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

AmericaView℠

Empowering Earth Observation Education

AmericaView.org

AmericaView: A National Remote Sensing Consortium
Grant Award Number: G18AP00077

AmericaView Technical Report for Grant Year 2020

Period of Performance
18 September 2020 to 17 September 2021
(With NCE from 18 Sept 2021 to 30 June 2022)

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

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Glossary of Terms

AGI	American Geosciences Institute
ARSET	Applied Remote Sensing Training
ASPRS	American Society for Photogrammetry & Remote Sensing
AV	AmericaView
AWS	Amazon Web Service
CO-I	Co-Investigator
DOI	Department of the Interior
DRR	Disaster Risk Reduction
EAA	Earth as Art
ED	Executive Director
EO	Earth Observations or Earth Observatory
EOD	Earth Observation Day
EOS	Earth Observing System
EROS	Earth Resources Observation and Science
ESA	European Space Agency
ESRC	Earth Sensors and Research Committee
ESRI	Environmental Systems Research Institute
ESW	Earth Science Week
FTM	Fall Technical Meeting
FY	Fiscal Year
GEE	Google Earth Engine
GY	Grant Year
HIA	High Impact Activity
ISRSE	International Symposium on Remote Sensing of Environment
LST	Landsat Science Team
LWG	Landsat Working Group
NASA	National Aeronautics and Space Administration
NCE	No Cost Extension
NLI	National Land Imaging
NLRSEORA	National Land Remote Sensing, Education, Outreach and Research Activity
OBIA	Object Based Image Analysis
OLI	Operational Land Imager
OSM	Open Street Map
PI	Principal Investigator
PD	Program Director
SBSWG	Satellite Based Sensor Working Group
SPC	Strategic Partners Committee
SC	State Coordinator
STEAM	Science, Technology, Engineering, Art, and Mathematics
STEM	Science, Technology, Engineering, and Mathematics
sUAS	Small Uncrewed Aerial System
SV	StateView
SWOT	Strengths, Weakness, Opportunity, Threat
UAS	Uncrewed Aerial System
UAV	Uncrewed Aerial Vehicle
USGS	United States Geological Survey
VAP	Value Added Provider
WBM	Winter Business Meeting

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1 INTRODUCTION AND OVERVIEW

1.1 REPORT PURPOSE AND STRUCTURE

This report summarizes the activities for the United States Geological Survey (USGS) National Land Imaging (NLI) program Grant Award G18AP00077 for the National Land Remote Sensing Education, Research and Outreach Activity (NLRSEROA) to AmericaView (AV) from 18 September 2020 to 17 September 2021, with a no-cost extension (NCE) from 18 September 2021 to 30 June 2022. This report satisfies the grant year reporting requirements for Period 3 of the NLRSEORA award. The report contains a detailed description of completed activities for grant year 2020 (GY20). Metrics for this report were captured, interpreted, and presented by AV Staff.

The report is organized in four sections with associated supporting material available for download at links noted within the report. Section one provides an AV and StateView (SV) consortium overview. Section two presents selected achievements that have been accomplished by AV SV members, or at the national level, to meet the USGS NLI grant objectives. Section three is a brief grant year review. Section four is a fiscal summary and report of grant fund expenditures.

1.2 AMERICAVIEW – A NATIONAL CONSORTIUM

AmericaView, a 501(c) (3) non-profit education and research organization, is a nationally organized consortium of state-based consortia with more than 23 years of experience advancing the availability, timely distribution, education, and widespread use of remote sensing data and technology. AV SV members are led by 39 local universities that facilitate state-based consortia consisting of more than 300 local, state, and regional members with a directive of advancing the widespread use of remote sensing data and technology through education and outreach, workforce development, applied research, and technology transfer. Each SV delivers remote sensing related educational, research, and operational products and services that meet the needs of the state, local, and regional communities that it serves. The success of AV is a direct result of the power of collegiality and of the *power of the AmericaView network*.

The concept of a national consortium to advance the adoption and use of remote sensing technologies and products at the state level was conceived in 1998 with the establishment of OhioView. Expansion to the national level was authorized by the United States Congress and achieved by AV. AV was incorporated as a non-profit in 2003, and began with ten members. Today AV is a locally facilitated and nationally coordinated consortium that has grown to 39 SV members (Figure 1). AV SV Principal Investigators (PIs), Co-Investigators (Co-Is), and State Coordinators (SCs) include some of the foremost remote sensing scientists and educators in the nation, and include editors of major journals, authors of key remote sensing textbooks, and directors of major research laboratories. These remote sensing professionals impact the Earth science community in a wide variety of areas including, but not limited to, environmental monitoring; water quality, quantity, and utility studies; plant-phenology camera studies; natural resource management; traditional and precision agriculture; and, disaster response and risk reduction. Collectively, the PIs of AV are responsible for millions of dollars of competitive grants, lead quality research programs nationally and internationally, and successfully disseminate their research outcomes through publications, presentations, and the web.

Figure 1. The AmericaView national consortium during the GY18 Winter Business Meeting at USGS headquarters in Reston, Virginia.

AV facilitates sharing educational and research material. AV's national website, AmericaView.org shares remote sensing resources. AV's social media presence, including Facebook, Twitter, and YouTube, reaches thousands of educators, students, decision makers and scientists across the nation and around the world. Metrics collected over the past decade indicate broad interest and hundreds of thousands of visits and revisits, from the merely curious to the significantly interested. The volume of imagery and other geospatial data, training lessons, and articles that are downloaded through the website interfaces underscores the value of this information and of AV's continuing support of these resources.

AV's national organization includes three committees chaired by AV SV members and composed of SV consortium members. These committees align closely with key objectives of the NLI NLRSEORA program. Through the committees, AV is able to establish working groups that have the ability to respond rapidly to specific topics of interest or organizational needs. The structure of individual working groups is flexible in order to allow formation or dissolution as needed. One example is the formation of a one government approach working group with NASA and USGS each year to participate in the Earth Observation Day poster development. Committees and working groups are sustained by consortium members with greater than 1,000 hours of service per year, beyond the funded sub-grant activities.

1.3 Administration and Coordination

AV is a nationally organized consortium of states managed under the direction of its board of directors. The duties of the AV board of directors are to provide general oversight to the national organization and ensure the charter of the organization is observed and the bylaws are followed or modified as necessary. The board is elected from active SVs or other individuals having explicit interest in the mission of AV. Board terms are three years in length and are staggered to ensure that the retention of critical organizational knowledge is maintained and transmitted to new board members. Board member elections occur yearly. The board is guided by officers including chairperson, vice-chairperson, secretary, and treasurer. (Table 1)

Although AV has no formal employees, it operates with an annually-assessed Board-approved staff including an executive director, program director, financial manager and information analyst, and bookkeeper. The duties of the AV staff are to guide the national AV organization; to ensure the mission, goals, and objectives of projects are accomplished; to develop and sustain beneficial relationships; and

to transparently keep and share records of the fiscal accountability of the organization. The AV staff work in a virtual format from various locations.

AV is primarily funded by the USGS. Although an independent organization, AV maintains close ties to the USGS to ensure that needs and objectives of USGS/NLI, as they pertain to this grant agreement, are successfully addressed. This close working relationship is facilitated by regular communication between the AV Staff and the assigned USGS liaison and contract financial officer. USGS transmits needs, questions, and programmatic requests through the liaison to AV staff. AV staff can then respond to those requests or identify AV members that can assist in the response.

Board of Directors	**July 1, 2020 to June 30, 2021**	**Board of Directors**	**July 1, 2021 to June 30, 2022**
Mr. Brent Yantis	Chair	Mr. Brent Yantis	Chair
Dr. Russell Congalton	Vice Chair	Dr. John McGee	Vice Chair
Ms. Roberta Lenczowski	Secretary	Ms. Roberta Lenczowski	Secretary
Dr. Rebecca Dodge	Treasurer	Dr. Rebecca Dodge	Treasurer
Dr. JB Sharma	Director	Dr. Russell Congalton	Director
Ms. Mary O'Neill	Director	Ms. Mary O'Neill	Director
Dr. Thomas Mueller	Director	Ms. Robin McNeely	Director
Ms. Robin McNeely	Director	Dr. Lindi Quackenbush	Director
Dr. John McGee	Director	Dr. Bradley Shellito	Director
Staff		**Staff**	
Mr. Christopher McGinty	Executive Director	Mr. Christopher McGinty	Executive Director
Ms. Lisa Wirth	Program Director	Ms. Lisa Wirth	Program Director
Ms. Jeanie Congalton	Financial Manager and Info Analyst	Ms. Jeanie Congalton	Financial Manager and Info Analyst
Ms. Eufemnia Gough	Bookkeeper	Ms. Eufemnia Gough	Bookkeeper

Table 1. List of AV Board of Directors and Staff during GY20 with modifications after June 30, 2021 due to annual elections.

1.4 NATIONAL AND STATEVIEW CHANGES

During any given grant period, there are changes at both the national and membership levels. At the SV level, as PIs retire or step aside, the AV staff, Board, and membership have the opportunity to vet and approve new SV PIs. This process involves a thorough review of the prospective PI credentials and interests by the AV staff, Board, and membership. The Board and membership then vote to accept or reject the PI. In GY20, AV welcomed four new PIs.

ArkansasView	Dr. Mohamad Aly
MarylandView	Dr. Chuyuan Wang
MissouriView	Dr. Vasit Sagan
New MexicoView	Dr. Carol Campbell

2 AMERICAVIEW GRANT YEAR 2020 OBJECTIVES AND KEY SUCCESSES

2.1 NLRSEORA OBJECTIVES

2.1.1 Objective 1 - Gather Nationwide Remote Sensing Data and Information Requirements

As a nationwide consortium, led by 39 universities, AV will continue its past work gathering, defining, consolidating, and communicating data and information requirements of local user communities to agency personnel and those that support the development of Earth observing platforms. As a national consortium, AV will work closely with agency scientists and researchers to relay the availability of data and tools and provide training to local user communities. AV will improve the nation's capabilities and resources in land remote sensing by creating clear communication channels between all levels. These objectives will be accomplished through AV's national and state consortia, by enhancing the coordination of information regarding the capability of existing remote sensing data products to meet the needs of its user constituencies (including academic, scientific, and local end user communities). AV will assemble this information at the national level and provide feedback to decision makers and agency personnel to help improve the nation's land remote sensing capabilities.

AV National Work Plan

Periods 1-5: AV's national and state consortia will collect information on the ability or identified weaknesses of existing remote sensing data and derivative products to meet the needs of the user constituencies.

In grant year 2020, grant period 3, numerous SVs continued research projects that are benefiting from the Earth Observation Enterprise. The result of interagency coordination and cooperation has allowed the opportunity for projects to bring different sensors and platforms together for projects that benefit multiple user constituencies. A few examples are noted below. AV will continue to identify, encourage, and engage in projects throughout the duration of the grant that help take the pulse of the user community to identify new approaches to combine new and existing data sets.

- KansasView developed the Sentinel Green Report application leveraging Google Earth Engine to measure and monitor vegetation across the United States. Four maps were created from the Sentinel-2 archive. These maps can be used for a wide range of applications such as crop monitoring and disaster assessment.
- ConnecticutView has developed multi-temporal (2015–2020) water clarity estimates based on Landsat satellite imagery reflectance characteristics of surface waters in Connecticut. A StoryMap was developed to share and visualize the findings.
- VermontView is leveraging cutting-edge technology and big data analytics to keep Vermont's high-resolution land cover dataset (previously developed with AV funds) up to date. By leveraging Landsat image products from the USGS and machine learning approaches, VermontView can identify areas where change has occurred and then update the land cover mapping accordingly. This ensures that the maps are not just accurate and detailed, but current.
- IdahoView is using terrestrial LiDAR analysis for geohazard identification along railroad corridors in northern Idaho that are subject to landslides, debris flows, and rock fall. These geologic hazards have the potential to severely impact railroad assets, profitability, and public safety, particularly when hazardous materials are transported. Using a multiscale model to model

comparison, they were able to quantify new mass movement activity at sites along the river corridors.

AV Satellite-Based Sensor Working Group (SBSWG) Work Plan

Period 1: AV will use its unique position as a consortium of 39 SV's to help define, consolidate, and communicate the data and information requirement of its constituents. The SBSWG will further this objective by identifying and communicating data, information needs, and requirements of AV's constituents and stakeholders to agencies charged with the development and operation of the Landsat and related programs. Prior to its initial Fall Technical Meeting (FTM) under this grant, AV will request information from USGS about specific sensors or platforms about which USGS may be interested in seeking additional or specific information. Each SV member will identify current remote sensing data and information requirements from its own consortium members and other state and local-based stakeholders. General guidance regarding the reporting process will be provided by the SBSWG. A workshop will be held as part of the FTM, during which members will present, discuss, and consolidate the current remote sensing data and information requirements of the AV stakeholders. The results of this workshop will be summarized and delivered to USGS and the Landsat Science Team (LST) within two months of the meeting and presented as part of the AV annual report for this grant period. AV will contribute stakeholder and constituent medium resolution land-imaging needs and requirements to the LST and will participate in relevant public LST discussions vital to AV constituents and stakeholders.

Period 2-5: The SBSWG (now the Earth Sensors and Research Committee) and AV staff will review the results of information and data collection and reporting efforts in Period 1 and will be responsible for revising the data collection and workshop procedures each year, as appropriate. Needs and requirements workshops will be conducted in each of Period 2-5. The SBSWG will be responsible for collecting and disseminating recent developments of each state consortium and incorporation into future lesson plans and research. All information will be shared with USGS staff.

During GY19, the AV committees and working groups were reorganized to increase participation, collegiality, and efficiency. The Satellite-Based Sensor Working Group was combined with the Water Working Group and the UAS Working Group to form the Earth Sensors and Research Committee. This new committee has broadened the discussions on different Earth sensors that are relevant to the work of AV member states and USGS NLI priorities. Notable discussions have been facilitated through presentations by Mark Bauer, USGS, "A UAS Lidar Review" and Genevieve Patenaude, Earth Blox, "Earth Blox Makes EO Data Analytics Easy, Rapid and Powerful."

Due to the COVID-19 pandemic, AV was not able to hold an annual meeting, which is when the AV membership would participate in our information requirements gathering effort. AV staff is currently working with USGS to develop topics that they are interested in having as part of the information requirements effort that will take place at the next AV annual meeting being held in Fort Collins, Colorado in May 2022. This information will be reported to USGS and presented to the LST during a future meeting.

<u>Encouraging New Affiliates Work Plan</u>

Periods 1-5: As AV continues to pursue the USGS NLI objectives, the AV national consortium will seek new affiliate state members who are interested in furthering the NLRSEORA objectives. Ultimately, AV will strive to include all fifty states, the District of Columbia, and U.S. territories as appropriate levels of funding are realized.

Following modification to the AmericaView bylaws by the Board, staff, and approved by the membership, AmericaView now recognizes two levels of membership, Full and Associate Members. Full Members are entitled to all voting rights and opportunities to request continued annual funding when available. Associate Members are entitled to all voting rights but are not eligible for sustained annual funding until the level of full membership is achieved. To reach Full Membership status, an Associate Member must demonstrate successes in program and consortium development, participation in AmericaView committees, and a demonstrated desire to further the vision and mission of AmericaView. Efforts to encourage affiliate development were continued during GY20 in Tennessee and Nevada. Contacts were made in GY19 with Dr. Qiusheng Wu from the University of Tennessee Knoxville, and Dr. Robert Washington-Allen from the University of Nevada, Reno and discussions were continued during GY20. Discussions were fruitful; all parties were invested in the NLRSEORA objectives and priorities through their existing projects and were excited at the possibility of joining the AmericaView program.

AmericaView StateView Activities Work Plan

Period 1-5: All AV members will continue to develop and build local SV consortiums through relevant and timely High Impact Activities (HIAs) and by interfacing with local users. SVs will summarize these relationships and issues, educational opportunities, and outreach opportunities initiated through these consortia developments.

AmericaView has been steadily developing its national consortium since 2003. The maintenance of the consortium enables AV to better understand and serve the remote sensing needs of the residents in the states that it serves. Encouraged growth of the national consortium and state consortia strengthened AV's networking, remote sensing expertise, and knowledge sharing collaboration. AV continues to work to sustain and strengthen its consortium through each SV that consists of varying numbers of members, ranging from 3 to 45 members. Figure 2 describes the wealth of activities conducted by all of the SVs in GY18, GY19, and GY20 to benefit their local consortiums, which in turn, strengthens AmericaView's national impact. A comparison between GY18, GY19, and GY20 was made to interpret the impacts on SV programs from the COVID-19 pandemic. As anticipated, education and outreach activities, EOD/GIS day outreach, and posters presentations were fewer in GY19 and GY20 as compared to GY18. Efforts were redirected to activities that did not require in-person contact. In GY20 AV continued to support students, presentations, projects beyond HIAs, and publications. These efforts showed a net increase from GY18 efforts; however, the COVID-19 pandemic did play a role in limiting even greater positive impacts. Publications include published articles, books and eBooks, posters, conference abstracts, thesis, dissertations, and videos. There was a large increase in video creation during GY19 due to the shift in SV program deliverables to online content production and the GY19 mini-grant program. That trend continued during GY20 (as compared to GY18), though at a reduced rate than in GY19 due to there not being a mini-grant program.

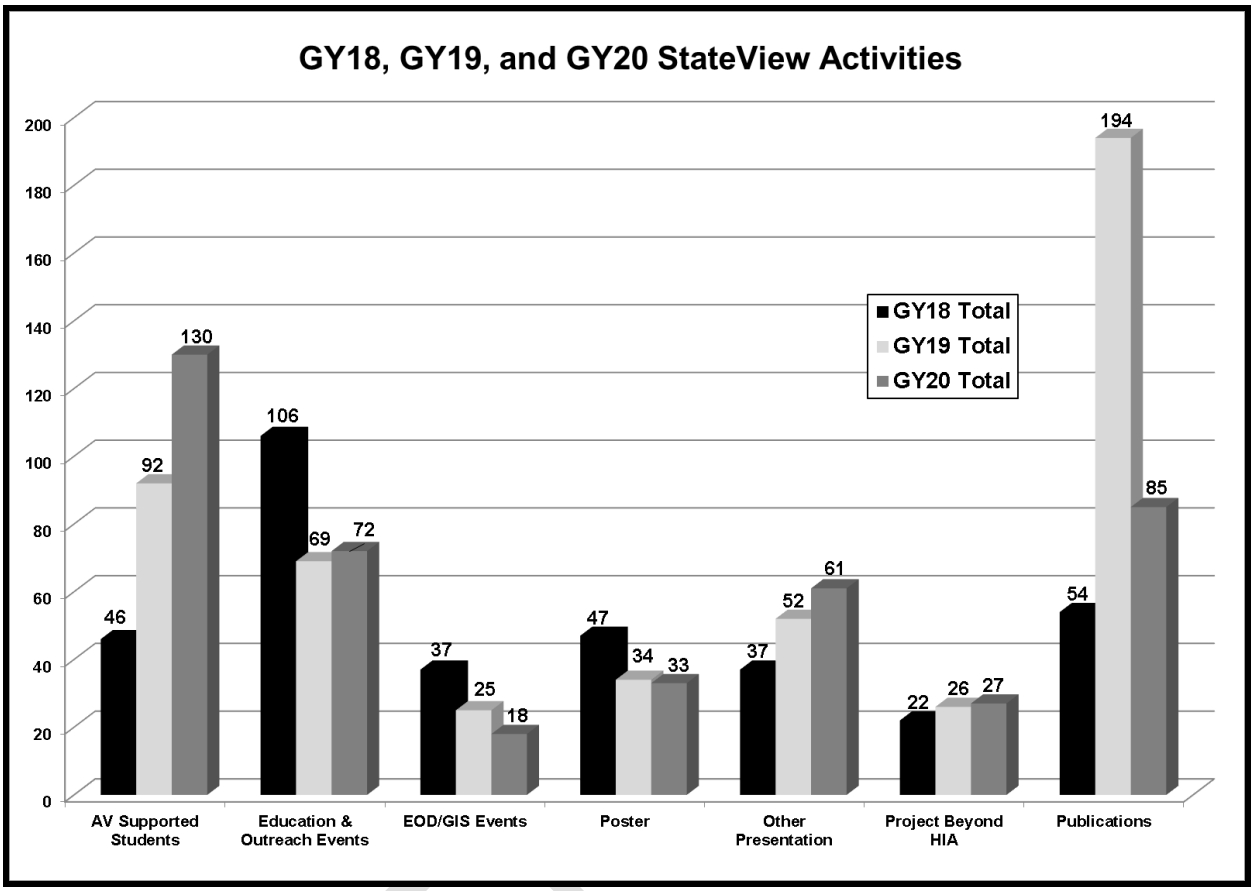

Figure 2. Categories of StateView activities in GY18, GY19, and GY20 contrasted to show the impact of the COVID-19 pandemic on SV programs during GY19 and GY20. SVs reduced participation in activities that required in-person contact (Education and Outreach, EOD/GIS, and Poster) and increased participation in efforts that did not require in-person contact (AV Supported Students, Other Presentations, Project Beyond HIA, and Publications).

During GY20, all SVs invested time in maintaining and expanding their local state consortia to the benefit of USGS NLRSEORA priorities and objectives. Notably, Rhode IslandView recruited and mentored two graduate research assistants to create an ESRI StoryMap to tell the story of the ongoing Landsat program. The StoryMap provided basic information about remote sensing, the historical background of the Landsat program, the characteristics of Landsat data, example applications, and instructions on how to access the data. The Story Map was geared toward a non-technical audience to make it applicable to a broad community of professionals and the general public. In their first year as an associate member, MissouriView developed three teaching resources for K-12 and college level courses. These resources include: Missouri as Art, Forest Conservation with AI, and Water Disparity and Levee Management. These training modules are designed to promote the use of geospatial data and contribute to the mission of AmericaView by advancing K-12 and college education. Another significant benefit of AV funding is the ability of the SVs to leverage those dollars in support of larger projects that are primarily funded from a different source. The SVs that leveraged funding in support of larger efforts are shown in Table 2. Efforts such as these dramatically increase the return on investment for the Department of the Interior by funding the AV program. The success of AmericaView is through the power of the network, made possible through each member state consortium.

State	Name of Project	Funding Agency
IN	Integrating Geospatial Information Across Disciplines	Purdue University Integrated Data Science Initiative
KS	Between a Rock and a Hard Place	Haskell Environmental Research Studies (HERS) Institute
KS	Eight ESRI StoryMaps developed by Haskell Students	Haskell Environmental Research Studies (HERS) Institute
LA	Undergraduate GIS/RS Certification	University of Louisiana Lafayette
MO	GeoAI: Building a diverse STEM Workforce in Missouri through Geospatial AI Research and Training	NASA Missouri Space Consortium
MS	Monitoring water quality in the Mississippi Sound	MBRACE
MS	Structure performance in siesmic event (use of airborne thermal sensors)	University of Mississippi seed funds
MT	Multi-scale analysis of Ventenata control treatments on the Crow Reservation	Montana Noxious Weed Trust Fund
NY	Deriving lake phytoplankton information from satellite imagery	New York State Department of Environmental Conservation
NY	Investigating the impact of ground control points distribution and count in positional accuracy of orthophoto and digital elevation model (DEM) creation in forest areas	ARCADIS (arcadis.com/en-us)
WV	Deep Learning Accuracy Assessment Best Practifces	NSF
WV	West Virginia LiDAR Download Tool	West Virginia GIS Tech Center

Table 2. A selection of StateViews that leveraged funding in conjunction with their AV activities.

Metrics Assessment of Progress

Periods 1-5: Within the Technical Report for each grant period, and at annual meetings, AV SVs will summarize their experiences with the consortia's remote sensing data and information requirements gathering efforts. Metrics, to be determined by the SBSWG, may include the following: issues faced at local levels; data and sensors used to address issues; successes of data and sensors to solve local issues; and needs or shortcomings of data and sensors to solve local problems. AV will report these summarized metrics to USGS/NLI in annual reports.

During GY19, the AV committees and working groups were reorganized to increase participation, collegiality, and efficiency. The Satellite-Based Sensor Working Group was combined with the Water Working Group and, as described earlier, the UAS Working Group to form the Earth Sensors and Research Committee. This committee continued in GY20 and has broadened the discussions on different Earth sensors that are relevant to the work of AV member states and USGS NLI priorities. A remote sensing data and information requirements gathering effort is currently in development with USGS staff and will be conducted as part of the AV annual meeting being held in Fort Collins, Colorado in May 2022.

Consortium development will continue to be closely tracked by AV. SVs will report annually on the status of their consortium development efforts. Metrics, to be determined by the ED, may include the following: name(s) and roles of consortium members; additions to local consortiums; benefits those members provide to the consortia, and how new and current members help the SV meet their HIAs and project objectives.

AV tracks the number of consortium members for each SV as a part of our annual metrics gathering effort. SV consortium totals per SV in GY20 are shown in Figure 3. Consortium member affiliation per

SV, with the categories of Federal, Local, University, and Private are also tracked and shown in Figure 4. During GY20, the consortium participation from greatest to least was: University, Local, Private, and Federal. Tracking the diversity of SV networks is important in an effort to better understand the unique users at the local level. Understanding this metric allows AV to communicate and understand the needs of Earth observation resources to meet local needs and translate that information to the Federal level. Each state has a diverse consortium, which is the mechanism that makes the programs effective and beneficial to each community and is illustrative of the reach and influence of the AV network.

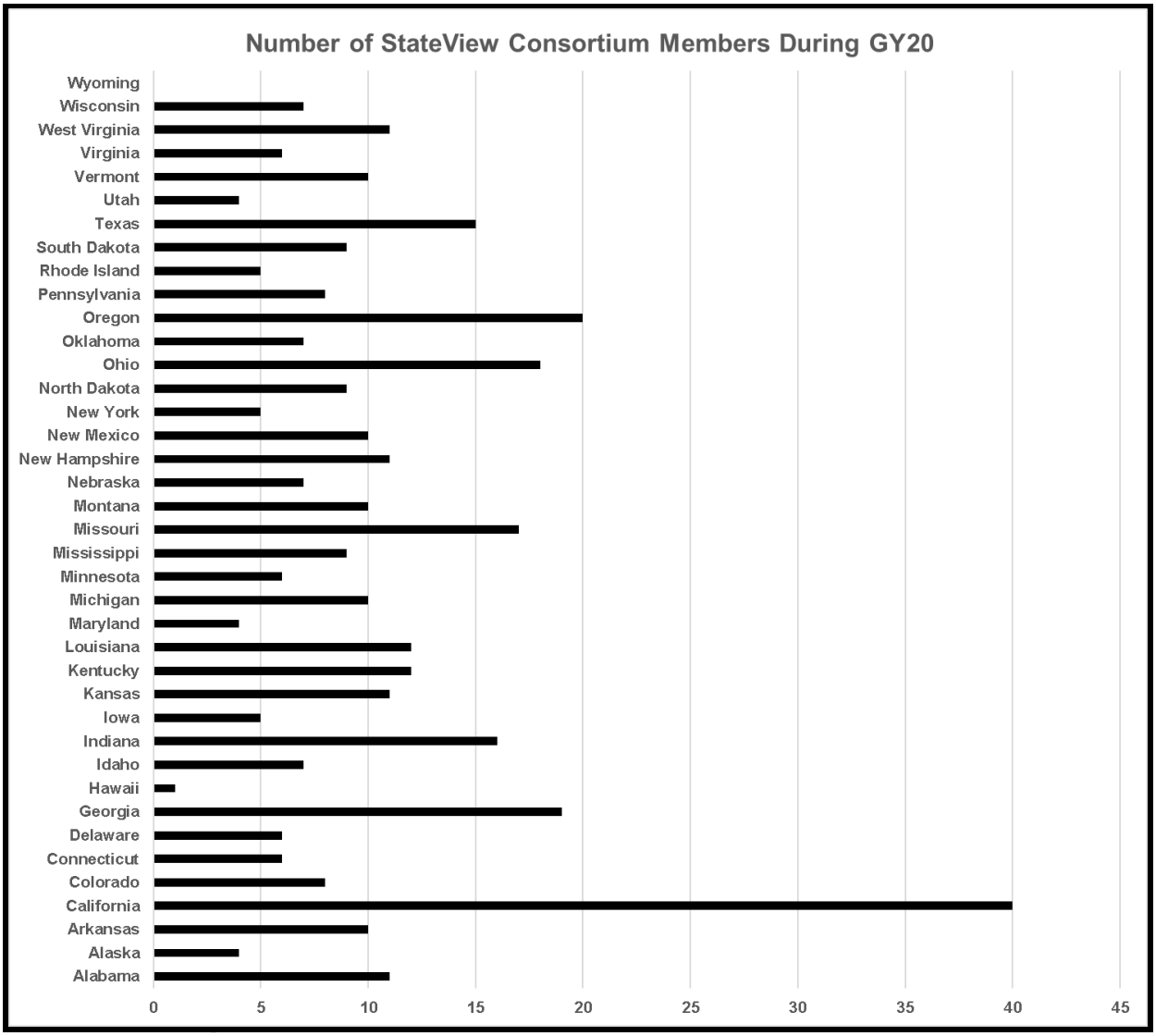

Figure 3. Total consortium members per StateView during GY20

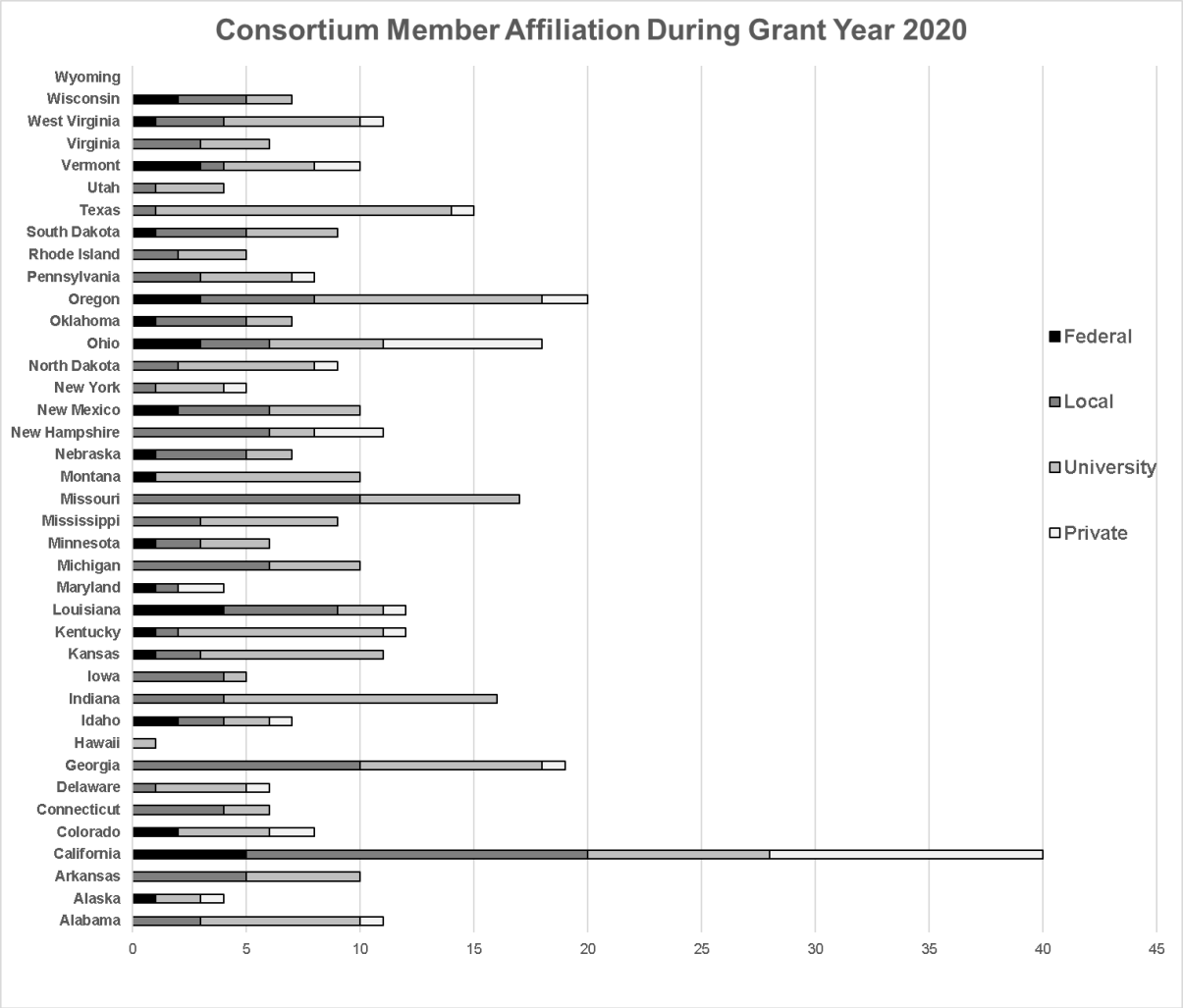

Figure 4. Consortium member affiliation (Federal, Local, University, and Private) per StateView during GY 20. The participation from greatest to least is: University, Local, Private, and Federal.

2.1.2 Objective 2 - Establish Strategic Partnerships

AV enjoys many vibrant strategic partnerships at the national and local levels, which it will further strengthen through this proposal. As remotely sensed and other geospatial applications proliferate into many areas of our society and economy, AV will actively seek and develop new partnerships that reinforce the study, development, and deployment of these applications, educational materials, and tools. With these partnerships, emergent tools, systems, and applications in remote sensing and related geospatial technologies (such as Google Earth Engine (GEE), Uncrewed Aerial Systems (UAS), object-based image analysis (OBIA), Amazon Web Services (AWS), novel sensors, proliferating satellite image providers, big data, and deep/machine learning - will be introduced into the repertoire of the current and future remote sensing workforce. AV will establish well-defined partnerships with industry leaders, who have common interests in STEAM workforce development. These relationships will help develop a workforce proficient in remote sensing that is strategically postured to benefit society and the economy. AV will collaborate with institutions that share its strategic goals of advancing remote sensing literacy, applications, STEM/STEAM, and workforce development. AV aspires that its nationwide SV network will continue its 15-year expansion and anticipates, with this grant, an even greater direct connection to regional communities, school systems, local, tribal state governments, and NGOs.

AmericaView National Activities Work Plan

Periods 1-5: AV's Executive Director will look for opportunities to grow the strategic partnerships. The ED will attend national meetings and symposia as an advocate for the NLI NLRSEORA program objectives and will actively participate to help establish the positive awareness that stimulates the formation of effective and mutually beneficial alliances.

The AV ED is responsible for the long-term viability of the AV program and opportunities to advocate for the NLI NLRSEORA program. During GY20 the ED has attended meetings, conducted outreach, and worked to develop relationships to further this objective. Two unique and high-profile opportunities occurred in GY20, where AV built partnerships within NLI and NASA to provide a one government approach to successfully carrying out the events. AV supported USGS NLI in planning and participating in the Imagery Summit, held virtually in August/September 2021. AV provided selected speakers from the network and organized a student session, where AV supported students presented on their research. AV was proud to support the launch of Landsat 9 in September 2021 from Vandenberg Space Force Base in California. Through collaborations with the USGS and NASA, AV highlighted and celebrated the Landsat program with multiple displays and activities in and around Lompoc, CA during the Landsat 9 launch week festivities. Mr. Brent Yantis, LouisianaView Principal Investigator and Chairman of the AV Board of Directors, packed and transported the traveling Earth as Art exhibit from Lafayette, LA to Lompoc. The exhibit, consisting of dozens of Landsat images as art, were displayed at the Lompoc Public Library, the Lompoc Aquatic Center, and several recreation centers and businesses around the Lompoc area. Ellie Leydsman McGinty, UtahView State Coordinator supplied Utah as Art canvases showcasing Landsat imagery of the Southwest United States. AV Program Manager, Lisa Wirth (Texas), AV Executive Director, Christopher McGinty (Utah), and AV Board of Director, Mary O'Neill (South Dakota) organized event tables with Earth Observation Day materials to help promote and empower Earth observation education (Figure 5). Several notable partnerships that were created during GY19 were our acceptance as an Associate Member in the Group on Earth Observations and with the NASA AEROKATS and ROVER Education Network and those partnerships continued to be fostered during GY20.

Figure 5. From Left to Right: Brent Yantis, Mary O'Neill, Chris McGinty, and Lisa Wirth at the Landsat 9 Launch event site in Lompoc, California.

The ED will alert the AmericaView Board and SVs to announcements about possible private and public grants that, if won, would encourage leveraging AV and partners' expertise and advancing appreciation of the great value of remote sensing. These opportunities will enable AV and its members to leverage projects and funding to further the overall beneficial impact of the NLRSEORA grant objectives and mission of USGS NLI.

AV gained significant ground in identifying strategic opportunities outside of the NLRSEORA grant in GY20. While no NLRSEORA funds were used for this particular effort, it is important to note because it allows AV to identify leveraging opportunities to further the vision and mission of DOI, USGS, and NLI in the areas of Earth observation education. During GY20, two NSF GeoPAths proposals were successful and awarded to OhioView and LouisianaView.

Industry representatives will periodically be invited to provide technical presentations at AV monthly members meetings and the FTM and WBM gatherings. Engagement with these experts encourages more strategic interactions, keeping both AV and the invited guest(s) aware of joint opportunities for collaboration.

To foster collegiality among SV members due to our inability to hold an in-person membership meeting in GY20 because of the continuation of the COVID-19 pandemic, AV began conducting SV updates at the monthly membership meetings. This has been well received from USGS and the AV membership. The ED and PD worked diligently during GY20 to further enrich the program with opportunities to hear technical presentations at the AV Earth Sensors and Research Committee meetings. Table 3 lists each presentation that was held during the third grant year.

Month	Speaker	Organization	Title
September 2020	Qi Chen	AmericaView	Lidar Remote Sensing for Forest Applications
October 2020	Tristan Goulden	NEON	Overview of NEON's Airborne Observation Platform
December 2020	Becky Eaves	NEON	Data & Infrastructure to Understand Changing Ecosystems
January 2021	Tom Neumann	NASA	The Ice, Cloud, and Land Elevation Satellite - 2 (ICESat-2) Mission: measuring global elevation with photons
February 2021	Genevieve Patenaude	Earth Blox	Earth Blox Makes EO Data Analytics Easy, Rapid, and Powerful
March 2021	Mark Bauer	USGS	A UAS Lidar Review
September 2021	Brian Killough and Joshua Baptist	NASA and Analytical Mechanics Associates	The Open Data Cube

Table 3. List of presentations held at AmericaView Earth Sensors and Research Committee meetings during GY20.

2.1.3 Objective 3 - Promote Undergraduate and Graduate Research and Employment Skills

Leveraging its strength as a national consortium of more than 180 colleges and universities in 39 states as well as its strategic partnerships, AV will continue to promote meaningful research and remote sensing experiences for university undergraduate and graduate students. These opportunities will allow students to obtain hands-on experience in both emerging and evolving areas of remote sensing science and applications. AV PIs and consortium members are, and will continue to be, actively engaged in the use of spaceborne sensors such as Landsat and Sentinel; employing emerging technology such as machine learning, OBIA, and UAS; and, developing methods, tools, and algorithms that integrate multiple data types to address a host of societal issues. AV SVs will support educational opportunities and internships for undergraduate and graduate students, including veterans. Students will gain critical employment skills by learning to conduct research that address local concerns and evaluates national and global problems, and endeavors to solve some of society's most pressing issues. AV members' proven success at generating research grant dollars will enable this objective to be highly leveraged. Student-involved research activities will increase the ability of the nation's future workforce, both quantitatively and qualitatively, to incorporate remote sensing technologies as a basic aspect of our nation's infrastructure.

AmericaView National Work Plan

Periods 1-5: Undergraduate and graduate students will participate in the development and distribution of Earth Observation Day (EOD) materials within participating SVs.

Earth Observation Day was successful in GY20 despite the complications for in-person events due to COVID-19, with seventeen SVs that held 18 events across the nation, reaching over 1,100 individuals. OregonView and Oregon State University graduate student, Selina Lambert, was the lead in the development of the Earth Observation Day game: Rivers: Our National Water Resource. In collaboration with NASA partners, Selina designed the gameplay, content, and created a virtual (Tabletopia) version of the game. Thousands of copies of the poster have been distributed to educators and partners to provide a fun, interactive introduction of use of remote sensing data in managing natural resources.

Several other notable EOD activities are listed below, where undergraduate and graduate students were engaged in the development of the events and distribution of materials.

- New MexicoView partnered with the NMSU Department of Language & Linguistics to recruit a graduate student to complete the Spanish translation of the EOD poster.
- OregonView celebrated EOD with the Oregon State ASPRS Student Chapter, playing the online and printed version of the game they were pivotal in developing (Figure 6).
- DelawareView celebrated EOD with high school students that are enrolled in their AV funded dual credit course.
- IowaView participated the annual ISU Reiman Gardens Spirits in the Gardens event featuring a self-guided pathway with hundreds of carved pumpkins as well as "meet-the-scientist" opportunities along the way. They shared posters featuring remote sensing and GIS and gave away educational materials.

Figure 6. OregonView students celebrating Earth Observation Day with the Oregon State ASPRS student chapter.

Periods 1-5: AV and SVs will promote research publications and presentations by students through diverse media, including in-person presentations, webinars, email blasts, and social media (including Facebook, Twitter, and YouTube).

- AlabamaView trained graduate and undergraduate students in using Remote Sensing methods for environmental applications and the students produced a series of informational videos that are shared on the Alabama Environment Awareness YouTube Channel.

- MontanaView awarded 10 fellowships to students at six institutions across Montana and they presented their work at the MontanaView Annual Fellowship Meeting on April 25, 2021, and submitted a final written report to MontanaView and the identified project stakeholder(s).
- IndianaView provided scholarships to four graduate students from member institutions to participate in geospatial projects. Each of the students provided a fact sheet about their project and a testimonial on how the scholarship assisted them. The testimonials showed that the scholarship opportunity motivated them to apply remote sensing data in their disciplinary studies and improved their confidence in using cutting edge technology in field data collection.
- New HampshireView funded an undergraduate intern to work in the Basic and Applied Spatial Analysis lab (BASAL) to aid their research resulting in a poster presented virtually at the UNH Undergraduate Research Conference in April 2021.
- VermontView students developed an ESRI StoryMap detailing their experience as an intern at UVM's Spatial Analysis Lab during the summer of 2021.

Metrics Assessment of Progress

Periods 1-5: At the national level, the responsible committees will collect and summarize reports from every SV with an EOD effort, following past practice. SVs will report the outcomes of student engagement efforts at the SV level. Other metrics, to be requested by the ED, may include the following: tracking number of students involved in SV-funded research or other employment opportunities; tracking the number of publications and presentations by AV-funded students. AV will report these summarized metrics to USGS/NLI in annual reports.

Throughout GY20, 30 SVs financially supported a total of 130 undergraduate and graduate students with AmericaView funds. The students worked on a variety of remote sensing related topics. Some SVs focused on education and outreach training and materials development, others simply allowed the opportunity to learn about GIS and remote sensing in a professional environment, and others were supported for a Master's thesis and PhD dissertation. Selected projects are listed below and the total amount of publications created in GY20 is shown in Figure 7.

- ArkansasView trained two graduate student interns from the MS Geography program at the University of Arkansas during the summer of 2021. They supported the development of the ArkansasView geospatial database, and one intern finished their MS research: machine learning & big data analyses for wildfire & air pollution incorporating GIS & Google Earth Engine. The outcomes from the wildfire study can help in fire prevention and preparedness to save lives and reduce economic loss in Arkansas.
- NebraskaView supported a summer intern that participated in the urban forest canopy mapping project that is done in conjunction with a Nebraska Environmental Trust (NET)-supported project that partnered with three cities in Nebraska (Lincoln, South Sioux City and Waverly) to develop urban forest canopy maps for their respective communities from USDA National Agricultural Imagery Program (NAIP) multispectral imagery.
- New YorkView worked with the New York State (NYS) Department of Environmental Conservation (DEC) Water Hub to support an ongoing water quality project aimed at using satellite imagery to derive chlorophyll-a concentration in NYS lakes. A New YorkView graduate student reviewed the literature to develop an annotated bibliography of lake assessment methodologies based on satellite imagery, with a particular focus on sensors that researchers

have integrated with European Space Agency (ESA) Sentinel-2 imagery. The review reported different atmospheric correction approaches applied, and documented the range of multi-band indices used to estimate chlorophyll-a.

- North DakotaView supported two student interns that investigated the history of oil and brine spills in Bakken Formation in North Dakota from 2013 to 2021, and conducted research on the geospatial distribution of these spills. Landsat satellite imagery was used to create a Canopy Response Salinity Index (CRSI) to better show the locations of brine spills and their effect upon vegetation.
- AlaskaView supported two graduate students for their contributions to the Remote Sensing of Wildlife online course development as co-instructors. They also offered two AV fellowships to support and promote geospatial research at University of Alaska Fairbanks.

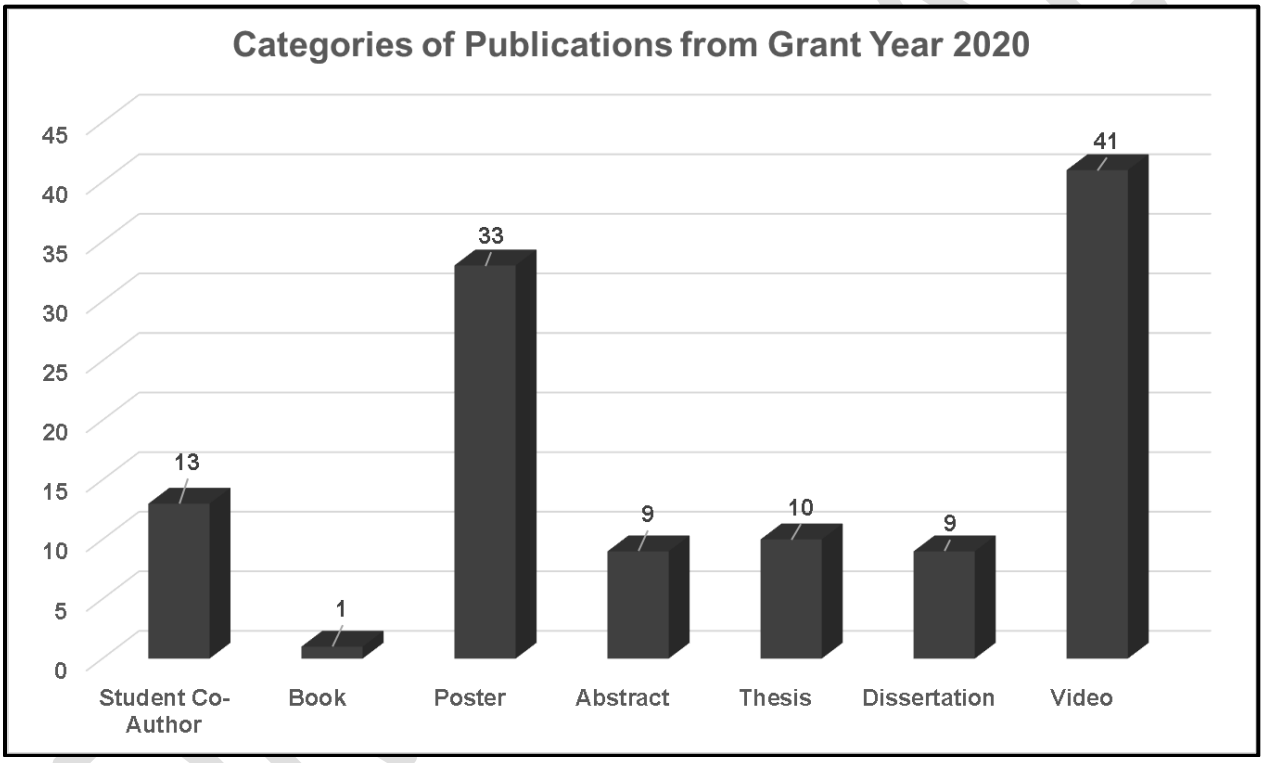

Figure 7. Categories of GY20 publications from all SVs.

2.1.4 Objective 4 – Advance Education and Training, Technology Transfer, and Outreach

Originally conceived and established to facilitate free and rapid access to Landsat data, AV has long been successful at facilitating the sharing of remote sensing data and technology to meet needs at state, local, and regional levels. Through time, and advancements in technology and open data policies, the mission of AV has shifted from access and availability, to one of education, training, technology transfer, and outreach. AV will increase the remote sensing competency of the nation's current and future workforce. Quantifiable objectives include supporting remote sensing science instruction in K-12 grades to improve STEAM education and to strengthen national science education standards; utilizing AV's academic university network to improve the quality of instruction at the university and college level; and increasing the employability and effectiveness of workers by introducing remote sensing skills into the existing

workforce. AV, through SV consortia, and as part of the NLRSEORA program, will continue to reliably and successfully conduct education and training, technology transfer, and outreach activities at the community, state, regional, and national levels. These activities will continue to include the development of education and training materials; establishment and refinement of curricula; hosting of local, state, national workshops; and, conducting outreach locally and nationally.

- Sixteen SVs conducted K-12 teacher training workshops and reached 660 teachers.
- West VirginiaView reorganized and updated previously developed open source software training modules for use as workforce development resources for USGS personnel.
- Rhode IslandView created a "Remote Sensing with Landsat in Rhode Island" StoryMap that provided basic information about remote sensing, gave historical background of the Landsat program, described the characteristics of Landsat data, discussed example applications, and provided instructions on how to access the data.
- UtahView produced four informational posters on Landsat missions, collections, products, and analysis ready data as well as a USGS Analysis Ready Data video series. All resources are available on the AV website.

AmericaView National Work Plan

Periods 1-5: The AV Education Committee will continue to organize and celebrate Earth Observation Day. AV will continue its national participation in the American Geosciences Institute (AGI) Earth Science Week (ESW) (which is held annually in October). AV's website published ArcGIS and Google Earth-based lessons, as well as additional Earth imagery games and puzzles, will be updated and expanded to provide complementary materials for educators and students.

AV (in collaboration with NASA, USGS, and AGI) developed a poster for Earth Observation Day and for inclusion in the Earth Science Week packet that is hosted on the AV website. IndianaView completed the creation of online puzzles of the 2021 EOD poster images, https://www.indianaview.org/image_puzzle.html. Additionally, more than 10,000 posters were distributed by mail in AGI ESW packets to educators throughout North America. With the launch of the new AV website in GY20, all materials related to EOD can easily be searched and downloaded.

Periods 1-5: AV will continue to facilitate interaction and association of SVs with the International Charter in support of disaster risk reduction, mitigation, and support. AV will establish the Disaster Risk Reduction (DRR) working group of interested SVs and partners to focus on use, training, and deployment of remote sensing data and technology. AV members will share their expertise in disaster analysis with others via online and in person AV meetings, via email blasts, and at regional/national conferences. The shared information will include identifying or sponsoring training opportunities offered by the USGS, suggestions for how to manage data flow and data provision to first responders, research results, and approaches to post-disaster land and water cover analysis.

An overall reorganization of committees and working groups began during GY18 and a DRR working group was not established, but work involved with this effort was undertaken within the newly formed Strategic Partners Committee (SPC) in GY19.

LouisianaView held their 22nd Data Mining Virtual Workshop for Emergency Geospatial First Responders during GY20. Through the cooperation of the LouisianaView consortium members and co-sponsored with the local USGS liaison, this workshop was offered free to everyone interested in up-to-date

information on data availability for the geospatial emergency responder. Two Hundred and twenty-five (225) Geospatial First Responders from more than 20 different countries attended this workshop held June 3, 8-10, 2021 via Zoom from the UL Lafayette Regional Application Center. This 4-day virtual workshop hosted 21 speakers from multiple Federal, State and Private Response Teams, each presenting their data, websites, links, and contacts while also fielding questions live from those in attendance, proving again and again what a cohesive and informed network of geospatial responders can mean to the inhabitants and economic base within Louisiana, the Gulf of Mexico region and the Caribbean. A summary report was developed for distribution for participant reference and to reach others that could not attend.

Periods 1-5: AV will enhance its digital presence by actively enhancing its website (www.americaview.org) and sustaining a social media presence (Facebook, Twitter, and YouTube) to share and promote remote sensing resources, educational material, tools, and data, and to facilitate the development of nationwide and global partners. A reassessment of the AV University educational portal will be conducted and suggestions for updates to support AV and NLI objectives will be developed.

Websites are essential to sharing important information and educational resources. During GY20, the AV website had 33,697-page views from 173 different countries. Though, these statistics do not include information about how many visitors returned or even how long they visited the website. Such information would help identify the level of interest in particular topics or how often returning visitors seek updates or more in-depth study, underscoring confidence in the quality of content. During GY20, AV's revised website, in development with WisconsinView, was launched and is a more effective mechanism for relaying updated information and providing easy access to resources through a ckan database interface.

Social media is an important way of sharing resources, tools, and successes. During GY20, AV utilized Twitter, Facebook, and YouTube to transmit these materials.

During GY20, AV's website and social media served the following:

- **Website (9/18/2020 - 9/17/2021):**
    - There were 27,314 unique page views
    - The AmericaView website has visitors from 156 countries
        - Top 10: USA, China, India, Indonesia, Canada, Brazil, UK, Germany, Iran, Japan.
    - AmericaView top visited pages:
        - Google Earth Engine Tutorials 21.64%
        - Remote Sensing Imagery Game 5.24%
        - Earth Observation Day Page 4.67%
        - AV Membership Map 2.12%
- **Facebook (9/18/2020 - 9/17/2021):**
    - AmericaView Facebook Page had 1,678 unique views
    - Most popular post
        - Announcement of the 2020 EOD poster availability and download links.
- **YouTube (9/18/2020 - 9/17/2021):**
    - 8,117 Views
    - 492 Hours of watch time (our streamed content)
    - 89 new subscribers

- **Twitter (9/18/2020 - 9/17/2021):**
    - 79,125 Impressions
    - 1,552 Engagements

These interactions only tell a small portion of the story. Many of these views led to the access and download of remote sensing educational materials, access to online (digital) resources, and the viewing of educational videos ranging from training modules for Google Earth Engine, remote sensing of wildfire, and open source software. In addition to AV's website and social media presence, each SV maintains its own website and/or social media account. During GY20, there were a total of 106,516 unique visits to all of the SV websites/social media accounts combined.

Periods 1-5: AV will continue to educate local and national decision makers. AV SVs will be encouraged to schedule visits with decision makers in Washington, D.C., and their own states, where they will provide educational updates and have educational discussions regarding the successes of their SV efforts and the benefits of the NLRSEORA program overall. These visits provide the opportunity for PIs and accompanying students to explain how remote sensing programs, such as those supported by NLI, have been beneficial to natural resource management issues within their state.

Education of national leaders and decision makers is a critical component of NLRSEORA. Historically, AV has worked to share the success stories of each SV member. These stories have been shared through annual national outreach and educational activities. During period 3 of the NLRSEORA grant, congressional outreach was limited as previously conducted due to circumstances beyond the control of AV. Standard methods of congressional outreach and education were not conducted on a national level; however, some SVs with strong congressional relationships were contacted by congressional members and education and outreach efforts continued outside of AV efforts.

Metrics Assessment of Progress

Periods 1-5: Through annual SV reporting, AV SVs will track and report on the success and impacts of education, training, technology transfer and, outreach at the national and SV level. For example, the number of projects, descriptions of educational and training materials, offered (and links if they are offered online), technology transfer successes, and numbers of outreach opportunities offered and numbers of participants/workforce personnel reached. During the RCA process, each SV will describe the proposed HIA and answer specific questions regarding the applicability of the effort to specific objectives of the grant proposal. At the end of the funded period, each SV will assess the status of the original intent and report outcomes. Those will be summarized in AV's Technical Report submitted to USGS/NLI at the end of each period. Each SV will submit a fact sheet on each HIA at the end of a grant period, describing impact with numerical and textual summaries as appropriate. These fact sheets will be peer-reviewed and approved by the ED and PD before cumulative information is provided in the Technical Reports.

Each SV submitted a factsheet that summarized their work during GY20. Additional metrics chosen to describe the *overarching impact on populations served* for objective 4 during GY20 included:

- Number of students supported by AV funds
- Number of education and outreach events
- Number of Earth Observation Day or GIS day events
- Number of posters developed
- Number of other presentations outside of the previous categories

- Other projects leveraged with SV funds beyond their HIA
- Number of publications

Results shown in Figure 2 illustrate how SVs are continuing to evolve their programs due to the disruptions caused by the COVID-19 pandemic. In GY19, there was a dramatic shift in producing online content as shown in the "Publications" category. While that remained a significant effort in GY20, SVs were able to redirect more of their funding to support students since campus COVID-19 protocols had been well established by that point in time. Education and outreach events and EOD/GIS events remained lower than their pre-pandemic levels due to large gatherings continuing to be limited. Looking at the impact of education and outreach/EOD events at the local level in more detail, Figure 8 compares the total numbers of participants for each category for GY18, GY19, and GY20. Numbers of K-12 students that were able to participate in educational activities were dramatically greater in GY20 as compared to GY19 due to the adoption of virtual events and of some in-person events being held. K-12 teacher participation was up from GY19, though participation still falls below pre-pandemic levels. AV SVs continued to successfully re-design their programs to work within the ever-changing environment that has occurred over the past two years to benefit their communities.

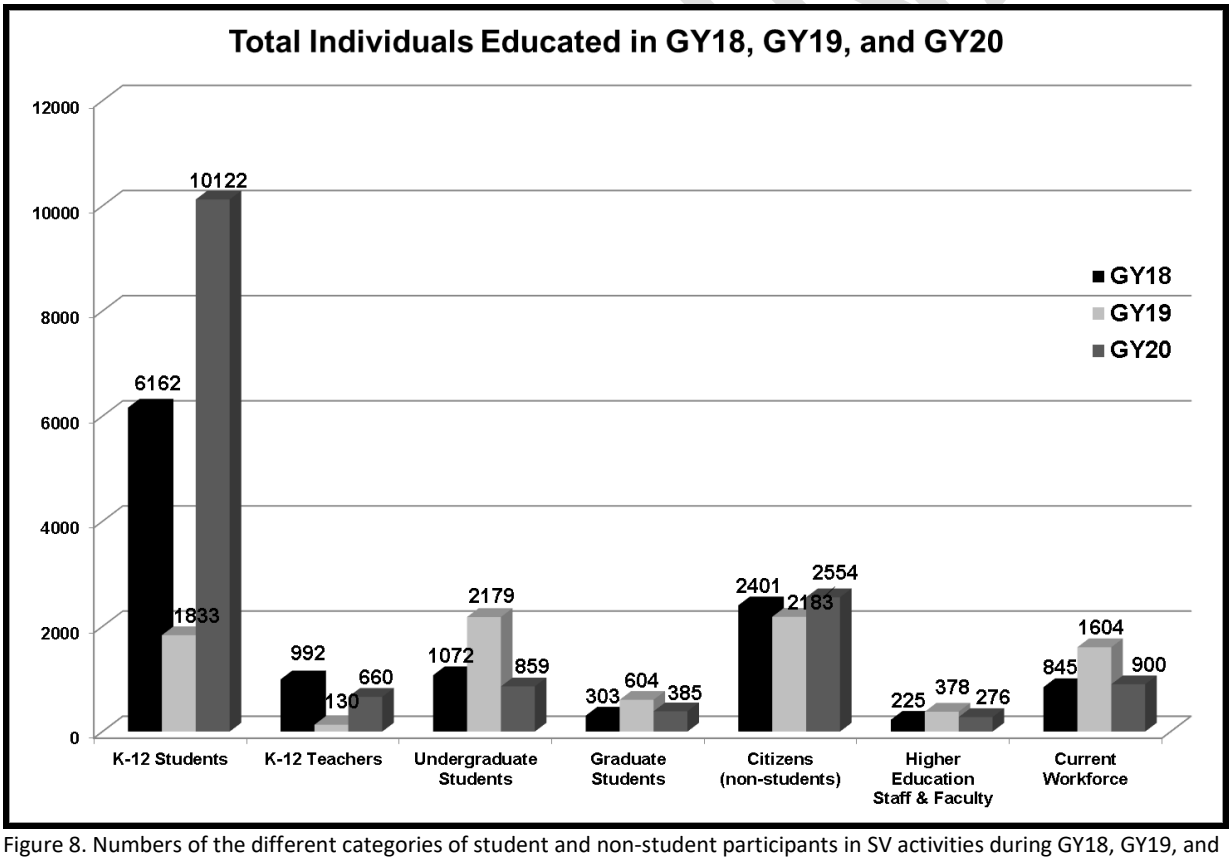

Figure 8. Numbers of the different categories of student and non-student participants in SV activities during GY18, GY19, and GY20.

2.1.5 Objective 5 - Support the U.S. Department of the Interior Secretarial Priorities

As a nationwide, university-based, and state-implemented consortium, AV advances the widespread use of remote sensing data and technology through education and outreach, workforce development, applied research, and technology transfer to the public and private sectors at community levels. These

key AV objectives directly align with the U.S. Department of Interior Secretarial Priorities, as they relate to the NLI program. AV's SV PIs will continue to focus on remote sensing needs at local levels, building trust between AV consortia, communities, local governments, the U.S. DOI, and other government and commercial entities. Through the NLRSEORA program, and the goals of NLI, AV will continue to focus on building strong, beneficial relationships that advance the use and understanding of remote sensing through education, research, outreach, education, and technology transfer. These key objectives, the very heart of AV, act as a vector for better understanding and use of remote sensing science and technology. The use of this dynamic and rapidly evolving technology will support current and future generations in the establishment of best practices to better manage our land and water resources and adapt to environmental and societal changes.

The program proposed by AV will enable, in documented ways, the DOI goals and will reinforce cooperation throughout the team of Bureaus, Services, and Offices that comprise the department. AV is organizationally structured, as a consortium, to communicate with and understand local communities and to build confidence within those communities' leaders with whom AV commits itself to working on demanding environmental, social, and economic challenges. This proposed work plan describes the communications approaches that have been used in the past and that will be improved and expanded during this next grant agreement. The AV committees and working groups will continue to coalesce the SV efforts and to encourage discussion and sharing of best practices at both community and national levels to aid in the dispersion of learned experiences for managing land and water resources, while adapting to observed environmental changes.

AmericaView National Activities Work Plan

Periods 1-5: The overall work plan, and ultimate objective for this proposal, is to build trust and to work within our local communities to encourage the use of remotely sensed data, technology, and to provide educational opportunities to support the core ideals of active conservation and management of our lands and waters. Through these efforts, AV will help to restore and maintain trust within the local communities, improving communication between the local and federal levels with many technology transfer efforts and frequent outreach involvement. These efforts will support both the current workforce and the next generation of community and business leaders, scientists, and educators.

The fundamental mission of the AmericaView program is suited to achieve many of the DOI Secretarial Priorities, even through the transition of Administrations. During GY20, AV helped continue to build and maintain trust within local communities in each of our member states. Below are selected projects that investigated environmental disparities for under-represented communities, financial support for Native American University students, and support of research being conducted on the Crow Reservation.

- MissouriView studied the issue of water equity along the Mississippi river, centered around levee maintenance and management using drone-based LiDAR and RGB photogrammetry. Inconsistent levee management, which is a major water equitability issue along the Mississippi River is causing environmental disparities for under-represented communities. A lab exercise was created using ArcGIS Pro for learners to quantify variables that can lead to levee breaches.
- KansasView awards mini scholarships to students at partner institutions to support remote sensing related education and research activities. In GY20, KansasView awarded 24 mini-scholarships to Haskell Indian Nations University students to support education in remote

sensing and geographic information systems. One of the scholarship recipients developed a StoryMap that describes the importance of the Haskell wetland.

- MontanaView supported graduate student Zach Fighter of Montana State University, on his research titled "Multi-scale analysis of Ventenata control treatments on the Crow Reservation." *Ventenata dubiais* an invasive winter annual grass that impacts plant community diversity and forage production. Zach's project aims to test the integration of two herbicides and an organic soil amendment for controlling Ventenata. The expected outcomes of the study are to determine effective management methods and to understand the spectral and temporal responses of Ventenatato treatments (Figure 9). Additionally, MontanaView supported two students from Salish Kootenai College through a fellowship award.

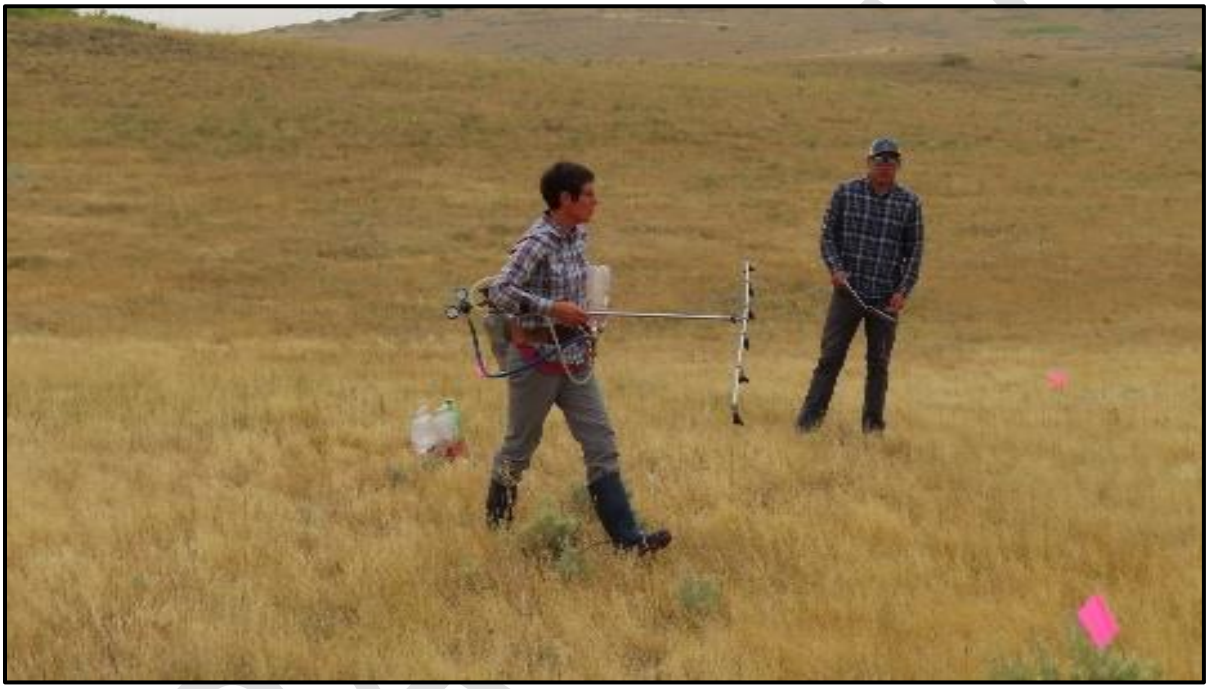

Figure 9. Zach Fighter (right) and Jane Mangold (left) applying herbicide treatment to a plot containing Ventenata dubiais, an invasive winter annual grass that impacts plant community diversity and forage production on the Crow Reservation.

2.2 AmericaView Summary of Grant Year Accomplishments

During GY20, AV helped foster communication between the local and federal levels through the completion of 426 activities by state consortium members, reaching over 230,000 students and citizens that were trained and educated on the societal benefits of remote sensing technologies and applications. AV has also worked diligently in associate development by supporting the development of two new SV associate members, MarylandView and MissouriView and continued conversations with two additional states, Tennessee and Nevada. All of these activities have allowed AV to effectively invest federal dollars into local communities, which culminates in advancing DOI and USGS priorities and objectives.

2.3 StateView Key Success Stories

During grant year 2020, AmericaView SV's worked with industry, local and state governments and communities, K-12 students and teachers, undergraduate students, and graduate students. Collectively, they have met all of five NLRSEORA objectives and have successfully carried the DOI message from the national to the local level.

AmericaView Benefits Local Decision Makers

NLRSEORA Objectives Fulfilled:
Objective 2 - Establish Strategic Partnerships
Objective 4 - Advance Education and Training, Technology Transfer, and Outreach
Objective 5 - Support the U.S. Department of the Interior Secretarial Priorities

GY20 marked MarylandView's first year as an associate member state, receiving seed funding to begin development of their consortium. They partnered with the City of Westminster to help them develop a city-wide tree plan and provided them with remotely sensed data product to include in their management planning process. Andrew Gray, Comprehensive Planner with the City of Westminster, Maryland, gave the below testimonial following this first year of the project.

"As part of the original City of Westminster Comprehensive Tree Plan (Plan), the Westminster Tree Commission (Commission) obtained Land Surface Temperature (LST) and Normalized Difference Vegetation Index (NDVI) maps, from Maryland View, that were incorporated and subsequently adopted into the Plan by the Mayor and Common Council of Westminster via Resolution No. 19-08, on February 25, 2019.

The Commission is currently in the process of reviewing and updating the Plan. During the June 9, 2021, Commission meeting, the Chair of the Commission asked staff to see if the City could obtain LST and NDVI maps, more recent then 2017, to include in the Plan update.

I would like to thank you for coming to the City of Westminster and not only providing the City with newer LST and NDVI maps of the entire City, but also providing more precise LST and NDVI data, along with Surface Elevation data. This imagery will help the City understand how different types of land uses and tree species affect LST in the approximately 17 acres of Downtown Westminster."

GeorgiaView's HIA was focused on making volume III of their land cover map atlas series for counties, congressional districts, and regional commissions. During this grant year, the GeorgiaView atlas focused on forest change. The atlas used Landsat imagery from the U.S. Geological Survey, air photos, the Cropland Data Layer (CDL) dataset from the U.S. Department of Agriculture, and the University of Maryland GLAD Lab Global Forest Change Data. The atlas was delivered to 83 local and regional offices in Georgia including the Georgia governor's office, U.S. congressional offices, regional commissions, Georgia forest commission, counties, and county chief rangers. The atlas is freely available in the PDF eBook format at the GeorgiaView website, website.

Rick Lane, Chief Ranger with the Georgia Forest Service, gave the below statement about using the GAView atlases.

"I want to reach out to say thank you for the Atlas you provided. It is very informative, and we will utilize the imagery and information to help educate our communities of the impact that urbanization and farming has had to our forest lands. Hopefully our relationship can grow more, we would appreciate any

new publications you have in the future. One of the main reasons I chose the profession that I am currently in, was to protect and conserve our woodlands as much as possible."

Undergraduate Student / Graduate Student / Workforce Development
NLRSEORA Objectives Fulfilled:
Objective 3 - Promote Undergraduate and Graduate Research and Employment Skills
Objective 4 - Advance Education and Training, Technology Transfer, and Outreach
Objective 5 - Support the U.S. Department of the Interior Secretarial Priorities

VermontView provided a lecture to students for the Governor's Institute at the Perkins Geology Museum. Christine Massey, with the museum, gave the below testimonial.

"Thanks once again to you and AmericaView for presenting at this year's Governor's Institute. Our students are definitely thinking about their futures, and I know they really appreciate getting insights from an array of adults in science and higher education. Your efforts in mentoring and educating the next generation are so important!"

WyomingView intern, Madelline Ogborne, undergraduate student earning a BS degree in Rangeland Ecology & Watershed Management provided the below testimonial on the benefits that were provided due to AV funding.

"Taking Remote Sensing in the Fall of 2020 introduced me to the value of understanding varying indices, patterns, and applying information from other courses into a common application. By participating in this internship, I was able to further enhance my skills, apply them to research projects for flood mapping, and gave me the ability to better communicate my findings. These additional skills not only enhanced my resume but assisted me in getting a job after graduation as a Staff Scientist. This experience was greatly beneficial for me as a student and graduate"

ColoradoView intern, Anny Zhu, provided the below statement on her experience.

"As a ColoradoView intern, this is the first time I used programming to solve practical problems. In the past, I have learned programming, but I have not dealt with any meaningful problems. In such a wonderful internship, I understand that programming is an important tool for us to solve environmental problems. The most vital thing is our logic and then we can use it to solve our research questions step by step. As a future scientist, I also realized we need to think about error in our research. When it comes to my task, I need to analyze the difference between data from field and from satellites."

New Hampshire intern, Jacob Dearborn, gave the below statement on the impact the program had on his education.

"Thank you so much for providing me the opportunity to work in the Basic Applied Spatial Analysis lab (BASAL) during the fall of 2020 and spring of 2021 as an America View (NHView) intern. By working alongside of your PhD. student, Benjamin Fraser, I not only improved my remote sensing and geospatial analysis skills but learned valuable information that will serve me well in my career. The purpose of Benjamin's research is to determine the accuracy and feasibility of aerial technology to assess forest health, cover, stress monitoring, and other associated ecological practices. Using remotely sensed imagery, we were able to determine forest coverage, species, and best forest management practices to

continue research on the comparison of previously conducted ground sampling plots, pilot studies, and training missions.
Later this month, I will participate in the UNH Undergraduate Research Conference and present some of our work. I am very pleased to have been able to work with you and your graduate students in your research lab. I am grateful to America View for providing the funding to allow me to have this internship. I cannot thank you enough for the opportunity to work with your talented staff over the past year, I appreciate it immensely."

2.4 Board and Membership Meetings

AV board and membership meetings were conducted each month of the grant year. AV maintains excellent attendance at all its meetings by SV PIs, Co-Is, State Coordinators, consortium members, and government partners. Nearly 80% of SV members regularly attend the optional monthly membership telecons. These meetings were conducted through a Zoom subscription. The meetings contained informational presentations from industry, government, and AmericaView SVs (Table 3). Board members devoted over 1,100 hours to provide program governance, administrative guidance, and financial due diligence. SV PIs volunteered, at national, regional, state, and local levels, to give presentations, lead panels, and provide advice; these were all well-received efforts that enhanced the effectiveness of the consortium.

2.5 Committees

AmericaView members contributed more than 1,094 hours to committees to strengthen national collaborative endeavors and to share remote sensing information and knowledge. Committees work to support both the AV national organization objectives as well as supporting individual SV requests.

2.5.1 Education and Outreach Committee

The Education and Outreach Committee has supported AV national and SV activities with a focus on the development of lesson plans, specialized educational resources (including educational posters), and other remote sensing education tools. The committee also worked to increase remote sensing awareness by developing and maintaining strategic relationships and materials and facilitating outreach activities at the national and SV levels. In GY20, the committee was chaired by Dr. Tracy Deliberty and co-chaired by Dr. Thomas Mueller.

2.5.1.1 Earth as Art

Period 1: The AV Outreach and Education committees will identify SVs interested in hosting a traveling Earth as Art Gallery Exhibit, including preparation of necessary educational materials, and will begin strategies for touring the exhibit.

Figure 10. The travelling Earth as Art exhibit at the Lompoc Library in Lompoc, California as part of the Landsat 9 launch events held during September 2021. Kevin Gallagher (USGS) is shown with others assembling an Earth as Art floor puzzle of Santa Barbara County.

Period 2-5: As funding permits, the AV Earth as Art exhibit will be displayed at participating SVs and at AV annual WBM and FTM meetings.

The travelling Earth as Art (EAA) Gallery Exhibit continued to be an incredibly popular education and outreach tool during GY20. It was showcased in Lompoc, California in September 2021 as part of the Landsat 9 launch activities (Figure 10). UtahView continued their work on their Utah as Art collection, highlighting the national park system throughout Utah. During GY20, UtahView exhibited this map collection at two locations in Davis County, Utah, for the Davis Arts Council. The Utah As Art map collection was displayed at the Snow Horse Art Gallery at the Davis Conference Center from June 1, 2021 to August 30, 2021 and then at the Snow Horse Art Gallery at the Intermountain Layton Hospital from September 1, 2021 to November 30, 2021. Expansion of other SVs developing their own state-centric collections began during GY20. TexasView built the Texas as Art program by engaging multiple collaborators, including the Texas Parks and Wildlife Department, Texas' network of Regional Educational Service Centers, the Fa Fa Gallery (host of the first exhibit January – February 2021) and the Sibley Nature Center (host of the second exhibit March – June of 2021). The exhibit highlights the applications of satellite imagery across a broad range of challenges that affect Texas' ecoregions. Focusing on Texas State parks "brings the challenges home" and makes the exhibit relevant for diverse venues. Texas as Art has been disseminated through presentations in person (five); virtually (nine, including the 2021 South Dakota Geospatial Conference); and through walking tours of the physical exhibit (five). Proposals have been submitted to four new venues at partner institutions.

Education and Outreach – Earth Observation Day

Periods 1-5: The AV Education Committee will continue to organize and celebrate Earth Observation Day. AV will continue its national participation in AGI Earth Science Week (which is held annually in October). This affiliation allowed AV to provide material to thousands of K-12 teachers across the country. AV will continue to collaborate with NASA and USGS in the development of materials for the ESW packets. These materials, which include posters with earth science images and games involving imagery, have appeared in classrooms across the nation. AV's website published ArcGIS and Google Earth-based lessons, as well as additional Earth imagery games and puzzles, will be updated and expanded to provide complementary materials for educators and students.

Through a dynamic partnership with USGS and NASA, AV has developed educational Earth Observation Day (EOD) posters and activities. These posters are included in the AGI Earth Science Week Toolkit that is distributed to 10,000 educators annually. In addition to the EOD poster, online, digital *Earth Image Puzzles* were also developed for home and classroom use. As part of the 2021 EOD poster, was a game titled, "Rivers: Our National Water Resource." OregonView graduate student, Selina Lambert, converted the hardcopy game into a digital version that can be played online for free through the Tabletopia program. New in GY20 was the development of elementary and middle school lesson plans to accompany the 2020 and 2021 EOD poster. New HampshireView developed a Forests from Above and Below lesson for middle school students, designed for the 2020 EOD poster. DelawareView developed two lessons focused on Water, one for elementary and one for middle school audiences, that are based on the 2021 EOD poster. These lessons enable K-12 educators to incorporate the EOD poster into their Earth Science curricula because they are designed for the specific age and interest levels, and do not require excessive preparation time for teachers.

2.5.2 Strategic Partners Committee

Under the guidance of the AV Board of Directors, the AV Strategic Partnerships Committee (SPC) has worked to continue to refine the goals and objectives of the AmericaView vision and mission. In order to improve and further the mission of AV, the SPC has provided suggestions and guidance to the AV consortium regarding strengths, opportunities, and perceived challenges that may support or slow the AV mission to empower Earth observation education.

Significant work began in GY19 to refine the vison and mission of AV in order to align those critical topics with the advancing mission of USGS and NLI. The committee met nearly weekly beginning in May of 2020 to evaluate and refine the strengths and opportunities of AV such that the defined goals and objectives of DOI, USGS, and NLI are fully realized and achieved through the NLRSEORA. This work continued into GY20 and a new strategic plan was developed. Once it has completed the final review process, it will be made available on the AV website. In GY20, the committee was chaired by Roberta Lenczowski.

AmericaView's Working Vision Statement:
Empowering Earth observation education.

AmericaView's Working Mission Statement:
AmericaView advances Earth observation education through remote sensing science, applied research, workforce development, technology transfer, and community outreach.

Values Statement (Guiding Principles)
AmericaView is dedicated to maximizing the benefits of Earth observation education and applied research. We address societal needs, collegially advance widespread collaboration, provide open-access to data, tools, and curricula, and develop a diverse geospatial workforce. We support equity and inclusion, ethical use of technologies, and collaboration across the transdisciplinary geospatial community. AmericaView supports stakeholders at scales from local to global.

Period 1: The SPWG and Education Committee will develop a working partnership with the National Science Teachers Association (NSTA), capitalizing on the Association's nationwide network of state-based chapters that strive to promote excellence and innovation in science teaching and learning.

Dr. Rebecca Dodge (TexasView) has established a strong working relationship with NSTA members in Texas and the Gulf Coast states. Work on this effort was expected to begin during GY19 and GY20 but was not able to be realized due to the COVID-19 pandemic.

Metrics Assessment of Progress

Periods 1-5: To be a member of AV, a SV must have a state consortium that may include a "strategic partner." SV period reporting will include listing of their partners. Metrics may include the following: frequency of interactions between the partner and the nature of their work; the outcomes or opportunities of the partnership to the SV, AV, NLI, USGS, and DOI; and (if applicable) how many learners including traditional and non-traditional students, veterans, or working professionals were supported. AV will summarize this information to USGS/NLI in each period's Technical Report.

Figures 3 and 4 show the total consortium members for each SV in GY20, distinguishing between federal, state, university, and private members. Many of these members formed strategic partnerships at the state level. These partnerships will be further developed at the national level, expanding the effectiveness of the partnership and addressing the goals of NLRSEORA.

2.5.3 Earth Sensors and Research Committee

Period 2-5: The SBSWG (now the ESRC) and AV staff will review the results of information and data collection and reporting efforts in Period 1 and will be responsible for revising the data collection and workshop procedures each year, as appropriate. Needs and requirements workshops will be conducted in each of Period 2-5. The SBSWG will be responsible for collecting and disseminating recent developments of each state consortium and incorporation into future lesson plans and research. All information will be shared with USGS staff.

Due to the COVID-19 pandemic, AV was not able to hold an annual meeting during GY20, which is when the AV membership would participate in our information requirements gathering effort. AV staff is currently working with USGS to develop topics that they are interested in having as part of the information requirements effort that will take place at the next AV annual meeting being held in Fort Collins, Colorado in May 2022. This information will be reported to USGS and presented to the LST during a future meeting.

StoryMaps, an Esri (www.esri.com) tool that has been shown to effectively relay information through the use of maps, text, and media, is being used to help relay the impact of AV, its committees, and the successes of the SV members. During GY20, the ESRC completed two Esri StoryMaps that highlight the Sensor and Research expertise within AV members. Creating such powerful visualizations with clear text helps AV show potential partners the expertise that exists among the AV consortium and how AV can benefit other organizations. In GY20, the committee was chaired by Dr. Russ Congalton and co-chaired by Dr. Joe Knight.

3 NLRSEORA GRANT YEAR 2020 – IN REVIEW

3.1 MISSION AND OBJECTIVES

AmericaView's mission as a nationwide, university-based, and state-implemented consortium is to advance the widespread use of remote sensing data and technology through education and outreach, workforce development, applied research, and technology transfer to the public and private sectors.

Period 3 of AV's NLRSEORA grant was exceptionally successful despite ongoing complications due to the COVID-19 pandemic. This is owed to the resilience and dedication of each of the AmericaView members. AmericaView strives to empower Earth observation education through outreach, education, applied research, technology transfer, and workforce development – these activities have been successfully realized through the efforts of the AV consortium in GY20. The AV consortium was fully represented by a national audience who fully supported the United States Department of the Interior, the United States Geological Survey, and the National Land Imaging program initiates. AV continues to meet and exceed the objectives of all of these partner organizations as the foundation to its own mission promoting the use of remotely sensed imagery and geospatial technology throughout the United States and beyond. The mission of AV is not simply providing resources, but to understand local data and operational needs and transmit that information back to the USGS in order to serve the nation.

Throughout GY20, AV met and addressed the following USGS objectives:

- Gathering nationwide remote sensing data and information requirements and conveying those needs to U.S. DOI and USGS
- Establishing strategic partnerships that further both the goals and mission of U.S. DOI, USGS, and AmericaView
- Promoting undergraduate and graduate research and honing employment skills required of by students, veterans, and others in the workforce seeking to build or retool their skill sets
- Advancing education and training, technology transfer and outreach in the areas of remote sensing, geospatial data, and spatial analysis
- Supporting the U.S. DOI Secretarial Priorities, focusing on education and development of relationships within the Bureaus, Services, and Offices that comprise the DOI and, externally, at state and local levels
- Promotion and facilitation of education, outreach, and a broader understanding of the use of remote sensing science and expertise across the nation, thereby facilitating the use of DOI USGS products, services, and knowhow

These objectives were successfully addressed through the power of the AV network as a nationwide, collaborative and collegial process spearheaded by a national Board of Directors, Staff, and 39 incredible SV members.

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