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

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

AmericaView Technical Report for Grant Year 2019

Period of Performance
18 September 2019 to 17 September 2020
(With NCE from 18 Sept 2020 to 30 June 2021)

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
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
PM	Program Manager
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 Unmanned Aerial System
SV	StateView
SWOT	Strengths, Weakness, Opportunity, Threat
UAS	Unmanned Aerial System
UAV	Unmanned 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 2019 to 17 September 2020, with a no-cost extension (NCE) from 18 September 2020 to 30 June 2021. This report satisfies the grant year reporting requirements for Period 2 of the NLRSEORA award. The report contains a detailed description of completed activities for grant year 2019 (GY19). 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.

Note: In order to maintain a reasonably sized technical report document, all supporting materials are available for individual download:

- *Capability of Existing Remote Sensing Data Products to Meet the Needs of AmericaView's User Constituencies*
- *AmericaView Bibliography of NLRSEORA Grant Supported Publications*
- *AmericaView GY19 Fact Sheets (bulk download)*

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 20 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 websites, including AmericaView.org and the AmericaView University, share pertinent and updated remote sensing resources. AV's social media presence, including Facebook, Twitter, and YouTube, reach thousands of educators, students, decision makers and scientists across the nation and around the world. Metrics collected over the past decade indicate broad interest based 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 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 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 working group each year to participate in the Earth Observation Day poster development in coordination with NASA and USGS. 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 manager, financial manager and information analyst, and bookkeeper. The duties of the AV staff are to guide the national AV organization; ensure the mission, goals, and objectives of projects are accomplished; to enact responsible fiscal activities; to develop and sustain beneficial relationships; and to maintain fiscal responsibility over the organization. The AV staff work in a virtual format from various locations (Table 1).

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, specifically the NLI program are successfully completed. 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, 2019 to June 30, 2020**
Mr. Brent Yantis	Chair
Dr. Russell Congalton	Vice Chair
Ms. Roberta Lenczowski	Secretary
Dr. Rebecca Dodge	Treasurer
Mr. Jarlath O'Neil-Dunne	Director
Dr. Thomas Mueller	Director
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Mr. Christopher McGinty	Executive Director
Ms. Lisa Wirth	Program Manager
Ms. Jeanie Congalton	Financial Manager and Info Analyst
Ms. Eufemnia Gough	Bookkeeper

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Dr. John McGee	Director
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Ms. Jeanie Congalton	Financial Manager and Info Analyst
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Table 1. List of AV Board of Directors and Staff during GY19 with modifications after June 30, 2019 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 GY19, AV welcomed four new PIs.

HawaiiView	Dr. Qi Chen
IndianaView	Dr. Nicole Kong
KansasView	Dr. Dana Peterson
VirginiaView	Dr. John McGee

2 AMERICAVIEW GRANT YEAR 2019 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 2019, grant period 2, 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 and encourage 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.

- OregonView is continuing their research using ICESat-2 and Landsat-8 to conduct shallow bathymetric mapping, making data freely available to the public.
- ColoradoView is developing deep learning algorithms for missing pixel reconstruction using Landsat 8 Analysis Ready Data Land Surface Temperature Products and have published the results.
- VermontView has collaborated with state agencies to develop the first high resolution land cover dataset for Vermont and has developed new methodologies using the LCMAP dataset to keep the land cover dataset up-to-date.
- MississippiView used satellite-based Synthetic Aperture Radar data to detect and monitor ground surface subsidence to identify elevation changes in the lower Mississippi River valley. This information is important because changes in elevation can impact how well levees and floodwalls protect cities and infrastructure.

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 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.

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 Tristan Goulden with an overview of NEON's airborne observation platform, Becky Eaves, also with NEON, discussing data and infrastructure to understand changing ecosystems, and Tom Neumann, with NASA, discussing the ICESat-2 mission and data products.

Due to the Covid-19 pandemic, AV was not able to hold a FTM or an annual meeting as travel was not possible. AV staff worked with USGS staff over the course of the year to gather topics that they were interested in having as part of the information requirements. In lieu of the in-person workshop at an in-person meeting, AV staff developed an online survey to gather the remote sensing data and information requirements. This information will be presented to the LST during a future meeting.

Encouraging New Affiliates Work Plan

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 undertaken during GY19 in Missouri, Maryland, Florida, Tennessee, and Nevada. Contacts were made with Dr. Vasit Sagan from St. Louis University, Dr. Carter Wang from Towson University, Dr. Timothy Hawthorne from the University of Central Florida, Dr. Qiusheng Wu from the University of Tennessee Knoxville, and Dr. Robert Washington-Allen from the University of Nevada, Reno. 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. As a result of these efforts, two affiliate members were added to the AV consortium: MarylandView and MissouriView. Additional grant funding will be required to promote them to full member status and to bring on additional associate members to the national AV consortium.

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 2002. 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 and GY19 to benefit their local consortiums, which in turn, strengthens AmericaView's national impact. A comparison between GY18 and GY19 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 as compared to GY18. Efforts were redirected to activities that did not require in-person contact. In GY19 AV continued to supported students, presentations, projects beyond HIAs, and publications. These efforts showed a net increased 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.

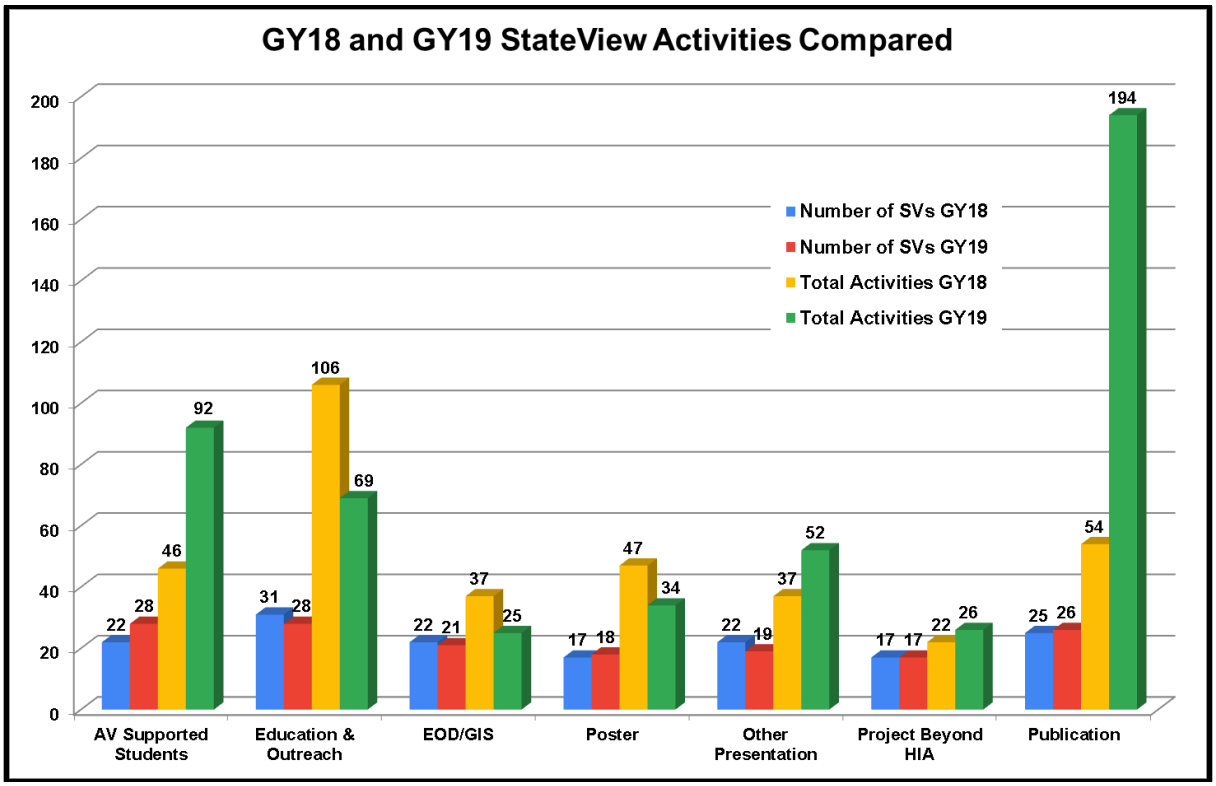

Figure 2. Categories of activities by SVs in GY18 and GY19 contrasted to show the impact of the COVID-19 pandemic on SV programs. SVs reduced participation in activities that required in-person contact (Education and Outreach, EOD/GIS, and Poster) and increased participation in efforts that did not require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

During GY19, all SVs invested time in maintaining and expanding their local state consortia to the benefit of USGS NLRSEORA priorities and objectives. Notably, MichiganView supported its K-12 educators and students through the development of online educational resources. Due to the COVID-19 pandemic, the transition to virtual learning by many schools across the state allowed MichiganView to work with educators to develop engaging activities for students to complete while learning from home. These activities were designed to have broad appeal by focusing on state curriculum standards. Two activities using ESRI Storymaps were developed; one was aimed at the elementary-level, https://arcg.is/zXj0C; the second was targeted to the community college-level, https://arcg.is/1KHGiL. KansasView supported one of their consortium members, Haskell Indian Nation University, by providing funding for 13 students and 1 professor to present at the regional AAG conference. 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. It is efforts such as these that dramatically increase the return on investment for the Department of the Interior by investing in 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	Other Funding Agency
IA	NASA EONS Kites Education	Iowa State University
ID	Idaho EPSCoR GEM3	National Science Foundation
IN	Integrating Geospatial Information Across Disciplines	Purdue University Integrated Data Science Initiative
KS	Characterizing Biological Structure and Ecological Function of Kansas Playas and Updating the Wetland Program Plan	EPA Wetland Development Grant through the Kansas Water Office
MI	Kenyan Grassland Mapping with Michigan State University Department of Ecology Evolution and Behavior	National Science Foundation
NE	Emerald Ash Borer Early Warning Project	City of Lincoln, NE Parks and Recreation
NE	Urhan Canopy Mapping Project	Nebraska Environmental Trust
NH	Mapping Japanese KnotBerry in Northern New Hampshire	United States Department of Agriculture
OH	ArcGIS Pro Workshops (2) - Non-HIA	Youngstown State University
OR	ICESat-2 bathymetric studies, product development, validation and continuity (PI: L. Magruder, UT-Austin)	National Aeronautics and Space Administration
VT	Lake Champlain Flood Modeling	International Joint Commission
WI	GeoData@Wisconsin portal development	Wisconsin State Cartographers Office, UW-Madison Dept of Geography

Table 2. List of some 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 new committee 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 was conducted through an online survey and summarized results are provided with this report. The survey was addressed by 48 respondents and addressed questions involving the use of Landsat data, benefits of other data types (such as Sentinel 2-A), use of UAS, and future needs of the remote sensing community.

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.

In period one of the five-year grant, AV initiated a program that tracks the number of consortium members for each SV as a part of our annual metrics gathering effort. A comparison of SV consortium totals per SV in GY18 and GY19 are shown in Figure 3. Each SV grew their consortium during GY19 with the exception of Minnesota, where they remained unchanged from GY18. New to the reporting information this year is the addition of consortium member affiliation per SV, shown in Figure 4. The categories chosen were Federal, Local, University, and Private. Tracking the growth 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.

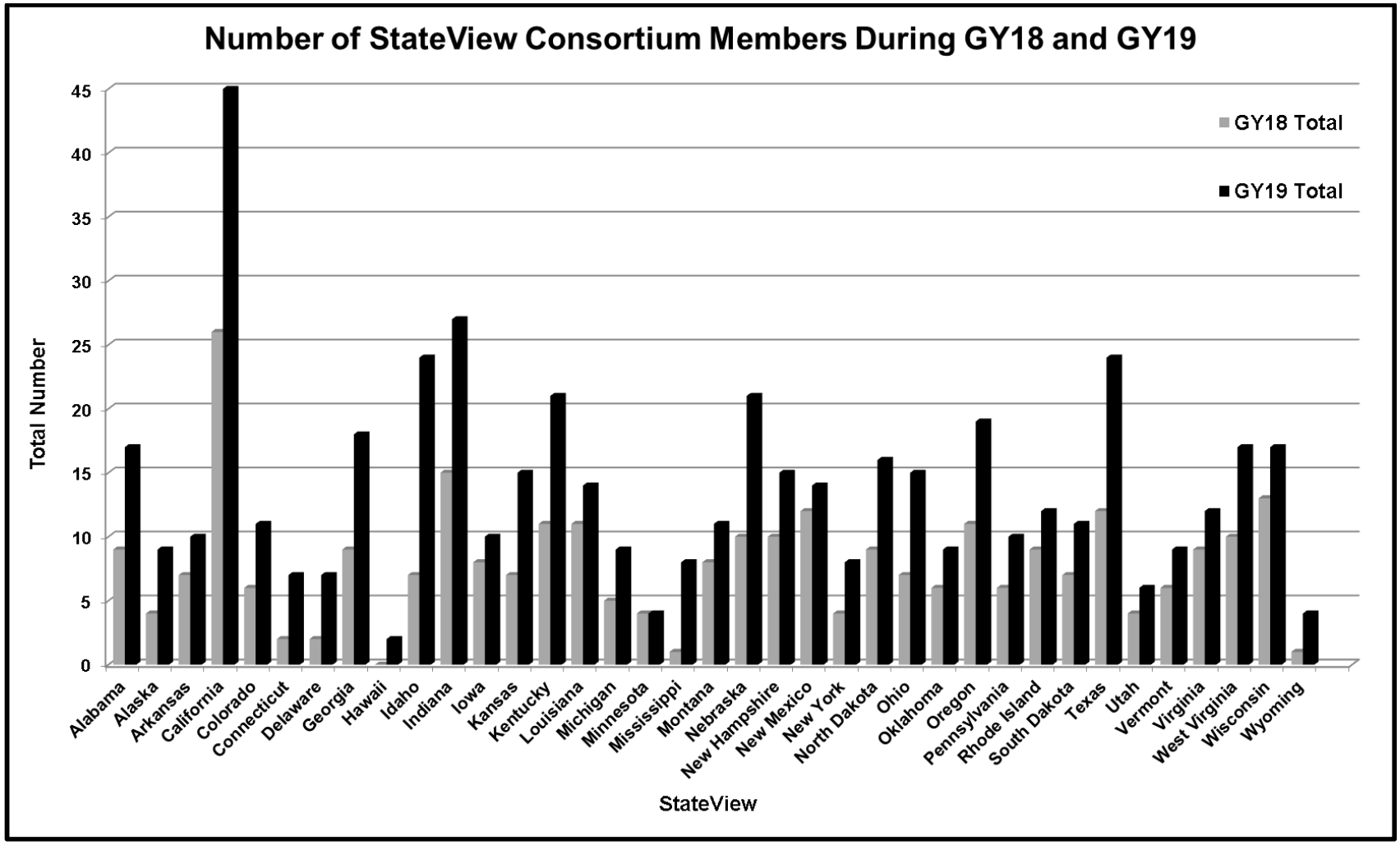

Figure 3. Total consortium members per StateView during GY18 and GY19 compared. Each SV grew their consortium during GY19, with the exception of MinnesotaView, where they remained unchanged from GY18.

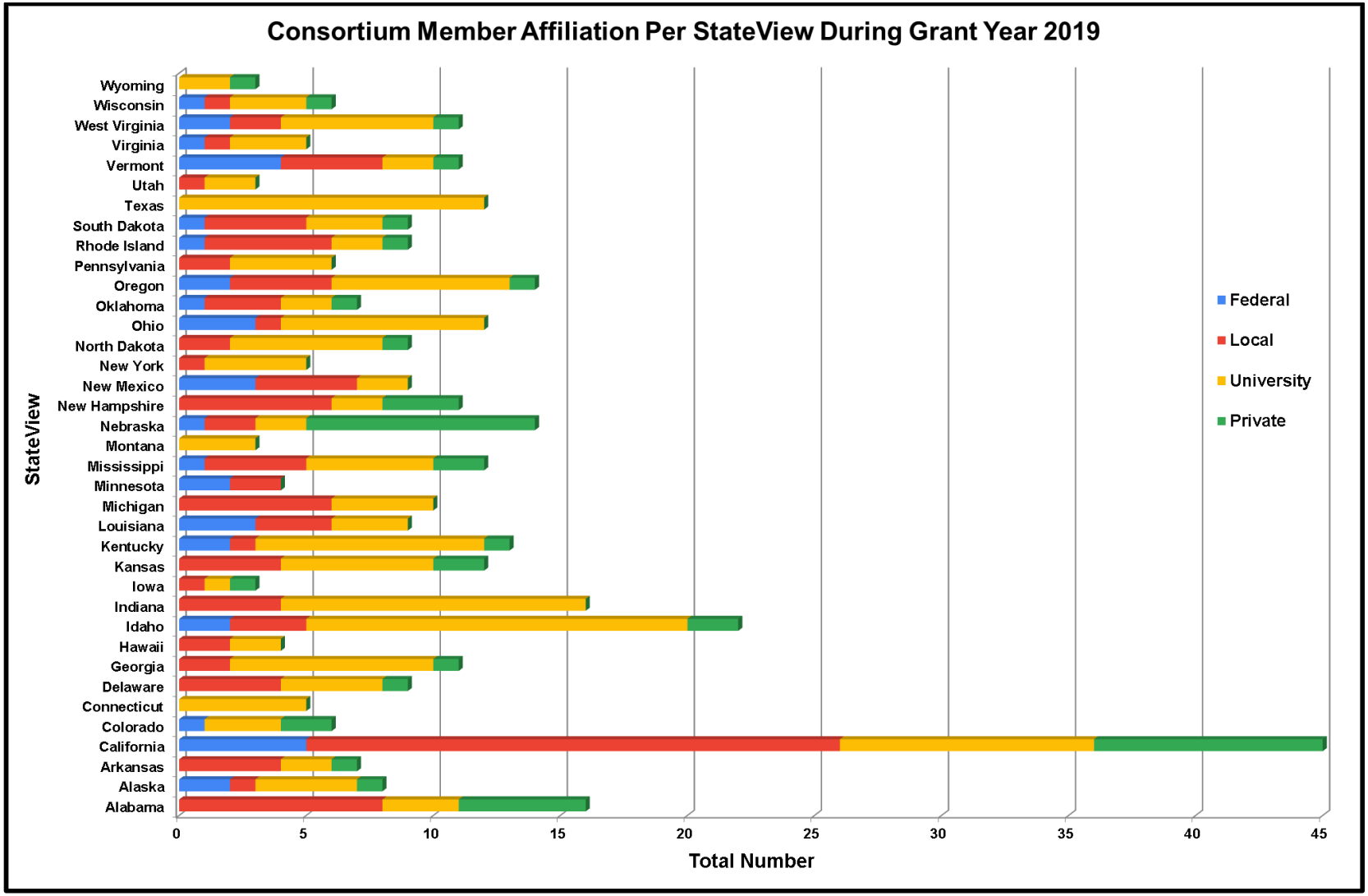

Figure 4. Graph illustrating consortium member affiliation (Federal, Local, University, and Private) per StateView during GY 19.

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), Unmanned 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.

<u>AmericaView National Activities Work Plan</u>

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. Throughout GY19 the ED has attended meetings, conducted outreach, and worked to develop relationships to further this objective. Specifically, the ED attended the Pecora 21/ISRSE 38 conference held during October 2019 in Baltimore, Maryland to promote the USGS NLI and AV Earth as Art initiative through a large display of the LouisianaView collection and through a STEAM event designed for area middle schools. Additionally, the ED, PM, and AV Board met with USGS NLI Program Coordinator, Mr. Timothy Newman, in February 2020 about the objectives and needs of the NLI program within the greater USGS purview. Several notable partnerships were created during GY19 with our acceptance as an Associate Member in the Group on Earth Observations and with the NASA AEROKATS and ROVER Education Network.

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.

The AV ED and PM gained significant ground in identifying strategic opportunities outside of the NLRSEORA grant. 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 GY19, four proposals were submitted to private and other government agencies, shown below. Those not immediately fruitful allowed AV to

gain insight into the different sectors for future submissions and the furthering of the NLRSEORA grant objectives.

- National Geographic Society
- NASA EONS
- NSF GEOPAths (2 different proposals submitted by AV PIs)

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.

The ED and PM worked diligently during GY19 to enrich the program with opportunities to hear technical presentations at the AV monthly membership meetings. Table 3 lists each presentation that was held during the second grant year. Presentations were not held at the monthly membership meeting during the months of March and April 2020 to allow time for the yearly AV Board of Directors elections process. During the August 2020 monthly membership meeting, the AV Lifetime Achievement Awards were awarded to the 2019 and 2020 recipients for their years of distinguished service to the AV organization. The 2019 recipients were: Larry Biehl, Rick Lawrence, and Tim Warner. The 2020 recipients were: Rebecca Dodge and Jim Campbell.

Month	Speaker	Organization	Title
October 2019	Salvatore Manfreda	University of Basilicata, Italy	Use of UAS for Hydrological Monitoring
November 2019	Dave Jones	GeoCollaborate	GeoCollaborate Data Sharing Platform
December 2019	Chris Parrish	OregonView Principal Investigator	Shallow Bathymetric Mapping with ICESat-2 and Landsat 8
January 2020	Jason Tullis	ArkansasView Principal Investigator	Geospatial Replicability and Reproducability (R&R) Concepts and Activities
February 2020	Jesslyn Brown	USGS EROS	What is Land Change Monitoring Assessment and Projection?
June 2020	Geoffrey Bland	NASA	AEROKATS and ROVER Education Network
July 2020	Ben Newall	ColoradoView Student	Missing Pixel Reconstruction Using U-Net with Partial Convolution: Application on Landsat Land Surface Temperature Images
September 2020	Jennifer Rover	USGS EROS	LCMAP Products and Example Applications

Table 3. List of presentations held at AmericaView monthly membership meetings during GY19.

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 GY19 despite the complications for in-person events due to Covid-19, with twenty-one SVs that held 25 events across the nation. Most events were able to be held in October 2019 prior to closures, but many SVs conduct EOD events throughout the year, which is why overall numbers of events were less than in GY18. Several notable EOD activities are listed below, where undergraduate and graduate students were engaged in the development of the events and distribution of materials.

- VermontView celebrated EOD with a 4-H teen science café to engage Vermont's youth in Earth observation education and career opportunities.
- North DakotaView led educational workshops on remote sensing for local elementary and middle schools.
- OklahomaView students and PI participated in EOD by conducting a GIS day at the capitol to educate their local government on the benefits of Earth observation education, Figure 5.
- IowaView dedicated Earth Observation Day to using OpenStreetMap to remotely map Wayland, Iowa and Mindanao region of the Philippines, https://www.iowaview.org/a-great-day-for-earth-observation-part-ii/.
- PennsylvaniaView worked with undergraduate students in a Humanitarian Aid Map-A-Thon using OpenStreetMap.

Figure 5. OklahomaView students and PI celebrating Earth Observation Day at the Oklahoma state capitol, educating state lawmakers on the benefits of Earth observation education.

Periods 1-5: AV will encourage multi-SV research projects that will involve graduate and undergraduate students to develop traits of collaboration and collegiality for future careers.

Collaboration between AV SVs is encouraged. These collaborations have demonstrated successful results and have produced educational resources and training materials. As an example, LouisianaVeiw and ArkansaView, in cooperation with the International Charter, partnered to create a detailed database of damage inflicted by Hurricane Dorian. Students were able to use recent Earth observation data do assess the impacts of the hurricane and support disaster response efforts. AV continues to encourage the participation of students for specific projects in the coming years.

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).

- ArkansasView students helped develop an ESRI StoryMap on COVID-19 Resources in Northwest Arkansas, https://storymaps.arcgis.com/stories/f330b94d4d464f0592cdeee698328db2. ArkansasView also had four peer-reviewed publications that included an AV funded student as a co-author.
- OhioView students developed a number of YouTube educational videos on numerous remote sensing topics for their SPLIT Remote Sensing program, https://www.youtube.com/channel/UCkmhoMQihvhRb1I8DpQ2wNw. They also had one peer-reviewed publication that included an AV funded student as a co-author.
- CaliforniaView paired five undergraduate interns with graduate students to work together on research projects, leaning to use image processing software and RTK GPS operations. CaliforniaView also produced three peer-reviewed publications that included a student as a co-author.
- New HampshireView students participated in the University of New Hampshire Undergraduate Research Conference in April 2020, where two student posters were presented.

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 GY19, 23 SVs financially supported a total of 60 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 support for a Master's thesis and PhD dissertation. Selected projects are listed below and the total amount of publications created in GY19 is shown in Figure 6. A bibliographic list of all publications resulting from AV GY19 funding is available here.

- IndianaView provided eight scholarships for undergraduate and graduate students. Their project topics were: designing K-12 instructional materials to integrate geospatial technologies in discovery and learning; studying the mycorrhizal drivers of non-native pest richness in U.S. forests; spatial analysis and habitat usage study of snapping turtles within an urban wetland; mapping archaeological excavations at Fort Ouiatenon using a self-developed geospatial mobile app; mapping local climate zone for Indianapolis using GIS-based methods and variables including building morphology and impervious surface; and study the evidence of alteration of sediments from past habitable environments in Gale crater, Mars using the Mastcam Imager. Six of the scholarships were in support of a Master's Thesis and one was in support of a PhD Dissertation.
- IdahoView supported a graduate student to map thermal environments of sagebrush and Red Band Trout and their response to heat stress using advanced thermal sensors in support of a Master's Thesis.
- South DakotaView supported two graduate students with their Master's thesis projects through their mini-grant program.
- PennsylvaniaView created an Outdoor Classroom in the Pike Run Watershed and provided scholarships for two undergraduate students to participate in the development of the program.

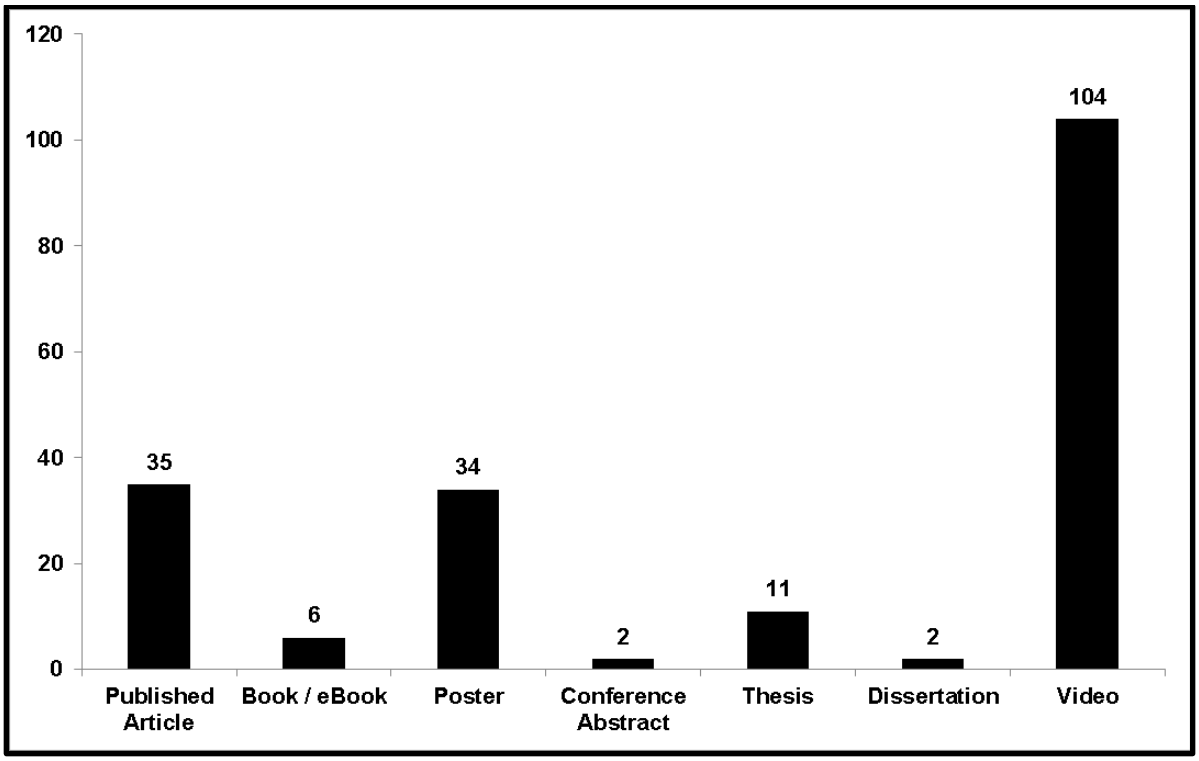

Figure 6. Categories of GY19 publications from all SVs.

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.

<u>AmericaView National Work Plan</u>

Periods 1-5: The AV Education Committee will continue to organize and celebrate Earth Observation Day. AV will continue its national participation in 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, https://americaview.org/program-areas/education/earth-observation-day/. IndianaView completed the creation of online puzzles of the 2020 EOD poster images, https://www.indianaview.org/image_puzzle.html. During GY19, the AmericaView Earth Observation Day website was one of the most visited pages for viewing and downloading EOD posters. Additionally, more than 10,000 posters were distributed by mail in AGI ESW packets to educators throughout North America.

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 21st Data Mining Virtual Workshop for Emergency Geospatial First Responders during GY19. As a first attempt, the workshop was held virtually due to COVID-19 restrictions. Through the cooperation of the LouisianaView consortium members and co-sponsored with the local USGS liaison, this workshop was offered free to all individuals interested in learning and sharing up-to-date information on data availability for the geospatial emergency responders. One Hundred and twenty-five (125) Geospatial First Responders from more than 20 different countries attended this workshop held June 4, 9-11, 2020 via Zoom from the UL Lafayette Regional Application Center. This 4-day virtual workshop hosted 24 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. This workshop has proven again and again what a cohesive and informed network of geospatial data responders can mean to the inhabitants and economic base for the state of Louisiana and now the Gulf of Mexico and the Caribbean. A detailed summary brochure of the workshop and associated resources was developed for public use.

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. During GY19, the AV website had 29,973-page views from 156 different countries. Though, these statistics say little about repeat visits or the length of visit and that order of information would help complete the story of visitor persistent interest and confidence in the presented information. The AV University educational portal was initially reassessed during GY18. It was decided that AV will work toward a more modern platform that will allow greater discoverability of data and ease of access. Work was started to replace the concept through the water working group in GY18. AV staff has continued this effort. A CKAN database was set-up to act as an

online data search and discovery tool, similar to data.gov. CKAN was selected due to the open source and simple, but powerful, ability to serve and manage all types of data, including spatial data types. AV's revised website, in development with WisconsinView, will encapsulate much of the online resources that are currently hosted on the AV website and the AV University educational portal. This will lead to greater use of the information by users and the ability to track metrics in more detail thereby reflecting vistitors' interest

Social media is an important way of sharing resources, tools, and successes. During GY19, AV utilized Twitter, Facebook, and YouTube to transmit these materials.

During GY19, AV's website and social media served the following:

- **Website (9/18/2019 - 9/17/2020):**
    - 88.4% of all visitors were NEW visitors to the website
    - 13.6 % of all visitors were returning visitors
    - There were 29,973 unique page views
    - The AmericaView website has visitors from 156 countries
        - Top 10: US, India, China, Australia, Indonesia, Brazil, Canada, UK, Japan, South Korea
    - AmericaView top visited pages:
        - Google Earth Engine Tutorials 26.13%
        - Remote Sensing Imagery Game 17.17%
        - Earth Observation Day Page 6.23%
        - Remote Sensing Tutorials 4.00%
- **Facebook (9/18/2019 - 9/17/2020):**
    - AmericaView Facebook Page had 1,343 unique views
    - Most popular post
        - Links for Teachers and Parents on March 23, 2020 as school were closing because of the COVID -19 pandemic 884 unique views
    - 250 page likes
- **YouTube (9/18/2019 - 9/17/2020):**
    - 5,947 Views
    - 329.20 Hours of watch time (our streamed content)
    - 44 new subscribers
- **Twitter (9/18/2019 - 9/17/2020):**
    - 56,148 Impressions
    - 1,139 Engagements
    - 406 URL Clicks to AV-Related Content

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, accuracy assessment of remotely sensed data, and object-based feature extraction. In addition to AV's website and social media presence, each SV maintains their own website and/or social media account. During GY19, there were a total of 100,964 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 historically been shared through annual national outreach and educational activities. During period 2 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 PM before cumulative information is provided in the Technical Reports.

Each SV submitted a fact sheet summarizing their work during GY19. Additional metrics chosen to describe the *overarching impact on populations served* for objective 4 during GY19 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

Previous results showed the publications category reflecting the greatest effort conducted by SVs, with AV supported students as the second, and Education and Outreach as the third (Figure 2). Looking at the impact at the local level in more detail, the education and outreach activities and the EOD/GIS activities were split into different student and non-student categories. Figure 7 compares the total numbers for each category for GY18 and GY19. Numbers of K-12 students and teachers were dramatically fewer in GY19 as compared to GY18 due to the inability of in-person events. Though many SVs supported K-12 students and educators with digital content during the COVID-19 closures, the ability to reach greater numbers was limited as the majority of these programs were designed for in-

person instruction. SVs were able to more quickly adapt their programs to support undergraduate and graduate students, citizens, higher education staff and faculty, and the current workforce. Total numbers of individuals educated in these categories were higher in GY19 as compared to GY18. Many SVs re-designed their programs to develop educational videos and courses that could be offered online, making it more consumable with these groups.

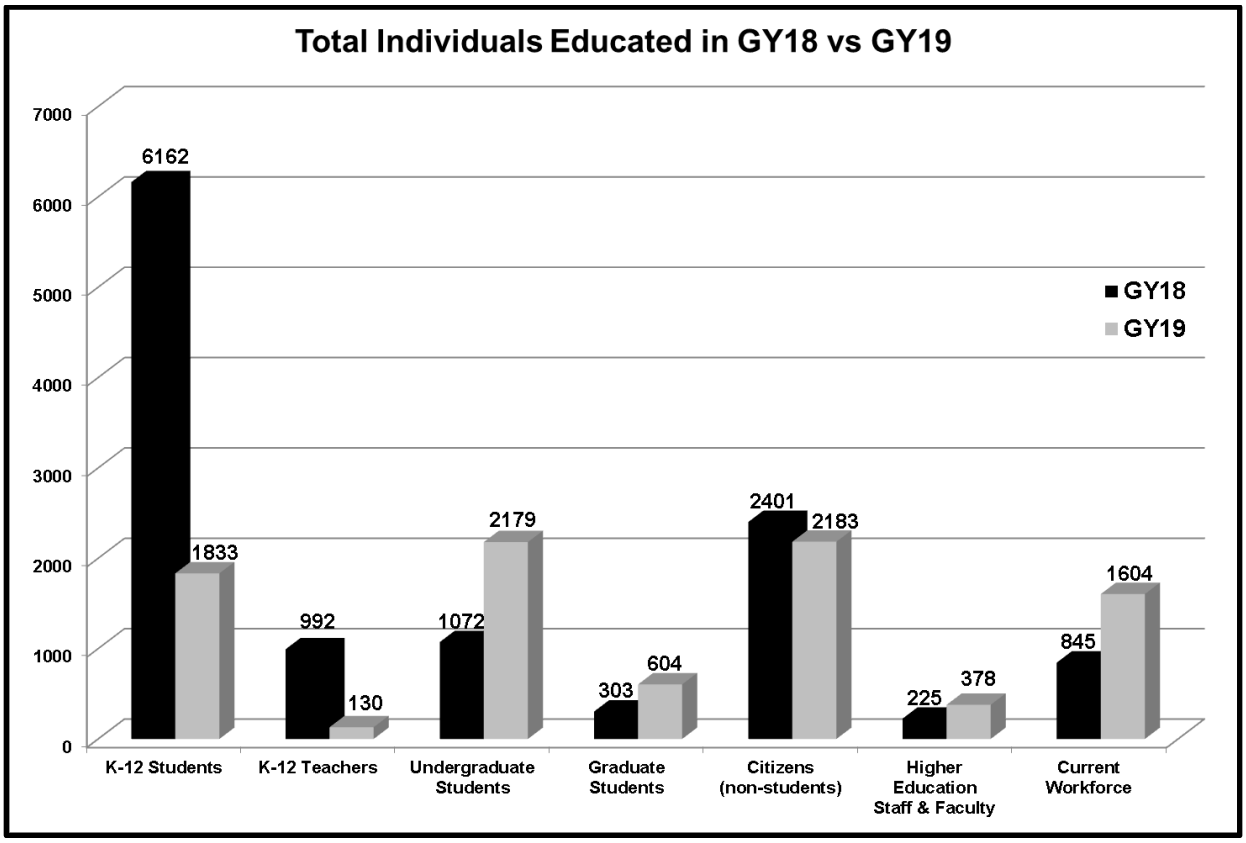

Figure 7. Numbers of the different categories of student and non-student participants in SV activities during GY18 and GY19.

GY19 Mini-Grant Program

AV was issued supplemental funding from USGS during GY19 and this funding was directed to the AV mini-grant program. The objective of the mini-grant program is to fund projects that will have a national impact, benefiting more than the local SVs' programs and consortium. A request for proposals was issued to the AV SV members and a total of 19 proposals were submitted, which is a record number from past mini-grant opportunities. Of the 19 submitted proposals, nine were approved for funding through a review process conducted by the AV Board of Directors and staff. The approved mini-grant projects were to produce digital content for use by educators across the globe and the list below shows the products that were developed and by which SV member. Additional material developed by LouisianaView under the mini-grant program is being finalized around the time of this report.

GeorgiaView: Introduction to Remote Sensing eBook and Video Tutorials
New HampshireView: Accuracy Assessment of Remotely Sensed Data Video Tutorials
New YorkView: Training Modules for Use of Google Earth Engine in Teaching, Research, and Outreach
Rhode IslandView: AmericaView ArcGIS Online
UtahView: Google Earth Outreach Tools: A History of the Landsat Program; A Tour of Earth As Art 4

VermontView: Object Based Feature Extraction Course
VirginiaView: sUAS Flight Planning Videos and Working with Lidar using ArcGIS Pro
West VirginiaView: Open-Source GIScience Course

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. During GY19, AV helped continue to build and maintain trust within local communities through undergraduate education efforts by working with local landowners in Wyoming using remote sensing imagery and analysis to improve land management practices for crop yields. As has been a regular success in previous grant years, in GY19 a WyomingView undergraduate geography student worked with real-world data provided by local farmers to conduct a research project on predicting

future harvest yields using Landsat data. The project results were then communicated back to the local farmers by the student and served as a resource for farmers to improve overall land management. This example is reinforced across the United States as SV consortium members develop and maintain strong local relationships.

2.2 AMERICAVIEW SUMMARY OF GRANT YEAR ACCOMPLISHMENTS

During GY19, AV helped foster communication between the local and federal levels through the completion of 492 activities by state consortium members, reaching over 200,000 members of the public and workforce that were trained and educated on the societal benefits of remote sensing technologies and applications. AV has also worked diligently in associate development by adding two new SV associate members, MarylandView and MissouriView and began conversations with three additional states, Tennessee, Florida, 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 2019, 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

During GY19, NebraskaView's HIA was to work with the city of Lincoln Parks and Recreation Department to assess the utility of airborne remote sensing for detecting and managing emerald ash border infestations. Lynn Johnson, Director of the City of Lincoln Parks and Recreation, gave the below testimonial following this first year of the project.

"The CALMIT team (and associated NebraskaView program) helped Lincoln Parks and Recreation flesh out our ideas regarding early detection of emerald ash borer (EAB) and the value of such detection. CALMIT then translated those ideas into a research proposal. Early data suggests that multispectral imagery can be used to identify EAB infestation "hot spots"—which means such imagery could ultimately prove valuable in targeting our community's limited treatment and removal dollars. We look forward to continuing our partnership with CALMIT to translate this early data into a "real world" tool benefitting not only Lincoln, but also other communities grappling with EAB."

GeorgiaView's HIA was focused on making volume II of their land cover map atlas series for counties, congressional districts, and regional commissions. During this grant year, the GAView atlas focused on croplands and their products. The atlas used Landsat imagery from the U.S. Geological Survey, air photos, and the Cropland Data Layer (CDL) dataset from the U.S. Department of Agriculture. The atlas was delivered to 70 local and regional offices in Georgia including the Governor's office, U.S.

congressional offices, regional commissions, counties, and agricultural extensions. The atlas is freely available in the PDF eBook format at the GeorgiaView website.

Habte Kassa, with the Georgia Department of Transportation, has been using the GAView atlases and provided the following testimonial.

"Our office has used the Atlas you provided in the past and using it now as a very useful validation reference. As you know, GDOT develops and maintains the Georgia Statewide Travel Demand Model (GSTDM) and it covers the entire state. We also develop and maintain 14 Metropolitan Planning Organization (MPO) models to assist them develop analysis tool for the federally required Long Range Transportation Plan (LRTP) update. The Atlas is being used from a state level as well as regional (MPO) level to compare the spatial distribution of zonal socio-economic data. A map showing labeled "where people are Georgia , 2017" and for each county is very useful."

Georgia Congressman Sanford Bishop, a recipient of the atlases, provided the below testimonial on their usefulness.

"On behalf of the Second Congressional District, I would like to commend you for the efforts you and your staff have taken to ensure practical decision making within the agricultural industry. Your image atlas will give agriculturalists across the state further knowledge of the croplands that they care for and will open the door for future technological advancements to be made in our state's top industry.
I appreciate that you understand the need to educate producers with the data that your team has been able to craft into this 200-page atlas. Not only am I honored to receive a copy of my own, but I welcome the thought that those in the Second District will have the use of this data at their fingertips in order to more efficiently produce the crops needed to feed our growing world.

Please also pass along my compliments to Jessica Sinel and Jordan Woodall for their hard work. Their dedication to this project is an indicator that their futures are sure to be bright, and I look forward to seeing more of their work as they enter their professional careers. As far as feedback, I would also be interested to see what blueberries would look like on future maps, as Georgia is the second top producing state in the nation, bringing in over ninety-two million pounds of this commodity per year. Again, I greatly appreciate your commitment to your work. I trust that you will continue to share your thoughts with me on other matters of concern. If I can ever be of assistance to you, please do not hesitate to call on me."

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

MississippiView provided a grant to a Geological Engineering Master's student from the University of Mississippi, Steven Terracina. He provided the below testimonial on how this support gave him the skills to gain employment as a mine engineer.

"The grant from AmericaView provided me the opportunity to research synthetic aperture radar (SAR), a remote sensing application capable of detecting earth deformation on a scale of a few millimeters through temporal analysis of satellite imagery. My thesis focused on detecting earth deformation

processes such as subsidence along the lower Mississippi River Valley in the coastal area of Louisiana. During my thesis research, I gained valuable image processing and interpretation skills, as well as gaining an understanding of how and where geohazards occur. I believe these skills helped me gain employment as a mine engineer, where I regularly process images acquired via sUAS and solve both engineering and geology problems. The grant provided by AmericaView allowed me to become a more well-rounded geological engineer, which resulted in me gaining employment during a global pandemic; for that, I'm very grateful."

IndianaView scholarship recipient, Shivani Ramoutar, a PhD Candidate in the College of Education at Purdue University provided the below testimonial on the benefits that were provided due to AV funding.

"The first time I saw the invitation for applications for the Indianaview scholarship, I felt really happy simply because GIS and geospatial tools were familiar terms to me, since I left my home country, Trinidad and Tobago having worked at the Department of Geomatics Engineering and Land Management where I pursued a MSc in Geoinformatics. I was accepted at Purdue in the College of Education on Fulbright scholarship to pursue the PhD in Learning Design and Technology at the College of Education. My area of research focuses on the intersection of GIS and pedagogy. How do we use these tools to improve learner outcomes and engagement? This grant opened the doors for me to be able to design my own course that I planned to offer at the Gifted Education Research and Resource Institute (GER^2I) entitled "Exploring the World with Geographic Information Systems (GIS)"

MontanaView scholarship recipient, Logan Swanson, a graduate student from Salish Kootenai College provided the below statement on her work.

"I am extremely excited to be doing work for the MontanaView Fellowship. I have one quarter to go on studying GIS at Salish Kooteni College, and this project has been a great learning experience. It has helped me focus on useful skills I will use in my career and given me a space to practice completing a professional project, which is a valuable learning experience.

I am currently pursuing my GIS technical certificate at the college and intend to get work in the field once I graduate. My goal in school is to practice as many different types of GIS work as possible, so that I can have a wide grasp of knowledge when I hit the job market. My project is analysis of the Jocko Valley with regards to wildland encroachment and development into forests. The project compares the forests in the Jocko Valley in the 1930s to the present day with emphasis on new housing in forested areas. I wanted to contribute to a project in my back yard and also something that could help my neighbors and anyone else in the area. I hope that what we learn will assist new developers in choosing suitable, safe areas to build homes."

TexasView mini-grant recipient, Jonathan Cubit, geography major from the University of North Texas details how his work with air quality during the COVID-19 pandemic was impactful.

"Beginning this project, I was not fully aware of how much life would change and how much my knowledge would grow. It was not apparent that we would be comparing COVID-19 air quality to previous year's air quality as no one knew of the troubles to come. Through it all, my academic career has greatly benefited from this project and it continues to surprise me about how much better I have

refined my own research. Thanks to the opportunity given to me by the TexasView Land and Education Grant, I have gained knowledge of remote sensing, air quality data, research techniques, GIS, and much more. I hope I am able to continue my journey in researching air quality and continue to learn about remote sensing and GIS. With the skills I have learned through this experience, I hope to one day serve my community in improving air quality and working towards a healthier environment."
DelawareView's focus during GY19 was on providing geospatial training to K-12 educators through online workshops. Several K-12 teachers gave feedback on how they plan to use the geospatial tools they learned in their classrooms.

"I plan to share already created items but will try to include the building of different maps and story maps when possible."

"My 1st graders are going to love using the tools to see our world. They will need a lot of support with the Digital Mapping and Story Maps. I am really not sure how much analysis we will do in the way a high school might use the Analysis Tools but I think as I become more comfortable with analyzing the data, I may share that with them if I can find a real application of it for them. They will truly love the survey part of mapping (gathering the data) as it makes them feel like real scientists! And the remote sensing imagery may be useful when we are simply comparing different maps to see what we can see geographically speaking."

The below responses are from when the teacher participants were asked what they feel are the best strategies for exposing more teachers and students to geospatial technologies.

"Creating curriculum that allows teachers and students to see the importance of these technologies and how they are useful in everyday life."

"Having a lesson that they can use right away. It's all well and good to say, "Hey I learned about this technology" but when you can hand them a lesson that they can use right away - that's powerful!"

"Right now, I think that teachers are overwhelmed with learning new technologies, so the best way to get more teachers to use geospatial technologies in their classroom is to provide them with some lessons that already have the technology use built in and planned out."

WyomingView has continued to provide student support through their internship program. This program has proven successful at supporting their local communities and by providing skilled professionals entering the workforce. WyomingView has begun an effort to track former internship recipients to identify where they were now and how the internship helped them to meet their goals. Many of the students are now employed by local, state, and federal agencies and you can read more about their stories on the WyomingView Blog, Then and Now, http://wyomingview.blogspot.com/p/then-now.html.

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 GoToMeeting subscription. The meetings contained informational presentations from industry, government, and AmericaView SVs (Table 3). The

GY19 Annual Meeting was scheduled to be held during March 29 – April 1, 2020 in Fort Collins, Colorado. This meeting was eventually cancelled due to the COVID-19 pandemic. Board members devoted over 730 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

A reorganization of the committees and working groups was completed during GY19 to better coordinate efforts for the organization and increase participation. The Education Committee and Outreach Committee have been working together as one group over the past several years and were formally combined into one Education and Outreach Committee. The Satellite-Based Sensors, Water, and UAS Working Groups were consolidated into the newly formed Earth Sensors and Research Committee. The Strategic Partners and Veterans Priority Working Groups were consolidated into the Strategic Partners Committee. AmericaView members contributed more than 1,445 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 committees 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 2019, the committee was co-chaired by Larry Biehl and Mary O'Neill and worked with all members to accomplish overlapping tasks and objectives.

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 8. Utah As Art, created by Ellie Leydsman McGinty, UtahView State Coordinator

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

became an incredibly popular education and outreach tool during GY18. It was hosted at four different events across the country and was requested by many others for display in GY19. During GY19, the travelling EAA exhibit was displayed at the Black Hills Digital Mapping Association conference in South Dakota and the URISA Caribbean GIS conference in Trinidad. Additional events had been scheduled but were cancelled due to COVID-19. UtahView continued their work on their Utah as Art collection, highlighting the national park system throughout Utah. Ten new maps were created in GY19 for the Utah as Art collection and were displayed with their Earth Observation Day activities. Bonneville Basin is one of the new images created this year and is shown in Figure 8. Expansion of other SVs developing their own state-centric collections began during GY19. With technical support from the LouisianaView PI, AlabamaView developed a "Mother Earth as Art" exhibit that was displayed (in-person and virtually) at the Jule Collins Smith Museum of Fine Arts. TexasView began developing a TexasView EAA collection based on the Texas State Parks system which will be displayed at the Sibley Nature Center in Midland, Texas beginning in early 2021.

2.5.1.2 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 9,000 educators annually. Additionally, online, digital *Earth Image Puzzles* have been developed for home and classroom use.

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 goals and objectives of DOI, USGS, and NLI are fully realized and achieved through the NLRSEORA. This work continues as a new strategic plan is developed.

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.

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. IdahoView completed an Esri story map that highlights the UAS 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.

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 but was not able to be realized due to the COVID-19 pandemicWe plan to begin work on this effort during the third grant period, GY20.

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.

Figure 4 shows the total consortium members for each SV in GY19, 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. During GY19, 11 AV SVs worked with the U.S. Department of Agriculture (USDA) on topics ranging from agriculture-based remote sensing research to education and outreach activities with local 4H groups. During GY20, the AV Board of Directors and staff will begin to formally develop a relationship with the USDA in order to further promote and accomplish the objectives of the NLI 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.

AV staff evaluated the needs and requirements assessment conducted in period one and determined it required significant modification as it pertained specifically to the current Landsat missions. For GY19, needs assessment and requirements questions were targeted towards the Landsat Next mission after consultations with USGS staff. The results of this assessment were further discussed in section 2.1.1.

3 NLRSEORA GRANT YEAR 2019 – 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 2 of AV's NLRSEORA grant was exceptionally successful despite 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 GY19. The AV consortium was fully represented by a national audience who fully supported the United States Department of the Interior, United States Geological Survey, and the National Land Imaging program initiates. AV continues to strive to meet 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 GY19, 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.