:

"The America Multi-State Server (AVMSS) server project represents more than just another way for AmericaView to serve data. It will provide a mechanism for us to explore new ways to make a difference with remote sensing technology. We need to think beyond what we know to be possible and explore the future. Like REDDnet, the AVMSS can be a test bed for developing future technologies and new, innovative remote sensing applications."

-- PR Blackwell, Principal Investigator, TexasView

AV members have coordinated and distributed land remote sensing data in support of disaster response and preparedness. A number of AV members, in support of the USGS's natural disaster response efforts, have completed training and served as Project Managers for International Charter activations, identified data needs, coordinated and placed data requests with Charter member agencies, identified and worked with value-added resellers (i.e., data processors), and provided data to first responders in a timely fashion. AV members have also shared their expertise in pre-processing and classifying data, and made valuable suggestions for managing data flow to first responders.

Examples of disasters that AV has assisted with during the grant period:

- Dr. Ramesh Sivanpillai (WyomingView PI) served as the International Charter on Emergency and Disaster Response's Project Manager for the 2011 Midwestern Floods. This was the second International Charter activation where the AV network was instrumental in securing the expertise of a remote sensing scientist (Teresa Howard, Center for Space Research, University of Texas at Austin) who was able to analyze radar imagery secured by the Charter. (GY 2010)

- Vermont View assisted with getting data to first responders during Hurricane Irene in August 2011. Heavy flooding took the state's key geographic information resources offline when state office buildings were flooded. VermontView quickly stepped in to coordinate all geographic information activities under the direction of VermontView PI, Jarlath O'Neil-Dunne. VermontView quickly established a mirror data download site available that provided FEMA and other federal agencies with access to Vermont's robust set of GIS data. Over the course of the week following Irene, VermontView downloaded, processed, and distributed over 300 satellite images to state and local agencies.

VermontView coordinated student volunteers at the University of Vermont, producing the first satellite-derived flooding maps for the state. Once the Vermont Center for Geographic Information (VCGI) had resumed operations after Hurricane Irene, VermontView facilitated an orderly transfer of all data products and worked with VCGI to train state and local personnel on the data products use. (GY 2010) This was the second time that an AmericaView consortium member assisted with filling in as the temporary state emergency headquarters, the first being when TexasView assisted with establishing a relief command center in 2008 after Hurricane Ike destroyed the Emergency Operations Center in Galveston County, Texas.



Members of Oak Glen Residential Community are assisted by rescue personnel as rising waters from a nearby creek forced them to evacuate their homes in Johnson, Ark., on April 25, 2011. Photo by Beth Hall/AP, in Christian Science Monitor.

AV StateViews have developed extensive materials and tools to assist decision makers with disaster preparedness and decision-making. Examples include:

- LouisianaView prepared an analysis of the Impact of Hurricanes Katrina and Rita on children's education programs; the effects of hurricanes on agriculture in South Louisiana; and storm drain routing for Lafayette Parish along the Vermilion River. (GY2008)
- LouisianaView co-hosted and presented at the state *2008 Hurricane Lessons Learned Workshop* in January 2009, where a questionnaire for state participants in emergency response was presented and filled out by attendees. (GY2008)
- MontanaView developed and implemented a national online Emergency Response Database of remote sensing professionals who are willing to serve with remote sensing image analysis in times of disasters. This database was based on the questionnaire and efforts of Louisiana in AV supported efforts prior to GY2008 and is still being maintained at the end of this report period. (GY 2008-2012).
- AlaskaView provided data to assist weather forecasters, emergency responders, marine users, and scientists in support of field operations. (GY 2008-2011).

- TexasView worked on developing a data distribution channel through the Research and Education Data Depot Network (REDDnet) for distributing free data from USGS. The system harvested free data from USGS GloVIS, uploaded it to REDDnet and added metadata to the REDDnet GloVis instance. (GY2008)
- KansasView developed potential flood inundation databases and user tools for emergency managers. (GY 2009)
- VirginiaView prepared ALOS PALSAR examples to demonstrate the use of SAR data to determine flooding extent. (GY 2009)
- South DakotaView prepared imagery (Landsat and NAIP) and maps showing the extent of flooding in northeastern South Dakota for the South Dakota Local Transportation Assistance Program (SDLTAP). SDLTAP personnel along with township and county officials used the imagery to assist in the task of prioritizing roads in need of repair due to extensive Spring 2010 flooding. (GY 2009)
- AlabamaView co-presented an analysis on assisting cleanup of debris and sand after hurricanes. Approximately 50 stakeholders who manage utilities were present, and the presentation led to funding of a project to map critical infrastructure on the Gulf Coast of Alabama. (GY2009)
- LouisianaView promoted the use of archived data in the GIS Certification Program GIS Level I and II for project development, data pertaining to emergency response such as Hurricane Katrina, Rita and Wilma data and pre- and post-imagery from multiple state sources including Homeland Security. (GY2009)
- KansasView mapped predicted flood extents in the event of dam breach events for emergency managers. (GY 2011)
- North DakotaView mapped the extent of lake and wetland flooding in the Devils Lake basin, and the extent of flooding near Williston, ND, near the end of a prolonged period of record-breaking floods in the Missouri River corridor. (GY 2011)
- MississippiView and partners provided each of the Mississippi Delta counties high quality map products that identified Mississippi Emergency Management Agency-listed Critical Infrastructure. (GY 2011-2012)

Numerical and Benefit Summaries for AV's Data Distribution Activities (See activity numerical summaries by Grant Year in Appendix A)

In GY 2008-2012, StateViews engaged in **244 activities that improved ease of access to geospatial imagery** through activities such as:

- Making imagery publicly available in an archive and at low or no cost (185 activities)
- Making the processing, distribution, and user interfaces easier so more residents and data users could access data (59 activities)

Benefits of activities. These archives made access to remote sensing data much easier, resulting in higher rates of data use. Freely accessible data removed a previous barrier to use in education and applied research, resulting in higher use rates and more applications. A number of StateViews generated user-friendly formats to accommodate the widest range of users, including K-12 teachers without access to, or knowledge of, the software necessary to utilize multi-band files. Maintenance of archives retains the ability of StateViews to remain in communication with the end data users in their states.

In GY 2008-2012, StateViews engaged in **137 activities that**, responding to a continued need in their states, **grew their remote sensing data archives**, adding Landsat, ASTER, MODIS, and various aerial

datasets including LiDAR and orthophotography. This archive growth was accomplished via mechanisms such as:

- Sharing arrangements within or among StateViews (39 activities)
- Leveraging other projects that purchase data as a source for the archive (26 activities)
- Collecting data from existing web sources (31 activities)
- 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 (41 activities)

Benefits of activities. Leveraging extended limited funding and resulted in additional freely available data. Having redundant data available for free can save time and effort for those who primarily access data through StateView archives. By sharing archives, data is more consolidated and therefore easier to search, browse, and access. Brokering data purchases leveraged funding and resulted in additional freely available data and strengthened collaborative efforts.

In GY 2008-2012, StateViews engaged in **36 activities that 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.

Benefits of activities. These important activities supported state and federal agencies in responses to natural disasters such as flooding, hurricanes, wildfires, and volcanic activity.

In GY 2008-2012, StateViews engaged in **96 activities that collected basic data download, user, and distribution statistics.**

Benefits of activities. This information assists StateViews and AV in determining which data sets are in high demand in their states and in some cases, who (by general sectors) is using this data. In some StateView instances, users can request further assistance or indicate which data sets they need that aren't currently provided. Over the grant period, AV has provided information on the remote sensing data needs of its state residents to the USGS (see examples of information requested of AV and provided to the USGS during GY 2009-2011 in Appendix E).

Program Area 2: Consortium Development and Outreach

NLRSEORP Objective 3: Establish strategic partnerships nationwide to develop and deploy remote sensing applications through collaborations involving university research teams, K-12 schools, Federal agencies, tribal, state and local governments, nongovernmental organizations, and commercial enterprises.

Overview of AV's Accomplishments

AmericaView conducts outreach efforts to highlight the many beneficial uses of sharing and applying public domain remotely sensed data in a wide range of civilian applications, from transportation and natural resource management, to agricultural production and disaster response. Since GY 2008, AV has completed 588 activities to strengthen its consortium and conduct outreach efforts regarding the many beneficial uses of remote sensing in the U.S.

AmericaView Consortium Development and Outreach Activities						
	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012 [1]	GY 2008-2012
Number of Activities	127	145	121	125	70	588

[1] Goals for activities changed in GY2012 to focus on fewer, High Impact Activities.

- ❖ Over the past five grant years (GY 2008-2012), AmericaView members met with an average of 100 decision makers (or their staff persons) each year to conduct educational visits to share the importance of remote sensing imagery and products to the residents of their states.
- ❖ Over the past four grant years (GY 2009-2012), AmericaView members made 330 Presentations to 10,545 attendees at scientific and technology sharing conferences, statewide geospatial data meetings, and at other venues.
- ❖ AV members have published or submitted 84 research papers that reference AmericaView or a StateView's activities.

Development of the AV Consortium. AmericaView has been steadily developing its national consortium since 2002 (see following table for a summary of the growth of the AV Consortium since formation). This growth has allowed AV to better serve the remote sensing needs of the residents in the states that it serves, and has strengthened AV's networking, remote sensing expertise, and knowledge sharing capabilities within the consortium. With the start of **GY 2008**, AV approved Full Member status for 11 new StateViews that had been waiting a number of years for funding. This growth constituted a 35% increase in the AV Consortium's size and greatly broadened AV's presence and impact at the national level. At the beginning of this reporting period (GY 2008), AmericaView consisted of 30 StateViews, 18 Full (funded) Members, 9 Associate Members and 3 Affiliates. By the end of GY 2008, the AmericaView consortium had expanded to 36 StateViews (29 Full Members, 3 Associate Members, and 4 Affiliates.) In **GY 2009**, two more StateViews were fully funded and an additional Affiliate StateView was added to bring the total number to 37 StateViews (31 Full Members, 1 Associate Member, and 5 Affiliates).

In October, 2009, with no prospect for increased funding in the foreseeable future, the AV Board made a decision not to fund any more StateViews since any further reduction would make significant activities very difficult at the StateView level and would result in a consortium that only had the ability to network. This decision was not made lightly, but was deemed necessary after evaluating the effects of decreased and static funding that resulted in a reduction of base level funding from \$93,500 to ~\$24,000 per StateView from GY 2002 to GY 2008. At this time, the AV Board also made a decision not to recruit any more StateView members since there was no ability to fund new members. Therefore, from GY 2010 forward, AV's Full (funded) Member number has remained constant at 31. **In GY 2010**, AV had 39 StateViews with 31 Full Members, 3 Associate Members, and 5 Affiliates. **In GY 2011**, AV had 39 StateViews with 31 Full Members, 3 Associate Members, and 5 Affiliates. **In GY 2012**, AV had 39 StateViews, with 31 full members, 3 Associate Members, and 5 Affiliates.

Table summarizing AV's growth through GY 2012

StateViews	Entry Date*	StateViews	Entry Date*
Full Members		Full Members	
1 AlabamaView	2004	17 MississippiView	2007
2 AlaskaView	2003	18 MontanaView	2004
3 ArkansasView	2002	19 NebraskaView	2003
4 CalView	2006	20 New Hampshire View	2008
5 ColoradoView	2008	21 North Carolina View	2008
6 GeorgiaView	2002	22 North Dakota View	2004
7 Hawai'iView	2005	23 OhioView	1996
8 IdahoView	2007	24 PennsylvaniaView	2006
9 IndianaView	2004	25 South Dakota View	2002
10 IowaView	2007	26 TexasView	2002
11 KansasView	2002	27 UtahView	2008
12 KentuckyView	2006	28 VirginiaView	2004
13 LouisianaView	2006	29 West Virginia View	2002
14 MarylandView	2006	30 WisconsinView	2004
15 MichiganView	2007	31 WyomingView	2003
16 MinnesotaView	2007		
Associate Member			
32 New YorkView	2009		
33 VermontView	2009		
Affiliate Member			
34 ConnecticutView	2010		
35 NevadaView	2007		
36 New Mexico View	2006		
37 OregonView	2011		
38 Rhode IslandView	2011		
39 WashingtonView	2009		

*Year in which StateView was accepted as an Affiliate Member

Over the past five years, AV has continued to grow into a strong, functional, and collaborative national consortium. Hallmarks of the strength of AV's network include: 1) 98% of Full Members attend AV's annual Winter Business Meeting, 95% attend AV's optional Fall Technical Meeting, and 75% of StateView members attend optional monthly membership telecons (standing university teaching responsibilities decrease this percentage); 2) AV members freely and openly share their products and expertise to help advance all member state's remote sensing capabilities; and 3) over the past four grant

years (GY 2009-2012) AmericaView members contributed 4,600 hours to committee work to strengthen national collaborative endeavors and to share remote sensing information and knowledge.

In addition to the host institution in each member state, each state has created state consortia with 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.

Near the middle of GY 2012, AV's Outreach Committee completed a Communications Plan that will provide guidance for AV's outreach efforts for the next grant period. The Plan included: five main outreach issues facing AV, goals for resolving those issues, audience identification, preliminary messages and communication channels.



President Obama speaking about the importance of STEM education at the White House Science Fair in 2010. SATELLITES student scientist Suzan Shalhout (left, back row) was invited to attend, and had the opportunity to meet the president and several other top administration scientists and advisors. The SATELLITES program is partially funded by AV.

Outreach to underrepresented groups in the geospatial sciences

- **HawaiiView** gave a presentation in an Introduction to Geotech course which was part of a "Women in Technology" project in which 27 STEM teachers from middle and high schools statewide participated. This on-line project is specifically aimed at **native Hawaiians and Pacific Islanders**. (GY 2008)
- **MontanaView** recruited and welcomed the Salish Kootenai College (SKC - a **Native American Tribal College**) as a MTView consortium member, opening doors to a variety of activities that they would not otherwise have experienced. Through shared resources, MTView has made available to SKC a variety of teaching resources such as spectroradiometers, links to the national remote sensing network, and updates on USGS Land Remote Sensing Program to assist their geospatial curriculum. (GY 2008)
- **North Dakota View** continued to work with NDView members at the Turtle Mountain Community College (a **tribal college**) to develop an Associate's Degree in Geography. (GY 2008)
- Members of the **MississippiView** consortium initiated a pilot summer camp program that was conducted in partnership with Youth Opportunities Unlimited (Y.O.U.) which is an "**at-risk**" **youth program** serving economically depressed areas of the state, the vast majority of participants were African-American students. (GY 2008)
- **New MexicoView** developed and presented a one day remote sensing short course hosted by New Mexico Highlands University (NMHU). Of the student body at NMHU approximately 54% are **minority** (Hispanic) and nearly 60% of all students are **low-income** and receive financial aid. (GY 2008)

- **South Dakota View** participated in a set of GPS activities for a Ready, SET (Science, Engineering and Technology), Go workshop for **high school girls**. (GYs 2008 and 2011) In a similar event named GEMS (Girls - Engineering, Math and Science), SDView offered a program for approximately 100 **middle-school girls**. (GY 2008)
- **South Dakota View** also offered a program for participants of the TRiO program at SDSU, a program that serves and supports low-income, **first-generation college and disabled students** with their academic progress. (GY 2008)
- **KansasView** continued assisting the **Haskell Indian Nations** University's Department of Geography in improving its geospatial education offerings. (GY 2010)
- The **Salish Kootenai College** joined the **MontanaView Consortium**. MontanaView PI Rick Lawrence worked with a student from the Three Affiliated Tribes to structure her research project on land use change on the **Fort Berthold Reservation** in North Dakota. (GY 2010)
- **North DakotaView** has completed assistance with obtaining and completing a 3-year NSF grant to improve geospatial technology education at Turtle Mountain Community College (TMCC) that serves the **Turtle Mountain Chippewa**. (GY 2010)
- **South DakotaView** members worked with three students from **Sisseton Wahpeton Tribal College** during the summer of 2010 on a lake water quality monitoring project. (GY 2010)
- **WyomingView** assisted with technology training and transfer at the Wind River Environmental Quality Commission through offering a graduate student scholarship to a Native American and assisting with mapping the surface area of Ocean Lake on the **Wind River Reservation**. (GY 2010)



Sisseton Wahpeton Tribal College Students Working on Lake Monitoring Project during the summer of 2010.

Increased Electronic Distribution of Remote Sensing Materials

With the combined StateView's web sites, along with the AV web site, blog, and Earth Observation site, AmericaView hosted more than 127,000 visitors and more than 244,300 page views during the reporting period. This information greatly enhanced the ability of decision makers, educators, scientists, and the general public to utilize remote sensing data and analytical tools.

Launching of Updated AV web site

AV updated its web site and re-launched it on January 13, 2011 with the assistance of a newly formed Website Subcommittee. The current version of the website reflects the growth and evolution of AV since its first website was created in 2003. The site was re-built on an open source code that would allow for future plug-ins of free modules, and allows committee representatives and other AV members to post information after minimal training. It was migrated to a Content Management System that would facilitate easier and more economical upgrades in the future. The site was upgraded and hosted by the Blacksburg Electronic Village at Virginia Tech that utilized student workers and drew upon the expertise of Dr. John McGee, VirginiaView State Coordinator and the Virginia Geospatial Extension Specialist. The site was upgraded with features such as testimonials on AV's Program Areas pages (<http://www.americaview.org/program-areas>), Landsat fact sheets rotating on AV's homepage (<http://www.americaview.org/downloadable-fact-sheets>), and the first pilot project on resource sharing

through posting 18 ERDAS IMAGINE version 10 labs and one eCognition version 8 lab for consortium member's and other educator's use (<http://www.americaview.org/remote-sensing-curriculum-and-exercises>).

Launch of AV Blog



AV launched its [blog site](#) in the fall of 2010 thanks to the efforts of the Technology committee (including Tyler Erickson, Sam Batzli, Dayne Broderson, and Arthur Endsley). As of March, 2011, posts to the AmericaView Blog were automatically cross-posted to Planet Geospatial (planetgs.com) which has resulted in many more visits to the AV Blog site. AV Blog posts include a description of the availability of Landsat Tutorials on [ColoradoView's Training Page](#) (see image to left). Since its launch, AV's blog has received more than 36,500 page views.

Since the majority of AV's research is applied research, it is critically important that its research findings are shared with decision-makers, resource managers, and other researchers. Examples follow to illustrate the types of conferences, state planning meetings, and statewide or regional geospatial data meetings that AV presented and interacted with participants at:

- Alaska Surveying and Mapping Conference
- ASPRS (national and regional meetings including Pecora with an AV panel at Portland)
- AAG (national and regional meetings)
- Space Grant regional meetings
- Rocket City Geospatial Conference, AL
- Applied Geography Conference, AL
- Alabama Forestry commission
- Arkansas Oil and Gas Commission
- Center for Disease Control and Prevention
- Atlanta Regional Commission
- Bureau of Indian Affairs, MT
- Columbia Regional Geospatial Service Center Workshop, TX
- East Texas Forest Entomology Seminar
- Arkansas Public Lectures in Space and Planetary Sciences
- Greater Ozarks Terrestrial Habitat Mapping Meeting in West Plains, MO
- Upward Bound Science and Math Meeting, AR
- Environmental and Spatial Technologies (EAST) Conference, AR
- The IdahoView coordinator participated in ~15 meetings in and around Idaho to help integrate IdahoView with state and

regional efforts to establish geospatial resource centers

- Indiana GIS Conference
- Iowa Geographical Informational Council Conference
- Kansas Precision Agriculture Conference
- Kentucky Geospatial Summit
- Remote Sensing and GIS Workshop for Louisiana
- Louisiana Hurricane Season National and Local GeoSpatial/Imagery Data Availability: Data Mining Workshop
- LaGIS Council meetings
- Louisiana National Guard
- Mid-Atlantic Space Grant Consortium meeting
- Maryland Space Business Roundtable
- Towson University GIS Conference (MD)
- Minnesota GIS/LIS Consortium
- North Dakota Chapter of The Wildlife Society
- Nebraska Floodplain and Stormwater Managers Association
- Intermountain GIS Conference
- Great Bay Watershed at GIS Day (NH)
- University of North Dakota Center for Community Engagement
- IAGLR (International Association for Great Lakes Research)
- MAGIC (Mid-America Geographic Information Consortium)
- South Dakota Geospatial Conference
- Texas National Guard
- Wyoming Weed & Pest workshop
- Wyoming Agricultural Experiment Station
- GIS in the Rockies Conference
- Kentucky Association of Mapping Professionals
- IHL Remote Sensing Council , MS
- Nebraska Natural Resource District (NRD) GIS Working Group
- Southwestern GIS Users Group (SWUG)
- Alabama Department of Economic and Community Affairs (ADECA)
- Mid-Atlantic Land Use/Land Cover Conference
- Wyoming Landscape Conservation Initiative (WLCI) meeting
- US Space and Rocket Center to help populate Virtual Alabama with critical mapping infrastructure data
- Geologic Survey of Alabama
- State Land Information Board, AR
- USGS Mid-Continental Mapping Center in Rolla, MO
- Arkansas Natural Heritage Commission
- Arkansas Geographic Information Office
- US Department of Transportation Research and Innovative Technology Administration (USDOT-RITA)
- Michigan Department of Transportation through the final phase of the TARUT (Transportation Applications of Restricted Use Technology Study) remote sensing study
- Ohio Aerospace Institute
- Ohio Board of Regents and the Chancellor of Ohio universities
- Ohio Department of Education
- Ohio Geographically Referenced Information Program (OGRIP)
- Wisconsin Land Information Association (WLIA)
- Energy Resources and Produced Water Conference, Laramie, WY

Presentations at state, regional and national conferences often involved StateView-sponsored graduate student research, or research accomplished by the PIs and their graduate students. In both cases, benefits accrued to the StateView PI, their students, and the larger and more diverse national geospatial community in attendance, and supported the critically important task of developing the future US work force.

On March 27, 2013, AV sponsored two special sessions at the ASPRS Annual Conference in Baltimore, MD. AV Vice Chair Russ Congalton moderated a session with four AV presentations on Applied Remote Sensing and AV Chair Rebecca Dodge moderated a session on Education/Outreach in Remote Sensing with five presentations. See more details on these events under the GY 2012 Annual Meetings summary in Section IV.

2013 saw the launch of Landsat 8, and AV members were on hand to witness this great (and long awaited) achievement. Three AV PIs traveled to participate in the launch of Landsat 8 in California and four AV members participated in the ceremony in May, 2013 when the US Geological Survey assumed operation of the LDCM mission from NASA. See more details on these events under the GY 2012 Outreach Summary.

Numerical Summaries and Benefits for AV's Consortium Building and Outreach Activities (See activity numerical summaries by Grant Year in Appendix A)

In GY 2008-2012, StateViews engaged in **126 activities to strengthen StateView consortia** through activities such as:

- Shared software licenses among other state consortia members (32 activities)
- Trained faculty members among consortia members and within their own institution (36 activities)
- Promoted opportunities for collaborative research among consortia members (29 activities)
- Strengthened StateView consortiums through mechanisms such as MOUs or hiring a StateView coordinator (29 activities)

Benefits of activities. Sharing licenses 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. Collaborative research leveraged scarce research funding and broadened the scope and effectiveness of research endeavors. Collaborative programs also fostered new research opportunities.

In GY 2008-2012, StateViews engaged in **63 activities that financially leveraged the prime award** through activities such as:

- Funding training grants for K - 12 teachers and college faculty in RS technology and applications (18 activities)
- Partnering with other institutions that sponsor training (e.g., Space Grant, Extension agents, insurance companies, 4H, etc.) (39 activities)
- Leveraging other non-AV funded projects (such as NSF grants or state data buys) to purchase data to be placed in public archives (6 activities)

Benefits of activities. Training grants for teachers leverage AmericaView base funding for training and development activities. "Training the Trainer" is one of the most effective returns for dollars invested in educational endeavors and AV trained or provided curriculum for 1,366 K-12 teachers during Grant Years 2009-12. Training K-12 teachers is essential for successful integration of geospatial technology in post-college classrooms. Partnerships leveraged resources and extended the effectiveness of the state consortia. Leveraging other projects supplemented ongoing efforts by StateView personnel to add imagery to their archives.

In GY 2008-2012, StateViews engaged in **124 activities that utilized and maximized the expertise and products of the national consortium** by engaging in activities such as:

- Shared remote sensing curricula developed by one StateView with others (22 activities)

- Collaborated and submitted multi-StateView requests for regional or topical grants such as invasive species, coastal risk mapping, agricultural pests, etc. (9 activities)
- Improved and maintained in-state remote sensing capacity through regular conference calls and conferences (40 activities)
- Contributed to statewide geographic data committees (52 activities)

Benefits of activities. Shared curricula reduced the efforts involved in developing new curricula and lab exercises. Regular communication at the StateView level has resulted in improved consortium activity, effectiveness, and remote sensing knowledge exchange. 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.

Program Area 3: Research

NLRSEORP Objective 4: Promote research and remote sensing experience at the university undergraduate and graduate level to increase numbers and visibility of graduating students with employment skills in remote sensing.

Overview of AV’s Research Accomplishments

AV utilized its expertise to complete applied research projects to assist with pressing decision-making needs at the state level. AV’s faculty-directed graduate and undergraduate research experiences supported training and mentoring of the next generation of scientists. Annual Fall Technical Meetings and monthly teleconferences/webinars allowed the sharing of research expertise within the AV Consortium. Since 2008, AV has completed 351 research activities.

AmericaView Research Activities						
	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012 [1]	GY 2008-2012
Number of Activities	82	69	74	77	49	351

[1] Goals for activities changed in GY 2012 to focus on fewer, High Impact Activities.

Activities related to remote sensing research/application projects are a function of individual state needs and the research expertise of the StateView. Each StateView, therefore, has a unique research emphasis closely tied to the needs of its particular state. StateView PIs have conducted research and developed applications over the past ten years in critical scientific and management areas including:

- Ecological monitoring
- Climate change
- Agricultural management
- Wildfire risk assessment
- Vegetation phenology
- Wetland function
- Invasive species monitoring
- Land use/land cover change
- Natural hazards
- Water quality monitoring
- Transportation management

By and large, research projects are expensive and time consuming relative to available support, and projects that depend *solely* on AmericaView funding are essentially non-existent due to their cost. Thus, *partnership-based research activities* predominated in GY 2008-2012, meeting shared goals of AV's academic, government agency, and NGO partners. The majority of AV research projects support undergraduate or graduate student's education and professional preparation. For example, seven



In GY 2011, Virginia View integrated Landsat imagery into a layer within the InFOREST online mapper. This server-based web mapping application was designed to provide landowners, natural resource planners, educators, and the public with access to local forest ecosystem information. InForest is available at www.inforest.frec.vt.edu. At the close of this 5-year grant period, the application is still in use and is being moved to a new platform will enable InFOREST to operate on an array of devices, including smartphones, tablets, etc. that will expand its use for mobile and real time applications.

StateViews reported hiring 15 students during GY 2010. Projects completed by the students included: developing educational materials for geospatial classes, assisting with preparing for a hurricane response workshop, preparing Landsat and other publicly available imagery for analysis and distribution to the public (including on their StateView websites), collecting field data for validation of land cover and vegetation maps, developing software for analyzing landscape fragmentation, learning new geospatial software, linking oral history collection with geospatial location and displays via Google Earth, and providing real-time satellite ephemeris and sensor imaging geometry data through the web. Through these efforts, students gained valuable work skills and solidified their theoretical understanding of the field of remote sensing.

Natural resource management activities that utilize moderate resolution data dominated research activities. An increasing number of states were involved with partners in natural disaster projects to develop tools and products that could be more readily and rapidly used in the field or by decision

makers. These applied research activities related to natural disaster projects are described on pp. 10-11. Several StateView PIs contributed to sensor design research to address sensor engineering and refine application utility.

A remote sensing basic science research endeavor was completed by Dr. Jungho Im (New YorkView). In GY 2011, New YorkView completed a project entitled “Development of Tools Synthesizing Advanced Machine Learning Approaches for Remote Sensing Classification”. This project incorporated recently developed classification methods into a free, publicly available software package to make these methods readily available to the broader remote sensing community beyond researchers and developers. As of the close of this grant period, AV’s Research Committee is working with Dr. Im with the goal of publishing his results in a peer-reviewed journal.

In GY 2012, AmericaView coordinated the efforts of five StateViews and submitted a proposal to the North Central Climate Science Center to launch a PhenoCam project that will link efforts between the PhenoCam Network and remote sensing science and imagery.

In May 2013, co-editors Rebecca Dodge and Russ Congalton (AV Chair and Vice Chair) collaborated with the American Geosciences Institute (AGI) to publish a summary piece on remote sensing applications entitled “Meeting Environmental Challenges with Remote Sensing Imagery”. The booklet starts with an overview of how remote sensing imagery is enabling scientists, engineers, policymakers, and others to meet the environmental challenges resulting from interactions between environmental change and human activities.

The booklet includes 22 case studies (17 contributed by AV members) to introduce applications of satellite imagery to issues that affect the environment and human society including: weather and geological hazards, land use/land cover and water resource change, climate variability, resource development, and environmental restoration. Copies were made available to the Land Remote Sensing Program. Additional print copies can be purchased if needed from AGI at <http://www.americangeosciences.org/environment/publications> or an electronic version is available online at <http://www.americangeosciences.org/sites/default/files/RemoteSensing.pdf>.

Numerical Summaries and Benefits for AV’s Research Activities (See activity numerical summaries by Grant Year in Appendix A)

In GY 2008-2012, StateViews engaged in **163 activities that developed new applications or uses for Remote Sensing data** through activities such as:

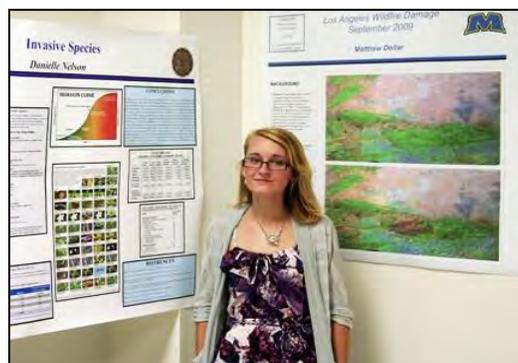
- Collaborated with agency personnel (or private companies) to assess utility of satellite data for monitoring and mapping activities that were not previously performed using satellite imagery (59 activities)
- Collaborated with researchers within or between other StateViews (32 activities)
- Found innovative uses for remotely sensed data – apart from routine mapping applications (24 activities) Examples include:
 - CalView used MODIS data to assess canopy water content and evapotranspiration in almond and pistachio orchards. (GY2008)
 - KansasView used MODIS time-series vegetation index data to map and characterize agricultural vegetation in the Central Great Plains. (GY2008)
 - KentuckyView used Landsat imagery to study ice storm impacts on Kentucky forests.
 - MinnesotaView researched land cover classification with AWiFS data and monitoring lake water quality properties with MERIS data. (GY2008)

- South DakotaView used NAIP imagery to locate new residences and streets. SDView also worked with the Water Resources Institute at SDSU to evaluate the potential of Landsat and other imagery for water quality assessments. (GY2008)
- South DakotaView personnel assisted a PhD student in the acquisition of AWiFS imagery for crop residue mapping through the AmericaView/USDA FSA agreement. (GY2009)
- WyomingView supported class projects that demonstrated the value of multi-temporal Landsat imagery for monitoring lakes, wildfires, rangeland, and cropland. The PI presented some of these findings to state agencies to highlight the potential of Landsat data for environmental monitoring. (GY 2009)
- AlabamaView funded a graduate student to map algae concentration as an indicator of Lake eutrophication in Lake Martin, Alabama. He used field spectroradiometer data and the reflectance in the channels matching band 3 on Landsat 5. (GY 2010)
- MinnesotaView acquired MERIS data that proved to be an excellent source of data for monitoring lake water chlorophyll.
- Flooding along the Missouri River was a major event in South Dakota during the summer of 2011. Change detection algorithms were used in conjunction with Landsat imagery to highlight the areas along the Missouri River that were covered by water in 2011, but not in 2004, a year of historic low water levels. (GY2010)
- The WyomingView PI supervised student interns in the following projects:
 - Use of Landsat images for assessing wildfire damage. The trade-off of using non-anniversary Landsat images (immediately prior to- and after the- fire) for assessing fire damage was evaluated.
 - A Landsat image was used to characterize the spectral differences in Salt cedar stands along the Powder River Basin.
 - Six years of Landsat images (1 image/year) were used to monitor the impact of beetle attack on Lodge pole pine stands in the Medicine Bow National Forest. (GY 2010)
- AlabamaView funded a graduate student to map algae concentration with Landsat as an indicator of Lake eutrophication in Lake Martin Alabama. (GY2011)
- ColoradoView staff and student interns worked with researchers on a project related to invasive Tamarisk in Southeastern Colorado. This research used remote sensing data including Landsat to detect and predict invasions by this species. The interns developed tutorials that coincided with processes used in the image analysis that are posted on the ColoradoView website using Colorado-specific data. (GY2011)
- South DakotaView worked with a South Dakota farmer/rancher who, along with several neighbors, had experienced a range fire that burned a very large area in south central South Dakota on September 19, 2012. A search was made for imagery that would document the extent of the fire for insurance purposes. Landsat 7 imagery was available, but the gap-filling process did not result in a satisfactory product for insurance purposes. SPOT imagery was also available, but could not be shared with the farmer/rancher because of licensing restrictions. The cost of the imagery was beyond what they were willing to pay (two scenes would be required for the burn area). (GY2011)
- Developed software to support distribution of satellite, airborne, and geospatial data (21 activities)
- Posted methodologies or tools for other StateViews to use or test (15 activities)
- Sought commercialization opportunities for tools and data in order to enhance technology transfer (5 activities)

Benefits of activities. These activities expanded the utilization of public investments in remote sensing imagery such as Landsat. These projects helped to get satellite data into the hands of partners and the public. These efforts reduced duplication, saved limited funding resources, and resulted in higher productivity by AV consortium members. Technology transfer of methodologies developed in the academic sector to the commercial sector strengthened the nation's economy and productivity.

In GY 2008-2012, StateViews engaged in **172 activities that utilized research efforts to improve education for university students** through activities such as:

- Awarded scholarships to students to promote remote sensing research including students in under-represented groups (women, ethnic minorities and first generation college students) (24 activities)
- Promoted use of StateView archived data in classroom research (term projects) – where students would not have had such an opportunity for use in the absence of free data (64 activities)
- Supported student publications or presentations in university forums (32 activities)
- Promoted research competitions (11 activities)
- Served on MS/PhD committees or otherwise advised, guided, and encouraged students to use remote sensing approaches. AV involved undergraduate and graduate students in the majority of its research activities. Additionally, through serving on graduate committees, AV's PIs assisted introducing the utilization of remote sensing technologies to disciplines throughout their universities in departments such as: Space and Planetary Sciences, Entomology, Geography, Physics, Environmental Science, Geology, Biology, Criminal Justice, Communications, Earth System Science, Computer Science, Civil Engineering, Renewable Resources, Botany, Rangeland Ecology, and Watershed Management. (41 StateViews reporting)



KentuckyView sponsors a semi-annual geospatial-themed poster session for undergraduate students.

Benefits of activities. These activities effectively advanced the nation's need to support STEM education fields, including under-represented groups in those fields, and prepared the next generation of remote sensing scientists that will address our nation's management issues. These activities improved education for university students through: a) creating internships (and possible future job opportunities) located within natural resource management agencies and private businesses that are StateView consortium partners, b) improving university research through interacting with USGS and other agency scientists, and c) sharing remote sensing scientific knowledge within the AV Consortium that PIs shared with their students.

In GY 2008-2012, StateViews engaged in **20 activities related to submitting and/or publishing their AV-funded research results in peer-reviewed journals.**

Benefits of activities. These publications assist in advancing the science of remote sensing analysis, applications, and the usage of public and emerging remote sensing imagery.

Program Area 4: Education

NLRSEORP Objective 5: Develop materials for and conduct or participate in appropriate educational and training organizations, curricula, programs, workshops, meetings, seminars, as well as technology transfer and outreach activities.

Overview of AV’s Educational Accomplishments

AmericaView’s education activities have been central to the organization’s mission. From GY 2008-2012, all funded StateViews continued to support education activities of various types, including K-12, higher education, or professional development. 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 have actively trained numerous sectors of the current and future workforce, including:

- 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

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) program
- Seminars and workshops

Since 2008, AV has completed 512 education activities.

AmericaView Education Activities						
	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012 [1]	GY 2008-2012
Number of Activities	116	111	113	106	66	512

[1] Goals for activities changed in GY 2012 to focus on fewer, High Impact Activities

AV has improved remote sensing teaching opportunities at the university level through sharing lesson plans and lab materials for annually changing remote sensing software analysis packages so that our graduates are competitive and more effective in their new jobs. Support provided by the AV Consortium has resulted in the establishment of 27 new university-level remote sensing courses or

programs at AmericaView member universities that will advance remote sensing education throughout the country. Teaching resources such as information about the Landsat Program or imagery for lesson plans are shared via the AV network and strengthens the robustness of remote sensing education across the U.S. Several StateViews have provided teaching resources for community colleges that have limited accessibility to expensive satellite imagery processing software.

A number of StateViews that continued to maintain an archive continued to encourage and enable the use of their data for teaching purposes. AV provided access to state-specific imagery from StateView archives regularly as part of remote sensing courses taught by consortium member institutions, eliminating the time required for initial processing that would be necessary if the data were accessed via USGS [EarthExplorer](#) or [GloVis](#) sites. These data were used in a wide range of student-developed project applications across the country, focused mostly on natural resources management issues such as forest and range management, agricultural productivity assessment, drought monitoring, land use/land cover change analysis, and coastal zone monitoring.

Online education has been growing in popularity for a variety of reasons, including the increasing cost of traditional education, less rigid time requirements, and the flexibility of not being tied to a specific geographic location. AmericaView responded with the multi-state sponsored '[AmericaView University](#)' web-based project, offering a model for multi-state, collaborative online education that was launched in 2008. AV University is a collaborative effort initiated by CalView and has been advanced by Dr. J.C. Seong of GeorgiaView. AV University has 16 modules designed to cover the needs of introductory image interpretation and processing as identified by the course developers who have taught geospatial sciences at the university level for many years. AV University will be updated in the next 5-year grant (GY 2013- 2017) period. Since its launch in GY 2009, the online AmericaView University had 808 users access the site, and 206 users actively explored course contents in order to improve their remote sensing image interpretation and processing skills. This included many instructors who downloaded instructional materials to improve the content of their remote sensing courses.

AV Education Resource Web Portal – In GY 2011, Ms. Milda Vaitkus, NebraskaView State Coordinator, coordinated efforts with the AV Education Committee and inventoried more than 200 educational resources produced by AV over the prior ten years. In GY 2012, Dr. John McGee, VirginiaView Co-Investigator, established a beta site for [AV's Education Resource Portal](#) and uploaded over 90 educational resources with the ability to search for educational resources via fields such as grade level, type of resource (e.g. lecture, lab, video), software requirements, and type of imagery (e.g., Landsat, MODIS). At the close of GY 2012, that beta link is in the final test stage and will be made live in the following grant period.

Home » Resources »

Sort by: Title | Order: Asc | Target Audience: Higher Education | Software Requirements: <Any> | Type of Imagery Used in Exercises: Landsat

Type of resource: Tutorial | Affiliation: <Any> | Search: Search Terms

Apply | Reset

- Calculating Vegetation Indices from Landsat 5 TM and Landsat 7 ETM+ Data** ☆☆☆☆

Author(s): Grant J. Firl and Lane Carter
 Affiliation: ColoradoView
 Date: 11/30/2010 Download Access: Public Access
 Course Material: No Resource Type: Tutorial
 Audience: Higher Education
- Classification** ☆☆☆☆

Author(s): Jay Morgan
 Affiliation: MarylandView
 Date: 07/31/2011 Download Access: Public Access
 Course Material: No Resource Type: Tutorial
 Audience: High school, Higher Education
- Compositing Landsat Data** ☆☆☆☆

Author(s): Grant J. Firl
 Affiliation: ColoradoView
 Date: 11/30/2010 Download Access: Public Access
 Course Material: No Resource Type: Tutorial
 Audience: Higher Education
- How to Bring Landsat Data into ArcGIS, Mosaic and Clip Scenes** ☆☆☆☆

Sample page from AV Education Resource Web Portal (still in beta version) at <http://www-test.americaview.org/resources>

One of AV's goals is to excite the next generation of scientists with its K-12 education activities. AV has introduced K- students to the value of satellite imagery in their daily lives and the integration of geospatial sciences in STEM (Science, Technology, Education, Mathematics) into their education. This is vitally important given the poor position that the U.S. is in currently with regard to STEM proficiency.¹ AV has assisted K-16 teachers with integrating remote sensing curricula with national and state standards in states including Texas, Hawaii, and Ohio.



Earth Observation Day (EOD) is an AV consortium-wide event designed to highlight the use of remote sensing as an effective, exciting, and powerful educational tool in K-16 educational and informal environments. First launched by AV and the USGS in 2007, EOD was updated with online curriculum by the Education Committee assisted by AV's USGS Liaison and EROS Center staff and contractors. In GY 2008 and 2009, educational materials, including lessons designed for K-12 science teachers and students, and a series of posters using USGS imagery to distribute to schools were

¹ Only 16 percent of American high school seniors are proficient in mathematics and interested in a STEM career. The United States is falling behind internationally, ranking 25th in mathematics and 17th in science among industrialized nations. (<http://www.ed.gov/stem>)

posted to a stand-alone website that were then migrated to the AV website at <http://americaview.org/earth-observation-day>.

- In GY 2010, 14 states participated, involving 42 in-service and 26 pre-service teachers and 1,494 students. EOD and Education Committee efforts included initial design of five lessons for K-12 science teachers, a set of three posters for all 50 states available on the EOD web site to support projects, and ideas for implementation. In GY 2010, the EOD web site had 3,156 unique visits; 2,384 first time visits; and 772 return visits. The visitation by 2,384 first time visitors indicated the effectiveness of this outreach mechanism and the continued interest in this educational activity.
- In GY 2011, EOD was celebrated on April 11th, 2012, with 11 states participating. Approximately 75 K-12 in-service and pre-service teachers participated. Along with the teachers, at least 670 students took part in the event. Although the vast majority of students were in K-12 classrooms, there were also some participants from higher education. Students were supported by a range of lessons provided on the AmericaView EOD web site and accompanied by tutorials developed by AmericaView PIs.
- In GY 2012, 16 StateViews participated in EOD and engaged 57,076 students or members of the public and 553 teachers. Please see Appendix D for more detail. Highlights included:
 - Magnetic Landsat Mosaic State Puzzle, Aerial Photography City Quiz, Landsat Mosaic cake (CalView)
 - Viewing of the LDCM launch video followed by a Google Earth exercise, exercises for high school students involving geographic coordinates, measurements, change detection, and object delineation (GeorgiaView)
 - Three day field camp exercise in remote sensing by measuring, recording, and analyzing changes in features such as snow pack, at the McCall Outdoor Science School (IdahoView)
 - Utilizing the [Satcam](#) application “Where are You?” The SatCam application lets you capture observations of sky and ground conditions at the same time that an Earth observation satellite is overhead (MississippiView)
 - Discussion of Landsat applications to water, fire, and pest management with high school students (New MexicoView)
 - University level exercises including taking surface temperature and GPS readings (via GLOBE Protocols), completion of Land Use / Land Cover maps of colleges and universities, and uploading of a campus to Open Street Map (PennsylvaniaView)
 - Developed TEKS resources with links to teach High School Earth and Space, using resource layers developed for State Parks throughout the state (see fact sheet on TexasView’s EOD activity in Appendix F)
 - University students participated in the EOD SATELLITES Surface Temperature Field Campaign in conjunction with scientists from Greece, used IRTs, GPS units, and Landsat RGB and thermal subsets covering their local area (West VirginiaView)



In WyomingView 2012 EOD activities, students worked in teams and measured spectral reflectance values in ten different regions of the EMR, calculated percent reflectance and plotted the reflectance curves of four different leaves with an ALTA spectrometer. See: <http://wyomingview.blogspot.com/2013/04/eighth-graders-measure-and-analyze.html>

- Offered hands-on demonstrations of satellite imagery visualization for kids and parents (WisconsinView)
- Hands on learning opportunities with the Electromagnetic Spectrum and water resources for junior high students (WyomingView)

“Ramesh Sivanpillai from the University of Wyoming in Laramie has been presenting information about remote sensing to my classes for several years. My 8th grade physical science class is an introductory class for physics and chemistry In my assessment of the two 90 minute sessions my students continue to be excited about remote sensing and the tools, both simple and complex, that are able to detect different frequencies of the electromagnetic spectrum.”

-- Mr. Ron Whitman, eighth grade physical sciences teacher, Laramie Junior High School

Numerical and Benefit Summaries for AV’s Educational Activities (See activity numerical summaries by Grant Year in Appendix A)

In GY 2008-2012, StateViews completed **141 activities that strengthened general remote sensing university education** by engaging in activities such as:

- Sharing licenses for image processing software (13 activities)
- Sharing course materials developed at one university with other universities (30 activities)
- Encouraging/enabling use of data from the StateView archive for teaching purposes (50 activities)
- Funding short courses in some aspect of remote sensing (11 activities)
- Delivering guest lectures in other disciplines to promote the utility of remote sensing (35 activities)
- Promoting recruitment of new remote sensing faculty (2 activities)

Benefits of activities. The first three activities leveraged limited education dollars. Shared materials saved valuable time and effort, strengthened existing course offerings, and led to the development of new courses that would not otherwise be possible. Utilization of archived and free data for teaching purposes strengthened course content and advanced college-level remote sensing image processing and analysis skills across the United States. Short courses provided professionals with a quality educational experience in a limited time-frame, and allowed them to bring remote sensing analysis skills to bear in their workplaces. These workforce training opportunities have improved our county’s capacity to deal with increasingly complex management issues, enhanced the employability of our workforce, decreased unemployment, and filled high growth sector job openings. Guest lectures provided an important outreach element to non-geospatial disciplines, creating increased opportunities for interdisciplinary applications for remote sensing technologies.

In GY 2008-2012, StateViews engaged in **42 activities that provided training programs for the future workforce** (for students in universities and colleges) through activities such as:

- Offering hands-on training opportunities for students in government agencies, the private sector, or other educational institutions (7 activities)
- Funding stipends to encourage students to pursue a remote sensing component of their education (19 activities)
- Developing training programs that address topical ideas tailored for specific state and discipline needs (16 activities)

Benefits of activities. Internships offered invaluable learning experiences for students, strengthened the employment marketability of graduates, and often supported a critical remote sensing need within

partner agencies and organizations. Because many students experience financial challenges, stipends and scholarships often fill a critical need in their remote sensing educations and allow them to pursue minors or develop remote sensing analytical skills that they would not otherwise be able to complete in the normal course of their college education. Training programs focused on specific needs also enhanced students' marketability in the rapidly changing geospatial work sector.

Through this WyomingView internship I have learned and worked with many challenges of acquiring, organizing, and maintaining a collection of Landsat imagery for the state of Wyoming. The Landsat data in this collection are from diverse sources over many years, some of it older imagery in forms such as nearest neighbor, which may not be available from any other source. Quality control carefully examined for errors, header information, and various other factors which determine the usefulness of this data. The goal is to encourage the use of Landsat imagery by making it available in a form easily used by people of diverse levels of expertise in working with remote sensing data.

- Michael L Pritchard (Masters special student, University of Wyoming)

In GY 2008-2012, StateViews engaged in **123 activities that trained personnel in the current workforce in the use of remote sensing data and applications** through activities such as:

- Preparing and delivering short courses for government agencies, private companies, extension agents, private citizens and students (60 activities). Examples of audiences, topics, and StateViews that taught the current workforce training follow:
 - Alabama Department of Economic and Community Affairs (unsupervised classification of water bodies); AlabamaView
 - Arkansas GIS User Meeting (introduction to Object-based Image Analysis); ArkansasView
 - GIS/Project Learning Tree Workshop (geospatial science and technology workshop for K-12 teachers); KentuckyView
 - USGS (introductory and advanced remote sensing for wetland identification); LouisianaView
 - Louisiana Hurricane Season National and Local Geospatial/Imagery Data Availability: Data Mining Workshop. Attendees included: USGS Natural Hazards Response program, NOAA National Weather Service-Lower Mississippi River Forecast Center, FEMA Region 6, USGS National Wetlands Research Center, University of Louisiana at Lafayette Mobil Emergency Response Unit, USGS EROS Hazards Data Distribution-International Charter-Remotely Sensed Image Access, US Army Corp of Engineers-New Orleans District, Louisiana National Guard, Department of Homeland Security, Louisiana Governor's Office of Homeland Security and Emergency Preparedness, Regional Application Center-LouisianaView (overview of the data clearinghouses, applications, and data acquisitions of federal and state agencies which collect and host geospatial data, as well as operations and planning updates for the upcoming hurricane season); LouisianaView (GY 2008-2012)
 - Maryland State Geographic Information Committee (Introduction to Remote Sensing Workshop); MarylandView
 - US Forest Service (focusing on forest type and structure mapping in support on habitat modeling. The training was focused on the lynx recovery team, but also involved a wildlife biologist, silviculturist, and geospatial analyst); MontanaView
 - NOAA National Estuarine Research Reserve and U.S. Fish and Wildlife Service (Assessing the Accuracy of Remotely Sensed Data); New HampshireView

- National Weather Service, DNRC, County Commissioner and two county employees, Agricultural producers (Remote Sensing Applications for Natural Resource Management); MontanaView
 - Nebraska Department of Natural Resources (National Hydrography Linear Referencing Workshop)
 - 'Optimizing Digital Information for NebraskaMAP' (training participants on the creation of geospatial metadata for inclusion in the state-wide data portal. The eight participants represented the Nebraska Game and Parks Commission, the State Surveyor's Office, a county Assessor, City of Grand Island GIS, Nebraska Department of Health and Human Services and a private consultant).
 - Spatial Applications and Research Center (remote sensing short course); New MexicoView
 - NRCS soil scientists (a week-long pilot remote sensing course); West VirginiaView
 - Georgia Department of Transportation (a week long course in GIS, including utilization of satellite images for environmental assessment, and digitizing satellite images and aerial photos); GeorgiaView
 - U.S. Census Bureau (to familiarize census staff with new data, software and the use of geospatial tools); MississippiView
 - Wind River Environmental Quality Commission, a tribal governmental agency (use of remote sensing software and applications); WyomingView
 - Society of Wetland Scientists - South Central Chapter (application and uses of remote sensing and GIS for use in wetland studies); MississippiView
 - "TexasView Fundamentals of Image Processing workshop" in conjunction with the Texas GIS Forum in Austin, Texas. Participants represented the private sector; local, state and federal government; and academia.
- Providing periodic follow-on support (answering questions through telephone, e-mails etc.) to those trained via the above short courses (33 activities)
 - Developing web-based tutorials, FAQs and 'how-to' materials (30 activities)

Benefits of activities. AV has been responding to the critical need for providing workforce training skills needed in 21st century, through its special emphasis on the Geospatial Technologies area that has been identified as a "High Growth Industry".² AV has offered short courses that provide professionals with a quality educational experience in a limited time-frame, allowing them to efficiently maximize their time and effort. AV has also provided ongoing technical support that is critical to a large segment of the non-remote sensing professional community, and that can make the difference between using remote sensing data and technologies successfully, or not using them at all. Because of their academic positions, StateView PI's and coordinators have been available to answer questions, provide feedback, and otherwise provide follow-up support to those that they've already trained. The willingness on AV's part to sustain contact with participants resulted in added effectiveness, and strengthened the partnerships that are the basis of successful professional development and training. Web-based

² The Department of Labor's Employment and Training Administration (ETA) tagged Geospatial Technologies as a "High Growth Industry" in March of 2010. The ETA . . . has estimated that the geospatial technology profession will experience a growth of over 330,000 geospatial professionals between 2008 and 2018. This growth figure would bring the number of geospatial professionals to just under 1.2 million and is supported by similar estimates by other geospatial organizations. As quoted by the Geospatial Information & Technology Association (GITA), "uses for geospatial technology are so widespread and diverse, the market is growing at an annual rate of almost 35 percent, with the commercial subsection of the market expanding at the rate of 100 percent each year." <http://www.directionsmag.com/articles/geospatial-technology-the-land-of-milk-and-honey/175871>

tutorials and materials were critically important as aids in circumventing technology (software) and analysis barriers for many non-technical users because these materials are easily available 24/7 and at the point in the day when the person in the workplace needs them.



On the left, TexasView PI PR Blackwell speaks with a Texas State National Guardsman during a training session in March 2009 at the Columbia Regional Geospatial Services Center. On the right, a guardsman and trainer examine aerial photographs to plan the day's mission.

In GY 2008-2012, StateViews engaged in **123 activities that improved STEM education and geospatial technologies in K-12 schools** through activities such as:

- Preparing and delivering guest lectures (to highlight remote sensing applications) and demonstrations (25 activities)
- Developing education workshops (31 activities)
- Organizing activities targeting 4-H, Boy/Girl Scouts, related youth organizations (11 activities) Examples include:
 - TexasView offered a land navigation and field orienteering workshop for individual Boy Scout and Girl Scout Troops. (GY 2008)
 - NebraskaView supported the 4H Big Red Summer Camp, an academic camp for high school seniors from across the country, during which they presented a half day workshop on "Mapping in the 21st Century - GPS, GIS & Satellite Images". (GY 2009)
 - VirginiaView helped design a geocoin to encourage geocaching and use of geospatial technologies in informal education. The geocoin and related activities was distributed to middle / high school educational communities, as well as informal groups (4-H, scouting, etc.) (GY 2010 and GY 2011)
- Sponsoring mentor programs for high-school students (3 activities)
- Supporting state educational standards (13 activities)
- Supporting pre-Service K-12 education (6 activities)
- Providing training for teachers during summer months – so that they will incorporate one or two lesson RS lesson plans in their classroom during the school year (23 activities)
- Developing lesson plans for remote sensing or to incorporate remote sensing in other disciplines (Geography, Botany etc.) (11 activities)

Benefits of activities. Guest lectures provided an important outreach element to K-12 educators and administrators through 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. K-16 teachers

need to be given an introduction to remote sensing and sample curricula because they cannot be expected to have the time to conduct independent research or develop curricula in such a specialized topic area. Teacher workshops are an essential element of introducing remote sensing and related geospatial technologies into the classroom, and are often the first step in adopting these tools into the larger curriculum. Summer workshops are one of the most effective ways to reach teachers and provide professional development, because teachers are busy during the school year. Because of their heavy workloads, teachers are much more willing to adopt and implement educational resources that are closely tied to their state standards. Remote sensing lesson plans help teachers and students understand the application of remote sensing and related geospatial technologies to other disciplines and how these lesson plans assist them with meeting state and national STEM education standards. The literature stresses the importance of introducing and exciting students about STEM topics by middle school or significant educational opportunities will be lost. This “window” for STEM education is one of the main reasons that AV focuses on introducing remote sensing science into K-12 education. “Informal” education and outreach activities introduced groups to the power and excitement of geospatial technologies in ways that may not be possible in the classroom, for instance in an outdoor setting where students can practice and experiment. These programs provided hands-on learning, often for students of reduced income or students who have other challenges.



Dr. Rick Landenberger, AmericaView Executive Director from GY 2008-2012, engages students at EOD 2010 at Oak Glen High School

“A new science was discovered by me that I can see relates to other sciences. I will always have remote sensing in my head when I wonder at night the field of science I may want to study.”

- A high school senior participating in a 2013 EOD event hosted by GeorgiaView

In GY 2008-2012, StateViews engaged in **83 activities that increased the public’s awareness of remote sensing imagery and technologies** through activities such as:

- Promoted understanding of geospatial data among public through activities such as Earth Observation Day (45 activities)
- Participated in museum and other public venue displays (10 activities) Examples include:
 - MarylandView provided Landsat posters of Maryland to the Maryland Science Center for GIS Day. (GY 2008)
 - NebraskaView presented an exhibit at the State Museum of Natural History as part of their “Sundays with a Scientist” series on using satellites to see the world in different ways. They showed how Landsat images can be used to monitor pivot irrigation and lake levels at the state's largest reservoir. (GY 2009)
 - [WI] In conjunction with the Cooperative Institute for Meteorological Satellite Studies at the Space Science & Engineering Center and Tandem Press, UW-Madison,

WisconsinView participated in the planning, design, production, and installation of satellite imagery and related educational material at a major exhibit entitled “Satellites See Wisconsin” at the Dane County Regional Airport opening February 11 and running until Sept 10, 2011. (GY 2010)



The “Satellites See Wisconsin” Exhibit filled the Dane County Airport Art Court from February 2011 through September 10, 2011. A number of the 1.5 million passengers that travel through the Airport each year were introduced to satellite imagery and the importance of such imagery in their daily lives. For more details on the exhibit, see <http://www.ssec.wisc.edu/airportexhibit> , and for more pictures see <http://www.ssec.wisc.edu/media/spotlight/seewisconsin/seewisconsinpix.html>.

- WisconsinView maintains two displays in the main elevator lobby of the 16-story AOSS (Atmospheric Oceanic, and Space Science) Building on the University of Wisconsin-Madison campus. Approximately 300-400 people enter and leave the building through the main lobby every weekday during the school year. One display is a computer monitor in a glass exhibit case that continually shows the USGS "EarthNow" Landsat-7 scrolling display in special USGS-authorized "Kiosk" public display mode. The other display is a semi-permanent large graphics poster display that describes the founding and legacy of satellite meteorology by Space Science and Engineering Center (administrative home for WisconsinView) founder, the late Dr. Verner Suomi. (GY 2012)
 - Initiated mass mailings, posters, StateView screen savers, etc. (7 activities)
 - Made presentations to service organizations (15 activities)
 - Used imagery in public venues such as museums, storefronts, etc. (15 activities)

Benefits of activities. 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 a very broad audience, in some cases (as in the WisconsinView example, above) to reach a “captive” audience, tie remote sensing into other genres such as art that will interest a broader sector of our citizenry, and illustrate 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.

IV. Annual Summaries for GY 2008-2012

GY 2008: September 30, 2008 – September 29, 2009 (December 31, 2009)

GY 2008 Funding overview: National vs. StateView

Grant funding for GY 2008 was \$960,000. Seventy one percent (71%) of those funds went directly to support StateView sub-awards and assistance for Affiliate Member travel. Sub-Awards for each of the 29 fully funded members for GY 2008 was \$23,989. This was a 47% reduction from GY 2007, when each of the 18 funded states received \$51,000. This per state reduction in GY 2008 was the result of the addition of 11 new StateViews in GY 2009, as well as the reduction in the total USGS award from \$1,274,000 in GY 2007 to \$960,000 awarded in GY 2008.

GY 2008 StateView members

Eleven new StateViews were welcomed as Full Members to AmericaView in GY 2008 to bring the number of fully-funded StateViews to 29 in GY 2008. Unfunded StateView members included three Associates (CO, NC & UT) and four Affiliates (NV, NY, VT & WA.)

GY 2008 Governance

The AV Board met monthly via teleconference or in person to provide leadership to the Consortium. In GY 2008, the AV Board of Directors devoted more than 800 hours in Board service to AmericaView. See Appendix C for a list of AV Board of Directors and staff for this Grant Year.

GY 2008 Committee activities

AmericaView achieved significant progress in the development of functional committees. During GY 2008, the Education Committee, the Outreach Committee, the Technology Committee, and the Research Committee were all strengthened significantly, and began to operate effectively to identify, coordinate, and share ideas that support new and innovative state and multi-state programs and projects. It is within these committees that many of AV's proactive, multi-state projects originate and see fruition.

GY 2008 AV national projects/activities

AmericaView was asked to testify at a Congressional House Committee hearing in Washington, DC on July 23, 2009. Three AV Board members presented information on the effectiveness of AV, the importance of AV's partnership with the USGS, and the importance of geospatial education and data delivery in the U.S.

Dr. Seong at West Georgia University initiated improvements of an on-line database for AV. The ability to enter information such as areas of research interest for PIs, remote sensing degrees offered by institution, and eventually, contact information for all 300+ AV Consortium members was created as well as accessibility by authorized persons at the State or National level. This database was piloted early in 2010.

GY 2008 Mini-grants

None

GY 2008 Annual Meetings

AV's Winter Business Meeting on March 9-10, 2009, was held in conjunction with the 2009 ASPRS Annual Conference meeting in Baltimore, MD. 34 attendees, representing 29 StateViews attended. The March 9 sessions were held at USGS headquarters in Reston, VA. Educational Congressional visits followed the meeting.

AmericaView's **Fall Technical Meeting** was held October 5-6, 2009 at the EROS Data Center in Sioux Falls, South Dakota. This meeting was hosted by the USGS, and was a joint meeting between AV and the Upper Midwest Chapter of American Society of Photogrammetry and Remote Sensing (ASPRS). More than 80 AV and ASPRS members, students, USGS employees, and Congressional staff members learned about remote sensing research and applications, shared information on efforts to provide funding for AmericaView, and presented AV's [first award for K-12 GIScience Education](#) to Cassandra Soeffing, a contractor for SAIC and Raytheon at the USGS EROS Data Center. The award was an acknowledgement of Cassie's many contributions to GIScience (GIS, GPS, and Remote Sensing) education at the local, state, and national level including: strengthening GIScience technology courses with an emphasis on inquiry and application to middle school children, teachers and students from tribal colleges and schools, and graduate students; assisting with advancing GIScience education at the state and federal education levels; and assisting with the Science, LandDAAC, and AmericaView project areas at USGS EROS Data Center.

For conference abstracts and PowerPoint presentations: see <http://www.americaview.org/2009-fall-technical-meeting-presentations>.

GY 2009 (September 30, 2009 – September 29, 2010 (March 31, 2011))

GY 2009 Funding overview: National vs. StateView

Grant funding for GY 2009 was \$967,400. More than 74% of the grant went directly to support StateView Full Member sub-awards, mini-grants to Full Members and Affiliates, and Affiliate travel. Sub-Awards for each of the 31 fully funded members for GY 2009 was \$23,152. Per state awards were reduced from the grant year GY 2008 award of \$23,989 because two additional states were funded.

GY 2009 StateView members

In GY 2009, with an addition of two new funded members, the number of StateViews rose to 37, consisting of 31 fully-funded, one Associate (UT), and five Affiliates (CT, NV, NY, VT & WA) members.

GY 2009 Governance

The AV Board met monthly via teleconference or in person to provide consortium leadership. In grant year 2009, the AV Board of Directors devoted more than 700 hours in Board service to AmericaView. See Appendix C for a list of AV Board of Directors and staff for this Grant Year.

GY 2009 Consortium development and outreach program summary

AmericaView On-Line Database

Dr. Seong at West Georgia University continued to improve AV's on-line reporting database. This saved staff time in report generation, created a metrics section for important activities, and saved member's time in submitting Requests for Continued Assistance.

GY 2009 Data delivery program summary

The opening of the Landsat Data archive on October 1, 2008 vastly increased our state residents' access to Landsat imagery. About six proposed activities in GY 2009 were not necessary since the provision of

free data that the states had planned to assist with allowed those StateViews to focus on other data delivery needs within their states.

The 17 states reporting had 177,091 visitors and 555,080 page views. 13,909 GB of new data was archived (by 10 states) adding to a total of 62,548 GB archived (by 14 states). Of the over 15 TB of data downloaded from AV sites, approximately 1 TB consisted of Landsat data within 6 states.

GY 2009 Outreach program summary

Landsat fact sheets

At the request of the USGS Land Remote Sensing Program, AV members created a set of 18 Landsat fact sheets that introduced the use of Landsat imagery for research and education purposes at the national and state levels throughout the AV consortium. These fact sheets were organized by categories and posted on [AV's Outreach Program webpage](#) and also on [AV's homepage](#) as rotating images to catch the eye of visitors.

GY 2009 Committee activities

During the grant year, more than 1,590 hours were devoted to committee work by AV members. The Technology Committee initiated coordination of ten StateViews' efforts to plan a collaborative GY 2010 activity: building an imagery web server that will serve multiple states. This collaborative pooling of skills and hardware funds will allow many states to provide services that they could not on their own.

GY 2009 Annual Meetings

Winter Business Meeting

The AmericaView Winter Business Meeting, held on March 1-2, 2010, was attended by 45 members and guests in Washington, DC. 29 of 31 Full Members, and two Affiliates attended. Following the Meeting, a number of StateView representatives visited their elected officials and staff members to update them on the important Remote Sensing related activities that took place in their state during the year.

Fall Technical Meeting

The AmericaView Fall Technical Meeting, held on October 11-13, 2009, was attended by 67 members and guests in Madison, Wisconsin. The FTM was hosted by WisconsinView and the [Space Science and Engineering Center at the University of Wisconsin-Madison](#). Powerpoints of presentations, photos, and poster abstracts can be viewed at the [WisconsinView](#) website.

GY2010: September 30, 2010 - June 30, 2011 (December 31, 2011)

GY 2010 Funding overview: National vs. StateView

Grant funding for GY 2010 was \$967,400. More than 78% of the grant went directly to support StateView Full Member sub-awards, mini-grants to Full Members, Associates, and Affiliates, and to Associate and Affiliate travel. Sub-Awards for each of the 30 fully funded members* for GY 2010 was \$25,000. (* One funded member from GY 2009 failed to submit an RCA and was not funded in GY 2010.)

GY 2010 StateView members

Two additional StateViews were added in GY 2010, bringing the total number of StateViews to 39. Although the number of fully-funded StateViews (31) remained unchanged from GY 2009, two additional Affiliates were added and several Affiliates were promoted to Associate status. The final number of unfunded StateViews in GY 2010 was 3 Associates (UT, NY, VT) and 5 Affiliates (CT, NV, OR, RI, and WA).

GY 2010 Governance

The AV Board met monthly via teleconference or in person to provide consortium leadership. In GY 2010, the AV Board of Directors devoted more than 535 hours in Board service to AmericaView. See Appendix C for a list of AV Board of Directors and staff for this Grant Year.

GY 2010 Data delivery program summary

Increased Usage of Landsat Imagery for Teaching

The use of Landsat imagery in undergraduate remote sensing courses has increased dramatically since the Landsat archive was opened to the public by the USGS in October 2008. Dr. Ramesh Sivanpillai of WyomingView documented a three-fold increase in imagery usage in his undergraduate remote sensing classes between Fall 2009 and Fall 2011. Free access has allowed his students to conduct multi-temporal image analysis with images from different seasons and years. Additionally, the students are able to analyze areas of interest such as their family farms or ranches which greatly enhances their motivation and interest in learning.

"In using Landsat 5 to look at alfalfa fields, I learned that there are many valuable tools to use to analyze the imagery. You can use these tools to help determine what management practices are working and areas that need more work."

Undergraduate Rangeland Ecology & Watershed Management
student (University of Wyoming, Class of 2011)

Continued Data Delivery

The 19 states that maintained web visitation statistics had 115,775 visitors and 218,505 page views. With the opening of the USGS Landsat archive, GY 2010 marked the time when the majority of the StateViews began to point their visitors to USGS GloVis or Earth Explorer sites. However, of the states that still archived data, 4,114 GB of new data was archived (by 11 states) adding to a total of 85,560 GB archived (by 18 states). Of the nearly 27 TB of data downloaded from AV sites, approximately 1.6 TB consisted of Landsat data within 9 states.

- SV Web visitors: 115,775 visitors (19 states reporting, 2 for partial year)
- SV Web page views: 218,505 page views (17 states reporting)
- Remote sensing data archived: 85,560 GB (18 states reporting)
- Remote sensing data newly added: 4,114 GB (11 states reporting)
- Remote sensing data downloaded: 26,947 GB (10 states reporting)
 - Landsat data downloaded: 1,654 GB (9 states reporting)
 - MODIS data downloaded: 327 GB (4 states reporting)
 - Orthophotos downloaded: 4,492 GB (7 states reporting)
 - Other remote sensing data downloaded: 20,474 GB (7 states reporting)

GY 2010 Research program summary

A number of refereed journal articles were submitted by AV PIs utilizing AV funds, including:

- ❖ "A Remote Sensing and GIS-assisted Spatial Decision Support System for Hazardous Waste Site Monitoring"
- ❖ "Scale Management and Remote Sensor Synergy in Forest Monitoring"

- ❖ “Per-segment Aboveground Forest Biomass Estimation Using LIDAR-derived Height Percentile Statistics”

GY 2010 Education program summary

New Remote Sensing Course Offering

PennsylvaniaView PI, Dr. Thomas Mueller, created a new course called *Remote Sensing of the Environment* that was established as an official course offering at California University of Pennsylvania as a general education course under Technology Literacy. This course became (in GY 2010) the first general remote sensing course taught at the university in eight years, and is still offered in alternate years. While planning the direction of the course, Dr. Mueller sought input from the AmericaView Consortium. To assist, over 20 members sent information about their introductory remote sensing courses.

GY 2010 Committee activities

During the grant year, more than 1,591 hours were devoted to committee work by AV members.

GY 2010 AV national projects

Improvement of AmericaView On-Line Database

Dr. Seong at West Georgia University continued to improve AV's on-line reporting database. This grant year, Dr. Seong added the capability to allow all members to view and search all annual and semi-annual reports and proposed activities. This capability greatly enhanced the ability for collaborative efforts among StateViews and helped new PIs and StateViews in their orientation to the activities to AV.

GY 2010 Mini-grants

Three mini-grants were awarded in this grant year to Affiliates: **New YorkView** developed a website and an electronic pamphlet to be used for recruiting consortium members, **ConnecticutView** developed a website, developed a list of 11 potential consortium members and began initial outreach and introduced ConnecticutView to 75 attendees at GIS Day in November, 2010. To illustrate the value of its newly formed StateView, **VermontView** developed three short videos focused on accessing and using Landsat data, and accessing and displaying orthophotos. They also developed a Charter for VermontView, added two new members, and established a website.

Three additional mini-grants were awarded in a competitive process open to full members.

IdahoView completed a mini-grant that developed NDVI image services from Landsat 5 TM imagery for all growing seasons (April 1-September 30) from 1984-2010 for path 39 row 30. This project was entitled the LISA project. White papers and instructional videos were created and are available on the Idaho State University GIST Training and Research Center's website at:

<http://giscenter.isu.edu/research/Techpg/LISA/index.htm>

South DakotaView educated local transportation managers about the availability and use of remotely sensed data in conjunction with GPS and other geospatial data. The materials were made available to all StateViews and the national [Local Technical Assistance Program](#) for distribution and use as appropriate. To obtain the PowerPoint presentation or the map package, contact AV staff.

GeorgiaView created a digital multimedia exhibit entitled *Historic Hall County: Spaces and Places*.

Through oral history interviews, Gainesville State College (GSC) students preserved the personal histories of the families who were directly affected by construction of Buford Dam and the creation of Lake Lanier in the 1950s. Using digital photomaps, GSC faculty and students identify specific locations

and visually connect personal histories to the changing landscape. Through interactive features, website users can view interviews, as well as photos and essays, related to specific locations. The website is currently being moved and the project will be continued in GY 2013.

GY 2010 Annual Meetings

Winter Business Meeting

Forty-two members and guests attended the AmericaView Winter Business Meeting, held on March 7-8, 2011, in Arlington, VA. Attendees included twenty-nine of the 31 Full Members, one Associate member, and one Affiliate member. Highlights included a day-long visit to USGS Headquarters for updates from USGS personnel. Following the Meeting, a number of StateView representatives visited their elected officials and staff members to update them on the important Remote Sensing related activities that took place in their state during the year.

Fall Technical Meeting

The AmericaView Fall Technical Meeting (FTM) was held on October 10-12, 2011 and was attended by 87 members and guests in Cleveland, Ohio. Hosted by OhioView, the FTM coincided with OhioView's 15th anniversary. Thirty-four presentations were held in conjunction with the Eastern Great Lakes Region of ASPRS.

Highlights included the Honorable Ralph Regula's review of the history and importance of the formation of OhioView and reiteration of the relevance and effectiveness of AmericaView today, focusing particularly on AmericaView's STEM education contributions. Twenty middle and high school students (from four schools) presented their SATELLITES research projects during a poster session. For more information (and photos) see: <http://blog.americaview.org/search/label/2011>.

GY2011: 2011 September 30, 2011 – June 30, 2012 (December 31, 2012)

GY 2011 Funding overview: National vs. StateView

Grant funding for GY 2011 was \$967,400. Nearly 82% of the grant went directly to support StateView Full Member sub-awards, mini-grants to Full Members, Associates, and Affiliates, and to Associate and Affiliate travel. Sub-Awards for each of the 31 fully funded members for GY 2011 was \$23,800.

GY 2011 StateView members

AmericaView continued its policy of not accepting full (funded) members until additional funding is secured that would allow expansion to all U.S. states and territories. No new members joined AmericaView in GY 2011. As of June 30, 2012, AmericaView had 39 StateView members: 31 Full Members, three Associate Members (UT, NY, and VT) and five Affiliate (CT, NV, OR, RI and WA) Members.

GY 2011 Governance

The AV Board met monthly via teleconference or in person to provide consortium leadership. In GY 2011, the AV Board of Directors devoted approximately 762 hours in Board service to AmericaView. See Appendix C for a list of AV Board of Directors and staff for this Grant Year.

GY 2011 Minigrants

Strategic mini-grants: Four mini-grants were awarded in a competitive process open to all AV members. The awardees were **GeorgiaView**, which developed four tutorials to introduce 6-12 grade students to land cover classification using MultiSpec© see <http://americaview.org/earth-observation->

[day#quicktabs_11%3D1](#); **VermontView**, which distributed data and educational resources post Hurricane Irene; **NebraskaView**, which consolidated AmericaView educational resources in preparation for subsequent web distribution; and **New YorkView**, which improved and synthesized recently proposed machine learning approaches to assist with extracting information such as land use and land cover from remote sensing imagery.

GY 2011 Annual Meetings

Winter Business Meeting

Forty-six AmericaView members and guests attended the AmericaView Winter Business Meeting, held on March 5-7, 2012, in Arlington, VA. All of the 31 Full Members, two Associate members, and one Affiliate attended. Highlights included sharing High Impact Activities planned for grant year GY 2012; sharing tips for creating high impact via outreach by presenters from USGS, NASA, and EarthSky; sharing of USGS LRS goals held by the USGS; and an examination and discussion of AV's goals and objectives. Following the Meeting, a number of StateView representatives visited their elected officials and staff members to update them on the important Remote Sensing related activities that took place in their state during the year.

Fall Technical Meeting

The AmericaView Fall Technical Meeting was held on September 14-15, 2012 at the USGS EROS Center and was attended by 42 AV members and guests and numerous USGS employees and contractors in Sioux Falls, SD. Eleven presentations were made by USGS employees and contractors and 15 presentations were made by AV members and guests. The goal was to share information and create synergy surrounding joint remote sensing projects and research in seven interactive sessions involving remote sensing and covering land cover mapping science and applications; ecosystem mapping and monitoring science; mapping and analysis of fire, water, and phenology; data production, archiving, distribution, and mapping products; geospatial science and technology education and outreach; and disaster response. An interactive poster session was held with 17 posters presented. Three workshops were held: Processing LiDAR Point Clouds Using eCognition, Sharing and Demonstrating Online-capable Educational Outreach Materials, and Introduction to Google Earth Engine.

GY 2012: September 30, 2012 – September 29, 2013

GY 2012 Summary of highlights and impact by program:

GY 2012 was the first grant year in which AV utilized a 1-2 High Impact activity/funding year approach. This approach is a better fit for the current funding levels for StateViews described on p. 7 of this report. The numbers of activities completed for GY 2012 are summarized in Appendix A. Fact Sheets describing the High Impact Activities for GY2012, arranged alphabetically by StateView, are found in Appendix F.

GY 2012 Funding overview: National vs. StateView

Grant funding for GY 2012 was \$967,400. More than 77% of the grant was budgeted to directly support StateView Full Member sub-awards, mini-grants to Full Members, Associates, and Affiliates, and for Associate and Affiliate travel. Sub-Awards for each of the 31 fully funded members for GY 2012 was \$23,500.

GY 2012 StateView members

AmericaView continued its policy of not accepting full (funded) members until additional funding is secured that would allow expansion to all U.S. states and territories. No new members joined AmericaView in GY 2012.

As of September 29, 2013, AmericaView had 39 StateView members: 31 Full Members, three Associate Members and five Affiliate Members.

GY 2012 Governance

The AV Board met monthly via teleconference or in person to provide consortium leadership. In GY 2012, the AV Board of Directors devoted more than 564 hours in Board service to AmericaView. See Appendix C for a list of AV Board of Directors and staff for this Grant Year.

GY 2012 Consortium development and outreach program highlights

2013 saw the launch of Landsat 8, and AV members were on hand to witness this great (and long awaited) achievement. Three AV PIs (Jim Campbell, VirginiaView; Larry Biehl, IndianaView, and Sam Batzli, WisconsinView) traveled to participate in the launch of Landsat 8 in California on February 11, 2013.

On May 30, 2013 the US Geological Survey assumed operation of the LDCM mission from NASA, and four AV members participated in that event. Representing AmericaView at the celebration were Rebecca Dodge (TexasView and AV Board Chair), Mary O’Neill (South DakotaView), and Brent Yantis (LouisianaView). Sam Batzli (WisconsinView) was selected as a member of a 30-member Social Media group that assisted USGS-NASA spread the word about the event via social media. Sam tweeted throughout the event on WisconsinView’s website: <http://www.wisconsinview.org/>. Ramesh Sivanpillai (WyomingView) also posted highlights from the ceremony on his [WyomingView Facebook](#) and [Google+](#) pages.

The numbers of consortium development and outreach activities completed for GY 2012 are summarized in Appendix A. See fact sheets for data delivery High Impact Activities for GY2012, arranged alphabetically by StateView, in Appendix F.

GY 2012 Data delivery program summary

Collaborative efforts by AV StateView during GY2012 in the area of data delivery are described on p. 9 of this report. The numbers of data delivery activities completed for GY 2012 are summarized in Appendix A. See fact sheets for data delivery High Impact Activities for GY2012, arranged alphabetically by StateView, in Appendix F.

GY 2012 Research program summary

The numbers of research activities completed for GY 2012 are summarized in Appendix A. See fact sheets for AV’s research focused High Impact Activities for GY2012, arranged alphabetically by StateView, in Appendix F.

GY 2012 Education program summary

Summaries of Earth Observation Day activities for GY 2012 are found in Appendix D. The numbers of education activities completed for GY 2012 are summarized in Appendix A. See fact sheets for AV’s education focused High Impact Activities for GY 2012, arranged alphabetically by StateView, in Appendix F.

GY 2012 Annual Meetings

AV’s Winter Business Meeting was held March 28-29, 2013 in Baltimore, MD in conjunction with ASPRS’s Annual Conference. On March 27, 2013, AV sponsored two special sessions at Conference. Session titles, authors and co-authors follow:

Special Session: Applied Remote Sensing

Moderator: Russell Congalton, *University of New Hampshire*

**Hyperspectral Remote Sensing as a Monitoring Tool for
Geologic Carbon Sequestration**

Gabriel Bellante, *Montana State University*; Scott Powell, Rick Lawrence, Kevin Repasky,
and Tracy Dougher

**Mapping and Analyzing Conservation Reserve Program
Enrollment Patterns from 1991 to 2011 in Nelson County,
North Dakota, Using Remote Sensing and GIS Techniques**

Nicholas Roehrdanz, *University of North Dakota*; Bradley Rundquist

**Using Spatial Models with Remote Sensing to Map
Invasive Species Distributions: A Case Study of Tamarix
Along the Arkansas River, Colorado**

Amanda West, *Colorado State University*

**Evaluating Worldview-2 Imagery for Forest Cover Type
Mapping in Complex New England Forests**

Jenna Kovacs, *University of New Hampshire*; Russell Congalton

Special Session: Education/Outreach in Remote Sensing

Moderator: Rebecca Dodge, *Midwestern State University*

Helping Educators to Educate with Geospatial Technologies

John McGee, *Virginia Tech*; Tammy Parece and James Campbell

**Place-based and Event-based Learning using Geospatial
Technologies; The TexasView Earth Observation Day
Program**

Rebecca Dodge, *Midwestern State University*; Paul R. Blackwell

SATELLITES: A K-12 STEM Education Project for the 21st Century

Kevin Czajkowski, *America View*; Rick Landenberger, Todd Ensign, and Rick Sharpe

**Earth Observation Day: An Outreach Event to Increase the
Use of Geospatial Science and Technology in K-12 and
Higher Education**

Tom Mueller, *America View*; Rick Landenberger

**Introducing Land Cover Classification in Middle and High
School Classrooms**

Allison Howard, *University of Georgia*; Sergio Bernardes, Chris Strother, Taylor Johnson,
Patrick Lines, Larry Biehl, Rick Landenberger, and Marguerite Madden

No Fall Technical Meeting was held in GY 2012 due to uncertainty regarding continued USGS funding.

Appendix A – Numerical Summary of Activities for GY 2008-2012

Consortium Development & Outreach Activities	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012	GY 2008-2012
	Number of Activities	5-yr total for activities				
External vehicles						
Present StateView program and activities at state, regional and national conferences and meetings (e.g., ASPRS, PECORA, State GIS Users Groups.)	26	25	22	21	15	109
Publish in 'grey or trade' journals to highlight the utility of remote sensing or the value of StateView programs – Geo Info Systems, GeoWorld, ArcNews	1	1	1	1		4
Deliver seminar presentations to Users Groups, Geospatial Consortia	7	8	4	6	4	29
Deliver presentations at the annual 'Planning Meetings' at local, state, federal agencies to promote the StateView program and the services provided	7	5	5	3	2	22
Visit and present RS materials to agencies and elected officials at federal, state, regional, county and district levels	11	19	16	17	13	76
Identify opportunities for faculty exchange (between consortium members) or internship possibilities (for undergraduate and graduate students)	8	7	7	8	5	35
SUB TOTAL	60	65	55	56	39	275
Internal Vehicles						
Share software licenses among consortia members	9	9	5	5	4	32
Train faculty members among consortia members and within own institution	7	8	9	9	3	36
Promote opportunities for collaborative research among consortia members	5	6	5	8	5	29
Develop collaborative programs (certificates, transfer agreements, MOUs to support StateView consortium efforts, etc.)	4	6	5	5	2	22
Generate enough funds to hire a StateView coordinator	3	2	1	1		7
SUB TOTAL	28	31	25	28	14	126
Financial vehicles						
Obtain NSF/other grants for training faculty members in RS technology and applications	1	1	1	1		4
Fund training grants for K - 12 teachers	3	5	3	3		14
Partner with other institutions that sponsor training (Space Grant; Extension agents; insurance companies; 4H; etc.)	7	10	10	10	2	39
Leverage other projects that purchase data to get imagery for archive (new and archive data)	3	2		1		6
SUB TOTAL	14	18	14	15	2	63
StateView/AmericaView vehicles						
Share RS curricula developed by one StateView with others	2	6	5	5	4	22

Share software licenses between several StateView Programs					1	1
Collaborate and submit multi-StateView requests for regional grants such as Gulf Coast; High Plains; Southwest; etc.	1	1		1		3
Collaborate and submit multi-StateView requests for topical grants such as invasive species; coastal risk mapping; agricultural pests; etc.	2	2	1	1		6
Improve and Maintain Instate Communications through regular Conference calls and conferences	6	9	9	10	6	40
Participate in statewide geographic data committees	14	13	12	9	4	52
SUB TOTAL	25	31	27	26	15	124
TOTAL CONSORTIUM ACTIVITIES	127	145	121	125	70	588
Data Archive & Distribution Activities	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012	GY 2008-2012
	Number of Activities	5-yr total for activities				
Develop and maintain a data archive						
Maintain a remote sensing data archive that is publicly accessible	25	29	25	25	15	119
Make data available at low or no cost	17	15	13	13	8	66
Generate "user-friendly" formats (GeoTIFF, Jpeg and others) to accommodate a wide variety of users	11	9	6	7	1	34
SUB TOTAL	53	53	44	45	24	219
Archive growth						0
Add new images to archive by sharing arrangement within the StateView or among StateViews	11	10	8	7	3	39
Leverage other projects that purchase data as a source for archive (both new and historical data)	10	7	5	4		26
Collect free Landsat, ASTER, or MODIS from existing web sources (while StateViews can pass the 20% Landsat discount on to their members, keep in mind that AV Inc. funds cannot be used to buy USGS data since the money itself comes from USGS).	9	9	6	6	1	31
Host data sets for StateView partners (e.g. NAIP for USDA-FSA)	4	4	13	11	4	36
Broker data purchases and "evangelize" to discipline-specific user communities	2	1	1	1		5
SUB TOTAL	36	31	33	29	8	137
Processing, distribution and user interface						0
Develop a simple html map-interface to help users find data for their area of interest	1		2	4	2	9
Install the special StateView version of GloVis	2	2	1	2		7
Develop an ArcIMS or MapServer interface for finding data	3	3		1	2	9
SUB TOTAL	6	5	3	7	4	25
Ground station or airborne operations						0

Receive, capture, process, and distribute satellite or airborne data	7	4	4	4	2	21
Develop near real-time data collaborations with emergency responders	4	5	1	1		11
Develop near real-time data collaborations in support of field operations		2	1	1		4
SUB TOTAL	11	11	6	6	2	36
StateView website metrics						0
Install or configure a mechanism for reading web access logs for tracking web usage	12	13	8	8	3	44
Develop mechanism for collecting basic data download statistics (required by all StateViews)	12	9	8	7	4	40
SUB TOTAL	24	22	16	15	7	84
Additional Metrics						0
If data distribution is managed by a StateView institution develop a web-form, php/MySQL database, or other method to collect user information	1	2	1	1		5
If data distribution is an external activity develop ability to retrieve user information	1	1	2	2	1	7
SUB TOTAL	2	3	3	3	1	12
TOTAL DATA DELIVERY ACTIVITIES	132	125	105	105	46	513
Education Activities	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012	GY 2008-2012
	Number of Activities	5-yr total for activities				
RS courses and resources offered through AV funding						
Share software licenses for some image processing software and install it in a central server. (e.g. another university within that consortium could use that license to start a remote sensing course and wouldn't have purchased the license by itself).	2	3	2	2	4	13
Share course materials developed at one university with others	7	7	8	6	2	30
Encourage/enable use of data from the StateView archive for teaching purposes	13	12	11	10	4	50
Fund short courses (1 or 2 or 3 days) in image processing or in some aspect of remote sensing	1	2	4	4		11
Deliver guest lectures (e.g. in certain Geography, Botany or Ecology course on campus, to promote the utility of remote sensing).	8	7	7	9	4	35
Promote recruitment of new remote sensing faculty			1	1		2
SUB TOTAL	31	31	33	32	14	141
Training programs for current workforce - gov't personnel and others						0

Prepare and deliver short courses for government agencies, private companies, extension agents, private citizens and students.	18	12	11	10	9	60
Provide periodic support to the above group (answer questions through telephone, emails, etc.)	11	8	6	5	3	33
Develop of web-based tutorials, FAQs and 'how-to' materials	7	7	7	4	5	30
SUB TOTAL	36	27	24	19	17	123
Training programs for future workforce - students in universities and colleges						0
Offer summer training programs (in other member institutions, or in agencies such as EDC)	1					1
Offer Hands-on training opportunities for students in government agencies (who may also be consortium members in the StateView)	2	2	1	1		6
Fund stipends to encourage student to pursue RS component of education	6	3	3	4	3	19
Develop training programs that address topical ideas tailored for specific state and discipline needs	1	3	4	6	2	16
SUB TOTAL	10	8	8	11	5	42
Programs targeted towards K-12 programs						0
Prepare and deliver guest lectures (to highlight RS applications) and demonstrations	5	6	5	6	3	25
Develop education workshops	7	7	6	7	4	31
Organize activities targeting 4-H, Boy/Girl Scouts, related youth organizations	3	3	2	2	1	11
Sponsor mentor programs for high-school students (during summer)		1	1	1		3
Support state educational standards	2	3	3	3	2	13
Support pre-Service K-12 education	1	2	1	1	1	6
Provide training for teachers during summer months – so that they will incorporate one or two lesson RS lesson plans in their classroom during the school year	6	5	6	3	3	23
Develop lesson plans for RS or to incorporate RS in other disciplines (Geography, Botany etc.)	1	1	3	2	4	11
SUB TOTAL	25	28	27	25	18	123
Increasing public RS awareness						0
Promote understanding of geospatial data among public through activities such as Earth Observation Day	7	9	11	11	7	45
Participate in museums displays	2	1	3	2	2	10
Initiate mass mailings, posters, StateView screen savers, etc.	1	1	2	2	1	7
Make presentations to service organizations	1	2	2	1		6
Use imagery in public venues-- "Landsat as art themes"	3	4	3	3	2	15
SUB TOTAL	14	17	21	19	12	83
TOTAL EDUCATION ACTIVITIES	116	111	113	106	66	512

Research Activities	GY 2008	GY 2009	GY 2010	GY 2011	GY 2012	GY 2008-2012
	Number of Activities	5-yr total for activities				
Development of new applications or uses for RS data through pilot research projects						
Collaborate with agency personnel (or private companies) to assess utility of satellite data for monitoring and mapping activities that were not performed using imagery in the past	14	16	9	9	11	59
Collaborate with researchers in your or other StateViews	5	5	9	9	4	32
Find innovative uses for moderate resolution satellite data – apart from the routine mapping applications	8	4	4	5	2	23
Develop software to support distribution of satellite airborne, and geospatial data	6	4	5	5	1	21
Post methodologies or tools for other StateViews to use or test	2	4	4	4	1	15
Seek commercialization opportunities for tools and data in order to enhance technology transfer	2	1	2			5
SUB TOTAL	37	34	33	32	19	155
Research opportunities for students						0
Offer scholarships to students to promote RS research and promote participation of under-represented groups (women, ethnic minorities and first generation college students).	6	4	4	6	4	24
Promote use of StateView archived data in class room research (term projects) – where students would not have had such an opportunity for use in the absence of free data.	10	8	7	8	4	37
Support student publications or presentations in university forums	6	8	7	6	4	31
Promote research competitions among member institutions within a consortium	3	2	2	2	2	11
Offer Summer research programs for high school students at your institution			1	1		2
Serve on MS/PhD committees or otherwise advise students to guide/encourage use of RS approaches	9	7	8	9	6	39
SUB TOTAL	34	29	29	32	20	144
Innovative ways and methods to process and deliver data						0
Enhance ability to subset (spatially and spectrally) on the fly	2		2		1	5
SUB TOTAL	2	0	2	0	1	5
Using StateView resources for leveraging research						0
Leverage StateView coordinator’s salary and or data archive as matching cost while submitting grant proposals	1		2	4	2	9
Promote the value of the consortium (agencies, private companies, non-profit etc) to attract research dollars	5	3	4	4	2	18
SUB TOTAL	6	3	6	8	4	27

Publication of results in peer-reviewed journals						0
Submission and/or publication of research results in peer-reviewed journals	3	3	4	5	5	20
SUB TOTAL	3	3	4	5	5	20
TOTAL RESEARCH ACTIVITIES	82	69	74	77	49	351

Appendix B – List of StateViews and Principle Investigators

As of December 31, 2013, AmericaView had 39 StateView members: 31 Full Members, three Associate Members and five Affiliate Members. AV's current StateView members are:

FULL (FUNDED) MEMBERS

AlabamaView

<http://www.alabamaview.org>

Dr. Luke Marzen
Department of Geography
Auburn University

AlaskaView

Mr. Tom Heinrichs
Geographic Information Network of Alaska
University of Alaska Fairbanks

ArkansasView

http://www.cast.uark.edu/cast/arkansas_view

Dr. Jason Tullis
Center for Advanced Spatial Technologies
(CAST)
University of Arkansas

Mr. Bruce Gorham
Center for Advanced Spatial Technologies
(CAST)
University of Arkansas

CaliforniaView

<http://cstars.metro.ucdavis.edu/education-and-outreach/californiaview>

Dr. Susan Ustin
Center for Spatial Technologies and Remote
Sensing (CSTARS)
University of California at Davis

Pia van Benthem
Department of Land, Air and Water Resources
University of California at Davis

ColoradoView

<http://coloradoview.org/>

Dr. Wei Gao
USDA UV-B Monitoring and Research Program
Colorado State University

GeorgiaView

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

Dr. J.C. Seong
Department of Geosciences
University of West Georgia

Dr. Mark Patterson
Geographic Information Science Service
Center
Kennesaw State University

HawaiiView

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

Dr. Robert Wright
School of Ocean and Earth Science and
Technology

University of Hawaii

IdahoView

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

Dr. Jan U.H. Eitel
Geospatial Laboratory for Environmental
Dynamics
University of Idaho

IndianaView

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

Mr. Larry Biehl
Purdue Terrestrial Observatory
Purdue University

IowaView

Dr. Kevin Kane
College of Design
Iowa State University

James Giglierano
Extension GeoSpatial Technologies Program
Manager
Iowa State University

KansasView

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

Dr. Steve Egbert
Kansas Applied Remote Sensing Program
(KARS)
University of Kansas

Kevin Dobbs
Kansas Applied Remote Sensing Program
(KARS)
University of Kansas

KentuckyView

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

Dr. Haluk Cetin
Director, Hyperspectral Laboratory
Murray State University

LouisianaView

<http://www.rac.louisiana.edu/>

Mr. Brent Yantis
Regional Application Center
University of Louisiana

MarylandView

<http://marylandview.towson.edu/>

Dr. John (Jay) Morgan
Dept. of Geography and Environmental
Planning
Towson University

MichiganView

<http://wiki.americaview.org/display/miview/Home>

Dr. Nancy French
Michigan Tech Research Institute (MTRI)
Michigan Technological University

K. Arthur Endsley, GST
Research Scientist
Michigan Tech Research Institute (MTRI)

MinnesotaView

<http://minnesotaview.gis.umn.edu/>

Dr. Marvin Bauer
Department of Forest Resources
University of Minnesota

Dr. Joseph Knight
Department of Forest Resources
University of Minnesota

MississippiView

<http://www.msview.olemiss.edu/>

Dr. Greg Easson
Enterprise for Innovative Geospatial Solutions
University of Mississippi

Mr. Hal Robinson
Geoinformatics Center
University of Mississippi

MontanaView

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

Dr. Rick Lawrence
Land Resources/Environmental Science Dept.
Montana State University

NebraskaView

<http://nebraskaview.unl.edu/>

Dr. Brian Wardlow
Center for Advanced Land Management
Information Technologies (CALMIT)
University of Nebraska-Lincoln

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

New HampshireView

<http://www.nhview.unh.edu/>

Dr. Russ Congalton
Department of Natural Resources and the
Environment
University of New Hampshire

New MexicoView

<http://Newmexicoview.Nmsu.edu>

Dr. Ken Boykin
Center for Applied Spatial Ecology
New Mexico State University

North CarolinaView

<http://www.ecu.edu/cs-cas/geog/ncview/>

Dr. Yong Wang
Department of Geography
East Carolina University

North DakotaView

<http://www.und.nodak.edu/org/ndview/>

Dr. Brad Rundquist
Department of Geography
University of North Dakota

OhioView

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

Dr. Pete Clapham
Department of Biological, Geological, and
Environmental Sciences (BGES)
Cleveland State University

PennsylvaniaView

<http://www.paview.psu.edu/>

Dr. Tom Mueller
Department of Earth Science
California University of Pennsylvania

South DakotaView

<http://sdview.sdstate.edu/>

Dr. Jeppe Kjaersgaard
Ag & Biosystems Engineering
South Dakota State University

Ms. Mary O'Neill
Water Resources Institute
South Dakota State University

TexasView

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

Dr. P.R. Blackwell
Columbia Regional Geospatial Service Center
Stephen F. Austin University

Dr. Rebecca Dodge
Department of Geosciences
Midwestern State University

VirginiaView

<http://virginiaview.cnre.vt.edu/>

Dr. James Campbell
Department of Geography
Virginia Tech

Dr. John McGee
Department of Forest Resources and
Environmental Conservation
Virginia Tech

West VirginiaView

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

Dr. Tim Warner
Department of Geology and Geography
West Virginia University

WisconsinView

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

Dr. Sam Batzli
Environmental Remote Sensing Center (ERSC)
University of Wisconsin

WyomingView

<http://www.uwyo.edu/wyview/>

Dr. Ramesh Sivanpillai
Wyoming Geographic Information Science
Center (WYGISC)
University of Wyoming

ASSOCIATE MEMBERS

UtahView

<http://earth.gis.usu.edu/>

Dr. Douglas Ramsey
Department of Wildland Resources
Utah State University

New YorkView

Dr. Jungho Im
Department of Environmental Resources and
Forest Engineering
State University of New York

VermontView

<http://www.uvm.edu/vermontview/>

Mr. Jarlath O'Neil-Dunne
Spatial Analysis Laboratory
University of Vermont

AFFILIATES

ConnecticutView

Mr. James Hurd
Center for Land use Education and Research
(CLEAR)
University of Connecticut

Dr. Daniel Civco
Director of CLEAR
University of Connecticut

NevadaView

Mr. Ronald H. Hess
Nevada Bureau of Mines and Geology
University of Nevada at Reno

OregonView

Dr. Michael Wing
Department of Forest Engineering, Resources
and Management
Oregon State University

Rhode IslandView

Dr. Y.Q. Wang
Dept. of Natural Resources Science
University of Rhode Island

Mr. Greg Bonyng
Dept. of Natural Resources Science
University of Rhode Island

WashingtonView

Dr. Mark Swanson
Department of Natural Resources
Washington State University

Appendix C
AV Boards of Directors and Staff During GY 2008-12

	GY 2008	GY 2009	GY 2010	GY 2012¹	GY 2012
Chair	Dr. Rick Lawrence Montana State University	Mr. Larry Biehl Purdue University	Mr. Larry Biehl Purdue University	Dr. Ramesh Sivanpillai University of Wyoming	Dr. Rebecca L. Dodge Midwestern State University, TX
Vice-Chair	Mr. Larry Biehl Purdue University	Dr. Ramesh Sivanpillai University of Wyoming	Mr. Brent Yantis University of Louisiana	Mr. Brent Yantis University of Louisiana	Dr. Russ Congalton University of New Hampshire
Secretary	Ms. Milda Vaitkus University Nebraska – Lincoln	Ms. Milda Vaitkus University Nebraska – Lincoln	Ms. Milda Vaitkus University Nebraska – Lincoln	Ms. Milda Vaitkus University Nebraska – Lincoln	Ms. Milda Vaitkus University Nebraska – Lincoln
Treasurer	Ms. Mary O’Neill South Dakota State University	Ms. Mary O’Neill South Dakota State University	Dr. Christine McMichael Morehead State University, KY	Dr. Christine Emrich Morehead State University, KY	Mr. Jarlath O’Neil- Dunne University of Vermont
Member	Dr. Sam Batzli University of Wisconsin	Dr. Sam Batzli University of Wisconsin	Dr. James Campbell Virginia Tech	Dr. James Campbell Virginia Tech	Dr. James Campbell Virginia Tech
Member	Dr. James Campbell Virginia Tech	Dr. James Campbell Virginia Tech	Dr. Rick Lawrence Montana State University	Dr. Rick Lawrence Montana State University	Mr. Brent Yantis University of Louisiana
Member	Dr. Ramesh Sivanpillai University of Wyoming	Dr. Rick Lawrence Montana State University	Mr. Jarlath O’Neil- Dunne University of Vermont	Mr. Jarlath O’Neil- Dunne University of Vermont	Dr. Rick Lawrence Montana State University
Member				Dr. Rebecca L. Dodge Midwestern State	Ms. Pia van Benthem Univ. of Cal. Davis

¹ Board membership increased from 7 to 9 members to reflect the greater need for Board activity related to the management of an organization of 39 StateViews and upcoming 5-year grant proposal

Appendix C
AV Boards of Directors and Staff During GY 2008-12

	GY 2008	GY 2009	GY 2010	GY 2012¹	GY 2012
Member				University, TX Dr. Russ Congalton University of New Hampshire	Mr. Kevin Dobbs University of Kansas
Advisor	Dr. Rebecca L. Dodge Midwestern State University, TX	Dr. Rebecca L. Dodge Midwestern State University, TX	Dr. Rebecca L. Dodge Midwestern State University, TX		
Executive Director	Dr. Rick Landenberger University of West Virginia	Dr. Rick Landenberger University of West Virginia			
Program Manager	Ms. Debbie Deagen Montana State University	Ms. Debbie Deagen Montana State University			

¹ Board membership increased from 7 to 9 members to reflect the greater need for Board activity related to the management of an organization of 39 StateViews and upcoming 5-year grant proposal

Appendix D – Summary of Earth Observation Day Activities for GY12

❖ *CaliforniaView*

1. Annual University Open House attended by 55,000 visitors in 2013. Display of Geospatial Art Project with Junior High School, Magnetic Landsat Mosaic State Puzzle, Aerial Photography City Quiz.
2. Center for Spatial Technologies and Remote Sensing (CSTARS) EO Day celebration attended by 24 people serving Landsat Mosaic cake.

❖ *GeorgiaView*

On March 14, 2013, GeorgiaView hosted the Earth Observation Event at University of West Georgia, Carrollton, Georgia. 22 high school seniors and 2 teachers from Coweta County Performance Learning Center attended. The event started with watching the LDCM launch video followed by a Google Earth exercise. Students worked on various topics including geographic coordinates, measurements, change detection, and object



delineation. During the lunch at the UWG dining hall, two research projects were presented – Remote Sensing on Urban Heat Islands by Jared Ogle and Geospatial Technology Applications by Michael Edwards. The EOD event was enlightening to many students. For example, Alix Tanner’s testimonial said, “A new science was discovered by me that I can see relates to

other sciences. I will always have remote sensing in my head when I wonder at night the field of science I may want to study.”

❖ *IdahoView*

Students took repeated images of the same ground location on their campus at the McCall Outdoor Science School over the course of three days. Students recorded the date, time, and location as well as any changes they saw between the image acquisitions dates. The purpose of the students taking repeated photographs was to i) allow students to take their own remote sensing imagery ii) give them a better understanding of how remote sensing can be used to obtain information about earth surface features without physically touching them and iii) familiarize students with potential uses of remote sensing e.g., for detecting and mapping change. After a set of images was collected over a period of three days, students analyzed their images by visually identifying change on their imagery (e.g., snow melt, see Fig. 1). After finishing analyzing their data, the lesson was expanded by discussing with students the wide variety of different uses for remotely sensed imagery



Images taken by students and changes identified. Differences could be seen in some of the photos over a 24-hour period.

- ❖ *MississippiView*
MississippiView used the Satcam application “Where are You?” by putting the quiz on monitors in the School of Engineering. The “Where are You?” exercise is a series of imagery that runs in PowerPoint on a timer. An image is displayed, then after 20 seconds the answer is displayed.
- ❖ *New MexicoView*
Working with the Science teachers at Centennial High School, NMView selected two days (April 15-16) to bring every science class into the performing arts theater during their regularly scheduled time. The NM PI then gave a 50-minute presentation on the background and uses of satellite imagery with a focus on Landsat, aerial photography, and geospatial technologies. The presentation included videos of the Landsat launch, and applications of Landsat to water, fire, and pest management. He also demonstrated the changematters.esri.com website and a demonstration on using Google Earth. Over the course of the two-day event, 8 presentations were given. There were 332 male and 320 female students. Minorities were well represented within the 652 students, there were 185 minority males and 171 minority females.
- ❖ *OhioView*
Students took surface temperature observations. They collaborated with a school in Peru to see the difference in temperature between the southern and northern hemispheres.
- ❖ *PennsylvaniaView*
 - 1) 60 students (broken into groups) acquired Surface Temperature and GPS readings today (via GLOBE Protocols) and using Google Earth
 - 2) 60 students completed Land Use / Land Cover maps of colleges and universities - via Google Earth
 - 3) 90 students already completed this assignment in the fall
 - 4) 30 students uploaded Cal U's Campus to Open Street Map
 - 5) Groups of students completed a SatCam Assignment - <http://www.ssec.wisc.edu/news/articles/755>
 - 6) 2 students uploaded Cal U's campus to ESRI
- ❖ *South DakotaView*
Presented *Geospatial Technologies* as a one-hour lecture to an Introduction to Precision Agriculture class at South Dakota State University on April 9th. Additionally, the PI sent out information about EOD and links to the EOD materials to K-12 teachers on her listserv, which includes about 200 K-12 educators and administrators.
- ❖ *TexasView*
Dr. Rebecca Dodge from Midwestern State University developed TEKS resources with links to teach High School Earth and Space, these links are also appropriate for Environmental Systems and 8th grade Science.

❖ *VirginiaView*

On April 19th, VirginiaView, partnered with 4 other entities to present a full day of geospatial activities. The day included a Google Earth Engine workshop, a poster presentation with ~33 student poster presentations (high school, undergraduate, and graduate), engaging presentations, and a Luncheon and an Evening Social to expand networking and educational opportunities. The event was attended by over 100 individuals representing the private sector, high school teachers, faculty from other universities, state and local government officials, and faculty, administrators, and students from Virginia Tech.

❖ *West VirginiaView*

April 1st – Approximately 185 WV students participated in the EOD SATELLITES Surface Temperature Field Campaign, using IRTs, GPS units, and Landsat RGB and thermal subsets covering their local area.

The AV ED partnered with a Greek scientist. Teaching materials developed included: a You Tube video, GLOBE surface temperature protocol videos in [English](#) and [Greek](#), a [video](#) of a how teachers could acquire surface temp data in the context of an exploratory study of surface temp patterns around their schools, data sheets and Dr. Landenberger's data are also provided in his YouTube video linked above.

❖ *WisconsinView*

Participated in the Science Expeditions open house at the University of Wisconsin-Madison. They offered hands-on demonstrations of satellite imagery visualization for a total of over 400 kids and parents on Saturday, April 6th, 2013.

❖ *WyomingView*

2 activities completed in GY12 funding year:

1. 8th grade physical sciences classes, Laramie Junior High, on April 2 and 3 & April 9 and 10, 2013. 111 students and 6 teachers. For the 4th year in a row, the WyView PI visited Laramie Junior High School. Please see the photos and testimonials from this event at: <http://wyomingview.blogspot.com/2013/04/eighth-graders-measure-and-analyze.html>
Describing the value of this hands-on exercise, Mr. Ron Whitman, eighth grade physical sciences teacher, said, "[M]y approach to teaching science has always been having the students experience the practical applications of science. Ramesh Sivanpillai from the University of Wyoming in Laramie has been presenting information about remote sensing to my classes for several years. My 8th grade physical science class is an introductory class for physics and chemistry. One of the topics discussed is electromagnetic waves. Ramesh presented information to my classes for two, 90 minutes sessions. Ramesh introduces the electromagnetic spectrum with a very informative power point presentation. Most of the two 90 minute sessions the students get to use ... spectrometers to measure and eventually calculate the percent reflectance of particular wavelengths emitted by dead vs. living deciduous leaves and dead vs. living coniferous needles. This year the students got to plot their data on a computer spreadsheet and have the program calculate and graph the data. Wow! This was awesome. Students compared their own data and other student's data and discussed what was similar, different and reasons for error. In my assessment of the two 90 minute sessions my students continue to be excited about remote sensing and the tools, both simple and complex, that are able to detect different frequencies of the electromagnetic spectrum."

2. 6th grade social sciences classes, Laramie Junior High
Date: April 25, 2013, with 60 students, and 3 teachers

The WYView PI visited two sections of the 6th grade class, and it was his 3rd visit in as many years to Jared Long's class. Jared is teaching his students about water, its role in sustaining life in this planet, and how countries manage their water. The WYView PI used images (mostly Landsat) to show how countries are managing their water resources and changes over time.

Please see the photos and testimonials from this event at:

<http://wyomingview.blogspot.com/2013/05/students-saw-value-of-satellite-images.html>

Appendix E

Examples of Requests for Information Dissemination and Provision from the USGS During GY 2009-2011

There have been two general types of communication from the USGS. One is information the USGS would like disseminated about their data and products (current and future) and the other is a request for information from AV's membership.

Examples of communication from Bruce Quirk, LRS Program Coordinator, USGS:

- ❖ Communication on 40th Anniversary of Landsat (5 messages including invitation to participate in *Earth as Art* and *My American Landscape* contests).
- ❖ Landsat updates (2 messages)
- ❖ Earth Explorer update
- ❖ Info. on Landsat RFI
- ❖ Opening on Landsat Science team (forward from Tom Loveland)
- ❖ Request for information on economic value of Landsat
- ❖ ASPRS scholarships
- ❖ ESA's Eduspace
- ❖ Pecora Nomination announcement
- ❖ Request for input into ECV development

Examples of communication from Tom Cecere, USGS/AV Liaison:

- ❖ **SPOT image purchase data utilization details**
- ❖ Input requested on SPOT 4 & 5 data acquisition:
 - 1) To make people aware of the most recent task order that the USGS Land Remote Sensing Program has awarded (with help from USDA) and
 - 2) To ask for feedback from the user community regarding obstacles that might prevent the potential user community from better utilizing these resources (possibly lack of training, software, time, etc.) along with recommendations to our program of what could be done to better serve the community.
- ❖ Inquiry about usefulness of USGS imagery for natural disasters of 2011 that AV provided data analysis for.
- ❖ Inquiry if presentation made by Tom about AmericaView at an international conference in Australia in April resulted in upsurge in international users utilizing AmericaView University or Multi-Spec.
- ❖ Request for Landsat factsheets
- ❖ Numbers of student employees, Historically Black Colleges, Native American collaborations: per USGS directives
- ❖ Feedback on the new USGS Earth Explorer version (April 2010)

Examples of communication from Tom Loveland:

- ❖ Call for Landsat 9 requirements

APPENDIX F – StateView High Impact Activities for GY 2012 (in alphabetical order)



AlabamaView

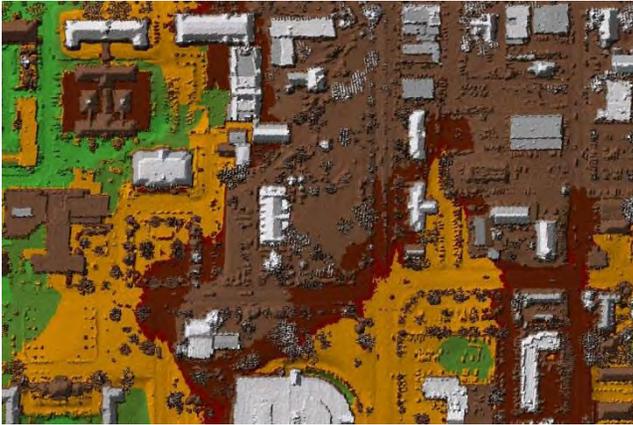
Remote Sensing Activities

2012 - 2013



Collection, Processing, and Sharing of New Remote Sensing Resources

High Resolution LiDAR & Orthophotos



Digital Surface Model (DSM) of Auburn, Alabama, Sept. 2011. This is a Triangulated Irregular Network (TIN) representation high resolution airborne LiDAR.

High Impact Activity 1 for 2012-2013 involved processing high resolution LiDAR & Orthophoto datasets for a number of Alabama counties. This was accomplished through the use of use of ESRI specific data structuring such as LASer (LAS) File Format Datasets, Terrain Datasets, and Mosaic Datasets for inspection, surface interpolation, and rendering. The results are stand-alone geodatabases with point file information, statistical analysis, pyramid enabled surface model renderings, and accompanying high-resolution raster imagery.

These processed data provide sub-meter topographical information for bare-earth, vegetation canopy, and built structures that are useful for thousands of geospatial applications and are made available to the public for free. Students funded by AlabamaView provide technical support to users of the data and often gain hands-on experiences in real-world applications. An example of an application students are working on using these data is mapping and monitoring urban forests in a partnership with the US Forest Service.

Utilization of New Remote Sensing Technologies

Ultra High Resolution Ground Based LiDAR



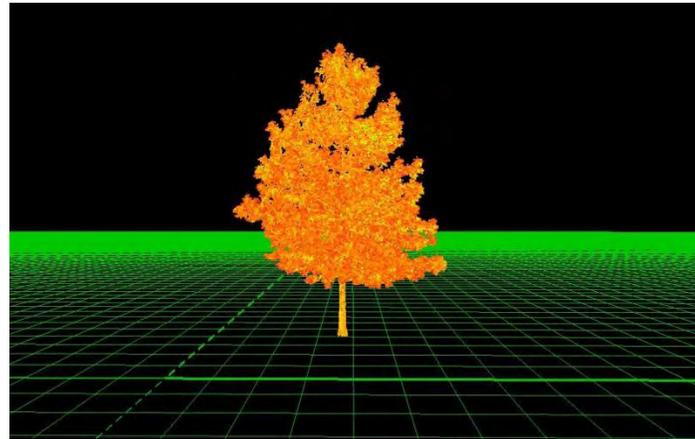
Model created by students from ground-based LiDAR scanner of Toomer's Corner in Auburn, Alabama, June 2012. Highly accurate measurements and drawings can be derived from these types of data.

High Impact Activity 2 for 2012-2013 involved training students and faculty on the use and manipulation of ground-based LiDAR equipment and data. Students were trained in the proper field techniques necessary to accurately capture data as well as in software techniques to manipulate and derive measurements from the data. The results are databases capable of transforming and exporting the data into more common Computer Assisted Drawing (CAD) programs such as AutoCAD or Autodesk Revit.

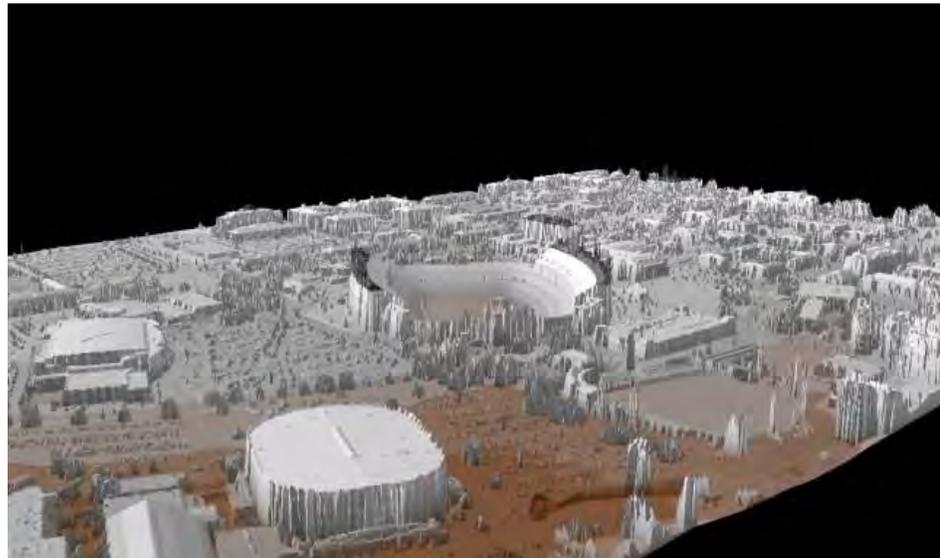
Ground-based LiDAR can be used to provide more detailed 3D models which can be used for very localized studies. Students funded by AlabamaView are utilizing ground based LiDAR to help calibrate the airborne LiDAR and improve urban forest mapping. In training students to use these cutting edge methodologies AlabamaView promotes the development of applications using these technologies to benefit the citizens of Alabama.

Benefits to the state of Alabama

- Processing of Airborne LiDAR for topographical data made available for free to Alabama citizenry.
- LiDAR datasets have been used by municipalities to assist in the strategic planning and allocation of local fire department resources.
- Ground-based LiDAR datasets are being used to remotely gather urban tree metrics that will facilitate increased public safety.
- Workforce training – Training sessions for Alabama state employees were conducted covering the use and manipulation of ground based LiDAR equipment and data. These training sessions allowed members to set up Leica C10 scanner and targets, collect point cloud data as well as imagery, perform 3-dimensional registration, and analyze finished results.



Employees of the Alabama Cooperative Extension Service are trained on the use of ground-based LiDAR to aid in a stream restoration project.



AlabamaView PI

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AmericaView Web Site:
www.americaview.org

AlabamaView Web Site:
<http://www.alabamaview.org/>

AlaskaView

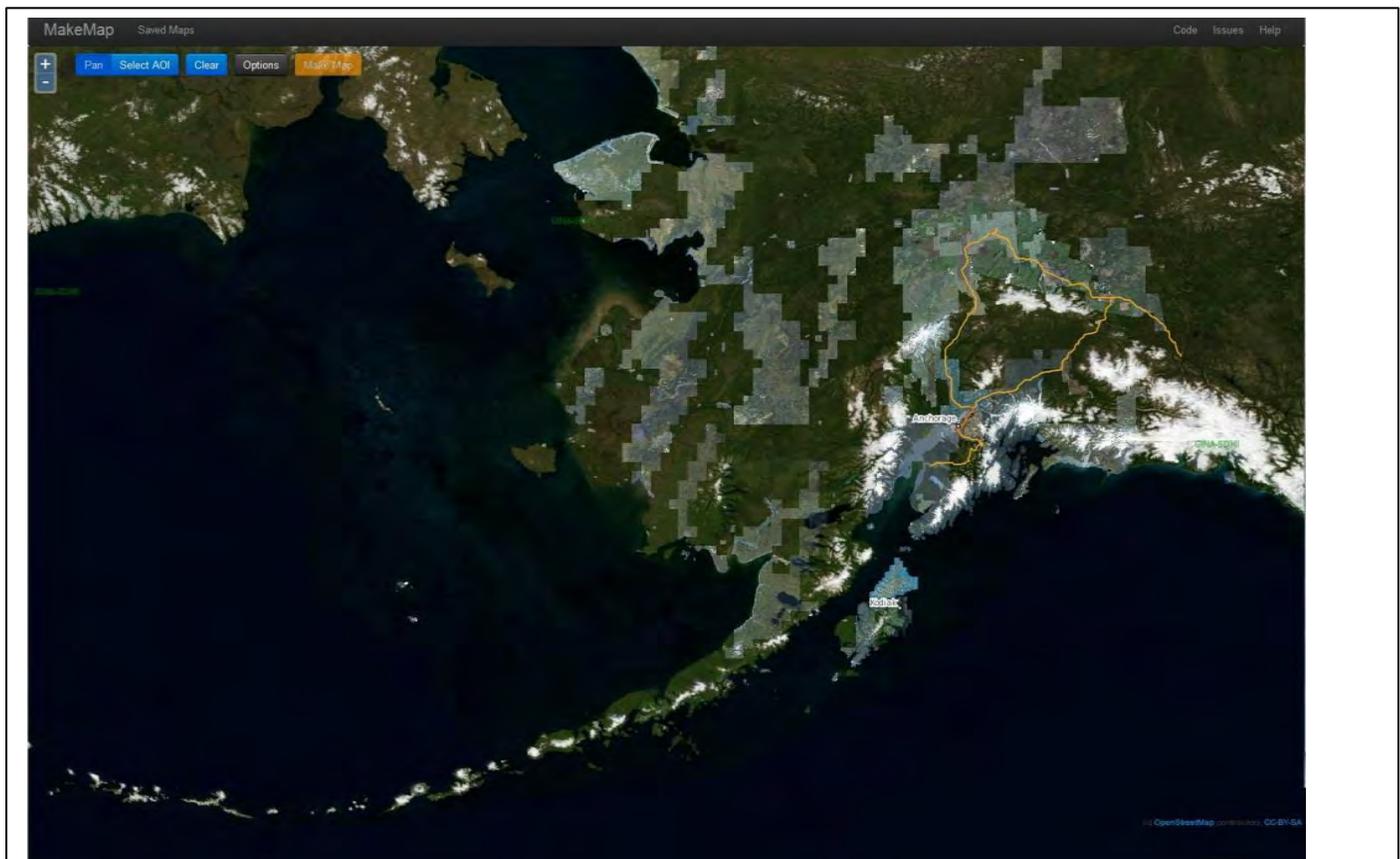
Remote Sensing Resources for Alaska

2012-2013



Simplifying Access to Geospatial Data for Alaskans

In 2013 AlaskaView released a tool named MakeMap that allows residents in Alaska to create custom maps of specific areas of interest using base data layers that include Landsat, as well as bathymetry and ortho imagery. The source code, bug tracker, and project website is open to the public at <http://github.com/gina-alaska/makemap>. MakeMap is available for use at <http://makemap.gina.alaska.edu>.



AlaskaView's MakeMap application lets users easily create custom maps

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



AmericaView Web Site: www.americaview.org

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Providing Easy Access to Geospatial Data

- ❖ Through the Geographic Information Network of Alaska (GINA), AlaskaView provides the public with free access to its 60+ TB archive of AVHRR, GOES, DMSP, Landsat, MODIS, aerial photography, and digital elevation models. AlaskaView heavily promotes and integrates data into Open Geospatial web services to lower the barrier to access large geospatial data archives via Web Mapping Service and Web Coverage. In GY12, AlaskaView continued to expand its delivery, **servicing more than 2,000 unique users and 5,400 page views every month.**



AlaskaView has focused on distribution of remote sensing data using web services such as WMS and tile interfaces.

In 2013, AlaskaView/GINA supported:

- ❖ 35,000 maps drawn on user screens every day (one every 2 seconds)
- ❖ 75 million WMS requests and tiles served in 2013; more than half came from State networks
- ❖ 120 million requests are projected for 2014 based on a 280% increase in usage since July 2013
- ❖ 2.5 Tbytes of data served via WMS, 940Gbytes served via tiles.

Developing and Updating Archives

AlaskaView/UAF GINA continues to do its own direct reception satellite data reception, partners with NOAA FCDAS for expanded satellite reception, and hosts the State of Alaska's high resolution imagery and elevation archive. This has expanded in the last year to start including Aerial LiDAR collections.

The archive is being updated with additional Landsat, MODIS, AVHRR, DMSP, SPOT5, Suomi NPP, and other high resolution aerial and satellite data sources. An exciting development for AlaskaView is the addition of 50% of the state of Alaska as a 2.5m SPOT5 orthomosaic which will be completed by 2015 providing a new high resolution digital basemap for Alaska. As AlaskaView/UAF GINA makes the new SPOT5 orthomosaic imagery and other high resolution aerial imagery available as web services the data becomes integrated and available for MakeMap users.

AlaskaView Partners /Collaborators



Tom Heinrichs, PI and Dayne Broderson, Coordinator
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ArkansasView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Expansion of Remote Sensing Curriculum and Delivery of an Image Analysis Workshop



ArkansasView-supported graduate students demonstrate several remote sensing-assisted silviculture workflows using the NSF-funded RazorVue collaborative display at the Center for Advanced Spatial Technologies (CAST), University of Arkansas, Fayetteville, AR (Mar 2013). Associated Landsat 7 ETM+ and Landsat 5 TM imagery from USGS were critical in the development of the resulting study:

Jones, J.S., J.A. Tullis, L.J. Haavik, J.M. Guldin and F.M. Stephen, 2013, "Monitoring Oak-hickory Forest Change During an Unprecedented Red Oak Borer Outbreak in the Ozark Mountains: 1990-2006", *Journal of Applied Remote Sensing*, in press.

With Arkansas' first PhD program in Geosciences approved by the Arkansas Department of Higher Education (ADHE), new doctoral graduate students can now specifically emphasize remote sensing and other areas of geoinformatics in their research. To prepare for the new curriculum demand, ArkansasView:

- created new and updated laboratory exercises for *Principles of Remote Sensing* and *Remote Sensing of Natural Resources*,
- designed a "shared provenance store" to help students collaboratively design, compare, and replicate remote sensing workflows with the ArcGIS 10 platform, and
- prepared and delivered a workshop in object-based image analysis (OBIA)

University of Arkansas students now have the opportunity to study remote sensing with a uniquely stronger appreciation for collaborative remote sensing-assisted problem solving, and the state's pool of OBIA-trained students and professionals has been expanded.

Benefits of Remote Sensing Education to Arkansans

While the Department of Labor has cited remote sensing and other geospatial developments as key emerging technologies, county and local governments in Arkansas are challenged to find qualified employees. By focusing on undergraduate and especially graduate education at the state's flagship university, ArkansasView is addressing this need. As graduates contribute to Arkansas' rural and urban remote sensing workforce, and even educate students at other centers of learning, such investment has a clear economic benefit. Further, ArkansasView's land stewardship focus in laboratory and classroom materials helps inspire future remote sensing scientists to be problem solvers in a state with crucial natural and agricultural resources.



ArkansasView delivered an "Introduction to Object-based Image Analysis with eCognition" workshop with nine government and academic participants (Feb 2013).

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CalView

Remote Sensing Activities

2012 - 2013



Promoting Remote Sensing Education and Outreach

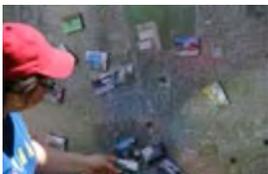
Public Outreach



Left: Visitors at the annual University Open House (**Picnic Day**, April 2013) were encouraged to match Landsat imagery of the CA state counties to their locations on the Landsat State Mosaic map.



Above: Middle school students' monochromatic paintings visualized locations on the map of the city of Davis, CA. Ongoing remote sensing research projects, for instance, land cover type classification in Costa Rica using Landsat 7 imagery were showcased in the framework of this exhibition as well.



Left: A visitor matched local photographs to locations on the city of Davis aerial map.

Outreach to the general public by educators and students has been among the highest priorities of the CaliforniaView program since its inception. Among the several activities completed in 2012-13 are the annual University of California Davis Open House (**Picnic Day**) and the regional **Science Olympiad**.

Over 75,000 visitors attended the 2013 **Picnic Day**. With this year's funding CalView was able to offer additional hands-on activities, as well as to built on already existing ones, e.g. additional locations were added to the aerial map (see photograph at the bottom left), utilizing Landsat as well as airborne imagery, to raise awareness of the importance of remote sensing sciences to better informing citizens of the state of the Earth and around them. All education materials will be updated and built upon to exhibit those at future Picnic Days.

Annual events, such as the regional **Science Olympiad** offer additional opportunities to educate students about the importance of remote sensing sciences and its various applications.



Left: In March 2013, high school students participated in the remote sensing session at the regional **Science Olympiad**, held annually by CalView.

Benefits to California

- Hands-on activities featuring imagery maps of the State of California were utilized to broaden the public's perception on the usefulness and applications of remote sensing imagery in daily lives. The activities help students in grasping complex technical concepts further down the road.
- Teachers requested a visit to a middle school open house showcasing remote sensing imagery to their students.



Above: At the annual middle school open house around 900 students explored aerial imagery of their city. They were matching photographs of city features to their location on the map.

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.

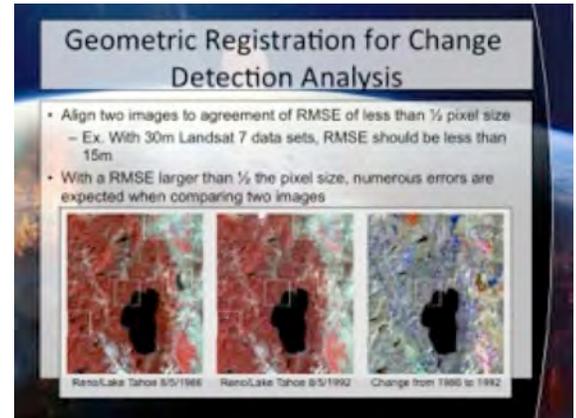


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Other StateView Projects

- Workforce training – During the past year CalView developed several lectures accompanying the CalView remote sensing certificate program (<http://cstars.metro.ucdavis.edu/education-and-outreach/remote-sensing-certificate/>) to equip the future geospatial workforce with tools and skills to advance in the work place. The image on the right is an example of content taught. Change detection is introduced to students highlighting its application for environmental analysis, e.g. fire detection, golf oil spill, glacier ice melt.
- Earth Observation Day Lesson Plans – Five lesson plans for middle school students featuring Google Earth were updated to the newest software version, enabling teachers to be well prepared for classroom instructions on geospatial technologies. Earth Observation Day is an AmericaView sponsored event with the goal to engage students and teachers in remote sensing as an exciting and powerful educational tool (<http://cstars.metro.ucdavis.edu/education-and-outreach/californiaview/california-science-teacher-conference-2013/>).
- Teacher Training Workshop – A teacher-training workshop utilizing the Earth Observation Day middle school lesson plans on Google Earth was developed and accepted for presentation, at the annual California Science Teacher Association Conference 2013.
- Website – During the past year CalView was able to create its program website, housed on the Center for Spatial Technologies and Remote Sensing website, raising awareness to the resources the StateView program offers to residents within California.



Above: CalView Remote Sensing Certificate Program example slide: Unit 9 "Introduction to Change Detection".

StateView Consortium

UCDAVIS

CSTARS
Center for Spatial Technologies and Remote Sensing

California Space Grant
CONSORTIUM

CalView is housed at the University of California Davis, CA 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. In FY 2012 CSTARS supported the development and became the host of the CalView website.

During the past year CalView was able to develop relationships with California Space Grant Consortium members promoting AmericaView consortium resources.

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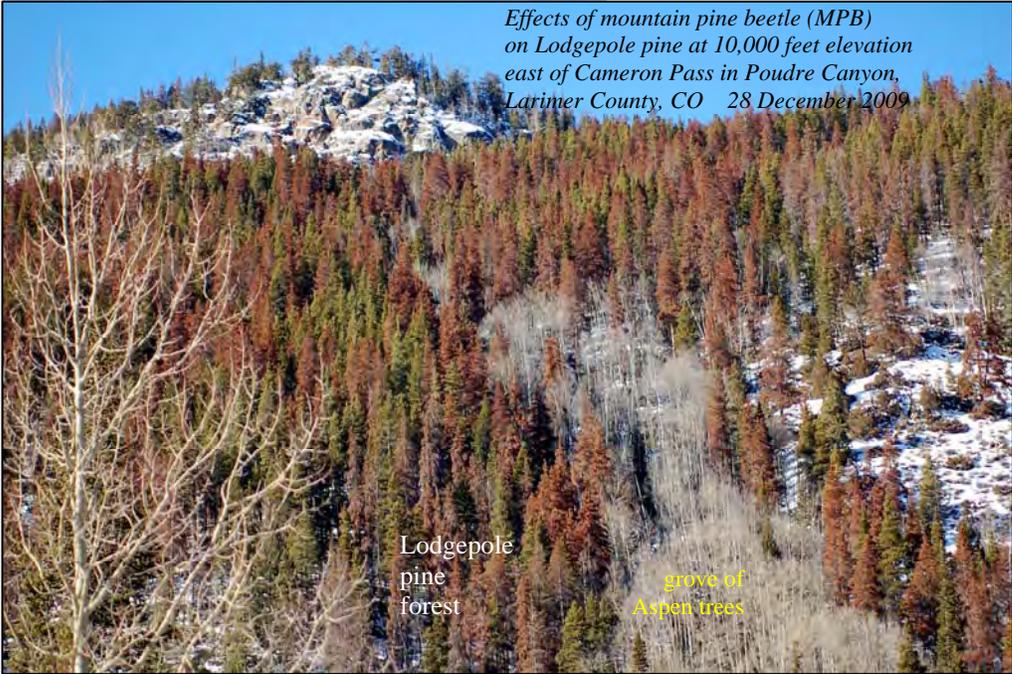
Colorado View



Fact Sheet 2012

Promoting the Benefits of Remote Sensing Data and Applications

Continue collaborative activities with the US Forest Service (USFS) that will focus on mapping forest stand structure with an emphasis on mountain pine beetle (MPB) infestation and fuel loads (wildland fire). This study will be performed in collaboration with the USFS Rocky Mountain Research Station, currently conducting research in the Arapaho-Roosevelt National Forest (CO) and Medicine Bow National Forest (CO\WY).



Benefits to Colorado

Continue to explore environmental impacts of invasive species using spatial modeling which integrates remote sensing and GIS to statistically map and predict invasive species, such as *tamarisk*, within Colorado. This work will be performed in collaboration with the University of Maryland, as well as with an on-going partnership between the US Fish and Wildlife Service (USFWS) and the National Institute of Invasive Species Science (NIISS) using data collected across four National Wildlife Refuges.

Other Projects

ColoradoView and AmericaView information, data products, and tutorials have been incorporated into the curriculum of a Physical Geography course taught in CSU's Department of Ecosystem Science and Sustainability by Dr. Wei Gao.

Colorado View continues to identify opportunities for undergraduate and graduate internships: specifically, our interns have added tutorials to the ColoradoView website:

- Trimble Geo Explorer GPS
- Garmin Etrex Vista and Legend GPS
- Circular calibration field plots
- USFS quarter acre forestry plots
- Creating interactive geospatial pdfs



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GeorgiaView

Remote Sensing Education

High Impact Activities 2012 - 2013



Summary of GeorgiaView Activities

Remote Sensing has been a key technology in Georgia allowing communities to monitor droughts, wildfires, floods, urbanization, and agricultural production. Since 2002, GeorgiaView has promoted remote sensing applications in Georgia including: identifying coastal erosions and farming practices on coastal lowlands, delineating urbanization and land cover changes in Piedmont Georgia, analyzing urban heat islands in metro Atlanta, restoring historical landscapes, and identifying damaging insect infestations such as the pine beetle onslaught in mountainous Georgia forests. Several activities were completed during 2012-13 including sharing remote sensing data, managing an introductory remote sensing course via online, educating remote sensing to K-12 students and teachers with Google Earth and Landsat imagery, making ortho-mosaics with historical photographs, sharing remote sensing software (PG-STEAMER 4.1) among GeorgiaView members, and proposing a multi-StateView project on geographic object-based image analysis (GEOBIA). In sum, GeorgiaView has had a high impact in State of Georgia through educating K-12 students and teachers.

Earth Observation Day Field Trip

On March 14, 2013, GeorgiaView hosted the Earth Observation Day (EOD) Event at University of West Georgia (UWG), in Carrollton, Georgia.



Twenty two high school seniors and two teachers from Coweta County Performance Learning Center joined the event. The event started with watching the Landsat Data Continuity Mission (LDCM) satellite launch video followed by a Google Earth exercise. Students worked on various topics including coordinates, measurement, change detection, and object delineation. During the lunch at the UWG dining hall, two research projects were presented by UWG students – “Remote Sensing on Urban Heat Islands” by Jared Ogle and “Geospatial Technology Applications” by Michael Edwards. The EOD event was enlightening to many students. For example, Alix Tanner’s testimonial said, “A new science was discovered by me that I can see relates to other sciences. I will always have remote sensing in my head when I wonder at night the field of science I may want to study.”

GeorgiaView 2013 Summer Internship



During June 17-21, 2013, GeorgiaView hosted a summer internship program at UWG for high school juniors and seniors. Twelve high school students participated from Carroll and Douglas Counties. They worked with Landsat imagery to create state-wide mosaic images and to analyze urban heat islands with Landsat thermal bands. Dr. Seong directed the internship with UWG students, Ms. Emily Sullivan and Mr. Jared Ogle.

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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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GeorgiaView

Remote Sensing Outreach Activities 2012 - 2013



Online Remote Sensing Course – <http://www.avuniv.org>

Since 2008, GeorgiaView has maintained an online remote sensing course via the AmericaView University website. The course

covers sixteen topics composed of lecture videos, presentation slides, assignments, exercises and exams. Over the last five years, there were nearly 1100 users registered, and over 200 users actively explored the remote sensing course materials. There were 685 accesses to the course in the one year period (July 2012 – July 2013).

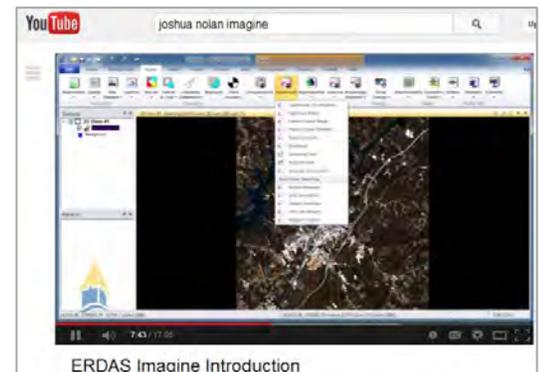
<http://www.avuniv.org>
AmericaView University

YouTube Videos on Remote Sensing with eCognition and ERDAS Imagine

Dr. J.B. Sharma and Josh Nolan at University of North Georgia developed instructional videos on Remote Sensing with eCognition and ERDAS Imagine that have been posted at YouTube and shared with the AmericaView members and the world. Examples are,

- ❖ eCognition Introduction: <http://www.youtube.com/watch?v=DYtqXUPXVtw>
- ❖ Parcel Extraction: <http://www.youtube.com/watch?v=0Hx6HF3o2S8>
- ❖ Rule Set: <http://www.youtube.com/watch?v=DYtqXUPXVtw>
- ❖ eCognition Server: <http://www.youtube.com/watch?v=zgdvFBNOvI0>
- ❖ Mosaic in Imagine: <http://www.youtube.com/watch?v=8htpuQwEF3s>
- ❖ Supervised Classification: <http://www.youtube.com/watch?v=tjHpjJ7dV0>
- ❖ Imagine introduction: http://www.youtube.com/watch?v=9visEx_wMxo

These videos now have thousands of views and cover several advanced concepts in GEO-Object-Based Image Analysis.



Support for Student Research Projects



Jared Ogle, a graduate student at University of West Georgia, presented a research project on urban heat islands using Landsat imagery at the Association of American Geographer's Annual Meeting and Conference (April 2013 Los Angeles, California). GeorgiaView supported his research with Landsat imagery, training, and partial travel support.

In addition, GeorgiaView continued to support student participation via mini-grants to Dr. J.B. Sharma at the University of North Georgia. Three students - Jake Nolan, Savanna Sapp and Morgan Bell - worked as GeorgiaView interns to geo-reference and orthorectify 1938 Aerial Imagery of the Chattahoochee National Forest. The images that were originally in hard-copy have been scanned and flight lines have been created. Then the images have been geo-referenced and orthorectified with a LiDAR-derived DEM. The project is currently about 30% complete.



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GeorgiaView

Remote Sensing Research Activities

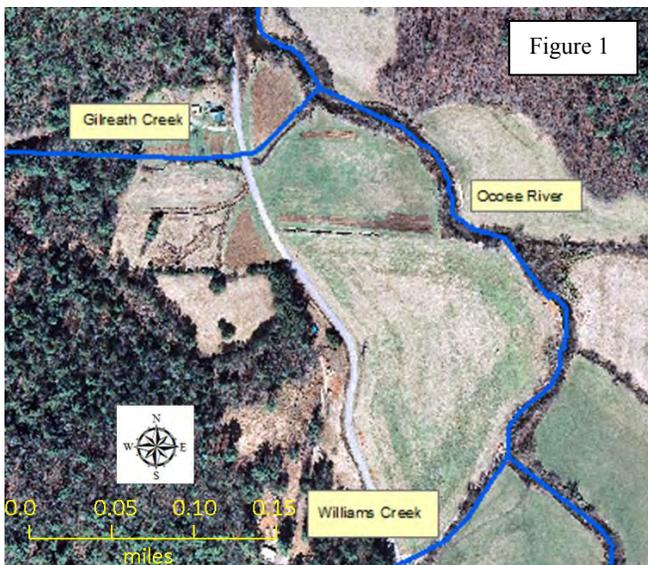
2012 - 2013



An Analysis of Riparian Zone Health along the Upper Ocoee River

Aaron Smith, University of North Georgia; Advisor: Dr. J.B. Sharma; Spring 2013

The Ocoee River originates within the North Georgia Mountains flows through Tennessee before meeting the Atlantic Ocean. Besides its obvious local ecological importance, the river also provides water and power to the surrounding populations via three dams constructed by the Tennessee Valley Authority. For these reasons it is important that the health of the river remains adequate and that riparian zone health is optimal. Upon leaving the Chattahoochee National Forest from which it originates, the river enters a series of dense agricultural lands that do not adhere to the standards that the state of Georgia has established for healthy riparian zones.



It was the objective of this case study to assess the health of the riparian zones surrounding the Ocoee River within a small 30 mile x 20 mile study area within Georgia using aerial multispectral ortho-imagery (Figure 1) and LiDAR and by creating a land-use/land-cover classification map (Figure 2) with eCognition Developer. It is the overall goal of this case study to develop a rule set with eCognition for use by the Georgia Environmental Protection Division (GEPD) to remotely assess the health of riparian zones without deploying significant time, money and resources into the field.

A Normalized Difference Surface Model was computed with QT Modeler for use with eCognition. Several algorithms such as NDVI, Delta NDVI, NDWI and Shadow Extraction were also used within eCognition to create a rule-set for the land-use/land-cover map. Once the land-use/land-cover map was created, it was imported into ArcMap 10 for further analyses. A 50-foot



buffer, complying with the Georgia State Code, was used to extract all land classes that existed within 50 feet of the streams (Figure 3).

Results showed that the Ocoee River and the Tributaries of Gilreath Creek and Williams Creek are covered by 81.05 % pasture or grassland within this study area. This analysis

concluded that the Riparian Zones surrounding the Upper Ocoee are severely impaired.

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HawaiiView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Landsat 8 Science Kits



Left: the reflectance spectrometer and infrared thermometer that form the core of the Landsat 8 Science Kits. Right: the Landsat 8 spacecraft, which carries the Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS).

The U.S. Landsat satellites have been continuously monitoring the Earth from Space for over 40 years. Landsat 8 launched in 2013 is the latest and most advanced. To support this effort, HawaiiView has developed self-contained "Landsat 8 Science Kits". The aim of this project was to provide a "lesson in box" that could be used at K-12 and college level, to introduce students to the value of the Landsat 8 mission. Hand-held reflectance spectrometers and infrared thermometers (pictured on the left) are used to make measurements of the light reflected and emitted by surfaces in the classroom, measurements that are equivalent to those made by the two instruments on board Landsat 8, the Operational Land Imager (OLI) and the Thermal Infrared Sensor (TIRS). The kits contain the instruments, lesson plans and all stationary required to complete the activity.

Benefit of Activity to Hawaii

Lesson plans focused on Earth observation science covers aspects of physical science, technology, engineering, and mathematics that can be applied to solve real world problems, in disciplines such as geography and environmental science. However, 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 have been successfully used at several workshops in the State of Hawaii to introduce the next generation of scientists to the science and technology behind the Landsat 8 mission.



Students using the Landsat 8 Science Kits, July 26, 2013, Hilo, Hawaii,

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IowaView

Improving Content and Access to Iowa's Remote Sensing Archives 2012 - 2013 Activities

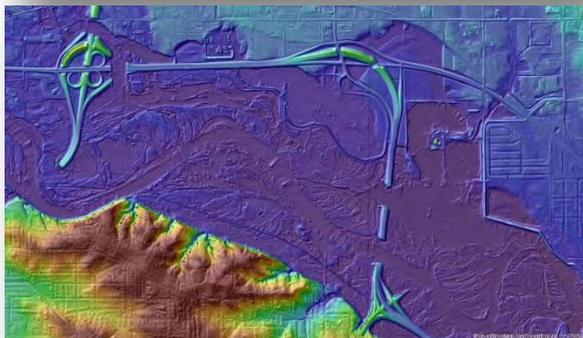


Cedar River near Waterloo, Iowa



**NAIP 2013 –
USDA FSA**

**1 meter color
and color-
infrared
orthophotos**



**Iowa Lidar
Project –
IDNR, IDALS,
IDOT, USDA
NRCS and
USGS**

**3 meter
DEMs, 1
meter
shaded
relief, 2'
contours**



**Flood of
1961 – IDNR,
US Army
Corps of
Engineers**

**1 meter BW
orthophotos**



**1930s
historical
ortho project
– IDNR,
IDOT, U of
Iowa Map
Collection,
USDA NRCS**

**1 meter BW
orthophotos**

Iowa has a very large and unique collection of current and historical orthophotos and lidar elevation data sets that are available free to the public for online viewing, file download or as web mapping services. The collection includes historical aerial photos from the 1930s, 1950s, 1960s, 1970s, 1980s and 1990s, as well as other projects from 2002 to 2013.

In 2012-2013 Iowa partners added new remote sensing layers including statewide 2013 NAIP color and color-infrared orthophotos, and completed the Iowa Historical Ortho Project by finishing the 1960s black and white photos for the state. A new project was initiated in 2013 to create orthophotos and mosaics from scans of US Army Corps of Engineer aerial photos of major floods along Iowa's rivers. New mosaics were created to show the 1964 Mississippi River flood of record along the entire Iowa border, and the 1961 flood along the Cedar River in Waterloo and Cedar Rapids.

Iowa's remote sensing archives are used by businesses, governments and the public to answer basic questions about current and past land and water features. Local governments have used the historical aerial photo archive to check features over time and have been used to help resolve land use issues before they require legal action. Photos of actual flood extent are useful to convince land owners and home buyers that floods have occurred in the past and flood insurance may be a good idea. The lidar data archive is used by just about everyone that needs to see the shape and form of the landscape itself. Every year several terabytes of lidar data are downloaded and used by engineers and consultants working for businesses and governments. In a recent return on investment analysis, the value of the lidar data to users was estimated to be at least \$5 million per year. These benefits include reducing the need for topographic and archaeological site surveys, and improving designs for local infrastructure projects, including culverts, road grading, erosion control structures and wetland mitigation.

Partners include the Iowa Departments of Natural Resources, Transportation, Agriculture and Land Stewardship, Homeland Security and Emergency Management, Iowa State University GIS Facility, University of Iowa Map Collection, University of Northern Iowa Geotree Project, Alliant Energy, US Army Corps of Engineers/Rock Island District, USDA FSA and NRCS, and the USGS. Over the past 15 years, numerous local governments have also supported imagery projects, and contributed photos to the data archive.

Current and historical orthophoto viewer and map services:

<http://ortho.gis.iastate.edu/>

Lidar data download website:

<http://www.geotree.uni.edu/lidar/>

Iowa DNR GIS Library:

<http://www.igsb.uiowa.edu/webapps/nrgislib/>

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IdahoView Executive Summary



Remote Sensing Education in Idaho

Promoting Remote Sensing Education

Remote Sensing Summer Camp



Figure 1. K-12 students learning about drones.

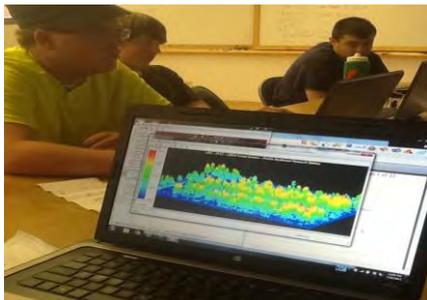


Figure 2. K-12 students working with light detection and ranging (LiDAR) data.

In 2012, IdahoView funds were used to pilot test a 5 day remote sensing summer camp for K-12 students at the University of Idaho's McCall Outdoor Science School or MOSS (<http://www.uidaho.edu/cnr/moss>). Based on the 2012 feedback and experiences, two revised curricula were created in 2013 – one for 7-9 graders and one for 10-12 graders.

Benefits of Activity to Idaho

- **Engagement of K-12 students in STEM activities**
We engaged a total of 21 K-12 students into STEM activities by delivering two, 6 day long remote sensing summer camps (see blog: <http://ecosensing.org/teaching/nr-101/al-moss>).
- **Increased interest in geospatial technologies**
From the beginning to the end of the camps, the average interest of camp participants in geospatial technologies increased from 3.0 to 4.4 (with 1 = not interested and 5 = very interested) based on pre and post surveys administered by instructors.
- **Graduate student training**
We provided a summer assistantship for one University of Idaho McCall Outdoor Science School (MOSS) graduate student, who helped deliver and restructure the remote sensing summer camp.

Other Projects



- Idaho's three major universities are actively involved in IdahoView activities and share its leadership responsibilities.

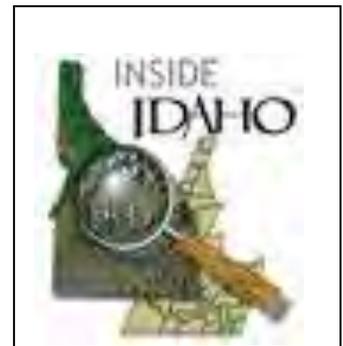


- IdahoView visits Idaho's Congressional delegates to create a better understanding of the remote sensing priorities and the need for improved STEM education within the State.



- IdahoView continues to assist researchers and stakeholders access imagery, including Landsat data, via INSIDE Idaho geospatial repository.

- IdahoView also assists in making LiDAR data and data processing toolkit freely available for research and teaching.



INSIDE Idaho now acts as our main geospatial data repository.

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IndianaView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

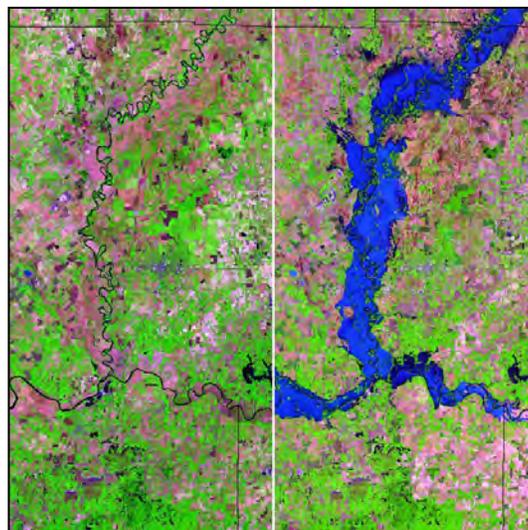
High School Geospatial Lesson Plans Utilizing Data from State Initiatives



The 11/5/2009 Landsat 5 (left) and the 4/22/2013 Landsat 8 (right) images illustrate land cover change due to construction of the new Interstate 69 corridor in southwestern Indiana east of the city of Washington.

A partnership with the Geography Educators' Network of Indiana (GENI) developed two interactive class lessons directed towards high school students that utilize state-wide Landsat and orthographic images from familiar areas to teach spatial technology skills. The lessons are tied to the Indiana Academic Standards. This project was a result of a need identified by several IndianaView consortium members for education and outreach materials that use and highlight the state geospatial data initiatives conducted during the 2011-2013.

The topic for the first interactive lesson was land-use/land-cover. The second topic was water & drought: two sides of the same coin. The data used for the inter-actives include Landsat data and the aircraft orthographic and LIDAR data collected for the state during the last three years. The inter-actives are available from the GENI web site (www.iupui.edu/~geni) and include images, maps and videos along with lesson plans for the teachers.



The 6/9/2007 (left) and 6/11/2008 (right) Landsat 5 images illustrate land cover change due to flooding (deep blue) of the White River in southwest Indiana in June 2008. Landsat 5 bands 5, 4, 3 displayed as red, green, blue.

Benefits of Activity to Indiana

These geospatial lessons introduce high school students to GPS, Remote Sensing and GIS in the context of data for Indiana. The activities include 1) IndianaMap with over 270 layers or maps of geographic information for Indiana, 2) Landsat data using USGS' LandsatLook Viewer, 3) the IndianaView website with access to Indiana Landsat data and the MultiSpec software program (described below) and 4) LiDAR data.

The lessons highlight the state geospatial initiatives by introducing the students to the ortho-images and LiDAR data that have been recently acquired for Indiana and how to access and use these data. A 25-year temporal sampling of Landsat data has also been made available for eight of the most populous counties so that the students can work with images of areas that they are familiar with.

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Other IndianaView Projects

Mini-grants fund projects conducted by the consortium partners to promote the use of remote sensing image data. The 2013 mini-grant funded a project to rectify 228 scanned Sanborn Historic map sheets (1891-1913) so that they can be used in the Wayne County GIS system. The new layers of rectified historic image maps provide the basis for long-term land use change studies. As the mini-grant was being finished, the layers explained a complication encountered during a construction project in the county that required it to be stopped and re-scoped.

IndianaView GloVis: <http://www.indianaview.org/glovis/index.html>
This portal provides easy access to analysis-ready images of Indiana including Landsat, ASTER and other image data such as MODIS Leaf Area Index (LAI) products and USDA National Agriculture Statistics Service crop data layers. Links are provided to 1) a portal operated by a consortium member, Indiana University, which provides the aircraft acquired orthographic image data and to 2) IndianaMap which provides many geospatial layers of information operated by consortium members IGIC & the Indiana Geological Survey. A link is also provided to a subscription service called PRESTIGE for near-real time MODIS data from Purdue's Terrestrial Observatory.

MultiSpec (<https://engineering.purdue.edu/~biehl/MultiSpec/>) is a free remote sensing application that is used for education and research. There were seven updates during 2012-13. A release in early 2013 allows users to more easily combine the separate Landsat (including Landsat 8) band files provided by USGS into a single GeoTIFF image file.



Side by side comparison of the 1909 Sanborn map of the Pennsylvania railroad depot with the current buildings from recently acquired ortho-image data in Richmond, Indiana.

IndianaView Consortium



INDIANA UNIVERSITY



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

<http://www.indianaview.org/apps.cfm>

Indiana University provides an easy access portal to the available aircraft-acquired orthographic data for Indiana (<http://gis.iu.edu/>) to augment the spacecraft-acquired data available on the IndianaView portal.

Partners have used the Landsat data available from the IndianaView GloVis portal and have shared image data from their own research libraries to be added to the portal.

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KansasView

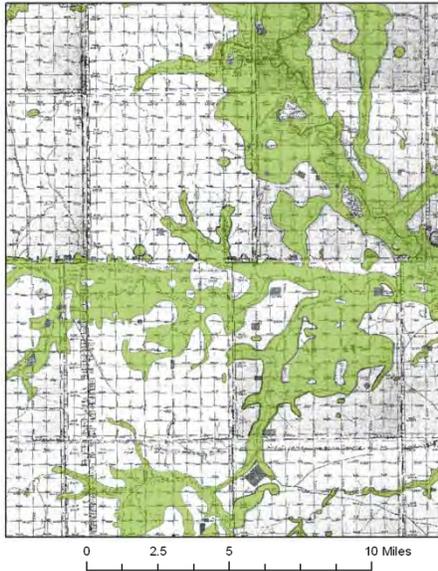
Remote Sensing Activities

2012 - 2013



Improved Mapping of Baseline Land Cover for the State of Kansas

Mapping 1850s Kansas Land Cover



Sample of original forest cover derived from the georeferenced 1850s Public Land Survey in Linn County, Kansas. The area shown represents approximately 7 townships, or 252 square miles.

Although Landsat satellite mapping dates back over 40 years, detailed land cover information for Kansas dates back to the 1850s. The General Land Office (GLO) transect surveys that were conducted to establish the Public Land Survey System define the over 80,000 sections of land in the state and also contain valuable information about the natural condition of the state.

Using meticulous and innovative image processing techniques, KansasView researchers have brought over 3000 GLO maps into the 21st Century in a way that makes them accessible to researchers in ecology, biology, climatology, geography, and history, as well as the general public. In addition, information that has been extracted from the georeferenced maps provides a detailed digital representation of historical conditions for comparative studies and analysis.

Benefits to Kansas

The information derived from this project will be used for many purposes, including:

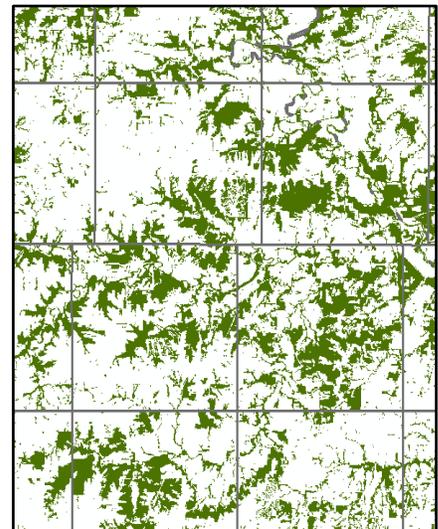
- Ecological trend analysis
- Conservation planning
- Invasive species mapping for management and removal
- Establish riparian reference condition and restoration planning
- Wetland identification
- Historical studies

The KansasView Consortium

KansasView is a consortium of higher educational institutions – the University of Kansas, Haskell Indian Nations University, Kansas State University, Emporia State University, and Fort Hays State University – partnering with state agencies and promoting the benefits of remote sensing through applied research, education, and outreach.

Some past and current efforts co-sponsored by KansasView include:

- Mapping inundation extents along Kansas rivers
- Statewide remote sensing conferences
- Research grants to undergraduate and graduate students
- Statewide imagery databases – Landsat, MODIS, and ASTER
- Project GeoHawk – a balloon-mounted aerial camera system designed and launched by students



Landsat TM based mapping of current forest cover for the Linn County, Kansas region.

PI: Stephen L. Egbert
Coordinator: Kevin Dobbs
Kansas Biological Survey
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Lawrence, KS 66047



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KentuckyView

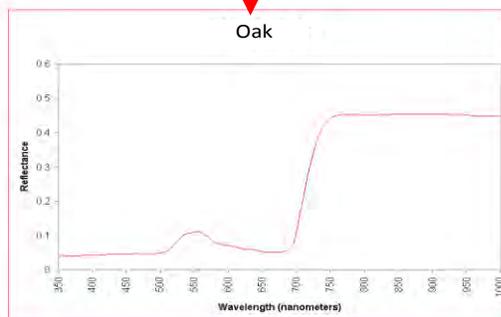
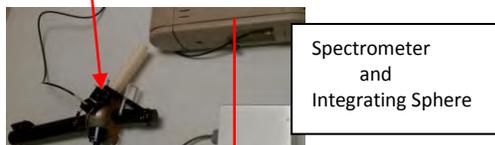
Remote Sensing Activities

2012-2013



Promoting the Benefits of Remote Sensing Data and Applications

Kentucky Spectral Library



For this project an integrating sphere, which has internal diffuse (lambertian) reflection and integration of the energy, collecting reflected light from samples over a full hemisphere, is used. It has an internal light source and provides repeatable response to the reflectance of the sample, such as the leaf in the above figure, placed in the beam at the port of the sphere. An ASD FieldSpec spectrometer with a spectral range of 350-2500nm is used for this project. The spectrometer's fiber optic cable is connected to the integrating sphere to collect the spectra.

Benefits to the Commonwealth

The primary focus of KentuckyView is on 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. KentuckyView presently has 11 members.

One of the high-impact studies being conducted is the "Kentucky Spectral Library" (KSL) project - the first key step in establishing a statewide spectral database of different natural and man-made materials in support of environmental planning and modeling activities. A statewide steering committee comprised of academic and state agency personnel has been formed. Currently, the Steering Committee has 12 members. This project is expected to encourage collaboration among institutions within Kentucky as well as interested institutions from surrounding states and the federal government, which should improve collaborative efforts, such as invasive species mapping and forest health studies.

Initial spectral data collection for western Kentucky started in 2013. Two major groups of objects for the data collection selected were soil samples and overstory vegetation samples. In addition to these samples' spectra, some of the spectral data that had been collected were also compiled.

In addition to existing ground-information data sets for land-cover mapping in Kentucky, a land-cover spectral library is being created to support high impact applications and calibration efforts for Landsat 8 data. Several Landsat paths/rows have been selected across the Commonwealth to obtain visible and Infrared ground spectra for this purpose. KentuckyView, led by the Mid-America Remote sensing Center (MARC) at Murray State University, and the Institute for Regional Analysis and Public Policy at Morehead State University, has partnered with the Commonwealth's universities and several state government agencies, to promote the benefits of remote sensing, particularly the Landsat Program, to K-16 education and public applications.



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LouisianaView Executive Summary

Remote Sensing Resources for Louisiana

Promoting the Benefits of Remote Sensing Science and Applications

Intimate Science – Intersection of Science, Art and Technology

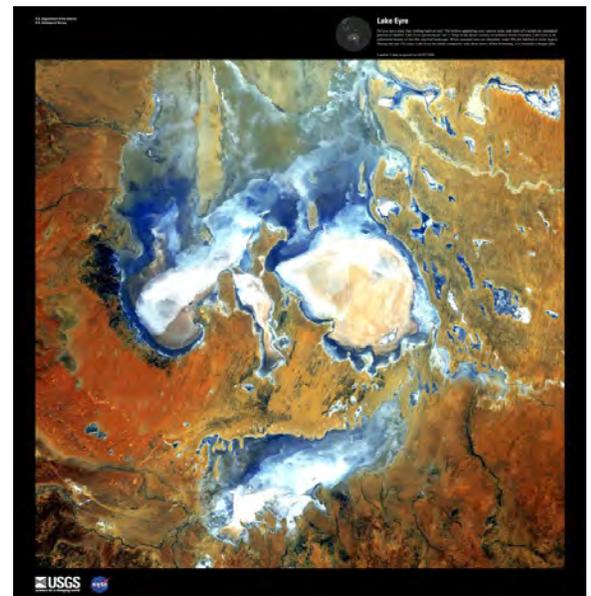


Above: Landsat 7 Satellite Image of the Bogda Mountains in northwestern China, illustrating a strange mix of salt lakes and sand dunes.

Benefits to Louisiana Education

The LouisianaView Program working in conjunction with curators from the University of Louisiana at Lafayette’s Paul and Lulu Hilliard Art Museum and a manifestation of artists working at the intersection of art, science and technology demonstrate a distinctly autodidactic, heuristic approach to understanding the physical and natural world. This exhibit is designed to educate on the Earth’s science through Satellite Imagery, while at the same instance portray the composition and tonal quality of the Earth’s natural art.

Right: Lake Eyre found deep in the desert country of northern South Australia is home to some rare ecosystems and is the largest salt pan in the world. This image acquired by Landsat 5 was voted a favorite by students viewing the museum exhibit. The image of a haunting fiery scull was observed by most.



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

In much of the work we do, images from Satellites play a large role in the way we study climate change, weather patterns, natural and man-made disasters, timber stand health and man-kinds development and use of the Earth's resources. In studying these images we also find many of the fundamental elements of fine art such as tonal quality, image composition and balance. In this exhibition, working with the USGS "Earth As Art" program, utilizing NASA Landsat Satellite Imagery we comprised images to excite the imagination and entertain creative fancies. Over 30 Images from Satellite systems were displayed for multiple gala events and school visitations, entertaining a host 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!



This exhibit is scheduling engagements across the state of Louisiana starting Fall 2013 and continuing, as it excites the imaginations of students and professionals alike.

LouisianaView Partners / Cooperators



UL Lafayette Regional Application Center
Louisiana Army National Guard – GeoSpatial Center
USGS Louisiana Mapping Partnership Office
USGS National Wetlands Research Center
Louisiana Dept. of Environmental Quality
Corp of Engineers - New Orleans District
Louisiana State University
UL Coastal Community Resiliency Studio
USDA Natural Resources Conservation Service–Louisiana
Louisiana Dept of Agriculture
Louisiana State GIS Council
Louisiana GOHEP GeoSpatial Data Division

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REGIONAL APPLICATION CENTER

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www.rac.louisiana.edu



MarylandView Remote Sensing Activities 2012-2013



Balloon Aerial Photography Project (joint project with PennsylvaniaView)

MarylandView and PennsylvaniaView completed a joint project to develop a “guidebook” for K-16 teachers and their students who are interested in mapping areas via balloon aerial photography (BAP). The guidebook provides step-by-step instructions on how to build a balloon mapping platform, how to undertake a balloon mapping mission, and how to process the aerial photographs after a mission to produce image composites and other mapping products.

The low cost option (under \$300 plus the cost of helium) uses a balloon mapping kit developed by *The Public Laboratory for Open Technology and Science* (<http://publiclaboratory.org/home>). The higher cost option (over \$500 plus the cost of helium) substitutes parts purchased from several commercial suppliers for the parts included in the kit. Both options are based on the use of a Canon camera.

Given the growing interest in BAP, the manual is a great resource for teachers in Maryland and Pennsylvania.

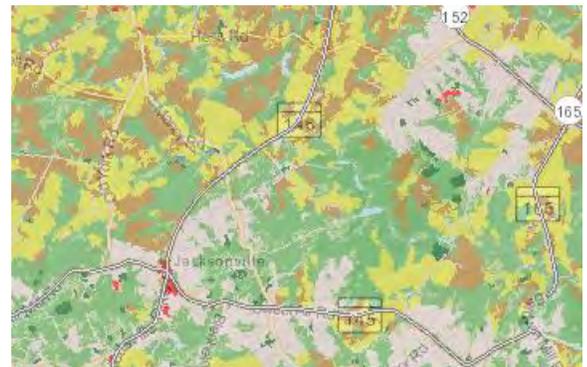


Maryland Environmental Trust Project

The Maryland Environmental Trust (MET), a statewide land trust, works with landowners and citizen land trusts to protect Maryland's most treasured landscapes and natural resources. As one of the oldest and more successful land trusts in the country, MET holds over 1,040 conservation easements preserving over 129,000 acres of land statewide.

The MarylandView Consortium worked with MET staff to develop a procedure to monitor changes in their conservation easements on an annual basis. The procedure uses Landsat 8 imagery to identify land cover changes--such as forest to bare ground or urban—warranting on-site investigation by MET staff.

This application of Landsat imagery will save the State of Maryland time and money, and will ensure that MET staff field check any of their easements where land cover changes have occurred.



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MarylandView Remote Sensing Activities 2012-2013



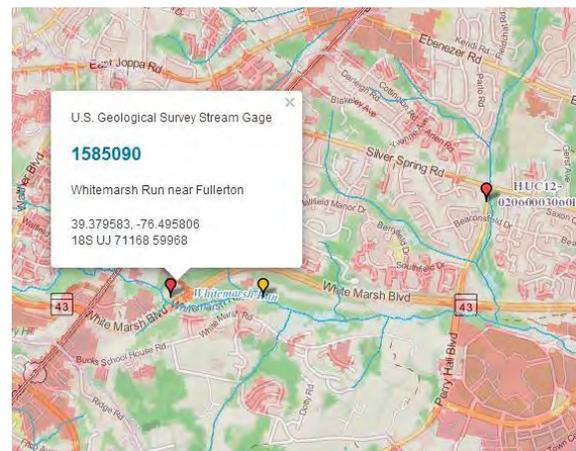
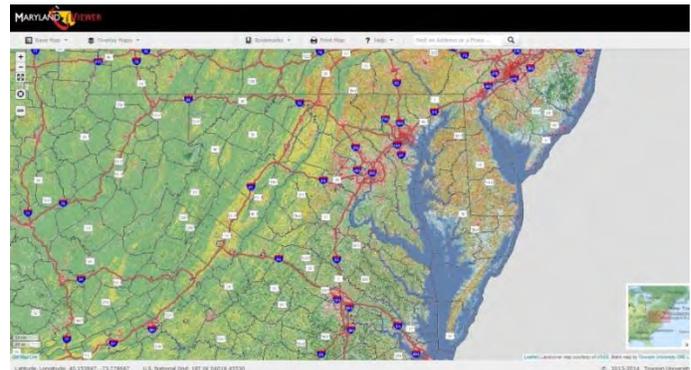
Web-Based Mapping Via *MarylandViewer*

The MarylandView Consortium developed an Open Source Web mapping application known as *MarylandViewer*. *MarylandViewer* enables visitors to the MarylandView Web site the opportunity to visualize remotely sensed and other digital geospatial data.

What is *MarylandViewer*?

Among the data layers included in *MarylandViewer* are those available as Web map services provided by the U.S. Geological Survey's Cumulus Portal for Geospatial Data Portal and *The National Map*. These include the National Land Cover Database (land cover, impervious surfaces, and tree canopy), the U.S. Department of Agriculture National Agricultural Imagery Program data, and a variety of other mapped data focused on watersheds.

In addition to USGS data, *MarylandViewer* includes map data from other federal and state government agencies. Real-time data, including NOAA buoy observations, NEXRAD radar, and OpenWeatherMap weather station data, are also available. The Web mapping application includes a variety of tools for navigating the map, displaying data, measuring distance, searching the map, and printing data.



Benefits to Maryland

MarylandViewer provides a solution for teachers, students, and citizens to readily view a variety of environmental data for Maryland. Because *MarylandViewer* was built using open source software and data, there is no need for users to purchase expensive mapping software or "credits" to visualize land cover and other data.



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MichiganView Remote Sensing Activities 2012 - 2013



Improving Utilization of Remote Sensing Resources

Crowd-sourcing invasive species detection: Wetlands ecology and remote sensing education through recruiting “citizen scientists” at the Fifth Grade level

1/2 Acre Site Description (40x50 Meters)

Observer Names: _____ Site Visit Date: _____

Group Name: _____ Time: _____

Group Number: _____ Water Level: _____

Waypoint ID: _____

Waypoint GPS: _____
[Latitude (Y), Longitude (X)]

Ecosystem Type: Open H2O / Floating Aquatic / Mudflat / Emergent / Wet Meadow / Wetland Shrub / Wetland Forest
(Circle One)

Dominant Species: _____

Circle 1 stand type and write in species below

Pure Stand (1 Species Present)	Mixed Stand (Less than 6 Species)	Mixed Stand (6 or More Species)
_____	_____	_____
_____	_____	_____

Species Distribution: Patchy/Evenly Mixed _____ **Phragmites Present?** Yes/No _____
(Circle One) (Circle One)

Phragmites Condition: Treated/Untreated _____ **Percent Cover:** _____
(Circle One)

Homogeneity: Sum must equal 100%
(Of Entire 1/2 acre area)

Dense Vegetation:	0%	25%	50%	75%	100%
Sparse Vegetation:					
Exposed Mud:					
Open Water:					

Pictures:

North: _____

East: _____

South: _____

West: _____

↓ DON'T FORGET THE OTHER SIDE

One side of the data sheet used by Fifth Grade citizen scientists in the field; students measure vegetation density, height, take photographs, and read GPS coordinates

In 2012-2013, MichiganView developed a program that exposed K-12 students to remote sensing and wetlands ecology. The project allowed students to become “citizen-scientists” by contributing to an ongoing effort to map the invasive wetland plant *Phragmites* in the Great Lakes region. To implement the first iteration of this program, Michigan Tech Research Institute (MTRI) staff collaborated with 5th grade teachers and their students at Wixom Elementary School in Wixom, Michigan.

- MichiganView created age-appropriate lesson plans which were taught as part of the science curriculum in the classroom by collaborating teachers.
- 94 Fifth Grade students participated in a field trip to a local wetland after learning about the basics of remote sensing and how it can be used to detect invasive *Phragmites*.
- MTRI staff instructed groups of students in plant identification and proper data collection techniques.
- Students learned how to use a variety of scientific tools, including GPS units, cameras, measuring tapes, and density sampling grids.
- Students uploaded their data to a public online database (<http://geodjango.mtri.org/phragmites-crowd>), allowing them to view their field data on a map overlaid with remotely sensed data.

Benefits of Activity to Michigan

This project directly stimulates STEM education in Michigan primary schools and allows participants to understand how remote sensing can be used to help solve local environmental problems. The project also supports a new generation of Michigan scientists and engineers who otherwise may not have been exposed to remote sensing. The success of the program has paved the way for future MichiganView work in educational outreach in the state of Michigan.



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.



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Other StateView Projects

Identifying new opportunities in remote sensing education at Michigan universities through focus groups with scientists and teachers

MichiganView hosted a series of meetings with remote sensing experts from Michigan Technological University (MTU) in order to explore opportunities to promote remote sensing education. Five meetings were held throughout the 2012-2013 project year. A multitude of potential activities were discussed and many opportunities to extend the educational scope of MichiganView were identified. Several activities have been implemented, including the following:

- Materials were posted for the *Introduction to Remote Sensing* class on the MichiganView web site (<http://apache.mtri.org:8080/display/miview/Resources+for+Students+and+Teachers>).
- MichiganView discussed collaboration opportunities with representatives of the Pure Michigan® campaign, Michigan's travel and tourism promotional program, about featuring remote sensing images of PureMichigan® places on MichiganView and PureMichigan® web sites.
- Resources from the *Introduction to Image Interpretation* class were compiled by student interns at MTRI.



Welcome to the website of the MichiganView consortium. The purpose of MichiganView is to promote the use of remote sensing technology for workforce development, and technology transfer. The consortium consists of academic, non-profit, and government resources and information.



The MichiganView.org website hosts a number of valuable resources for remote sensing scientists, teachers and other professionals as well as educational materials for students of remote sensing and an archive of Landsat, NAIP, and MODIS imagery covering Michigan.

Benefits of Activity to Michigan

New opportunities and ideas generated during the meetings, once implemented, will improve and broaden the education provided to students of science and engineering at MTU. Should these students continue their education or start their careers in Michigan, the expertise and enthusiasm they develop as a result will manifest in new on-the-job capabilities, new small businesses, and increased state workforce competency. The meetings have laid the groundwork to further develop educational opportunities both within the MTU community and beyond.



StateView Consortium

MichiganView is a statewide consortium led by the Michigan Tech Research Institute and Michigan Technological University.

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MinnesotaView

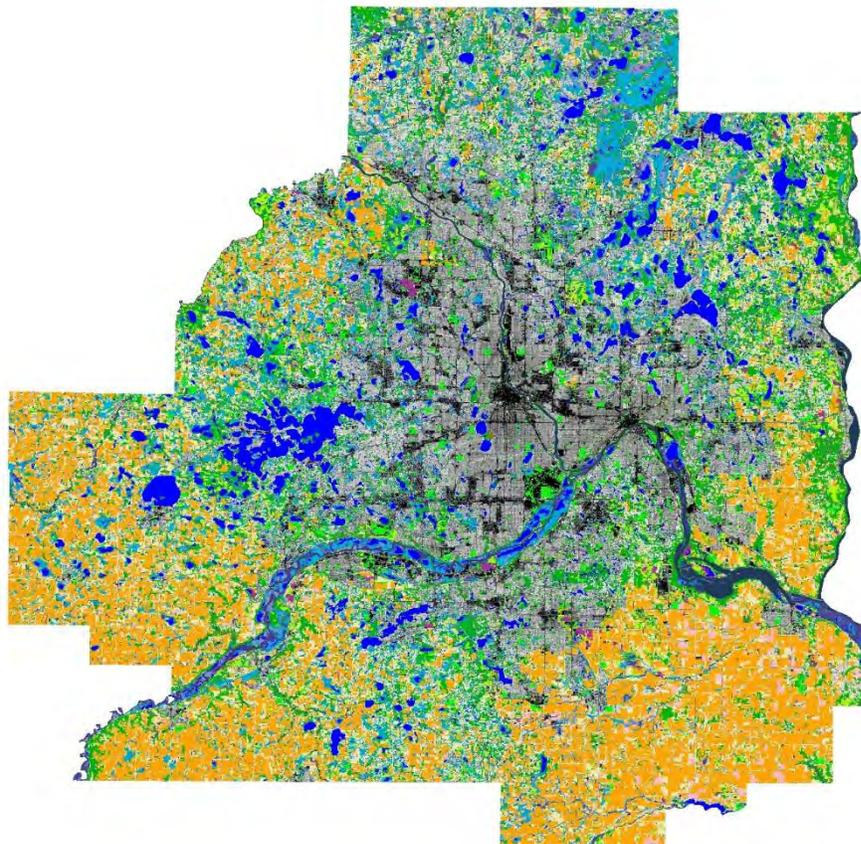
Remote Sensing Activities

2012 - 2013



Remote Sensing Resources for Minnesota

MinnesotaView supports the development, distribution and application of geospatial information for mapping, monitoring and analysis of land and water resources in Minnesota.



2011 Land Cover

Level 2 Classes

Wetlands

- Lakes & Ponds
- Emergent Wetlands
- Forested Wetlands
- Shrub Wetlands
- Rivers

Uplands

- Deciduous Forest
- Conifer Forest
- Mixed Forest
- Managed Grass
- Grassland
- Row Crops
- Hay and Pasture
- Small Grains
- Extraction

Urban / Developed



A combination of multitemporal Landsat data and lidar data with object-based image analysis was used to generate a new land cover classification of the seven-county Twin Cities Metropolitan Area. The classification includes percent impervious area for the urban class. The overall accuracy was 91 percent for level 2 classes. The digital format of the classifications makes it possible to easily include them with other digital maps and data in a GIS for further analysis and modeling by the Metropolitan Council, counties and cities. The Metropolitan Council will use the data to assess changes in impervious cover in the metro area and in its annual assessment of stream and river conditions. The results will help target areas needing improved infiltration and other best management practices to assist with water quality protection and restoration.

MNView Principal Investigator

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MississippiView

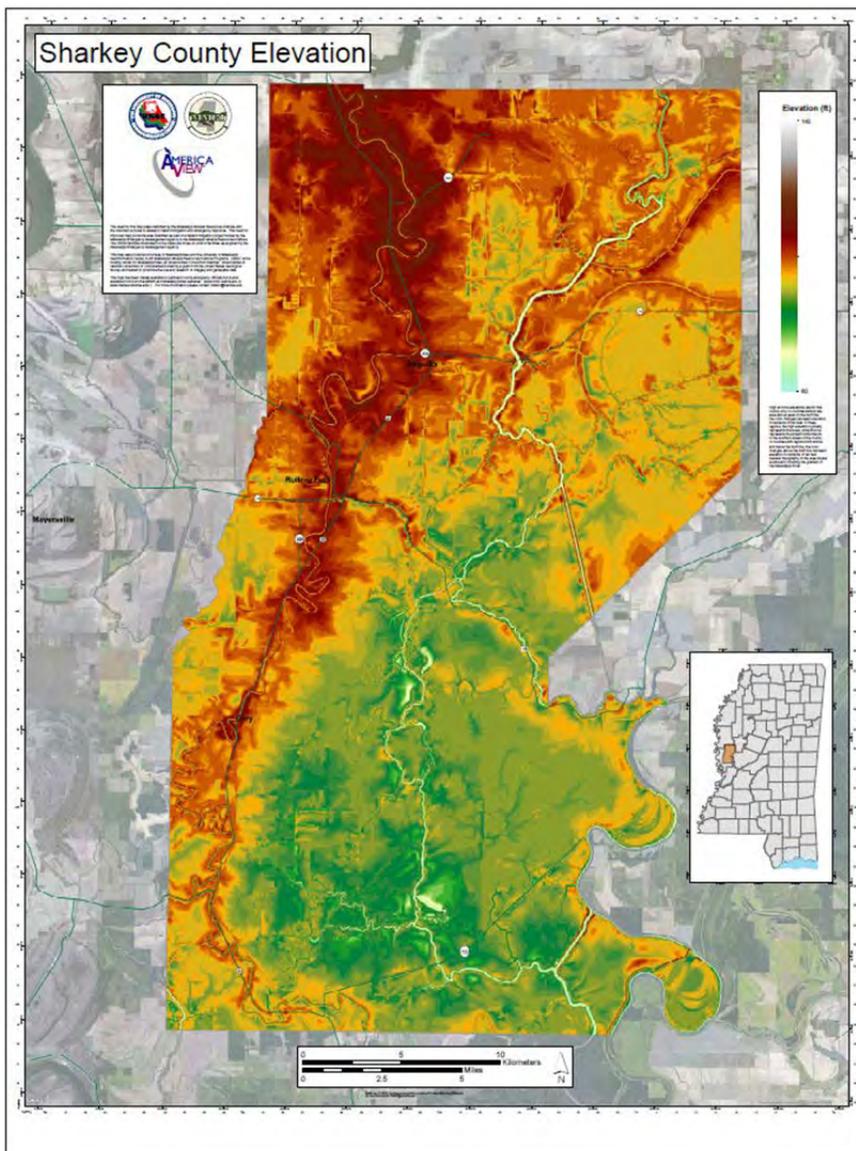
Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Improving Flood Awareness Using Remote Sensing



Sharkey County, Mississippi – Shaded digital elevation model overlaid on remotely sensed imagery to show those areas that will flood first and possible road closures that would block evacuation and assistance.

Description:

The University of Mississippi Geoinformatics Center worked with the Terrestrial Division of the Mississippi Mineral Resources Institute to evaluate flooding risk in the western Mississippi region known as the Delta. This flat-lying, heavily cultivated area is protected from flooding by levees along the Mississippi River.

Geologists and engineers in the Terrestrial Division worked with Mississippi Emergency Management Agency and students in the Department of Geology and Geological Engineering to evaluate the levees for potential risk and then developed flooding scenarios from potential levee failures.

All products and materials included the AmericaView logos and brand and will be hosted on the MississippiView website.

Benefits:

The MSView program produced informational products for each county in the Delta, using remotely sensed imagery and flood simulations to highlight areas and features of risk. Of particular interest were the critical facilities in each county. These facilities include features necessary to respond to and recover from floods. The maps were also important to show potential road closures due to flooding, that would block evacuation and response. These maps will be used by the county emergency managers for planning response actions.

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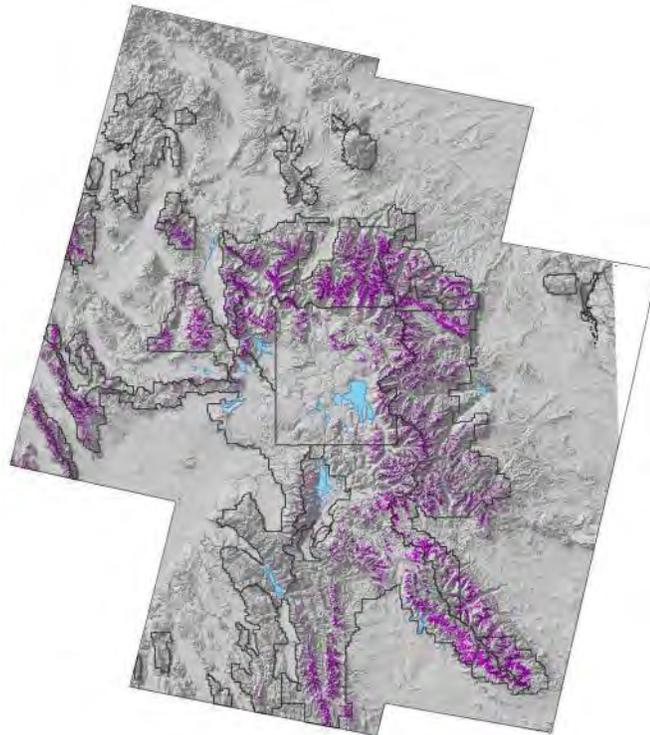
2012–2013 Activities

Bridging the Gap between Remote Sensing Research and Application

The mission of MontanaView is to assist Montana in using remote sensing resources to improve the health, safety, and prosperity of all Montanans. A needs analysis of remote sensing users in Montana conducted by MontanaView identified a high priority need of increasing the state's capacity to analyze and utilize remotely sensed data through improved higher education and training within governmental agencies.

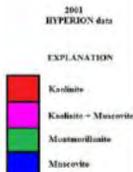
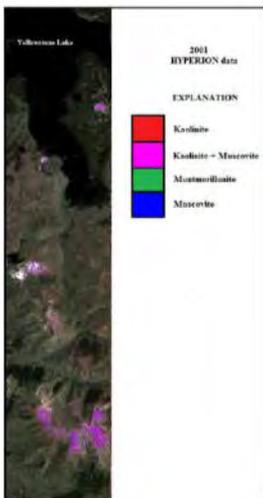
Agency Training Programs

- During 2012–2013, MontanaView held several training workshops focused on using the most modern remote sensing analytical methods for applications important to Montana-based land management agencies.
- Agencies represented at the workshops included the Montana Heritage Program, the U.S. Forest Service, the U.S. Geological Survey, and the Environmental Protection Agency.

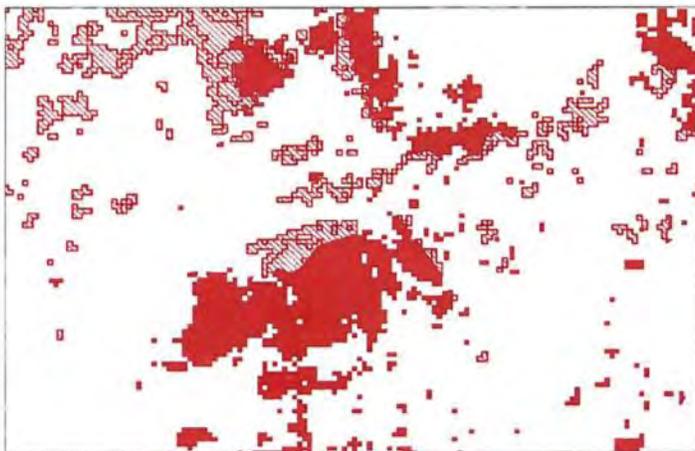


The map above, created by Montana State University in cooperation with the USGS, shows the distribution of whitebark pine (in purple) in the Greater Yellowstone Ecosystem. This tree species is important for grizzly bear recovery analysis. One workshop trained Montana-based geospatial analysts in efficient methods for keeping this map current in the face of extensive bark beetle mortality.

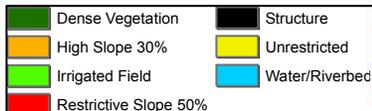
Student Service Learning Projects



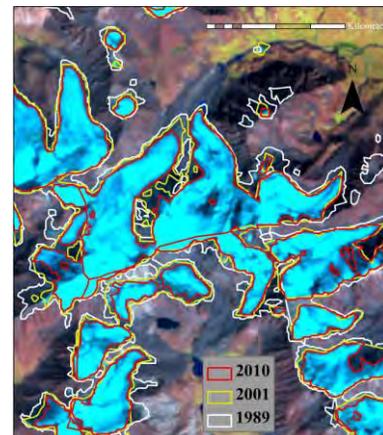
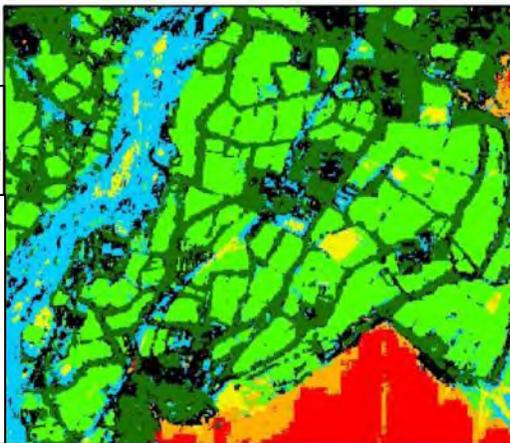
A student at Montana Tech worked with Terrestrial Data Systems to evaluate the ability of drones and hyperspectral data for mineral mapping. The above map shows the distribution of four minerals south of Yellowstone Lake.



A student at The University of Montana examined how areas of high severity burn at the north rim of the Grand Canyon varied between once burned (first entry) and twice burned (second entry) fires. There was an increase in size and number of high severity patches post second entry.



A student at Montana State University did a project for the Army Corps of Engineers using LiDAR and high-resolution satellite imagery to map terrain hindrance for tactical vehicle mobility. The image to the right shows the terrain features that might hinder such mobility.



A student at The University of Montana used Landsat imagery to map the extent of change in Mongolian glaciers over a 20-year period. The above image is an example of the substantial glacier losses that were documented.

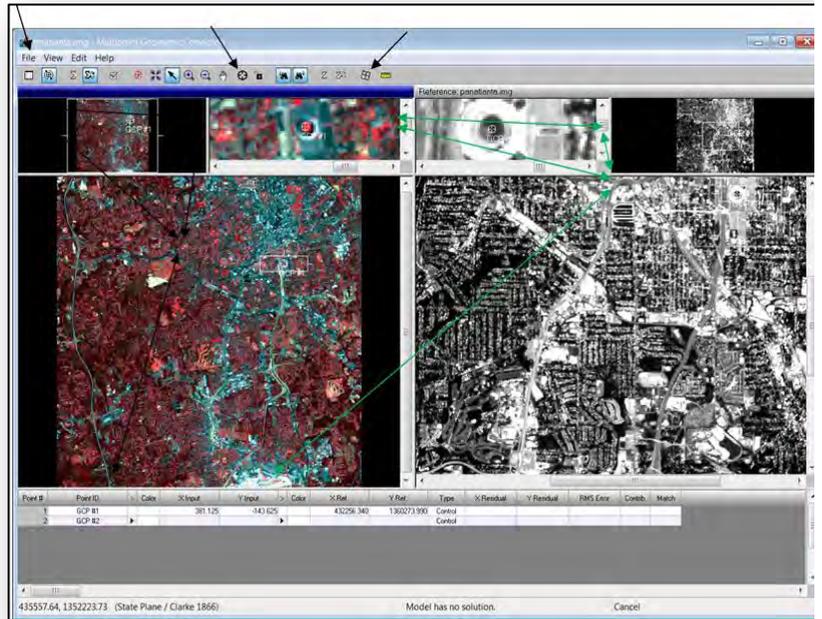
Partners



Sharing Remote Sensing Curricula

A set of 10 computer-based labs that are a part of a remote sensing course at the intermediate level were developed using ERDAS/Imagine version 2010/2011. The topics included import/export remote sensing datasets, terrain analysis, geo-referencing, image enhancement, spatial filtering using kernel function and Fourier analysis, principal components analysis (PCA) and tasseled cap analysis, and image classifications with different algorithms. The topics are essential because students' understanding of the concepts covered in lecture are advanced with hands-on opportunities for image processing.

Each lab is organized under a folder that consists of lab handout file(s) and data. The lab handout typically includes an introduction, instruction, and study questions. In the introduction, objectives and basic concepts are discussed. This section is critical because a transition is needed between the lecture and the lab activities. Detailed instructions and printscreen illustrations are provided in the instruction section. Student study questions related to the lab are near the end of the handout.



A print screen included in the instruction section of Lab 3 is illustrated. In this lab, geo-referencing was studied.

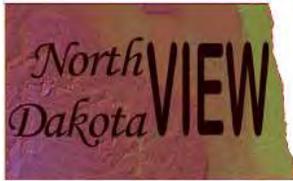
Effects of Landuse Change on Juvenile Fishes, Blue Crab, and Brown Shrimp Abundance in the Estuarine Nursery Habitats of North Carolina

The primary findings were that i) the loss of forested area to agricultural land was wide-spread throughout coastal counties, and ii) once the catchments became dominated by agricultural land and the forested environment was lost, this could lead to water quality degradation because of the increased sediment load from rapid run-offs, usage of fertilizers, and pesticides.

Benefits to North Carolina and the Nation

The computer-based labs were made available to educators throughout North Carolina and the nation when they were shared on the AV website at <http://americaview.org/remote-sensing-curriculum-and-exercises>. This effort is a part of a North CarolinaView effort to foster and promote uses of remotely sensed data and technology through education.

Concerned stakeholders in North Carolina are informed about how the abundance of juvenile fish and invertebrate species in the estuarine catchments of North Carolina has been affected by landuse change. The landuse change could have been even faster had some watersheds not been protected under the 1972 Coastal Area Management Act of North Carolina, which seeks to protect all coastal habitats essential to fisheries or water quality.



North Dakota View Remote Sensing Activities



2012 - 2013

Improving Use of Remote Sensing Resources

Monitoring the Impacts of Pervasive Flooding in Devils Lake Basin, ND



This false-color image of the Devils Lake Basin of north-central North Dakota, overlain on an image from NDViewer, is a composite of three USGS Landsat 5 scenes acquired in July 1996. At that time, the water surface elevation (WSE) of Devils Lake (visible as dark area in the southern basin) was 1438 ft. At the beginning of the current wet cycle that began in 1992, the WSE was 1422 ft.

In 2012 - 2013, NDView developed a Web GIS Viewer to enable easy access to remotely sensed data and land cover classifications related to the pervasive flood in the Devils Lake Basin of North Dakota. This is a closed hydrologic basin spanning more than 3,300 square miles that is particularly sensitive to climatic variation. An ongoing wet cycle that began in 1992 has led to massive increases in the surface water extent of the terminal lakes and wetlands in the basin, negatively impacting agricultural production and transportation while enhancing regional recreation and tourism. NDViewer can be accessed at <http://tinyurl.com/kehqtuc>. That site has 16 USGS Landsat composite images available for the basin with years ranging from 1987 to 2011. The data are atmospherically corrected and are presented in both true and false color. Some vector data sets are also available.



This image shows conditions in the Devils Lake Basin in July 2011, when the WSE of Devils Lake was 1448 ft. That is a 26-foot increase over the 1992 WSE. Also evident is the change in the surface area of the lake and the growth of smaller lakes in the central basin. The surface area of Devils Lake increased from 82,037 acres in 1996 to 131,040 acres in 2011.

Benefits to North Dakota

The North Dakota View consortium works to raise awareness about how remote sensing and other geospatial technologies can contribute to solutions to the complex issues facing the citizens of North Dakota. For example, NDView works to develop tools to put remotely sensed data related to flooding in the Devils Lake Basin more easily into the hands of anyone interested. The group is also engaged in a similar effort related to monitoring the impacts of oil production development in western North Dakota. The consortium reaches its goals by providing formal and informal training, developing tools for data dissemination, conducting and supporting basic and applied research, and promoting the professional development of students in North Dakota with interests in geospatial technologies.



NDView scholarship winner and UND Geography student Rick Thalacker presenting his research poster at the 2013 ND GIS Conference.

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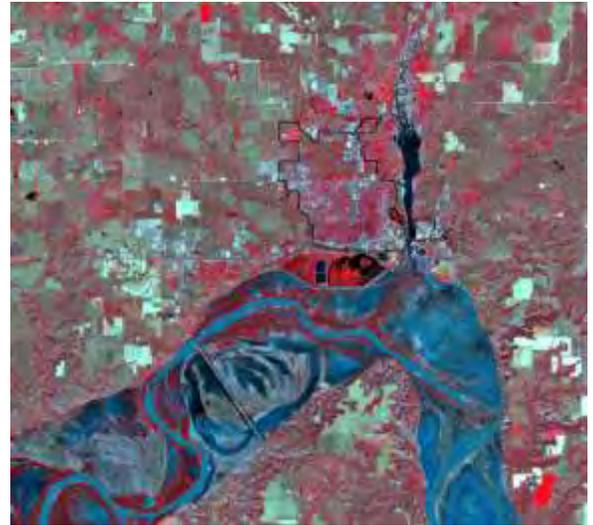
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NDView Scholarships

- Four students received North Dakota View Scholarships in 2012 - 2013. The scholarships are awarded to students to enhance their education and professional development in geospatial technologies. Here are statements from two scholarship winners:
 - “I am working on soil erosion models involving LiDAR datasets, geospatial analysis, and digital camera-based Structure from Motion. The NDView scholarship afforded me the ability to obtain additional research equipment including a digital camera, telescoping poles, and a small kayak for field work during the summer of 2013. This additional equipment allowed for me to finish my field work during the summer time frame ...”
--Rick Thalacker, UND Geography Graduate Student (M.S.)
 - “At (two) conferences (paid for with the scholarship), I had the opportunity to strengthen my presentation skills and meet with other colleagues and professionals. The exchange of ideas and feedback from my presentation has given me insight into other analytical and statistical approaches which I believe will enhance the quality of my research.”
--Prosper Gbolo, UND Geology Graduate Student (Ph.D.)



Williston, ND, outlined in black, and the surrounding area. This false-color image was acquired by the USGS Landsat 5 satellite in August 2011. Williston is the epicenter of the Bakken Oil Boom. The population of Williston rose from about 12,500 in 2000 to more than 14,700 in 2010, according to the U.S. Census Bureau. By 2017, the population is expected to triple. NDView is working with its partners to use remote sensing to monitor the impacts of the Oil Boom throughout western North Dakota. The blue ribboned region south of Williston is the Little Missouri River floodplain which is still showing the effects of flooding which occurred during the summer of 2011

StateView Consortium



Department of Geography
University of North Dakota



Dakota Science Center
Grand Forks, ND



North Dakota State Government
Information Technology Department
Geographic Information Systems Office



Sitting Bull College
Fort Yates, ND



Turtle Mountain Community College
Belcourt, ND

For a complete list of partners and cooperators see
[http://www.und.nodak.edu/org/ndview/index_files/
Page490.htm](http://www.und.nodak.edu/org/ndview/index_files/Page490.htm)

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<http://nebraskaview.unl.edu/>

NebraskaView High Impact Activity Grant Year FY12



Promoting the Benefits of Geospatial Resources

Public Outreach

Right: Weatherfest (April 2013) attendees were challenged to match Landsat images with locations on a map of Nebraska.



Left: In November 2012, visitors to **NaturePalooza** at the Nebraska State Museum learned how to use Google Earth to explore Nebraska and the Earth through specific activities developed by NebraskaView.

Public Outreach to promote an understanding of geospatial data and technologies (including remote sensing) among the general public has been a cornerstone of the NebraskaView program for many years. NebraskaView's involvement in public outreach has evolved and in 2012 reached thousands of Nebraska citizens through annual events such as **NaturePalooza, Weatherfest, Geography Awareness Week and Teacher's Night Out**. These events introduced parents and their children, as well as teachers, to the geospatial technologies that they see every day. **Displays in public venues** such as the Nebraska State Office Building inform the public about specific geospatial applications being used by state and federal government agencies for water and land management.

Benefits to Nebraska

- The general public learns about geospatial technologies, how they are intertwined with daily life and how government agencies use them at public events such as NaturePalooza, Weatherfest and Geography Awareness Week.
- Hundreds of teachers have hung "Satellite View of Nebraska" posters on their classroom walls and these remote sensing products are seen daily by thousands of schoolchildren as teachers are using these posters to supplement their Earth Science courses.
- Over 4000 state employees and visitors to the Nebraska State Office Building were provided the opportunity to learn how geospatial technologies are used by state and federal agencies.



A visitor to the **geospatial display at the Nebraska State Office Building** in October 2012 examines high-resolution imagery of the immediate area.

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New Hampshire View Remote Sensing Activities

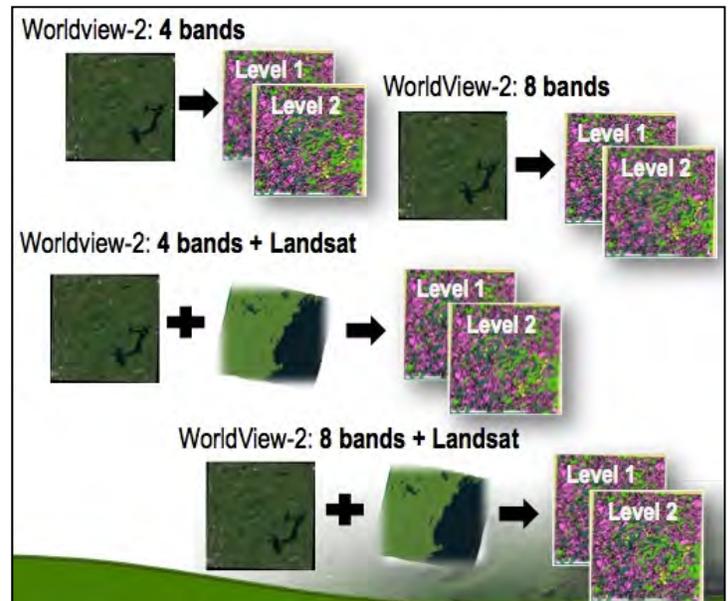


2012-2013

Improving Utilization of Remote Sensing Resources

Forest Cover Type Analysis of New England Forests Using Landsat and Innovative WorldView-2 Imagery

The WorldView-2 satellite was launched by DigitalGlobe in 2009. This sensor is the first orbiting device to have both high spatial resolution (i.e., pixel size) and high spectral resolution (i.e., wavelengths of light). Previous sensors had high spatial resolution, but lacked spectral resolution or had high spectral resolution, but lacked spatial resolution. Mapping forest cover in New England has been problematic because of the high species complexity and poor spectral or spatial resolution of the imagery. Our research was designed to test if the additional 4 spectral bands added to WorldView-2 would significantly increase the accuracy of our maps. In addition, our research evaluated if adding lower spatial resolution, but higher spectral resolution Landsat Thematic Mapper imagery would also improve map accuracy. Object-based image analysis techniques were used to make the maps and test the hypotheses at two different mapping levels (see flow chart). The results of the analysis showed that indeed better forest maps were made using the increased spectral bands on the WorldView-2 satellite and also by incorporating the Landsat spectral information.

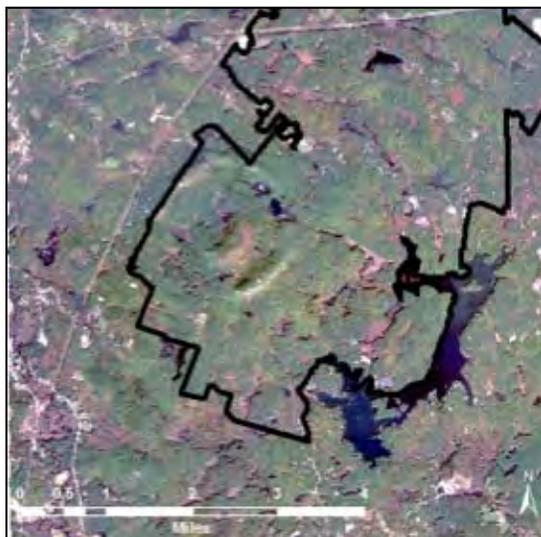


Flow Chart showing the experimental design for our research testing if WorldView-2 imagery improves forest mapping.

Benefits of Activity to New Hampshire

A great deal of money has been spent by the federal government and private sector on satellite-based earth observing systems since the early 1970's. In response to this investment, the research community has developed practical applications for mapping, monitoring, and managing natural and environmental resources. The potential of remote sensing technologies has been widely recognized over the years, yet the distribution of real-world applications has and continues to be problematic. The New Hampshire View consortium works to bridge the gap between the research and application to communities in NH.

This project evaluated a new remote sensing satellite, WorldView-2, that for the first time has increased spectral and spatial resolution to determine if this imagery could produce significantly better forest maps of the complex New England forests. As a result, we will be able to better map our forests and determine issues like habitat loss and degradation, landscape fragmentation, and change over time. This monitoring will allow our state's decision makers to make better plans for the state's number one industry: tourism.



Imagery of study area including Mt. Pawtucaway State Park and the surrounding area in New Hampshire.

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Program Manager: Debbie Deagen (debbie.deagen@montana.edu)

Other New Hampshire View Activities

Education / Outreach:

- Guest Lectures presented on Remote Sensing & Geospatial Technologies
- Presented at AmericaView, American Society for Photogrammetry and Remote Sensing (ASPRS), and other conferences
- Workshops taught on Accuracy Assessment and Object-Oriented Image Classification at ASPRS conferences
- Pilot study initiated as a result of a consortium members needs assessment to create a Geospatial Services Center on the UNH Campus

Applied Research:

- Supported two Undergraduate Research Internships & one Graduate Student
- Posted Accuracy Assessment & Fragmentation Tools on NHView website

Data Provision / Support:

- Faculty supported by sharing software licenses and survey-grade GPS units
- Geospatial data and remotely sensed imagery archived by our partners



Pilot study showing a student intern at the Geospatial Services Center (GSS) at UNH. The Center serves students, faculty, and the surrounding communities with consulting help on remote sensing and other geospatial questions and issues.

New Hampshire View 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 the pooling of resources. In addition, 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. For its members, the consortium provides networking and collaboration infrastructure, educational support and outreach.



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Professor of Remote Sensing and GIS
Department of Natural Resources & the Environment
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University of New Hampshire
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StateView Partners / Cooperators

Department of Natural Resources & the Environment, UNH

The Basic and Applied Spatial Analysis Lab (BASAL) for basic research on spatial data uncertainty/map accuracy and applied research applying the tools of remote sensing, GIS, and spatial data analysis to solving natural resource problems.

NH GLOBE Partnership, UNH

Carries out GLOBE teacher training in the areas of atmosphere, land cover, hydrology, soil and earth system science data collection and analysis with a focus on land cover mapping and geospatial technologies.

EOS-WEBSTER, UNH

A digital library of Earth science data that serves scientists, educators and the general public.

NH GRANIT, 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.

Forest Watch, UNH

A New England-wide environmental education activity using field, laboratory, and satellite data analysis methods for assessing the state-of-health of local forest stands.

Cooperative Extension, UNH

Offers a series of short courses in geospatial technologies including GIS, GPS, and field mapping.

Dartmouth College

Department of Geography and others

NH Planning Commissions

NH GIS Conservation Collaborative

NH Fish and Game Department



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OhioView

Remote Sensing Activities

2012 - 2013



Facilitating the Use of Imagery and Building the Audience for Remotely Sensed Imagery – including Landsat and Aerial Photography

The OhioView Cooperative Software Pool



Typical OhioView classroom using software obtained through the OhioView cooperative software pool

We often concentrate on hardware as the basis of computer-based research and teaching.

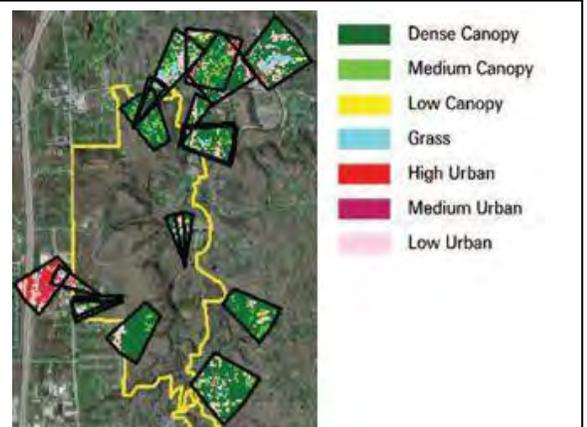
Even more important is the software that enables students to learn and teachers to teach.

OhioView offers its members the opportunity to join its cooperative software pool, which provides software to its members at a cost much lower than could be obtained if universities negotiated prices on their own:

eCognition
ENVI
ERDAS Imagine and ER Mapper
Idrisi

Benefits of Training the Future Workforce in Ohio

Availability of software for OhioView's remote sensing laboratories has enabled all OhioView universities to offer multi-course programs in remote sensing and related areas. Prior to the pool's existence, OhioView members were limited in their offerings and outreach opportunities. In increased enrollments, new faculty, and stabilized faculty teaching loads, we estimate that the OhioView Cooperative Software Pool has resulted in at least a 1600% annual return on the investment of AmericaView in its support of OhioView and an equivalent increase in OhioView universities' training of students in the use of Landsat and other remotely sensed imagery.



Land-cover map of coyote foraging areas in an urban area of Cleveland, Ohio. Area outlined in yellow is a Cleveland Metropark.

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OhioView

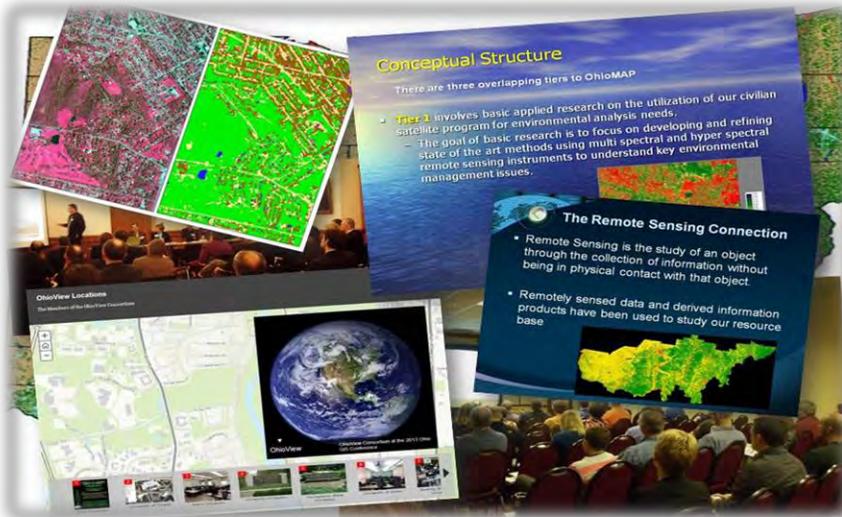
Remote Sensing Activities

2013 - 2014



Professional Outreach to Enhance the Utilization of Remote Sensing

Geospatial Technologies to Support Sustainable Development



OhioView conducted workshops and research sessions at the 2013 Ohio GIS Conference. Approximately 100 personnel from state and local government agencies attended these outreach activities.

Confronting the nuts and bolts issues of physically crafting a monitoring program using remote sensing assets, OhioView introduced methodologies to address sustainable development agendas within our state.

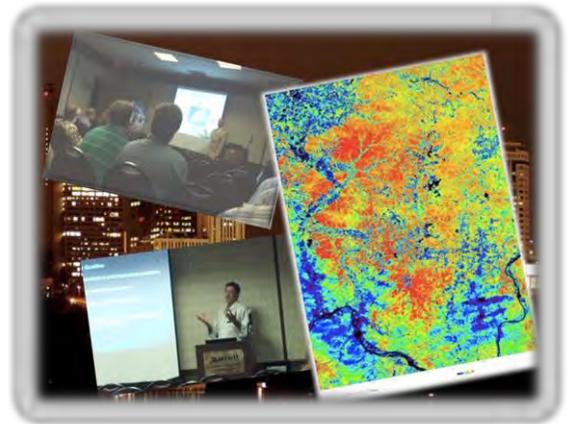
Emphasis on sustainable development provides the long-term (future) connection that integrates data products from Remote Sensing with GIS and modeling applications crucial to the planning/decision making process.

Demonstrations of the latest remote sensing techniques, and presentations highlighting current OhioView research were the focal points of our efforts.

Fostering Sustainable Development in Ohio

Sustainable development has been broadly defined as a pattern of development that meets the needs of the present without compromising the future. At its core, this concept is a form of decision making aimed at reducing negative impacts on the environment while building healthy, resilient communities where the resources needed to achieve a high quality of life can be accessed without exceeding the capacity of our natural ecosystems.

The provision of timely information is essential to guide sustainable development agendas, but data acquisition is often an uneven process particularly over extend time periods. Remote sensing is a well-recognized approach to document and describe the baseline status of the environmental system. The capacity of remote sensing systems to provide multi-temporal images of land surface objects enhances our ability to observe the progression of human and natural forces as they act on the landscape. OhioView researchers are at the forefront of integrating remote sensing technology into the developing methods of sustainability assessment and monitoring; sharing their success stories at professional conferences and in the peer reviewed literature.



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Remote Sensing Activities

2012 – 2013

Outreach to Teachers and Students: Bringing Remote Sensing to the K-12 Environment

SATELLITES K-12 Outreach



Teachers at the SATELLITES Summer Institute July 2013

Highlights of the *Students and Teachers Exploring Local Landscapes to Interpret the Earth From Space* (SATELLITES) Program for 2012-13:

- Held a 5-day summer teacher institute at the University of Toledo.
- Students participated in a GLOBE surface temperature field campaign in December.
- Students developed inquiry-based research projects using geospatial technologies.
- Students presented their findings at the SATELLITES Conference at Penta Career Center in Perrysburg, Ohio.

After participation in SATELLITES, teachers' content knowledge in geotechnologies and related STEM sciences increased significantly. SATELLITES teachers reported an increase in perceptions of their ability to do inquiry science and employ inquiry-based instruction. They also reported a significant increase in student engagement when students collected Landsat and field data and worked through the scientific process while participating in SATELLITES projects.



Benefits of SATELLITES to Ohio

Teachers across Ohio have attended the SATELLITES Summer Institute, trained their students on the use of geospatial technology and had them develop research projects to present at the SATELLITES conference. SATELLITES is changing students' lives by giving them opportunities to do science and present their results.

- Results of the SATELLITES program are posted on Dr. C's blog at <http://satellitesk12.org>
- Three groups of students presented their research projects at the GLOBE annual meeting August 12-16, 2013 at the University of Maryland.
 - Roswell-Kent Middle School – Akron, Ohio
 - Main Street Intermediate School – Norwalk, Ohio
 - Sotd Elementary School – Monroe, Michigan

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South Dakota View

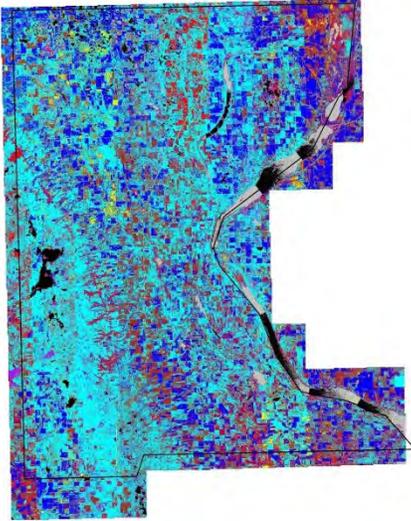
Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Land Cover Map for Roberts County, SD



Land cover map of Roberts County, South Dakota, showing pasture areas in light blue, cropland in dark blue, trees/bushes in red, vegetated wetlands in purple, built-up areas in yellow, and water areas in black and gray. National Agriculture Imagery Program (NAIP) imagery, acquired during the summer of 2010, was used for the project.

The South Dakota Department of Game, Fish, and Parks requested the assistance of South Dakota View (SDView) in creating a land cover map for Roberts County, located in the extreme northeastern corner of South Dakota. They were especially interested in identifying areas that are suitable for wildlife habitat. USDA's National Agriculture Imagery Program (NAIP) 4-band digital imagery acquired during the summer of 2010 was used to produce the map. Prior to performing the classification, digital image processing techniques were utilized to remove haze from the imagery. A graduate student from the Water Resources Institute at South Dakota State University was employed to perform the land cover classification.

Providing Remote Sensing Education

Workshops for 4-H Advisors

Increasing the interest and knowledge of students in STEM (science, technology, engineering and math) disciplines is a goal of South Dakota and our nation. To further this cause, SDView, in conjunction with the South Dakota 4-H STEM Field Specialist, held two workshops for 4-H advisors to acquaint them with the technologies of remote sensing, global positioning systems (GPS), and geographic information systems (GIS). The first workshop was held in Mitchell on September 23-24, 2013, with 21 advisors in attendance. The second workshop was held in Rapid City on September 26-27, 2013, with 15 advisors attending. The geospatial technology information presented at the workshop will be used by the advisors in their 4-H youth programming for schools and clubs.



Geospatial Technology workshops for 4-H Advisors held in Mitchell (top) and Rapid City (bottom) in September 2013.

Benefits to South Dakota

Our nation, in both the public and private sectors, has made a huge investment in remote sensing technology and imagery acquisition over the past several decades. The information about the Earth that is captured in remotely sensed imagery is of great importance and usefulness to citizens in all walks of life as well as to scientists, researchers, and educators. However, many potential users of remote sensing products in South Dakota are unaware of the benefits of using those products in their daily activities. **Educating the current workforce as well as the workforce of tomorrow (K-16 students) about the benefits of remote sensing and related geospatial technologies (such as GIS and GPS) is a major area of emphasis for SDView.** The Roberts County land cover mapping project and the 4-H advisor workshops are examples of SDView's efforts to create awareness of remote sensing products and assist in their use for practical application and education purposes.

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.



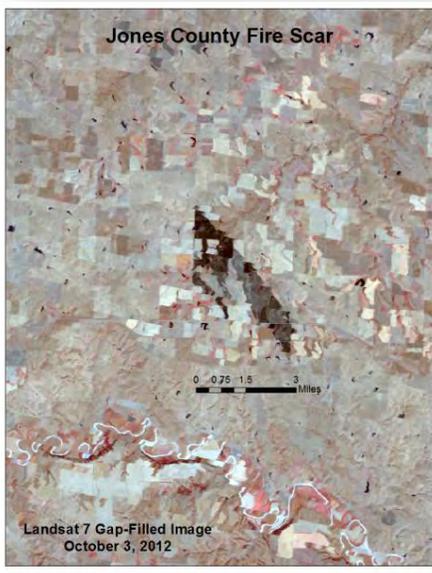
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Other SDView Projects

South Dakota was one of many states that experienced a severe drought in 2012. One of the many devastating effects of the drought was fires that destroyed many acres of cropland and rangeland in the state. One such fire occurred in Jones County on September 19, 2012. The Landsat 7 image shown on the left was acquired on October 3, 2012. The dark area in the center of the image clearly shows the area affected by the fire. Landsat imagery can be similarly used to document the extent of fires in forested areas.



A "Geospatial Data Use and Access" workshop was held October 30, 2012, in conjunction with the Eastern South Dakota Water Conference at South Dakota State University. Attendees included personnel from private industry; education; and local, state and federal government agencies. They learned about the many types of imagery available at no cost from USGS and other governmental agencies and how to utilize the data for various applications. They also learned how to access and use many other types of geospatial data such as soils and hydrologic data.



Guest lectures on the topic of Geospatial Technologies were presented to South Dakota State University Surveying and Introduction to Precision Agriculture classes during the 2012-2013 school year. Each class had approximately 30 students in attendance.

Ready, SET, Go! is a one-day STEM workshop sponsored annually by the College of Engineering at South Dakota State University. As part of the workshop on November 3, 2012, SDView presented three sessions of "Geospatial Adventures" with a total attendance of approximately 80 high school girls. The adventures experienced by the students included a GPS treasure hunt and overlaying their GPS tracks on remotely sensed imagery. Parents of the students were also given the opportunity to observe the workshop sessions.



An SDView presentation entitled "Using LiDAR Data" was a part of the 2013 Extension Subsurface Drainage Design and Water Management Workshop held February 27, 2013, in Aberdeen, SD, with approximately 70 in attendance.

SDView Vision and Goals

SDView Vision: Build partnerships and infrastructure in South Dakota to facilitate the availability of geospatial data and coordinate research and training activities utilizing remote sensing and associated technologies.

SDView Long-Term Goals:

1. 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.
2. Facilitate access to remote sensing data for South Dakota.
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.
4. Support remote sensing research at research universities in South Dakota through access to data and, as funding becomes available, through grants and contracts.
5. Develop the SDView consortium such that it meets the needs of South Dakota and participates synergistically within AmericaView, Inc.

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TexasView

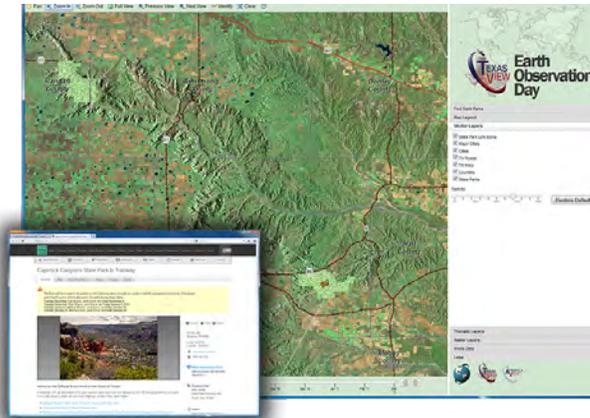
Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Connecting Earth Observation Day to Texas Landscapes



2005 Landsat 7 imagery of Palo Duro Canyon is displayed in the TexasView EODay viewer and tied to the Caprock Canyon State Park website enabling students to compare satellite imagery with photographs taken in the same area.

TexasView combined three activities to help Texas teachers add remote sensing to their daily curriculum: 1. Correlating remote sensing resources with the Texas Essential Knowledge and Skills (TEKS) state standards; 2. Continuing development of the TexasView Earth Observation Day (EODay) website as a resource for Texas teachers (<http://arcgis03.crgsc.org/EODay/>); and 3. Training teachers to use these resources to teach **Earth and Space Science and Environmental Systems** at the high school level.

AmericaView Multi-State Server

The AmericaView Multi-State Server (AV MSS) is a state-of-the-art Open Geospatial Consortium (OGC) compliant Web Mapping Server (WMS) on which AmericaView members can install and serve National Agricultural Imagery Program (NAIP) high-resolution rectified aerial photography. Providing a centralized service alleviates the overhead of configuring and maintaining a server at each AmericaView location. TexasView hosts and maintains the AV MSS along with the TexasView archives on the campus of Stephen F. Austin State University.

Benefits of Activity to Texas

By concentrating on educational outreach and providing better sources of data, TexasView is helping Texas leverage remote sensing to meet the challenges of today and tomorrow. Aligning remote sensing resources with the state standards requiring geospatial literacy means that Texas teachers are assured of meeting state requirements for Earth and Environmental Science classes at the high school level while providing rich and relevant educational opportunities for students.

Tools such as the Texas EODay website and the AmericaView Multi-State Server make sophisticated geospatial technology available to anyone with an Internet connection from classroom teachers to university researchers to state decision makers.

Training is the third leg in the TexasView approach to remote sensing advocacy. Regional training for teachers and one and two day workshops for geospatial professionals combined with on-line training opportunities make it possible for more individuals to benefit from remote sensing technology.



This image from the AV MSS shows 2012 NAIP aerial photography of Cypress, a suburb northwest of Houston, Texas. Hi-resolution, rectified imagery such as this is used in many fields for multiple purposes such as land use planning, change detection, natural resource inventory and emergency response.

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.



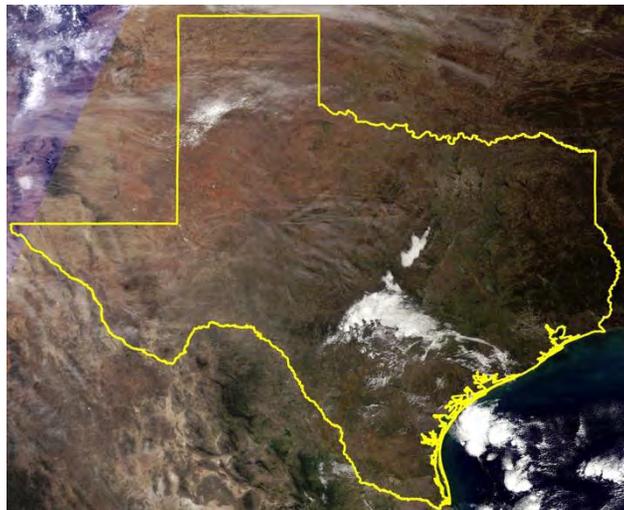
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Other StateView Projects

- Workforce training – The TexasView Fundamentals of Image Processing is a one or two-day workshop designed to introduce GIS professionals to remote sensing. The workshop is presented each year at the Texas GIS Forum in Austin, Texas and is available on-line. In 2013, 16 individuals attended the workshop.
- Research – TexasView ongoing research and development work in data logistics continues. During 2012-2013, TexasView partnered with the NSF funded Data Logistics Toolkit project to develop improved data delivery mechanisms for Landsat 8 and other remote sensing datasets.
- Archives – The TexasView Archives provide convenient and free access to remote sensing data for Texas, including Landsat data from 1974 to present, MODIS, NAIP imagery as well as a deep library of vector GIS data (<http://www.texasview.org/>).



This image of Texas from the MODIS sensor aboard the Terra satellite was captured on November 29, 2013. TexasView, in cooperation with WisconsinView, archives and makes available daily MODIS images of the State. <http://www.texasview.org/TexasDaily.aspx>



TexasView Consortium

Established in 2002, The TexasView Remote Sensing Consortium is one of the original founding consortia of AmericaView. TexasView members represent 14 universities from all regions of Texas as well as several state agency partners. Research interests of TexasView members reflect the landscape of Texas from high plains to coastal lowlands to desert mesas to pine forests. These interests cover a broad range of topics such as forestry, rangeland management, wilderness conservation, water rights, urban and international issues. Members represent tier one research institutions and small regional and private universities. This diversity combined with a common interest and unified goal makes TexasView a strong advocate for sensing technology.



Stephen F. Austin State University



The University of Texas at Austin



Midwestern State University



Texas Tech University



Texas A&M University



The University of Texas at El Paso



Lamar University



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



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Rice University

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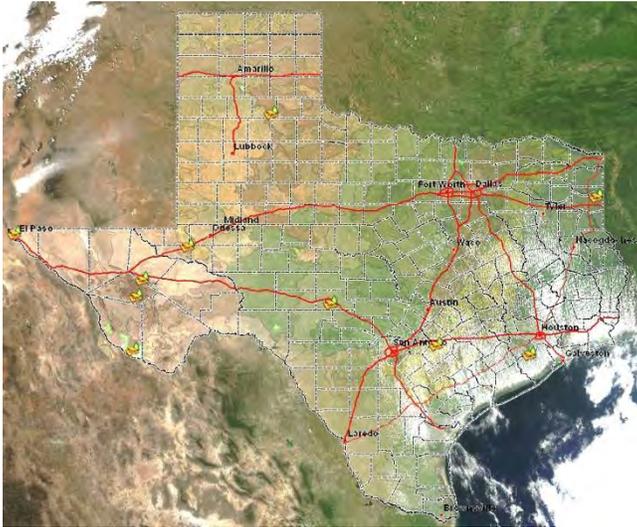
TexasView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing



The TexasView EODay Website is an interactive web-mapping application offering a variety of satellite imagery overlaid with ecological data. Links to Texas Park Service web sites allow students to go on virtual field trips without leaving the classroom.

Connecting Earth Observation Day to Texas Landscapes

The TexasView K-12 outreach project for 2012-2013 involved three areas of activity: 1) correlating remote sensing resources with the Texas Essential Knowledge and Skills¹ (TEKS) 2) continuing development of the Texas Earth Observation Day website² as a resource for Texas teachers, and 3) training teachers to use these resources to enrich Earth, Space Science education in Texas, particularly at the high school level. 25 Texas high school teachers attended a workshop covering use of these materials in the classroom.

This program uses satellite imagery of local and regional areas such as state parks, allowing students to associate what they see on the image with what they see in the world around them.

¹<http://www.texasview.org/default.aspx?id=203>

²<http://arcgis03.crgsc.org/eoday>

Benefits of activity to Texas

Recently developed (2010) high school Earth Sciences standards require that students be able to use satellite and other remote sensing data to interpret Earth's surface features. TexasView's growing resources integrate tightly with the current emphasis on Science Technology Engineering and Math (STEM) learning and provide the means for Texas teachers to meet the new standards while emphasizing the unique diversity of Texas.



Landsat image of Wichita Falls, TX was used in the workshop for teachers to demonstrate imagery application for mapping burn area extent just west of Lake Arrowhead State Park.



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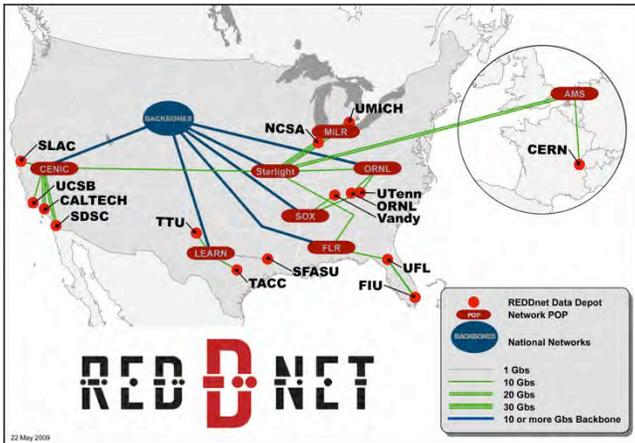
TexasView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing



This map shows the footprint of the Research and Education Data Depot Network, an NSF funded project that placed data logistics depots at strategic locations including at TexasView headquarters at Stephen F. Austin State University (SFASU). REDDnet currently comprises over 1/2 petabyte of distributed, redundant storage.

Logistical Networking

TexasView has a deep interest in logistical networking – technologies for disseminating large datasets such as satellite data – quickly and efficiently over networks. Partnering with NSF Funded projects such as the Research and Education Data Depot network (REDDnet) and Data Logistics Toolkit (DLT), TexasView has constructed a network of dedicated storage depots for dissemination of Landsat 8 data using DLT technology. Five DLT depots are prototypes for a potential remote sensing data distribution system consisting of nodes at well-connected AmericaView locations around the country.

The resulting AmericaView Data Logistics Network will create a robust, fault-tolerate and ultra-fast content distribution system for remote sensing data with technology already in use by other large-data research communities.

Benefit(s) of activity to Texas and the Nation

While building the potential for faster and more efficient delivery of Landsat 8 data for researchers and other users, this project offers a methodology for off-loading data delivery requirements from large data distribution centers such as USGS Earth Resources Observation and Science (EROS) Center, especially those users requiring large, recurring downloads of data. In the process, the geospatial community's, and particularly AmericaView's, visibility is heightened among the larger research community.



Data Logistics Toolkit

The NSF Funded Data Logistics Toolkit (DLT) project is intended to harden and package data logistics tools that make it easier for groups like AmericaView to deploy special purpose Data Logistics networks.



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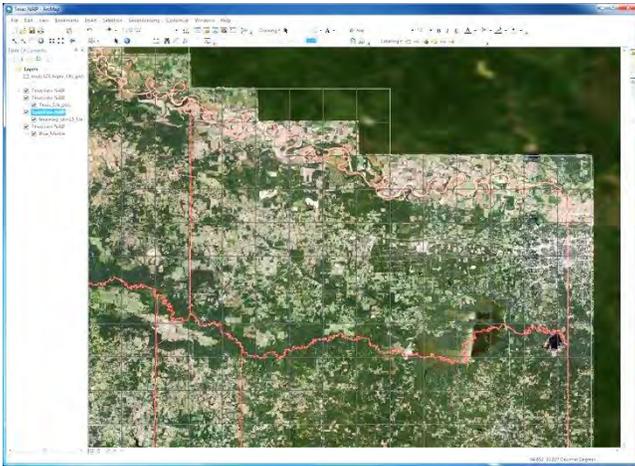
TexasView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing



NAIP data for extreme Northeast Texas overlaid NASA Blue Marble satellite imagery, both from the AV MSS, displayed in ESRI's ArcGIS desktop application. OGC compliant WMS services provided by AV MSS can be ingested by a wide range of geospatial software and used for diverse applications.

AmericaView Multi-State Server

The AmericaView Multi-State Server (AVMSS) project was envisioned to provide a shared resource enabling AmericaView members to publish National Agricultural Imagery Program (NAIP) orthoimagery and other remote sensing data in a state-of-the-art, Open Geospatial Consortium (OGC) Web Mapping Server (WMS). The physical server for this project is located at TexasView headquarters on the campus of Stephen F. Austin State University and leverages methodologies developed by the Geographic Information Network of Alaska (GINA) and AlaskaView. In addition, AVMSS provides a test bed for experimenting with WMS and other Internet-based mapping technologies.

During FY2012, TexasView, working with researchers from WisconsinView and AlaskaView, led a project to simplify, automate and document the process of preparing and loading data into the AVMSS.

<http://wms.americaview.org>

Benefits of activity to Texas

The current state of WMS technology is remarkably powerful and efficient. However, the work required to prepare and load data into a working WMS is complex and somewhat tedious. Automating many of the recurring tasks makes it possible to process large quantities of data with little intervention. The documentation will allow others to take advantage of the AVMSS with less investment. In time, as other StateViews are able to load their data, AVMSS will become an important resource for the nation.



This detail of 2012 NAIP imagery from the AV MSS reveals the proliferation of gas wells in northwest Nacogdoches County, Texas.



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UtahView Remote Sensing Activities 2012 - 2013



Improving Utilization of Remote Sensing Resources

Post-Fire Land Cover Change Metrics and Tool Development

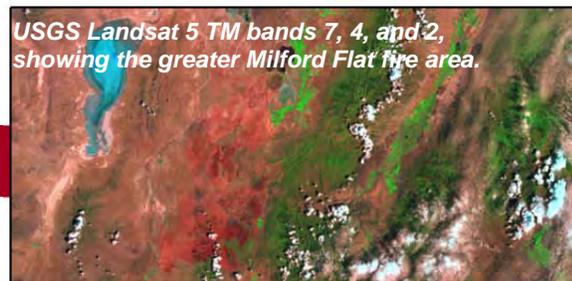


Field sites showing pre- and post-fire land cover on the Milford Flat fire complex.



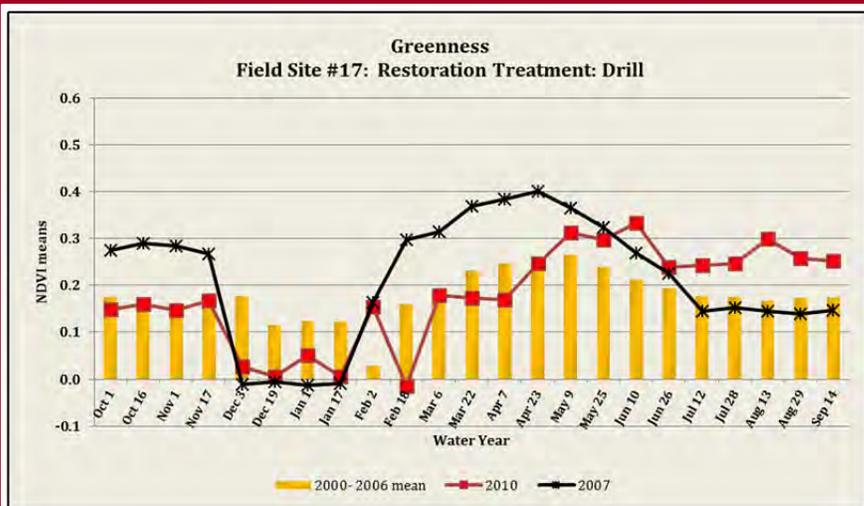
UtahView, in partnership with the Utah State University Remote Sensing/GIS Laboratory and Utah Bureau of Land Management have collaborated to develop tools and procedures for the purpose of monitoring the effects of post-fire land cover restoration. The 363,000 acre Milford Flat wildfire that occurred in 2007 was used as a test case to evaluate the overall impacts of wildfire on land cover as well as the results of extensive land cover restoration conducted by the BLM and the State of Utah. Remotely sensed USGS Landsat 5 TM imagery, National Agriculture Imagery Program (NAIP) imagery, NRCS soils data, and PRISM climate data were used to evaluate pre- and post-fire land cover change as well as changes in the vegetation growth cycles.

Field sites were visited and assessed for land cover components including current vegetation cover and presence of invasive species, and the site locations were drilled through multiple geospatial data layers to identify unique field site variables, precipitation levels, and air temperature. These data were plotted on *greenness curves* identifying trends in land cover through time and also allowing managers to compare previous and potential land cover from sources such as USGS LANDFIRE vegetation data layer.



USGS Landsat 5 TM bands 7, 4, and 2, showing the greater Milford Flat fire area.

Benefits for Utah



Phenology and precipitation through time at Milford Flat. Fire occurred on 6 July.

As the climate of Utah becomes more variable, the frequency and severity of large wildfires is predicted to increase. Many residents of Utah that rely heavily on public lands for livestock grazing and recreational activities support state and federal agencies in the restoration of land cover after large disturbance events occur. The methods developed through the efforts of UtahView provide land cover monitoring tools prior to and following disturbance events. Historic USGS Landsat data provides a pre-disturbance record, while continuing Landsat missions will provide critical information to assess the results of restoration efforts.

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UtahView Remote Sensing Activities 2012 - 2013



Improving Utilization of Remote Sensing Resources

Urban Tree Canopy Cover Mapping and Data Distribution

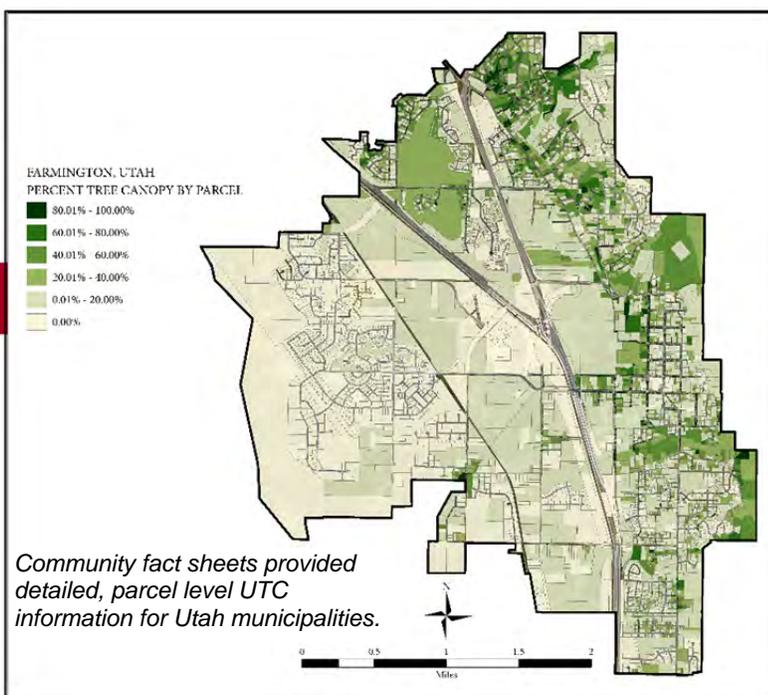


Green denotes areas of mapped urban tree canopy.

UtahView, in partnership with the Utah State University Remote Sensing/GIS Laboratory and Utah Division of Forestry, Fire and State Lands, developed a comprehensive urban tree canopy (UTC) data set for the Wasatch Front, Utah, and select areas of Iron and Washington counties in southern Utah. The primary goal of the project was to improve public and governmental awareness and understanding of the importance of UTC and to provide free access to UTC data in both geospatial (GIS) and viewable (web map) formats.

The data were developed using freely available National Agriculture Imagery Program (NAIP) aerial imagery and object-based image analysis techniques. Information and data distribution were provided through web-based maps, downloadable GIS data, and community fact sheets.

Data and Web Mapping: <http://www.gis.usu.edu/utc/>



Benefits for Utah

Utah is primarily composed of dry, high-desert environments with few trees in lower lying regions. As a result, the vast majority of the urban trees in the state were established by pioneers as they settled the region in the 1800s. These trees both use resources to thrive and provide important ecosystem services to the residents of Utah. Understanding where these trees are, how they change, and how Utah can improve its UTC is important in the proper management of this resource.

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VirginiaView

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

General Overview of the VirginiaView Consortium



VirginiaView provides workforce development opportunities to an array of stakeholders.

VirginiaView is a statewide consortium for cultivating state and local applications of satellite remote sensing through education, research, and geospatial applications. Our consortium includes universities, state agencies, and nonprofit organizations with interests in promoting applications of geospatial data. Many of our activities support STEM education, and outreach to K-12 and community college instruction.

VirginiaView as a member of the AmericaView consortium, supports AmericaView program goals by further expanding educational networks, providing regional workforce development opportunities, developing analytical resources, and extending capabilities for acquiring and using remotely sensed data among AmericaView members, state, and local stakeholders.

Billions of dollars have been invested by the federal government and private sector 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 distribution of real-world applications have been, and continue to be, challenging issues for both the federal government and the academic research community.

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 US Geological Survey. Landsat data and the USGS form key components of VirginiaView's mission.

Consortium Membership

VirginiaGeospatial
ExtensionPROGRAM
cne.vt.edu/gep



USGS
science for a changing world

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WESTERN
The Community's College



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MASON
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Virginia Tech
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COMMUNITY COLLEGE
From here, go anywhere.™

VirginiaView partners develop, leverage, and disseminate remote sensing resources and applications. VirginiaView's programs, supported by other AmericaView members and the National Geospatial Technology Extension Network (NGTEN), have the capacity for efficient national and international reach.

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VirginiaView

Remote Sensing Activities

2012 - 2013



Expanding Access to Remote Sensing Resources

STEM Education through Remote Sensing



This tutorial series supports STEM education and workforce development efforts using Landsat imagery and geospatial data.

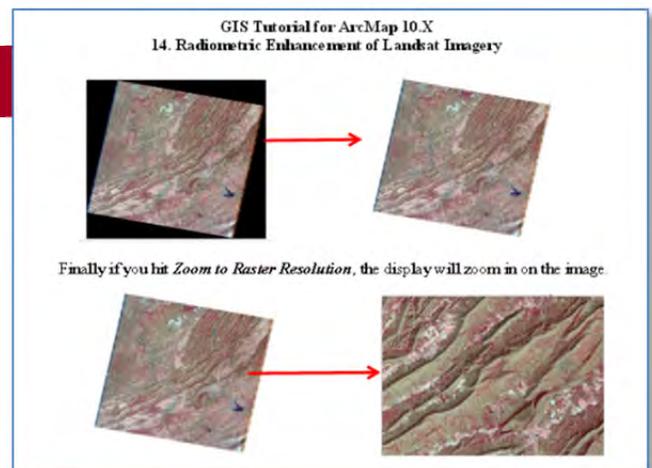
Through this initiative, VirginiaView developed a collection of remote sensing tutorials designed to expand access to software that will enable a broader community of institutions to provide students with hands-on experience in learning remote sensing analysis.

These tutorials provide educators with core instructional materials required to support a semester-long remote sensing course. They begin with the most basic steps (e.g., importing and formatting data), but progress to introduce students to a full suite of analytical techniques that cover basic operations covered in introductory remote sensing and image analysis courses. Examples include image registration and image classification.)

The resource is available without cost as a collection of 20 chapters (230 pages) of instruction. In addition, 29 short videos were developed to accompany the text-based instruction. These resources were released in October, 2013, available from the VirginiaView website – <http://virginiaview.net/education.html#RSinArcGIS10>

Benefits for Virginia

Many institutions and programs do not have the resources to support use of specialized software to provide hands-on experience in learning basic remote sensing analysis. These tutorials are based upon widely used ArcGIS software that is often already available at schools, government offices, and businesses. The VAView RS Stem Education tutorials are available without cost at the VirginiaView website, are easily accessible to instructors and to students, begins at the most basic level, so does not require previous instruction. They are intended to increase the ability of teachers to teach and students to learn, and therefore expand access to remote sensing skills and expertise.



Step-by-step instructions and videos are provided to appeal to a variety of learners.

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WisconsinView

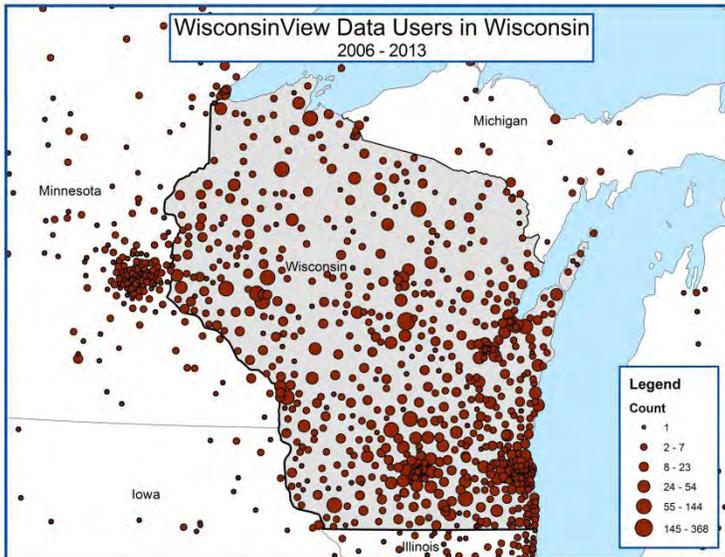
Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Enhancing WisconsinView Imagery Access Metrics



Knowing the location of WisconsinView data users helps us understand our user-base.

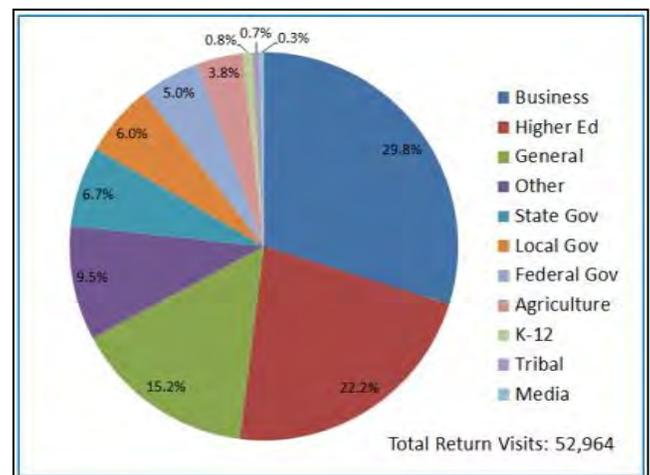
WisconsinView has over 13,000 registered users that download imagery. Over 8,000 of those users make return visits. The impact and multiplier effect of facilitating access to this imagery (including Ortho photos, Landsat imagery, MODIS, LiDAR DEMs, and others) is tremendous but difficult to measure.

WisconsinView is collecting user information and comments at the point of registration and developing follow-up surveys. With this information we will not only improve utilization of remote sensing resources and identify user needs in Wisconsin, but will also be able to better measure the impact and value of remote sensing resource utilization in the state.

The "Go-to" Source for RS Imagery of Wisconsin

Since 2004 WisconsinView has become the "go-to" source for many remote sensing data sets of Wisconsin. Users cite ease-of-use, unique datasets, and Wisconsin-specific projections as primary reasons.

- WisconsinView provides the only online source of certain statewide imagery sets.
- WisconsinView hosts approximately 9TB of remote sensing imagery data.
- In 2012 alone users downloaded 15TB of data.
- Metrics help us track who is downloading what types of imagery and where they are located.
- Knowing where the majority of people are requesting imagery/products allows custom access and better staging of the data.



Knowing the kinds of users of WisconsinView data helps us understand our audience.

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West Virginia View

Remote Sensing Activities

2012 - 2013



Improving Utilization of Remote Sensing Resources

Educational enhancement grants to students in the Mountain State



An undergraduate student at West Virginia Wesleyan College with his advisor, Dr. Bjorgo-Thorne, presenting the results of his remote sensing research at a conference.

During the last year, West Virginia View provided 8 grants to students in West Virginia to **enhance educational opportunities** in remote sensing. The funds were used in support of:

- Undergraduate research
- Graduate student research travel
- Workshop attendance
- Internships
- Research supplies

"I believe that this internship will greatly help me with my future career plans."

Comment from: Student at West Virginia Wesleyan College

Benefits to West Virginia

- Increased science, technology, engineering and mathematics (STEM) opportunities for undergraduate and graduate students in West Virginia.
- Workforce development in West Virginia's key, strategic High Tech industries of remote sensing, Geographic Information Science (GISc) and image analysis.
- Leverage existing resources by building on areas of current strengths.
- Improved research opportunities and national exposure for West Virginia's students.
- Help students gain skills and experience to increase their competitiveness in the marketplace.



West Virginia View consortium members share a focus on enhancing remote sensing in the Mountain State, including:

- Improving educational opportunities
- Workforce development
- Applied research

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West Virginia View

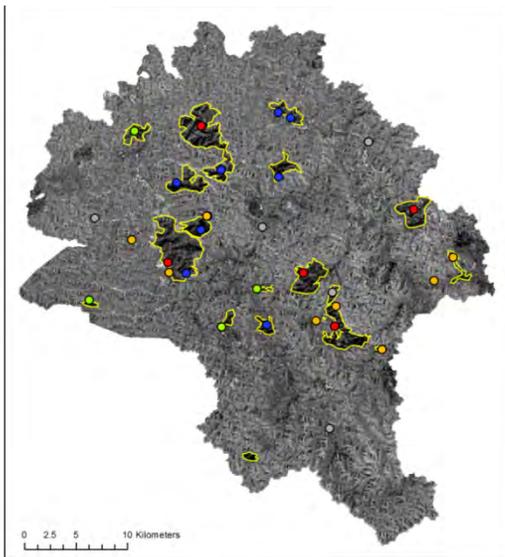
Remote Sensing Activities

2012 - 2013



Monitoring forest fires in West Virginia

Landsat satellite image of Boone Co, WV

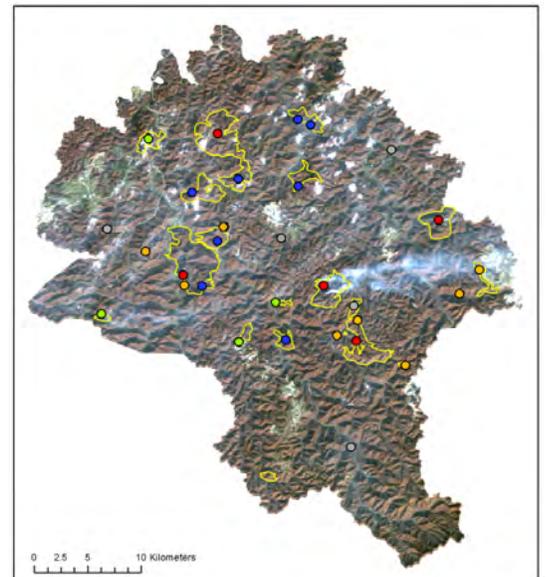


The combination of pre-fire (27 November 1998) and post-fire (17 January 2000) images used to produce the image above clearly shows the extent of burned areas (outlined in yellow) during the fall of 1999. Colored dots show fires mapped by WV Division of Forestry.

Fires are routinely monitored in the Western US using satellite imagery. However, the technology is not easily used in mountainous and humid West Virginia because the fire scars are detectable by remote sensing for less than 2 years after the fire.

This research investigated methods for overcoming the challenges of using satellite imagery in Appalachia. The research identified:

- Most effective satellite image analysis methods.
- Optimal timing of image acquisition.
- Minimum size of fires that can be mapped.
- Constraints on operationalizing fire monitoring.



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.)

Benefits to West Virginia

Forests are one of the major resources in West Virginia, providing

- Timber
- Wildlife habitat
- Recreation
- Tourism

Rapid and effective monitoring of forest fires can be used to help optimize the use of scarce resources, protect property, and monitor vegetation recovery.

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WyomingView

Remote Sensing Activities



2012 - 2013

Improving Utilization of Remote Sensing Resources

Mapping burn severity in collaboration with the US Bureau of Land Management (BLM)



Vegetation within the project area had become decadent (mostly due to age) thus decreasing its wildlife habitat quality. BLM Rawlins Field Office implemented a prescribed fire treatment (above) in May 2011 to promote the reestablishment of young vegetation.

Burn severity maps of prescribed fires are not readily available to land management agencies in Wyoming. These maps are necessary for monitoring vegetation regrowth following fires. Field surveys are expensive and most agencies do not have the resources to generate these maps from remotely sensed data.

In FY12 WyomingView collaborated with the Bureau of Land Management (BLM), Rawlins Field office to generate a burn severity map for the *Marking Pen Creek Prescribed Burn Project* located west of Seminoe Reservoir near Rawlins, WY (see location map in figure below).

Erik Collier, WyomingView intern, calculated the Normalized Burn Ratio Index (NBRI) values for the 2010 (pre-fire) and 2011 (post-fire) Landsat 5 Thematic Mapper images. Using the change in the NBRI value he generated the burn severity map (figure below). Orange-brown colors correspond to burnt areas with darker shades representing severely burnt areas.

Erik (an undergraduate student in Rangeland Ecology & Watershed Management) learned to process Landsat images and generate burn severity maps. He commented that “... using this type of technology can be very useful to resource advisors when doing prescribed burns. It shows them what the end result was, and if what they wanted to happen actually did.”

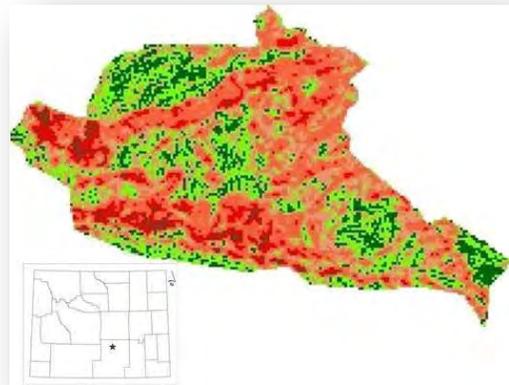
WyomingView uses its resources to address the needs of land management agencies in the state. The WyomingView PI worked with BLM personnel to identify their needs, select imagery, select and train the intern.

Benefits to Wyoming

This burn severity map is now available to the BLM and other land management agencies for monitoring post-fire vegetation response and evaluating future treatment options.

WyomingView generated this map by leveraging its own as well as USGS (no-cost Landsat data) and BLM's (personnel) resources.

WyomingView trained a student intern (i.e., workforce development) in an area of high employment potential. Erik Collier was one of nine interns trained by WyomingView in FY12, and he presented his results in the 2013 Undergraduate Research Day in Laramie, WY.



“After reviewing Mr. Collier's [burn severity] map based on the acquired Landsat Data, I feel it will be very helpful in evaluating vegetative/rangeland response post treatment... along with established vegetative transects and photo points, will provide the baseline required for future treatment priorities within the Seminoe Mountains.”

-Mike Murry, Rangeland Mgt. Specialist, BLM, Rawlins, WY

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WyomingView

Remote Sensing Activities

2012 - 2013



Increasing Remote Sensing Awareness

Promote Remote Sensing Science, Data & Applications Through Outreach and Training



Regional geospatial conferences are suitable avenues for reaching out to GIS professionals and others who might not be familiar either with Landsat data or with using the data as part of their workflow. These half-day workshops introduce the participants to Landsat data characteristics and their applications.

The entire Landsat archive is now available at no cost to users worldwide; this has created numerous opportunities for teaching, research and applications. In order to maximize the benefits of this resource, it is important that the entire geospatial community is aware of Landsat data along with its potential.

In FY12, WyomingView conducted two workshops as part of the *GIS in the Rockies* (2012, Denver, CO) and *Geospatial Conference of the West* (2013, Laramie, WY) conferences aimed at increasing Landsat data awareness and usage among GIS professionals.

These workshops introduced the participants to Landsat data characteristics and how the data are used for monitoring changes in the surface of the Earth. Landsat scenes acquired over time to depict dramatic examples of land cover change around the globe as documented by USGS and NASA were used to demonstrate how seasonal, annual, and long-term changes can be monitored and quantified.

Participants also learned how to download Landsat data from GloVis (<http://glovis.usgs.gov>) and EarthExplorer (<http://earthexplorer.usgs.gov>) sites. More than 35 GIS professionals and students attended these two workshops.

Benefits to Wyoming, USGS and Beyond

- Increased awareness about Landsat data and its utility for monitoring land cover changes among geospatial professionals.
- A trained workforce that can take advantage of existing Landsat data and products is very beneficial for states like Wyoming with vast geographic area.
- These workshops could lead to an increased use of Landsat data by students who will eventually enter the US workforce, resulting in maximizing the tax dollars invested in the Landsat program.
- Earth Observation Day activities introduced remote sensing science and applications and helped Junior High School students to better understand related course content from the physical and social sciences. Hands-on activities helped 8th graders in STEM topics such as: designing experiments, data collection and analysis, graphical representation, and interpretation.



As part of the Earth Observation Day activities, WyomingView introduced 103 sixth and eighth grade students in Laramie Junior High School to remote sensing concepts and how remotely sensed data are used for monitoring natural and man-made changes in Wyoming and elsewhere. Eighth grade students also measured and compared the spectral reflectance of live and dead leaves collected from the trees growing near their school.

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