



2019 ANNUAL REPORT

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LETTER FROM ESIP EXECUTIVE DIRECTOR + ESIP PRESIDENT

Dear ESIP Community,

In 2019 we launched into our third decade focused on action! We recognized how far we have collectively come, now able to do things that twenty years ago were just ideas. Our theme was “Data to Action: Increasing the Use and Value of Earth Science Data and Information.” However, it is not just data that leads to action, but data + community = action. As in the past few years, this theme led us to many fruitful discussions during our in person meetings, collaboration area activities, Lab projects and webinars. With you, we continue to make data matter.

The first part of 2019 tested our collective resilience as the Winter Meeting took place despite the federal furlough. The furlough highlighted the contributions that many civil servants and contractors make to ESIP year in and year out. Despite missing our colleagues, the silver lining is that we found new ways to share the meeting content: a key takeaways document, presentations added to our FigShare repository and session recordings added to our YouTube Channel. All of that content is now accessible through the meeting Sched site (Winter & Summer). Helpful for those of us that always seem to want to be in more than one session at once. ESIP would not be what or where it is without the dedication and contributions of our community.

The Summer Meeting in Tacoma, WA was a celebration of collaboration across ESIP and our largest meeting to date with the most attendees and contributions. In addition to great meetings over the past year, we are grateful for the contributions of 18 collaboration areas and 9 Lab projects. The ESIP staff has focused on action and made strides in all areas of ESIP support. You can see their contributions throughout this report. ESIP is thriving.

As we focused on action, it led to more direct partnership with stakeholders in the research and decision support community. A few key activities to highlight are Data FAIRs, a growing collaboration with AGU, EarthCube and our partners at society meetings like the AGU Fall Meeting and ESA, our new role as part of the EarthCube Community Office (ECO), and the Operational Readiness Levels (ORLs) that the Disaster Life Cycle Cluster implemented this year. Over 2019 our community grew as well - welcoming 18 new partners to the ESIP Assembly. ESIP is connected.

2020 will be a year of change. ESIP maintains a 5-year strategic plan, and we are coming to the end of the 2015-2020 Plan. In anticipation of starting a new strategic planning process, ESIP went through an external organizational evaluation in mid-2019 and the Board has worked over the last six months to hone a set of strategic themes as a starting point for the 2021-2025 Strategic Plan.

In addition, Erin informed the Board at the October Board Meeting that she will not renew her contract as ESIP's Executive Director at the end of this coming fiscal year in September 2020. Erin has devoted 10 years to her work with ESIP and has no plans of slowing down in this last year. While we will miss her leadership, we are grateful for her advance notice and very confident that the ESIP leadership, staff and community will make a smooth transition.

Thank you for your support and contributions,
Erin Robinson, ESIP Executive Director
Karl Benedict, 2019 ESIP President

WHAT IS ESIP?

Earth Science Information Partners (ESIP) is a community steward for global Earth science data professionals and provides a collaborative platform for advancing the usefulness and impact of data necessary to address pressing global environmental challenges and fuel new discoveries. For the past 20 years, ESIP has driven its mission to support the networking and data dissemination needs of members and the global Earth science data community by linking the functional sectors of observation, research, application, education and use of Earth science. By encouraging open and *FAIR* data platforms for the global ecosystem of Earth science data stewards to share resources, ESIP facilitates collaboration and builds connections across federal agencies, academia and the private sector.

For more than twenty years, ESIP has developed significant collaboration methods and infrastructure that provide a scalable, neutral platform to support Earth science research, data, and technical communities. Our partner organizations and community participants lead the advancement of Earth science information best practices in an open and transparent fashion.

HISTORY OF ESIP

ESIP was founded in 1998 by NASA in response to a National Research Council (NRC) review of the Earth Observation System Data and Information System (EOSDIS). The NRC called on NASA to develop a new, distributed structure that would be operated and managed by the Earth science community that would include those responsible for all elements of Earth observation, including observation and research, application, and education. So ESIP began with the 12 NASA Archives and 24 NASA-funded partners, whose purpose was to experiment with and evolve methods to make Earth science data easy to preserve, locate, access, and use by a broad community encompassing research, education, and commercial interests.

In 2001, ESIP created a 501(c)(3) non-profit organization to provide management support as it moved from an operational prototype to an independent organization. The next year staff was hired and operating policies were created. Soon afterward, ESIP's first strategic plan was developed, which was adopted by ESIP's Assembly in 2004. The 2004 strategic plan reflected the evolving role of ESIP as it expanded to 75 partners, which included NOAA's data centers, further broadening ESIP's scope and growing community voice.

In 2009, ESIP refocused its energy on data and associated technologies. New collaboration areas formed around data preservation and stewardship and information quality, while education and societal benefit activities addressed climate and energy. ESIP continues to respond to the needs of its partners by addressing timely topics that affect the broader community.

In 2019, ESIP turned 21 and now has a staff of 5 and has expanded our programs to include two robust in person meetings annually, 18 active collaboration areas and the ESIP Lab, all described in this report.

VISION, MISSION, VALUES

ESIP's Vision, Mission, and Values guide the planning and execution of short-term and long-term activities.

MISSION

To support the networking and data dissemination needs of our members and the global Earth science data community by linking the functional sectors of observation, research, application, education and use of Earth science.

VISION

To be a leader in promoting the collection, stewardship, and use of Earth science data, information, and knowledge that is responsive to societal needs.

VALUES

Our work is guided and informed by the following beliefs and commitments.

- **Openness** - ESIP is a neutral platform committed to a culture of teamwork and collaboration.
- **Participation** - We value and recognize the voluntary work done by our many partner organizations and individual contributors.
- **Inclusiveness** - ESIP is committed to equality and maintains a collegial working environment.
- **Innovation** - We encourage creativity and novel ideas that enhance our community and the use of Earth science data and information.

VALUE OF ESIP

In November 2018, ESIP staff and 2018 President, Christine White, convened a Science Gateways Community Institute Bootcamp, where we spent four days diving into how we could sustain ESIP in the next decade. As part of that we created a draft pitch deck and an initial value proposition for ESIP:

ESIP will help members of the Earth Science data community find each other across organizations by fostering rich collaborative experiences like meetings and seed funding to further data interoperability. Making Data Matter Together.

Over the last year, we published a series of interviews with community participants, who we asked to reflect on the progress toward making Earth science data matter over the last 20+ years. These interviews emphasize the growing recognition that collaboration is essential to everything we do and that the value of ESIP is in the community of diverse experts who enable one another to really dig in and tackle common data challenges and in the collaborative support that ESIP provides that enables these experts to find each other and work together.

PARTNER ORGANIZATIONS

ESIP's strength comes from its depth of partner organizations, which now number over 140. Among these are all NOAA, NASA, and USGS Earth observing data centers, as well as government research laboratories, research universities, modelers, education resource providers, technology developers, nonprofits, and commercial enterprises.

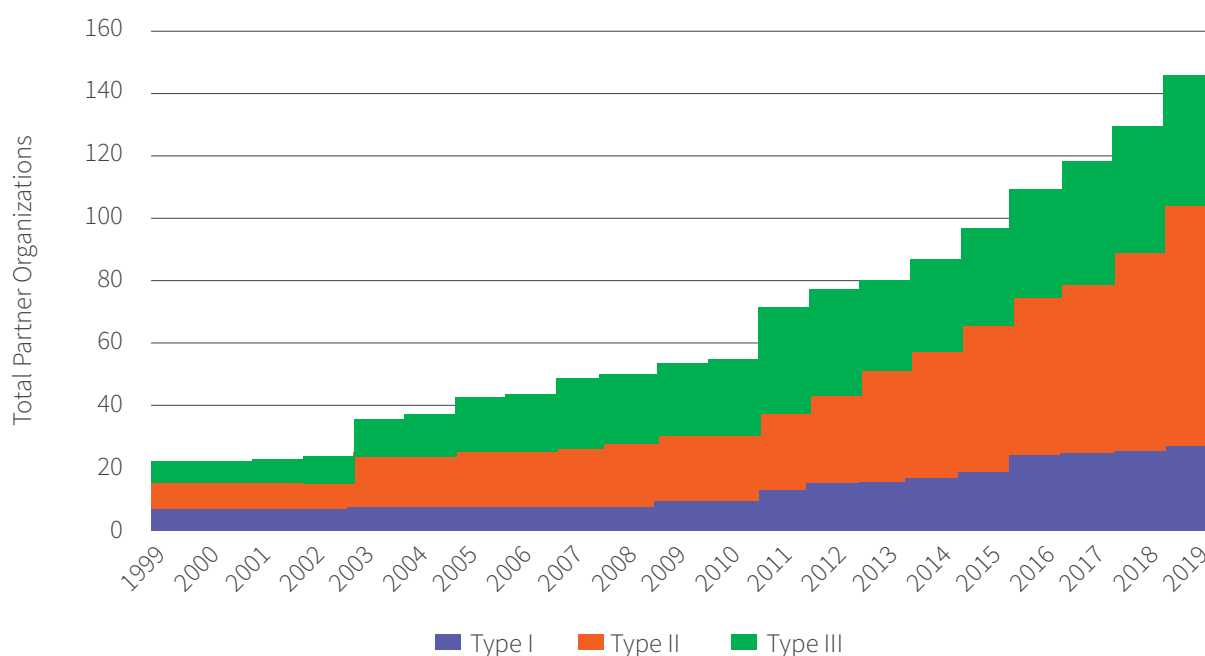
There are five types of ESIP partner organizations. Organizations specify their type when they apply for partnership. Applications are reviewed quarterly. For a large organization, such as universities, departments, research groups, or projects are welcome to join as partners. Although ESIP does not offer partnership to individuals, anyone can participate in its activities, such as clusters and working groups.

ESIP PARTNERSHIP CATEGORIES

- **Type I:** Distributors of satellite and ground-based data sets, as well as standardized products derived from those data
- **Type II:** Providers of data and information products, technologies or services aimed primarily at the Earth science and research communities
- **Type III:** Commercial and non-commercial organizations engaged in developing tools for Earth science
- **Type IV:** ESIP financial sponsors
- **Type V:** Non-voting financial or in-kind supporters of ESIP activities

GROWTH IN PARTNERSHIP

Overall participation in ESIP conferences and activities has grown over the years, both in terms of partner organizations and individual community members. As of 30 September 2019, there were 29 Type I partners, 69 Type II partners, and 39 Type III partners. The growth in organizational partners over the years is shown in the figure below. In addition, there were 3 Type IV financial sponsors (NASA, NOAA, and USGS), and 3 Type V partners.



NEW PARTNERS

ESIP welcomes applications from industry, government, academic, research and not-for-profit organizations interested in supporting our mission. ESIP was pleased to welcome 18 new partners in 2019. These organizations are:

AuScope Limited - ESIP-II
 Axiom Data Science - ESIP-II
 California Digital Library - ESIP-I
 CSIRO - ESIP-II
 Department of Earth Sciences, Montana State University - ESIP-II
 eScience Institute - University of Washington - ESIP-II
 ESS-DIVE Repository - ESIP-II
 Geological Survey of Canada - ESIP-II
 MIT Space Enabled Research Group - ESIP-III
 National Center for Supercomputing Applications (NCSA) - ESIP-II
 NCI Australia - ESIP-II
 ONTOLOG Forum - ESIP-V
 Open Topography - ESIP-I
 OSRS Group - ESIP-III
 TAG LLC - ESIP-II
 Terrestrial Ecosystem Research Network (TERN) - ESIP-II
 The University of Florida George A. Smathers Libraries - ESIP-II
 University of Nevada Reno Cyberinfrastructure - ESIP-II

BENEFITS OF PARTICIPATING IN ESIP

ESIP supports high quality collaborations with cross-domain data professionals. This combination sets us apart from other societies like AGU, where the interaction is brief once a year and from your office because while you may have very successful collaborations, you don't have access to the entire ESIP pool of experts.

Partnership is free. Partner organizations enjoy numerous benefits, including:

- Reduced registration fees for ESIP semi-annual meetings
- Eligibility for ESIP Lab funding
- Eligibility to start ESIP clusters
- Participation in developing guidance documents for Earth science data
- Eligibility to be elected to the ESIP Executive Committee
- Involvement in a community-driven organization of your colleagues

For more details on joining ESIP and answers to Frequently Asked Questions about partnership see the website:

<https://www.esipfed.org/get-involved/join>.

OUR SHARED AGENDA

ESIP utilizes many concepts of collective impact, including the idea of a shared agenda. Since ESIP is a grassroots and community-driven organization, it is difficult to connect the dots, so in addition to our mission, vision and values, ESIP uses high-level shared goals as annual themes and we see our community orient around these themes during our meetings, in collaboration area work and in work that each partner is pursuing individually.

ESIP's most recent 2015-2020 strategic plan outlines four primary goals that help ESIP advance and grow its research and education. ESIP relies on its internal communities to set priorities for the implementation of this strategic vision. ESIP remains uniquely positioned to make better use of science information and meet the growing need for information to solve the Earth's pressing environmental problems.

5-YEAR STRATEGIC GOALS (2015 – 2020)

1. Increase the use and value of Earth science data and information
2. Strengthen the ties between observations and user communities (e.g., technologies, research, education, and applications)
3. Promote techniques to articulate and measure the socioeconomic value and benefit of Earth science data, information, and applications
4. Position ESIP to play a major role in Earth science issues (e.g., climate change mitigation, sustainable science data infrastructure)

2019 THEME: DATA TO ACTION

We focused this year on the first of our goals: “Increasing the use and value of Earth science data and information” and we shortened this to Data to Action.



ANNUAL MEETINGS FOCUS

The January and July ESIP meetings brought together Earth science data and technology experts across the public, private, and academic sectors to discuss and exchange current trends, technologies, and expertise across the Earth science domain. This year's meetings both focused on the 2019 theme of Data to Action: Increasing the Use and Value of Earth Science Data and Information. Plenary talks included:

- *Ease Leads to Exposure, Exposure Leads to Adoption* (Dawn Wright, Esri)
- *Increasing the Impact of the Smithsonian's Geological Collections* (Adam Mansur, Smithsonian Institution)
- *Orchestrating Symphonies of Earth and Environmental Science Data and Information to Increase Their Reach, Value and Use* (Lesley Wyborn, Australian National University)
- *From Baseline Science Instruments to CubeSats: Challenges and Opportunities with the Growth of Space Based Data Acquisition and the Commercial World* (Dan Pilone, Element 84)

DATA TO ACTION WEBINAR SERIES

A monthly webinar series was launched in early 2019 focused on ESIP's annual theme. The series explored activities within and outside of ESIP that contribute to increasing the use and value of Earth science data and information by addressing 3 main questions: How do these activities contribute to increasing the use and value of Earth science data and information? What are quantitative and qualitative ways that can be used to assess and measure this use and value? And, what are the challenges and opportunities that currently exist in further increasing the use and value of Earth science data and information? <https://www.esipfed.org/webinars>

THE DISASTER LIFE CYCLE CLUSTER PUT OUR THEME INTO ACTION WITH OPERATIONAL READINESS LEVELS

The ESIP Disaster Lifecycle Cluster in collaboration with the All Hazards Consortium has developed Operational Readiness Levels (ORLs) to enable rapid decision making through 'trust levels' that can be easily identified in an operational workflow. The ORLs are designed to accelerate data-driven decision making between public and private organizations in communications, transportation, energy, food, agriculture, fuel and medical supply sectors. The ORL model is a tool that allows us to translate the operational readiness of a dataset from technical data characteristics to an easy-to-understand, standardized ranking. The cluster is now working to add levels of trust for Electric Sector Emergency Response, Electric Sector and Emergency Management Damage Assessment, and for emergency management personnel at state and federal levels. Learn more at <https://www.esipfed.org/orl>.



THE ESIP PARTNER ASSEMBLY ENDORSED AN UPDATED VERSION OF THE DATA CITATION GUIDELINES FOR EARTH SCIENCES AND THE SOFTWARE AND SERVICES CITATION GUIDELINES

The guidelines were both developed by the Data Stewardship Committee. Appropriately citing data, software, and services within research is one of the most important elements for making scientific research FAIR and open for informatics experts, researchers, publishers and authors. Learn more at <https://www.esipfed.org/esip-endorsed>.

ADDITIONAL 2019 INITIATIVES



The ESIP Board continued to build on success and momentum of the last few years and focused on a few key issues.

POSITION ESIP TO PLAY A MAJOR ROLE IN EARTH SCIENCE ISSUES

We believe that society's quality of life, economic opportunities, and stewardship of the planet are enhanced by regular use of scientifically sound Earth science data and information provided in a timely manner by a community that is collaborating to improve their collective services.

Positioning ESIP to play a major role in Earth Science issues has been part of our strategic plan for over a decade and this past year we gave it an earnest effort to go beyond our comfort zone and increase ESIP's visibility and reputation.

Over the last year, ESIP has worked to provide a platform for ESIP community outputs and activities to be shared. Our first step was to work with the Science Gateways Community Institute and with the ESIP Lab convene a bootcamp devoted to help ESIP, ourselves, and ESIP-funded and ESIP adjacent projects, specifically at USGS, who sponsored this activity, articulate the value of their work to key stakeholders and to create a strong development, operations, and sustainability plan. Workshop participants worked closely with one another and, as a result, built new connections across relevant projects that would not have happened without the workshop.

Since attending the bootcamp, all teams report the event being successful and a positive step towards project sustainability. Coming out of this workshop, ESIP was better able to articulate our value. One of the first products was a one pager (<https://www.esipfed.org/onepager>). In the last quarter of FY19, we engaged Reichert Communication to help us share ESIP activities and outcomes with a broader audience.

ESIP put out a press release following our successful Summer Meeting and several ESIP Lab projects have also been in the press this year:

- *MSU Earth Sciences duo take snow measurement to new heights*
- *Earth Science Information Partners: Promoting Innovation for Earth Science Data*
- *XrViz: An interactive visualisation interface for Xarrays*
- *Team receives Earth science funding*
- *The NASA GES DISC Top 10 Highlights of 2018*

All external press can be found here: https://www.esipfed.org/news/esip_in_the_media

ESIP work was shared in front of two major audiences this year by ESIP staff. Erin Robinson was a keynote at the Australian C3DIS meeting in May 2019 in Canberra. Dr. Annie Burgess and two Lab-funded PI's were invited to give a keynote as part of Earth on AWS at the AWS Public Sector Summit.

One sign that ESIP is playing a major role in Earth science issues is the growth we are seeing in the number of researchers showing up in ESIP spaces and the growth we are seeing in general. At the 2019 ESIP Summer Meeting, nearly 1/3 of participants were first-timers.

GROW ESIP'S STRATEGIC PARTNERSHIP AND EXTEND OUR PARTNERS' REACH

ESIP collaborates with world-class institutions and organizations working in Earth data science to advance common interests in evolving data and systems interoperability in support of science and to facilitate the distribution of data in support of science.

This year there are three to highlight:

1. Building on the partnership between the U.S. and Australian Earth and environmental informatics communities, ESIP and the Australian Research Data Commons (ARDC) signed an MOU. This MOU is exciting because it leverages the backbone infrastructure of both ESIP and ARDC in support of increasing the connectivity between the two countries. This year we had our first Australian representative to the ESIP Board, Lesley Wyborn (ANU/AuScope/NCI) and we had several exchanges of Australian and New Zealand participants at ESIP Meetings as well as U.S. participation both virtually and in person at Australian meetings. Beyond our Australian partnerships, ESIP is co-leading the Research Data Alliance (RDA) Earth, Space and Environmental Science Interest Group and is hoping to form more robust partnerships through EGU in 2020.
2. Building on our work last year focusing on the strategic goal: "Promote techniques to articulate and measure the socioeconomic value and benefit of Earth science data, information, and applications," we have become partners with both the VALUABLES Consortium, funded by NASA Applied Sciences, and the GEOValues Community. Karl Benedict, ESIP President, attended the GEO Data & Technology Workshop in April and represented ESIP at the GEOValues workshop in June. Moving forward we will continue to participate as a contributor to the GEO task on GEOValues.
3. Earth science researchers are fundamentally changing the way that they do their science because of forces like new publisher guidance on publishing data as well as generally more data intensive science. The ESIP Lab's small grants program and participation in Google's Summer of Code are creating strong connections with the scientific Python community, including engagement from companies like Anaconda Inc. and the Pangeo project, which have not traditionally been involved in ESIP. Our partnership with the American Geophysical Union has continued to mature with some products from the Enabling FAIR project migrating to the Coalition for Publishing Data in the Earth and Space Sciences (COPDESS) that is now an ESIP cluster. Our major outreach to scientists through the Data Fairs continued to grow last year at AGU Fall Meeting and for the second year spawned an entirely community-led Data Help Desk at the Ecological Society of America meeting thanks to the Environmental Data Initiative (EDI), DataOne, iDigBio, and others. Looking forward, we hope that our engagement with the EarthCube Community Office (ECO) will also increase the number of collaborations with the science community. A full description of ESIP's involvement in ECO can be found in [this blog post](#).

Together all of these activities help us to extend our partners' and sponsors' reach beyond what any one of us could do alone.

LAY THE FOUNDATION FOR SUCCESSFUL TRANSITIONS

ESIP Leadership made good progress in laying the foundation this year for a successful transition to our next strategic plan in 2021 and for our planned Executive Director transition in September 2020.

2019 ORGANIZATIONAL EVALUATION: From May-August 2019, ESIP underwent an organizational evaluation led by a third party evaluator, Middle Path Ecosolutions. The evaluation showed that we have a valued community and ESIP is one of the few places with true interagency collaboration. We also have a strong culture of remote participation. A few key weaknesses included issues with ESIP collaboration areas being silo'd, difficulty incorporating new members and needing to continue to diversify our community across career stages, economic sector and demographically. The evaluation also highlighted that while in 1998 there were not as many meetings or organizations vying for attention, in 2019 there are many other organizations competing for limited attention span and human resources. With this evaluation the Board has begun to look forward and in 2020 we will go through a lightweight strategic planning process to set us up as a community for success.

IMPROVED INSTITUTIONAL DOCUMENTATION: Over the course of the entire year, we have improved our documentation to aide in onboarding and offboarding staff and volunteer leaders. Dan Keyes led the ESIP staff in developing 'How it gets done' documentation and we practiced back-up staff handling essential tasks. Megan Carter, ESIP's Community Director, led our team in developing a Community Guidebook. We are looking forward to continuing to evolve the Guidebook in the next year. The Board also approved an updated version of the Executive Director job description.

COLLABORATION AREAS

The 3 types of collaboration areas within ESIP are Committees (standing and ad hoc), Working Groups, and Clusters. These range from formal (Committees) to less formal (Working Groups and Clusters). Working groups and especially clusters are ad hoc in nature, forming as member interest arises and disbanding when their goals are achieved. As of October 2019, ESIP had 4 Committees, 2 Working Groups, and 18 Active Clusters (see table). Anyone interested in participating in one or more of the collaboration areas is welcome to participate in the monthly teleconferences, regardless of their affiliate organization's ESIP partnership status.

The 4 committees are Data Stewardship, Education, Information Technology and Interoperability, and Semantic Technologies. **Data Stewardship** develops and fosters practices and standards in the field of Earth science informatics with a focus on providing stewardship to Earth science system data in order to facilitate their long-term management, preservation, and curation. **Education** provides educators and learners at all levels access to the Earth science data, information, tools, and curricula available within ESIP. **Information Technology and Interoperability** ensures that data, information, and services can be readily exchanged and integrated to improve Earth science data, information, products, and services. It encourages both the use of standards and protocols relevant to interoperability, and best IT practices to ensure the quality and usability relevant to interoperability. **Semantic Technologies** encourages and promotes research and development of semantic technologies in support of Earth science data management, data discovery, data dissemination, and data analysis. It collaborates with ESIP community members, working groups, clusters, and committees to identify semantic methods and tools that support the adoption of semantic technologies within ESIP and across its members' organizations.

The 2 working groups that existed this year are the Data Management Training Clearinghouse and Visioneers. The **Data Management Training Clearinghouse** grows and maintains a registry for online learning resources about research data management. The **Visioneers** working group assisted with planning the 2019 ESIP Meetings and has since evolved into a formal Meetings Committee, chaired by the ESIP Vice President.

ESIP's many clusters continued to thrive in 2019 and show no signs of slowing down. Recent activities range from open discussion to webinars to outputs like guidelines and events, and more. Here are some highlights: the Information Quality and EnviroSensing Clusters grew international connections through invited presentations in other webinar series, as well as by extending invitations to international participants to join ESIP events. The Software & Services Citation Cluster generated the [Software & Services Citation Guidelines](#), while the Citation Guidelines Cluster (now known as Research Object Citation Cluster) released an updated version of the [Data Citation Guidelines for Earth Science Data](#). Some of ESIP's newest clusters, including Marine Data, Schema.org, and Machine Learning, have hit the ground running over the last year, with some holding not just 1, but 2 virtual meetings per month! The Drones, Information Management Code Registry, and Semantic Harmonization Clusters have hosted hackathons in the last year. Anyone is welcome to join these groups (just hop on any call on the [ESIP Community Telecon Calendar](#)) and partner affiliates can propose a new activity at any time.

ACTIVE CLUSTERS [* INDICATES CLUSTERS ADDED IN 2019]

- Agriculture and Climate
- CLEAN Network
- Cloud Computing
- Community Resilience
- Community Ontology Repository (COR)
- Disaster Lifecycle
- Documentation
- Drones
- Enviro Sensing
- Information Management Code Registry
- Information Quality
- Machine Learning
- Marine Data
- Research Object Citation*
- Schema.org*
- Semantic Harmonization*
- Software & Services Citation
- Sustainable Data Management

ESIP LAB

The ESIP Lab supports scientists and data professionals in building insightful tools to search, serve, analyze, and visualize Earth science data. While there are many ways for an individual to find funding to modernize a workflow, expand a key open-source technology, or prototype a novel approach to searching data, the ESIP Lab provides an additional boost to projects by exposing and building collaborations around those advancements across agencies, institutions, and the private sector. It accomplishes this primarily through small grant funding, outreach, and workshops.

SMALL GRANT FUNDING

ESIP Lab provides small development grants for members to build or improve upon technology that makes Earth science data matter. Proposals are solicited twice annually through an RFP. The six-month awards have a maximum budget of \$10,000. Five projects were funded in Fall 2018 and their results were presented during the 2019 ESIP Summer Meeting Plenary in Tacoma, WA. The Spring 2019 solicitation resulted in four funded projects that will report their results at the 2020 ESIP Winter Meeting.

FALL 2018 FUNDED ESIP LAB PROJECTS

- *Developing Workflows for Assessing High-Resolution CubeSat Imagery to Infer Detailed Snow-Covered Areas for Studying Changes in Ecosystems and Water Supply* (Nicoleta Cristea, University of Washington)
- *Deep optical wave gauging: Real-time gauging of ocean wave height, period and direction from imagery of the surf zone using deep convolutional neural networks* (Daniel Buscombe, Northern Arizona University)
- *Improve conda-forge CI infrastructure and packages auto-updating dependencies* (Rich Signell, USGS)
- *FAIRTool.org toward better Earth science data stewardship* (Abdullah Alowairdhi, University of Idaho)
- *Use of UAVs to assess satellite measurements of snow albedo in mountainous regions* (Eric Sproles, University of Montana)

SPRING 2019 FUNDED ESIP LAB PROJECTS

- *Community Open Data and Experimental Mesonet (CODE-M)* (Agbeli Ameko, NCAR)
- *A cloud-based community tool for ambient seismic noise analysis and monitoring with Julia* (Dylan Mikesell, Boise State)
- *Scalable Serverless Workflows for Processing Cubesat Imagery to Identify Flowering Hotspots in Sub Alpine Meadows* (Amanda Tan, eScience Institute)
- *Subaqueous Landslide Morphometrics Database and Website for Global Outreach and Data Collection* (Zane Jobe, Colorado School of Mines)

ESIP small grants have seeded NASA and NSF proposal teams, resulted in peer-reviewed publications, conference presentations, reusable open-source software, and scientific discovery. All ESIP Lab funded projects host their code on Github with the tag 'esip-lab.'

“THROUGH MY ESIP LAB PROJECT, WE WORKED TO REFINE AN OPTICAL WAVE GAUGING TECHNIQUE TO ESTIMATE WAVE HEIGHT AND/OR WAVE PERIOD FROM IMAGERY OF COASTAL WAVES AND NEARSHORE AREAS.”

- Daniel Buscombe, Northern Arizona University

FUNDING FRIDAY COMPETITION

The annual FUNDing Friday competition occurs on the last day of the ESIP Summer Meeting. It highlights how ESIP leverages current technologies and member skills to add new services with a modest amount of effort and funding. FUNDing Friday encourages collaborations across members' organizations that demonstrate the value of ESIP participation. The competition is open to the imaginations and the needs of the ESIP partners. Awards range from \$5000 for partner-affiliates to \$3000 for students. In January 2019, the six 2018 FUNDing Friday winners presented their results. All winning FUNDing Friday posters can be found at: http://wiki.esipfed.org/index.php/FUNDing_Friday_Projects.

GOOGLE SUMMER OF CODE (GSOC)

ESIP was honored to have been selected as a second year mentoring organization for the Google Summer of Code (GSOC) in 2019. GSOC sponsors students to work full-time for three months on open source projects during the summer, supervised by a senior contributor from the mentoring organization. ESIP was awarded two student projects that were mentored by ESIP participants from the USGS, Anaconda, and Axiom Data Science:

- *OrcaCNN: Detecting and Classifying Killer Whales from Acoustic Data*
- *A Next Generation GUI for Visualizing Big Gridded Data in Python*

Results from both GSOC projects were presented at the 2019 ESIP Summer Meeting. Development of the XrVis project supported by USGS and Anaconda has continued and is getting contributions from several others outside the initial project team.

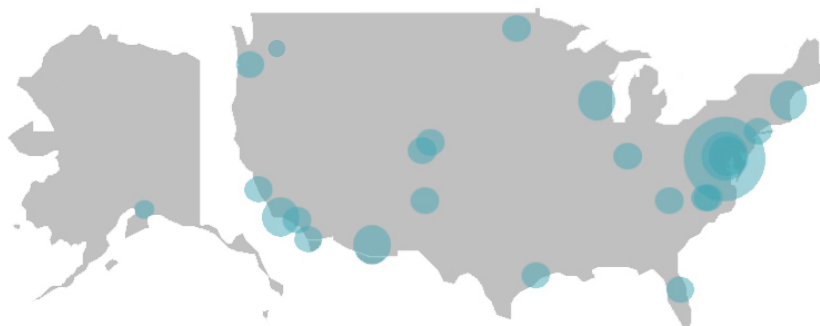
ESIP OUTPUTS

ASSEMBLY ADOPTED GUIDELINES

ESIP Collaboration Areas regularly develop outputs aimed at improving data practices on a number of fronts. These outputs can take a variety of forms and some are brought before the ESIP Partner Assembly for a vote on adoption. Two resources were endorsed by the ESIP Partner Assembly this year:

1. The **Software and Services Citation Guidelines and Examples** provide guidance on how to cite software and services for authors of journal articles. Journal publishers can also provide the Guidelines as a reference to their authors on how to cite software and services. The Guidelines were developed by the ESIP Software and Services Citation Cluster and endorsed by the ESIP Assembly in January 2019. <https://doi.org/10.6084/m9.figshare.7640426>.
2. The **Data Citation Guidelines for Earth Science Data Version 2** provide guidance on how to create a data citation that is meaningful to a human reader, and resolvable and actionable by computers. The first version of the Guidelines was endorsed in 2012. The updated version takes into account recent developments within the broader data stewardship community, including recognized data science and research communities and international standards organizations. The updated guidelines were developed by the ESIP Data Stewardship Committee and endorsed by the ESIP Assembly in July 2019. <https://doi.org/10.6084/m9.figshare.8441816>.

IN PERSON MEETINGS



Past ESIP Meeting locations

2019 WINTER MEETING

The ESIP Winter Meeting was held at the Bethesda North Marriott in Maryland, January 15-17. The three days of plenary talks, breakout sessions, poster presentations, and technical workshops addressed the annual theme. Nearly 200 members of the Earth science informatics community were in attendance to discuss current trends, problems, and emerging issues affecting the community. Although attendance was somewhat lower due to a federal furlough, it was still a very lively and productive meeting. Meeting presentations are accessible in the ESIP Figshare Portal and recordings and major takeaways can be accessed by going to the event description for each session at <https://2019esipwintermeeting.sched.com>.

2019 SUMMER MEETING



ESIP hosted its 2019 Summer Meeting in Tacoma, Washington, which brought together the most innovative thinkers and leaders around Earth science data and provided a platform for geoscientists, environmental scientists, technologists and other earth science data professionals to share ideas, collaborate on specific topics and build connections across federal agencies, academia and the private sector.

The meeting was the largest ESIP gathering to date with more than 300 members and guests assembled to address the theme, Data to Action - Increasing the Use and Value of Earth Science Data and Information. Speakers and attendees converged from diverse organizations including: Amazon AWS, Esri, Google, Microsoft, Planet, Smithsonian Institution, Stanford University, UC Berkeley, University of Washington, NASA, NOAA, U.S. Geological Survey and the Washington State Government. Nearly 100 people were first-time attendees. In addition, the Council for Data Facilities, DataONE's User Group, the LTER Information Managers, and the International Geo Sample Number Governance Committee (IGSN 2040) all co-located their meetings with ESIP.

The ESIP Semantic Technologies Committee hosted its annual **GeoSemantics Symposium** on the day before the ESIP Summer 2019 Meeting. The symposium investigated data semantics as a first-class citizen within the pervasive machine learning technology space. Other sessions during the week explored using Schema.org to create, maintain, and promote schemas for structured data.

Meeting presentations are accessible in the ESIP Figshare Portal and major takeaways can be accessed by going to the event description for each session at <https://2019esipsummermeeting.sched.com/>. Session recordings can also be found in the event descriptions, as well as in this YouTube playlist: https://www.youtube.com/playlist?list=PL8X9E6I5_i8jextid4zmX8WMkpawVAIT3.

OTHER ESIP-SUPPORTED MEETINGS

In addition to our own annual meetings, ESIP also supported NASA's ESDSWG Meeting in April 2019, USGS's Community for Data Integration meeting held in Boulder in June 2019 and NOAA's Environmental Data Management Workshop held in Seattle in September 2019. ESIP also supported a small meeting to review the draft USGS Scientific Working Collections Policy in February 2019.

ESIP Staff have also had an active role in supporting the Australian ESIP community's in person events, known as E2SIP that have been co-located at other larger meetings.

ESIP REPRESENTATION

To fulfill its mission to support the networking and data dissemination in the Earth science community, ESIP devotes significant time and resources to connecting with communities adjacent to ESIP.

MEETINGS AND CONFERENCES IN 2019 WHERE ESIP WAS REPRESENTED

- Workshop on Maximizing the Scientific Return of NASA Data, October 2018
- FORCE18, October 2018
- AGU Fall Meeting, December 2018
- AMS Annual Meeting, January 2019
- FAIR Data Hackathon, February 2019
- NASA Earth Science Data System Working Group, March 2019
- RDA Plenary 13, April 2019
- European Geophysical Union, April 2019
- GEO Data & Technology Workshop, April 2019
- National Science Teachers Association, April 2019
- C3DIS, May 2019
- EarthCube All-Hands, June 2019
- AWS Public Sector Summit, June 2019
- NOAA Emerging Technology Workshop, July 2019
- GEOValue Workshop, July 2019
- Analysis Ready Data Workshop, August 2019
- NOAA EDM Workshop, September 2019
- GSA Annual Meeting, September 2019
- ESA Phi Week, September 2019
- CODATA 2019, September 2019

EXTERNAL OUTREACH

DATA FAIR AND DATA HELP DESK

The Data FAIR at AGU Fall Meeting continued to expand at the December 2018 meeting, providing researchers with opportunities to engage with informatics experts familiar with their scientific domain at the Data Help Desk. They were able to learn about skills and techniques that will help further their research and make their data and software open and FAIR (Findable, Accessible, Interoperable, and Re-usable). The Data FAIR was continued at the Ecological Society of America in August, supported almost entirely by interested members.



IGNITE AT AGU

ESIP's popular science storytelling event Ignite@AGU returned to the 2018 AGU Fall Meeting in Washington, DC. Sponsored by NASA's Applied Sciences Program and held in partnership with AGU's Earth and Space Science Informatics Section, the event enables scientists to showcase their professional and personal interests through fast-moving, creative presentations lasting only five minutes. Recordings from the 2018 event can be viewed in this playlist: https://www.youtube.com/playlist?list=PL8X9E6I5_i8jh8CpR6JiE68AATCwIpcrG.

ESIP TEACHER WORKSHOPS

In 2019, the ESIP Education Committee again hosted a professional development workshop for educators at the ESIP Summer Meeting. The one-day workshop brought a group of Washington high school science teachers and community college faculty to take a deep-dive into two cutting-edge data science activities. First, workshop leaders introduced Jupyter Notebooks through an exercise to investigate a 100-year hurricane dataset. Another session leader introduced the SuAVE Visual Exploration Tool as a way of looking at GOES weather satellite tools, art history, geosciences, and biodiversity data. One of the teachers, Mimi Walker, participated in our annual FUNding Friday competition and won a \$3,000 award for her idea "Dive into Data: Our oceans, our lives, our future."

WEBINARS + BLOG POSTS

In addition to the Data to Action Webinar series, ESIP organized and led several webinars this year. The webinars are described in more detail below and can all be viewed on the [ESIP YouTube Channel](#).

ESIP MEETING HIGHLIGHTS WEBINARS

Initiated just after the 2018 ESIP Winter Meeting as a way to provide an overview of plenary and breakout sessions for those who weren't able to attend the meeting or were interested in conflicting breakout sessions, these webinars have now become a regular post-meeting event. The webinars typically feature a number of fast-paced lightning talks from a large number of community participants and can act as a catalyst for subsequent activities and collaborations.

COLLABORATION AREA HIGHLIGHTS

On the heels of the first successful Meeting Highlights Webinar, Collaboration Area Highlights Webinars were initiated as a way to broaden awareness of ESIP numerous collaboration areas, increase communication and collaboration between existing collaboration areas, and to invite new participants to join.

TECH DIVE WEBINARS

The IT&I Committee continues to encourage the use of best information technology practices to ensure the quality, usability and breadth of standards and protocols relevant to interoperability through monthly Tech Dives: http://wiki.esipfed.org/index.php/Interoperability_and_Technology/Tech_Dive_Webinar_Series.

ESIP BLOG POSTS

ESIP participants and staff regularly contribute blog posts to the ESIP Website. These include contributions from Community Fellows, Partner Highlights, and Collaboration Area Updates. You can learn more under the News & Events section of the ESIP Website.

ESIP INTERVIEW SERIES

To celebrate ESIP's 20+ year existence, Arika Virapongse (Middle Path EcoSolutions) interviewed ESIP community participants about their perspectives on progress toward making Earth science data matter over the last 20+ years last year. In total, 10 interviews were shared online in 2019. Check them out at <https://www.esipfed.org/category/esip-interviews>.

LEADERSHIP + MANAGEMENT

As a volunteer organization, ESIP is led by the community and is truly a team effort between the staff, board of directors, program committee, community fellows, and hundreds of volunteers that contribute to ESIP.

ELECTED LEADERSHIP

ESIP has a shared leadership structure between the Board and Program Committee.

2019 ESIP ELECTED LEADERSHIP

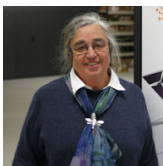
BOARD



Karen Moe



Mark Parsons

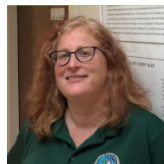


Lesley Wyborn

PROGRAM COMMITTEE



President
Karl Benedict



Governance
Denise Hills



Finance
Rebecca Koskela



Vice President
Mike Daniels



Partnership
Nancy Hoebelheinrich



Nominations
Danie Kinkade



Data Stewardship
Ruth Duerr



Education
Becky Reid



IT&I
Dave Blodgett



Semantic Tech
Lewis McGibbney

BOARD OF DIRECTORS

ESIP elects its officers, representatives, and committee chairs prior to the Annual Assembly meeting at the Winter Meeting. The new officers and committee chairs took office on January 17, 2019, and are listed below. The Board of Directors has the legal responsibility to oversee ESIP as a 501(c)(3) nonprofit corporation and it meets quarterly to govern ESIP.

2019 BOARD OF DIRECTORS

- Chair, Karl Benedict [UNM]
- Vice President, Mike Daniels [UCAR]
- Secretary and Governance Committee Chair, Denise Hills [Alabama Geological Survey]
- Finance Committee Chair, Rebecca Koskela [UCSD]
- Partnership Committee Chair, Nancy Hoebelheinrich [Knowledge Motifs]
- At Large Board Member, Lesley Wyborn, Australian National University
- At Large Board Member, Mark Parsons, RPI
- At Large Board Member, Karen Moe, retired, NASA

PROGRAM COMMITTEE

The ESIP Program Committee is comprised of the President, Vice-President, and all the programmatic and administrative committee chairs. The Program Committee meets monthly and provides programmatic direction on ESIP's activities throughout the year.

2019 PROGRAM COMMITTEE

- President, Karl Benedict [UNM]
- Vice President, Mike Daniels [UCAR]
- Governance Committee Chair, Denise Hills [Alabama Geological Survey]
- Data Stewardship Committee Chair, Ruth Duerr [Ronin Institute]
- Education Committee Chair, Becky Reid [Cuesta College]
- Finance Committee Chair, Rebecca Koskela [UCSD]
- Information Technology and Interoperability Committee Chair, Dave Blodgett [USGS]
- Partnership Committee Chair, Nancy Hoebelheinrich [Knowledge Motifs]
- Semantic Technologies Committee, Lewis McGibbney [NASA]

CLUSTER LEADERSHIP

In addition to elected ESIP leadership, ESIP is fortunate to have 18 active clusters this year. <https://www.esipfed.org/collaboration-areas>

CLUSTER LEADERS

Bill Teng	Dave Jones	Kristin Vanderbilt
Nancy Hoebelheinrich	Sean Gordon	Colin Smith
Frank Niepold	Anna Milan	Anne Wilson
Anne Gold	Jane Wyngaard	Jocelyn Elya
Patrick Quinn	Lindsay Barbieri	Carolina Berys-Gonzalez
Zhenlong Li	Scotty Strachan	Chris Olson
Arika Virapongse	Renée Brown	Mark Parsons
Adam Shepherd	H.K. Ramapriyan	Ruth Duerr
Jessica Hausman	Ge Peng	Margaret O'Brien
Karen Moe	David Moroni	

ACTIVE CLUSTERS

- Ag & Climate
- CLEAN Network
- Cloud Computing
- Community Resilience
- Community Ontology Repository
- Disaster Lifecycle
- Documentation
- Drones
- Envirosensing
- Information Quality
- IM Code Registry
- Machine Learning
- Marine Data
- Research Object Citation
- Schema.org
- Semantic harmonization
- Software & Svcs. Citation
- Sustainable Data Mgmt

AT-LARGE BOARD

Admin
Committees

President
Vice President

Technical
Committees

STAFF

COMMUNITY FELLOWS

The ESIP Community Fellows are graduate students and postdoctoral researchers interested in bridging the gap between informatics and Earth science. This fellowship provides a chance for recipients to work closely with professionals in an interdisciplinary, cross-sector group on current Earth science problems. Community fellows become engaged in ESIP collaboration areas as rapporteurs, documenting group activities on monthly telecons and at ESIP's semi-annual meetings. As fellows become more familiar with collaboration area activities, they may choose to integrate their own research, which can result in publication and additional funding opportunities. Fellows also contribute in many other ways, including leading sessions at ESIP Meetings, writing blog posts for the ESIP Website (see <https://www.esipfed.org/category/student-fellow-blog>), and helping to tell others about ESIP.

2019 FELLOWS

- Rose Borden | Information Quality | U. of Tennessee, Knoxville
- Patrick Chandler | CLEAN | U. of Colorado, Boulder
- Eleanor Davis | Ag & Climate | U. of S. Carolina
- Alexis Garretson | Data Stewardship | Brigham Young U.
- Daven Quinn | IT&I | Univ. of Wisconsin, Madison
- Yuhan Rao | Machine Learning | U. of Maryland
- Zachary Robbins | Semantic Technologies | North Carolina State U.
- Ben Roberts-Pierel | ESIP Lab | Oregon State U.
- Katy Rico | Education Committee | U. of Michigan
- Connor Scully-Allison | Envirosensing | U. of Nevada, Reno

“THE 2019 ESIP WINTER MEETING MADE ME REALIZE HOW LITTLE I KNEW ABOUT THE DATA-SPHERE. IT FELT LIKE A BOOT CAMP FOR ME. BEYOND THE IMMERSIVE EXPERIENCES WITH PASSIONATE DATA EXPERTS AT IN-PERSON ESIP MEETINGS, I FOUND WORKING WITH MY CLUSTER VERY ENGAGING AND REWARDING. I WAS ABLE TO SHARE MY IDEAS AND COLLABORATE WITH OTHERS. THE MONTHLY DISCUSSIONS TURNED INTO 2 CLUSTER INITIATIVES AND A FUNDING FRIDAY PROJECT. THESE ARE ONLY PART OF THE REWARDS OF MY FELLOWSHIP, IN ADDITION TO THE COMRADESHIP I FEEL AMONG THE FELLOWS, PARTICIPANTS, AND STAFF.”

- 2019 Community Fellow

PEER RECOGNITION

Three leaders in the field of Earth science information were honored at the Winter Meeting. The Martha Maiden Lifetime Achievement Award for Service to the Earth Science Information Community was given to Lesley Wyborn. The award, named for Martha Maiden [NASA], honors individuals who have demonstrated leadership, dedication, and a collaborative spirit in advancing the field of Earth science information. “With her simultaneously deep and broad knowledge in the Earth, computer, and information sciences,” her award citation noted, “Lesley has been engaged in the widest range of initiatives, from developing best practices for small data and physical samples to solving architectures for peta-scale computing, from rescuing data-at-risk to creating virtual research environments, from advancing FAIR data practices to advancing diversity and inclusion in the Earth and space sciences.” Lesley’s work over her lifetime has been deeply impactful on the disciplines she has worked in and on the people she has worked with. Throughout her career, Lesley has recognized that better outcomes can be achieved only through collaboration and actively pursued progress through collaboration. ESIP as a community wholeheartedly shares this vision. ESIP also recognized Karen Moe [NASA] with the President’s Award, which is given yearly to an individual who has made the most significant contribution to ESIP over the last year. Margaret Mooney [CIMSS], LuAnn Dahlman [NOAA], and Shelley Olds [UNAVCO] were also awarded with the Catalyst Award, which honors those who have brought about positive change in ESIP and inspired others to take action in the past year. DataONE took home the Partner of the Year Award.

In July, we honored the memory of Rob Raskin, who was a long-time ESIP participant and a mentor to many aspiring Earth science data professionals. ESIP remembers Rob and his dedication to support the next generation of Earth science data and technology leaders by awarding the Robert G. Raskin Scholarship each year to a talented individual in the Earth or computer sciences who has an interest in community evolution of Earth science data systems. The 2019 award was given to Kai Blumberg, a PhD Student at the University of Arizona Biosystems Engineering Department. Among other things, Kai works to create high-quality human and machine-readable meta-data in order to make environmental and genomic data findable, accessible interoperable for the next generation of artificial intelligence systems. ESIP celebrated Kai’s award during a plenary talk entitled *Toward Interoperable Microbiome Data: Bridging Earth-Systems and Life-Science Semantics*.

STAFF

In addition to the hundreds of volunteer participants, ESIP employs several full-time staff to ensure the efficient operation of activities and the overall organization. The staff is led by Erin Robinson, Executive Director and includes Dr. Annie Burgess is the ESIP Lab Director and Dan Keyes, Operations and Special Projects manager.

In October, Megan Carter joined the staff as Community Director to support the efforts of the 30+ diverse collaboration areas within ESIP. Megan’s background with data repositories makes her an ideal fit to support the ESIP community. In January, Megan began participating in the AAAS Community Engagement Fellows Program, a year-long professional development opportunity for individuals who cultivate member engagement and collaborative relationships. Through this program, Megan has worked to (1) grow communication and interaction between collaboration areas; (2) document and streamline collaboration area activities and workflows; (3) define and track collaboration area metrics; and (4) help the ESIP Community Fellows define and meet their goals.

SPONSORS + OTHER FUNDING SOURCES

ESIP is generously supported by cooperative agreements with NASA, NOAA, and the USGS. The NASA and USGS cooperative agreements were renewed this past year. Cloud computing costs for ESIP Lab projects are covered by the Amazon Web Service Cloud Credits for Research program.



New this year was the addition of ESIP activities in several of our partners' proposals. We are very excited to be part of the new EarthCube Community Office, where EarthCube can more formally leverage the ESIP backbone.



ESIP also continued its meeting sponsorship program and was grateful for support from AGU, Esri, AUI, Element 84, and Figshare. ESIP seeks additional partnerships with corporations, foundations, and other organizations and individuals who would like to sponsor our meetings or who share our goal of enabling early-career scientists to pursue innovative research without financial constraints. <https://www.esipfed.org/meetings/meeting-sponsorship>.

LOOKING FORWARD TO 2020

There is a lot to look forward to in 2020! Building on the feedback from our evaluation and the success of our theme this year on Data to Action, the theme of 2020 is “*Putting Data to Work: Building Public-Private Partnerships to Increase Resilience & Enhance the Socioeconomic Value of Data.*” We hope that this theme will give us the opportunity to cultivate more private sector partnerships within ESIP and it will allow us to continue exploring the interesting ways we put data to work in all types of research and decision-support applications.

We invite you to join us at the upcoming 2020 ESIP Winter Meeting in Bethesda, MD January 7-9, 2020! Details are at <https://2020esipwintermeeting.sched.com/>. Please save the date for our Summer Meeting will be July 14-17, 2020 in Burlington, VT. This meeting will include our annual Geosemantics Symposium and a Biological Data Workshop as well as confirmed plenary speakers including Julia Stewart Lowndes, a Marine Data Scientist, Mozilla Fellow and Founding Director – *Openscapes*.

ESIP will continue to build our international partnerships with during the colocated C3DIS/RDA Plenary in Melbourne Australia in March and the first attempt at an EGU Data Help Desk will occur in Spring 2020.

NOTES

Suggested Citation: Earth Science Information Partners (2020): Earth Science Information Partners (ESIP) Annual Report 2019. ESIP.

Online Resource. <https://doi.org/10.6084/m9.figshare.11499387>

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MAKING DATA MATTER

