

AmericaView: Promoting Remote Sensing Science and Technology Through Cooperative Partnerships

by
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The term "partnership" is nothing new to the U.S. federal administrative lexicon. Indeed, federal agencies have been partnering with a variety of organizations for decades. The idea is simple and the practice can be very effective – by working together, the government and their partners are more efficient, more responsive to the needs of taxpayers, and achieve a common goal. A great deal can be learned from partnerships, including how to better provide direction; improve local, state, and national services; provide access to data and information; and, provide other important resources in times of tightening budgets and reduced administrative support.

This is the story of AmericaView (AV, www.americaview.org), a locally controlled and nationally coordinated network of remote sensing scientists and practitioners who work closely with the United States Geological Survey (USGS) Land Remote Sensing Program to ensure that the benefits of the federal investment in civilian remote sensing are maximized. AV, a 501(c)(3) non-profit organization, is coordinated at the national level by a part-time staff and board of directors, and operates its programs at the state level through 39 "StateView" partners. Led in each state by an academic institution, each StateView consists of a consortium that can include other academic institutions, local, state and federal agencies, non-profit organizations, and private sector companies. Although the AV mission has evolved over time from a strong focus on public domain data archiving and access to the current emphasis on remote sensing education, data utilization, and applied research, the overarching goals remain essentially unchanged. AmericaView eliminates barriers to data access and utilization through a cooperative network of scientists and practitioners by providing remotely sensed data and the requisite knowledge to partners within their state and throughout the broader AV consortium.

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Membership map of AmericaView in 2011. The dark blue states are Full members and receive annual funding. Utah is an Associate member with voting rights but no annual funding. The light blue states are Affiliates and have neither annual funding nor voting rights. Affiliates are able to move into Associate status after one year, subject to a vote by the Associate and Full members.



**National Consortium For Remote Sensing Education, Research, and Applications
Delivering National Satellite Resources to Meet State Needs**

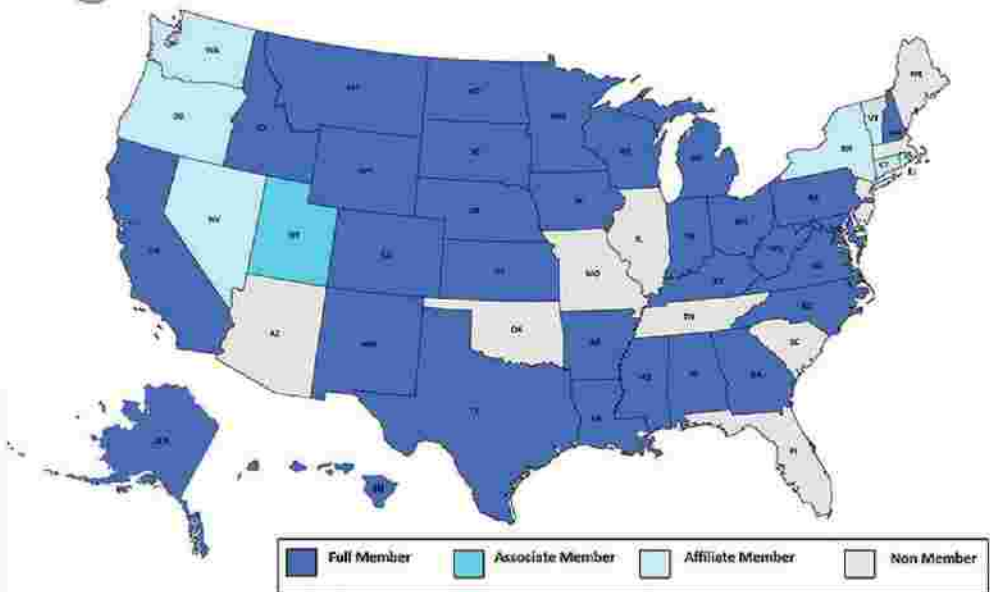




Photo of AmericaView members taken during the 2010 Fall Technical Meeting in Madison, Wisconsin.

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Origins and History of AmericaView

AmericaView's origins began with OhioView, a pilot project initiated in the late 1990s. At that time, access to public domain Landsat imagery was challenging, and as a result the federal investment in Landsat was not being utilized as effectively as possible. New acquisitions were not available to researchers in sufficient time to use the data for time-sensitive events, such as responding to disasters or studying timely vegetation phenology and health. The OhioView pilot project directly addressed the challenge by providing a free archive of statewide Landsat data, and by partnering with organizations that could effectively use the data. Championed by Ohio's 16th District Congressman Ralph Regula, and guided by Dr. Richard Beck, a University of Cincinnati faculty member and remote sensing scientist, the OhioView pilot project was funded through a combination of USGS and NASA-appropriated funds.

Given the initial success in Ohio, Congress, at the behest of Congressman Regula, directed the USGS in 2000 and 2001 to expand the pilot project into a prototype national program called "Gateway to Earth." Congress appropriated funding in 2002 for the USGS to develop the program to: (1) increase the number of StateViews through competitive grants; (2) compensate an Executive Committee to oversee the organization; and (3) provide administrative funding to support new state partners. In 2002, the USGS and several "charter members" convened to design and implement the concept. Representatives from the USGS Land Remote Sensing Program, the USGS EROS Data Center, the Ohio Aerospace Institute (OAI), a 501(c)3 non-profit that supports Ohio's aerospace industry, and representatives of eight states - Arkansas, Georgia, Kansas, Mississippi, Ohio, South Dakota, Texas, and West Virginia - developed the first AmericaView charter and mission statement.

Given the growing desire for easy access to data and increasing need for applied remote sensing research, the network grew rapidly during the years 2003 through 2007 to reach approximately 300 partners, including academic institutions, local, state, and federal agencies, non-profit organizations, and private sector members. The new consortium was guided by a joint, cooperative AV - USGS Land Remote Sensing

Memorandum of Understanding (MOU). Negotiated by USGS and AV and signed in 2002, the MOU outlined the responsibilities of both parties. The early emphasis on data provision is shown clearly in the first three fundamental AV responsibilities:

1. Define, consolidate, and maintain the data and information requirements of the AmericaView user community.
2. Implement, operate, and maintain adequate facilities for archiving and distributing satellite data, data products and other geospatial data received from the USGS.
3. 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 become available.

Clearly, access and distribution of remotely sensed data were the core elements of the MOU. Development of strategic educational and research partnerships, joint workshops, meetings, applied research and technology transfer projects were the remaining requirements of the agreement.

AmericaView in Operation

Much was learned during the first several years, but the AV mission remains much the same albeit with a current emphasis on education and applied research. Now operating under a competitive five year grant, AV maintains two core operational objectives. First and foremost, AV *collaborates with its partners to support and strengthen non-commercial remote sensing needs within each state*, particularly where their needs require the use of public domain data (e.g., Landsat). This emphasis underscores the underlying philosophy that has guided the AV program from the beginning: each state has specific needs, and these are best met by a network of remote sensing interests within each state. Second, StateViews, both with internal state partners and cooperatively among themselves, *advance the use of remotely sensed imagery by strengthening and advancing projects that address a specific issue or challenge*. In both cases, consortium members are one of several players, helping to accomplish important objectives that might otherwise be less effective or unmet. The key



Highlights of AmericaView educational activities. Clockwise from top left, GeorgiaView interns William Keith Rice and Bryan Victor won first place in the undergraduate student poster competition for their research on the environmental impact of impoundment of the Snake Creek Reservoir; lidar workshop for the current workforce sponsored by AlabamaView; West VirginiaView coordinator Dr. Rick Landenberger helps an undergraduate student with image interpretation during a remote sensing course that he taught at Davis & Elkins College, a West VirginiaView partner institution; a high school student explores an image during a geospatial technology workshop sponsored by ArkansasView; two high school students attending a GPS training workshop sponsored by VirginiaView.

involves networking, both within each state to identify and meet latent remote sensing objectives, and among the states, to leverage the accomplishments of the broader consortium. The following sections outline and describe both types of collaboration and highlight how public domain remotely sensed imagery is used in a wide range of contemporary issues involving data access, education and outreach, and applied research.

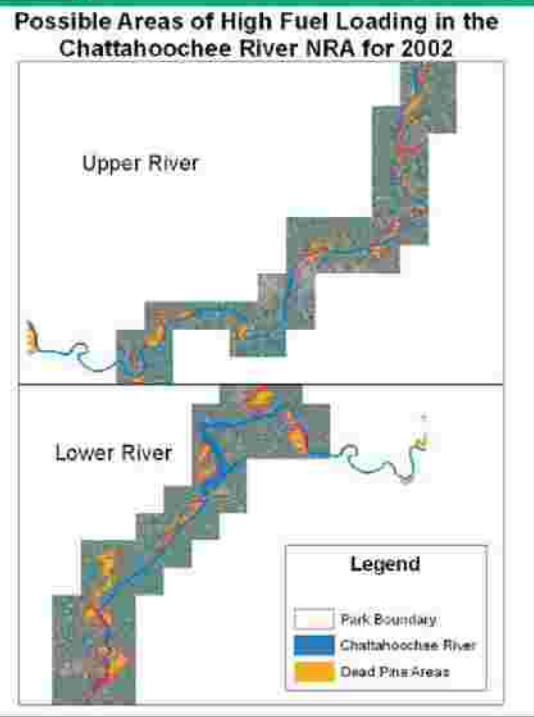
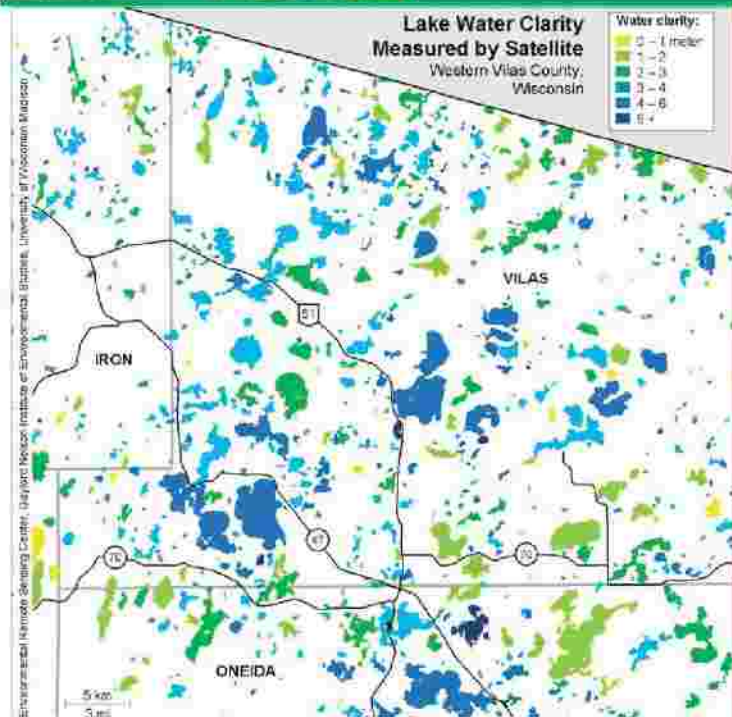
Data Archives

Access to public domain satellite data was limited, both in terms of availability and ease of access when AV was first formed. To address this, each StateView member was initially required to develop and maintain a free, public data archive. Landsat imagery was the key component, although many StateViews provided additional data from other public domain sources. Guidelines for archive development were flexible, given the differing spatial extent of each state (e.g.,

Texas required more Landsat scenes than West Virginia). Many of the early data archives were based on the USGS Global Visualization Viewer, GloVis, a web-based spatial search engine for identifying and downloading scenes via a simple interface. The USGS worked closely with AmericaView to develop the utility, the first archive tool with national coverage designed to get Landsat and other public domain data out on the Internet for free. As an example, during the 2005-06 funding year, 14 funded StateViews delivered 38 Gigabytes of imagery to users in government agencies, academia, the non-profit sector, and private industry.

Since November 2009, Landsat data have been made available at no cost through GloVis and EarthExplorer, reducing the need for the original StateView archives. Yet despite this, many StateViews continue to maintain their archives, hosting other geospatial datasets including MODIS and ASTER imagery, digital raster graphics, lidar data, kml files, NAIP imagery, radar data, and digital elevation models. In some cases,

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Highlights of AmericaView funded applied research activities. Clockwise from top left, VirginiaView Co-investigators Mr. Peter Sforza and Dr. John McGee analyze a land cover map generated from satellite images; using Landsat images, KansasView periodically generates information on water bodies using Landsat images; GeorgiaView interns identified areas of high fuel load in the forests along the Chattahoochee River NRA; WisconsinView uses Landsat data for measuring water clarity in lakes across the state.

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StateView archives provide a preferred source of Landsat data, either because of perceptions of a more user-friendly interface or because the data is provided in more accessible formats. Many StateView web sites also provide links to other geospatial clearinghouses. Thus, the AV data archive mission, although somewhat different than it was back in 2002, continues to provide a valuable service.

Outreach and Education

Outreach is the process of raising awareness, be it of an event, or an issue, or an opportunity. In AV, the outreach mission covers all three facets. Geospatial science and technology is one of the most rapidly growing fields in the U.S. and abroad, and for good reason – businesses, governments, and non-governmental organizations are increasingly aware that geospatial technology offers tremendous utility

and significant future potential for enhancing diverse aims. Satellite imagery has gone “mainstream”, appearing daily in the media, on cable and network television news, in marketing, and in documentaries and special reports. The public now recognizes the importance of remotely sensed imagery in documenting, describing, and visualizing extraordinary phenomena such as unusual weather, natural and human-made disasters like the Gulf oil spill, and the geography of droughts, massive wildfires, land use changes, and other geographic phenomena that capture our collective interest (see the Geospatial Revolution Project, an AV partner, at <http://geospatialrevolution.psu.edu/> for an overview). Clearly, a remotely sensed image is worth a thousand words, and satellite images offer a unique spatial perspective that is unlike, and often more powerful than, any verbal description. Given such heightened awareness, it is not surprising that geospatial technology is such a rapidly growing field.

Growth in the geospatial science and technology field has driven a need for qualified scientists and technicians, a need that AV is committed to support. AmericaView's education mission, dating back to the 2002 charter, addresses the basic question: *How much better prepared for the 21st century would U.S. society be if the public had a better understanding of remote sensing technology and related Earth System Science?* Multiple independent lines of evidence, many of which have been gained directly and indirectly through remote sensing, indicate very clearly that both the Earth's land surface and climate are changing rapidly.

To address these critical issues as effectively and efficiently as possible, more constructive and engaging STEM (Science, Technology, Engineering, and Mathematics) education is desperately needed, supplemented by stronger spatial thinking skills at all levels of formal education, from elementary school to graduate school. StateViews have programs like SATELLITES (Students And Teachers Exploring Local Landscapes to Interpret The Earth from Space; <http://satellites12.org>), a K-12 STEM education project developed by Dr. Kevin Czajkowski at the University of Toledo. SATELLITES provides STEM educational opportunities to K-12 teachers and their students through a cooperative, multi-state effort partially funded by AV annual grants to the StateViews and supplemented by other external sources such as NASA. Last year, SATELLITES students were invited to present their findings at the White House Science Fair.

Another example is AmericaView's Earth Observation Day, a national STEM initiative funded entirely by AV that began in 2007 and has grown to include 15 StateViews in 2011. Earth Observation Day (EOD, earthobservationday.org) aims to engage K-12 and undergraduate students in remote sensing by using Landsat imagery to develop a local land cover map of the area around each school. Students are then guided in a local assessment of land cover change. In areas that are both familiar and relevant, heightening awareness of the complexities of land use change while teaching powerful analytical and spatial thinking skills. These and other AV educational projects, including K-12 teacher workshops, remote sensing imagery exhibits, guest lectures in schools, and other education and outreach events, are becoming more popular and more important as teachers and students begin to explore and learn more about the exciting field of remote sensing.

Applications and Technology Transfer

The nature of geospatial applications and closely related technology transfer projects conducted by StateView consortia varies widely and is predominantly dictated by the needs of individual states, often in partnership with local, state and federal agencies. Technology transfer and applications have typically occurred under emergency situations, when the need for geospatial expertise, data and derived products is most pressing. What follows is a brief description of several key StateView application and technology transfer examples, in which AV partners were able to provide timely service and products.

When Hurricane Katrina struck the Gulf coast in 2005, LouisianaView PI Mr. Brent Yantis, working with state partners and students at the University of Louisiana at Lafayette, provided timely hardcopy maps to recovery teams. They also provided access to pre- and post-hurricane imagery to the public through the LouisianaView web site. Similarly, WisconsinView has repeatedly worked with state agencies to provide imagery and analyses for tornado and flooding events. In partnership with the Wisconsin state emergency management agency, WisconsinView PI Dr. Sam Batzli used satellite imagery and radar data to identify, quantify, and map flooded areas and tornado paths. For example, in 2008 WisconsinView coordinated image and radar processing of areas in the state that were impacted by a 500-year flood event. In a 24-hour period, Dr. Batzli and his StateView partners were able to provide valuable information on more than 25 flooded areas. In a similar example, AlaskaView PI Dr. Tom Heinrichs works closely with the Bureau of Land Management and U.S. Forest Service to provide daily monitoring of wildfires in Alaska. Because of the cooperative reception facility that receives both Landsat and MODIS data, AlaskaView and their partners are able to aid fire management teams on the ground in near real-time. Monitoring wildfires with remote sensing data was particularly useful during the summers of 2004 and 2005 when Alaska experienced extensive wildfire outbreaks.

Research

AmericaView research, in contrast to applications and technology transfer, are generally longer term, less time-sensitive projects. Typically, a StateView PI's research interest addresses or overlaps with state needs. By leveraging partnership resources, PIs can simultaneously add to the body of remote sensing literature and provide a service to local, state or federal agencies. University faculty and staff typically serve as the StateView research liaison, supported primarily by higher education students who help to develop the applications. As an example, invasive species are a growing problem in every state, with impacts in the billions of dollars nationwide. Many StateViews have responded by cooperating in detection and mapping efforts. In Georgia, the National Park Service needed data to support the development of a management plan for kudzu (*Pueraria lobata*) eradication. Working with digital elevation models and aerial photos, StateView Co-investigator Dr. Mark Patterson and his students mapped existing large patches of kudzu, aiding in the development of a Park Service management plan and allowing predictions of potential future growth. Similarly, OhioView cooperators have been working with the state department of agriculture to help combat the spread of the Gypsy moth, a threat to the state's highly valuable oak forests. Using Landsat imagery, an algorithm was developed to predict the presence of gypsy moth egg masses, which could then be destroyed, slowing the moth's spread.

Many StateView consortia have also supported habitat management plans and activities of various types. IndianaView, for example, works closely with the U.S. Forest Service to identify non-native conifer

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species introduced into the Hoosier National Forest in the 1930s and 1950s to control erosion. Extant stands require monitoring and mapping to aid forest managers in their confinement efforts. KansasView, working with the Bureau of Reclamation, has created annual land cover maps of high quality wetland habitats for migrating fowl. Their maps have assisted in wetland management, for example, in identifying and thus assisting in the elimination of invasive cattail stands that degrade wetland habitat and displace native wetland species.

Most projects, including those described above, include participation of undergraduate and graduate students. For example, an undergraduate student with the South Dakota State University Water Resources Institute designed a project that evaluated the utility of Landsat and other remotely sensed data for monitoring the state's water quality. KentuckyView funded two competitive grants to students, one of which modeled Japanese Honeysuckle distribution in parts of Kentucky using remote sensing and GIS, while the second developed and analyzed global climate change indices on vegetation vigor in protected areas of the state. Many StateViews continue to fund projects and internships to increase student participation in applied remote sensing projects. In the last year, 12 projects either funded undergraduate and graduate student research or provided funding for students to attend conferences.

These examples represent a very small fraction of the 65 applied research projects conducted by faculty, staff, and students at StateView member universities this year alone. The broad range of projects reflects the differing needs identified within each state. As AmericaView continues to develop and expand, so will the number and scope of applied research projects.

Present Challenges and a Look Ahead

AmericaView has filled a critical need in the remote sensing field. Through AmericaView, the USGS Land Remote Sensing Program continues to support the critical national infrastructure within which civilian, non-commercial applied remote sensing has been able to thrive in recent decades. AV was created in large part to support moderate resolution, non-commercial remote sensing needs at the state level throughout the U.S., and the organization plans to continue these efforts in the future. Meanwhile, StateView partners are actively pursuing the AV mission of education, outreach, technology transfer, and applied research with over 350 consortium members across 39 states, with a goal to eventually expanding to all 50 states as well as the U.S. territories.

Challenges remain however, including securing adequate funding for current activities and expansion to additional states. Although from a national perspective the reach of AV has increased, increasingly restricted federal budgets, combined with increasing numbers of StateView partners, have resulted in decreasing StateView budgets. AV has determined that increasing state participation results in *specific, tangible benefits* to all state partners because the consortium works

cooperatively, rather than competitively, to promote remote sensing. Meanwhile, StateViews remain dynamic and productive, and continue to train students and leverage their activities to the maximum extent possible. Despite the challenges imposed by restricted funding, the AV network of remote sensing specialists continues to work on promoting remote sensing applications across the U.S., whenever and wherever there is a demonstrated need that aligns with our mission. Given the experiences of the first eight years, AmericaView is well positioned to continue to leverage resources, expand opportunities, and help to meet the needs of the nation. As a model of a joint academic – federal effort that increasingly requires cooperative partnerships to meet the growing list of applied environmental remote sensing and STEM education challenges, the future is bright and clearly offers many exciting opportunities.

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