YEAR 10 ANNUAL REPORT OF THE NATIONAL SOCIO-ENVIRONMENTAL SYNTHESIS CENTER

Reporting on Activities from September 2020 to August 2021

www.SESYNC.org

INTRODUCTION

SESYNC's mission is to foster synthetic, actionable scholarship related to the structure, functioning, and sustainability of socio-environmental (S-E) systems. SESYNC was founded on the premise that progress toward a sustainable future requires new knowledge that arises from close collaborations across many disciplines including, for example, the natural, social, and computational sciences and involving academia, federal and state agencies, and non-governmental organizations. To achieve this mission, SESYNC catalyzes a rich portfolio of synthesis activities and provides essential support services that have helped researchers, policymakers, and representatives of many different groups to work together to discover solutions to socio-environmental problems. In this way, we have fostered the production of actionable science. SESYNC works with the world's leading natural, social, and computational scientists who travel to its Annapolis facility. There they develop and utilize collaborative teamwork skills to advance transdisciplinary synthesis research to address the fundamental challenges posed by S-E problems.

SESYNC's diverse offerings of programs, processes, and training are designed to accelerate knowledge generation, build new communities, and educate and engage early career scholars and educators. By building new capacities among many communities, SESYNC works to lower the barriers to adopting unfamiliar synthesis methods, and to grow the synthesis process. We place a premium on flexibility and openness to new ideas from the community – not only topically but on methods of engagement and synthesis team building. We are actively engaged with all the teams that work at the Center and practice "gentle interventions" to help them overcome hurdles.

Over the course of this grant year, SESYNC leadership and staff continued to fulfill our commitment to core activities through Pursuits, Workshops, Foundations, and Fellowships – efforts enabling the Center to serve the needs of a diverse and growing community of users in a manner consistent with our mission.

CAPACITY-BUILDING FOR S-E SYNTHESIS

Postdoctoral Training. SESYNC postdoctoral fellows participated in ample educational and professional development programming throughout the year, as detailed elsewhere. Multiple working sessions with the postdocs focused specifically on improving their teaching and educational experiences. One particularly impactful session had each fellow develop their own statement on Diversity, Equity, Inclusion, and Justice. In writing these statements, fellows honed their personal classroom approaches for increasing inclusivity and improving the learning experience for students with diverse backgrounds and learning styles. Additionally, many of the Immersion and workshop activities described in earlier sections provided learning opportunities that will enhance postdocs' capacities to mentor or teach students to be able to work in interdisciplinary settings or on topics that span disciplines. We received positive feedback on these sessions and many fellows indicated they will apply the knowledge acquired if and when they become faculty. Several current postdocs have already accepted tenure-track faculty positions at institutions such as Pennsylvania State University and the University of North Carolina.

Graduate Student Training. During this this reporting period, the *Diversity, Equity & Inclusion in Socio-Environmental Synthesis Workshop* series provided a rigorous and interactive educational experience for doctoral students. As described earlier, participating graduate students received training in topics such as "Enhancing S-E Synthesis Capacities to Promote Diversity, Equity, Inclusion, and Justice (DEIJ)" and "Advancing DEIJ with Actionable Science." Students worked closely with mentors in both formal and informal sessions over the course of 8 weeks.

Short Courses. Our annual short courses also continued to serve our broader community of socio-environmental scholars. These courses continue to be over-subscribed and include participants from diverse backgrounds. As described in previous sections, this year's short courses were held virtually and offered intensive learning experiences on Bayesian statistics, developing decision-support tools in R, and general data science skills using open-source software. Each course has specific learning objectives that are directed at enhancing participants' theoretical knowledge and technical expertise. Courses are project-based, and because the students work on their own research as part of the courses and interact with the instructors throughout the process, we have found that course experiences have a significant impact.

With a transition to remote courses this year, special attention was paid to making virtual learning experiences engaging and productive. Course instructors were coached in effective virtual teaching methods, such as using multiple platforms for communication and providing recorded lectures ahead of time so that meeting time could be used for discussion and questions. A combination of synchronous and asynchronous lessons was provided to make the programs more accessible to participants in different geographic locations or with internet connectivity concerns. We also took advantage of the switch to online teaching to develop permanent online resources, such as instructional videos, that will be based on our short courses and will be accessible to the broader community via the SESYNC Resource Collection. The SESYNC computational team and research support staff developed a series of articles on virtual collaboration, which both course instructors and research team leads found useful in designing their meetings.

As one example, our newest short course, *Interactive Web-Based Visualizations and Decision Support Tools in Shiny/R* had participants develop their own web-based application over the course of five weeks. Instructors developed a structured course website with five course modules each including learning objectives, pre-recorded lectures, and practice exercises and assignments. During the class sessions, time was dedicated to group activities, discussions, and answering questions. A post-course survey indicated an overwhelmingly positive response from participants, with 93% of participants agreeing or strongly agreeing with the statement "I can apply the knowledge created in this course to my work or other non-class related activities" and 86% of participants agreeing that they "feel confident in [their] ability to apply the skills [they] learned." The instructors of this course are currently analyzing the full pre- and post-course survey results to better understand virtual learners' experiences and improve any future iterations of the course.

In addition, SESYNC's annual Computational Summer Institute is slated for July 2021 and will combine lectures, hands-on computer labs, and project consultation designed to accelerate the adoption of cyber resources for all phases of data-driven research and dissemination. Participants from several research teams will receive instruction on scripting complete data pipelines and implementing distributed workflows within the R + RStudio development environment. Individual lessons will focus on widely applicable data skills (such as data wrangling, relational databases, GIS, and visualization) and break-out

sessions may introduce other useful languages (such as Python, SQL, and JavaScript). Open Science and Reproducible Research principles are an overarching theme of SESYNC training initiatives, so the tools presented will be freely available open-source software.

Finally, a new internal effort was launched this year to enhance learning by SESYNC's own staff, Graduate Research Assistants, and postdoctoral fellows on issues of diversity, equity, and inclusion in academia and the workplace. This included a series of Zoom-based sessions every month from early fall until February. Educational films with thought-provoking material were watched together and followed by individual activities related to the content. Time was provided for reflection and sharing afterwards.

IMPACT

Socio-Environmental Science. SESYNC has focused on using all of our resources to fully implement programs and processes that reflect our commitment to advancing the capacity of individuals and teams to advance socio-environmental synthesis and science. Our continuing engagement spans numerous disciplines and impacts key areas — all consistent with our theory of change.

We have challenged ourselves to advance understanding in new areas and to help participants in new ways. Iteration with SESYNC staff and detailed feedback from reviewers remains an essential element and has a high impact on those that apply for support, ultimately leading to stronger research projects. During this reporting period, we transitioned our research support activities to a virtual environment and improved our capacity to impact researchers well beyond the doors of our center. Our research support "practice" has continued to evolve and improve how we provide an integrated approach to learning the specific needs of each research team and to match our capacity to help accelerate the work that the community brings to the center. A recent article by SESYNC experts published in *Socio-Ecological Practice Research* reports on a key aspect of our unique research support practice: applying facilitation as a research method in order to create the conditions for effective interdisciplinary integration. Based on our preliminary review of our ongoing evaluation, these combined efforts have had a clear impact on teams.

SESYNC's efforts to advance S-E modeling were elevated during this reporting period. First, our ongoing partnership with Resources for the Future (RFF) has been fully implemented across three innovative SE-modeling Pursuits, all led by early career researchers. Each active modeling team has now completed their meetings and has started to produce publications. Additionally, a postdoctoral fellow at RFF is contributing actively to the development of modeling resources for SESYNC. Second, we launched a new effort to advance and bolster the use of socio-environmental systems modeling by a broad community of researchers. SESYNC Director Margaret Palmer put together an international core team of S-E modeling experts who developed a detailed plan for events and for the production of learning products; some of these are now available online with many more still in the works.

As detailed elsewhere in this report, SESYNC has also committed significant staff and resources towards developing the SESYNC Resource Collection during this reporting period. Many years of innovative, interdisciplinary scholarship at the Center will culminate in this collection of resources, which will represent the cumulative impact of SESYNC on the field of socio-environmental science and synthesis.

A Focus on Interdisciplinary Process.

The SESYNC programs team has invested a significant amount of time to assist participants in identifying scholars and knowledge users (see definition in the next paragraph) that are needed to address their research questions. Disciplinary diversity within teams is a key component of the proposal evaluation process, and often, members of SESYNC's Scientific Review Committee provide participant suggestions to teams during the iteration phase of the proposal review process (prior to support) to both increase the disciplinary breadth of participants and to ensure the right expertise is represented on the team.

Disciplinary diversity within and among teams is clearly very high, however we continue to note that when participants are asked to self-characterize according to the disciplinary categories that NSF (and SESYNC) use, they report that these are somewhat confining. Many of our participants feel that they cut across several disciplinary lines, a trend which is increasingly common throughout science. In the demographic survey that all participants complete, they are asked to self-characterize themselves (e.g., natural scientist, social scientist, government, etc.), and in addition, we categorize participants as either "scholars" or "knowledge users" based upon their selection for "institutional status." Scholars (or "academics") are those within academic institutions as graduate/postdoc students and teaching or research faculty, and knowledge users are those within the policy, business/industry, government, or NGO/nonprofit sectors. Of those reporting demographic information from our core programs supported under this award, 19% of SESYNC participants come from outside academia and 63% of the 92 research teams reporting include knowledge users in their teams. Such sectoral diversity is key in the SESYNC model and helps ensure actionability.

As previously mentioned, all SESYNC participants are asked to self-characterize as falling into one of the following categories: natural scientist, social scientist, both natural and social scientist, computer scientist, policy, NGO, government, business/private sector, or other. Of the participants from *all* programs (Pursuits, Workshops, Foundations, and Short Courses) who responded to the self-characterization question (response rate = 82%), 552 chose natural scientist (36%), 375 chose social scientist (24%), 386 reported as both natural and social scientist (25%), and 13 chose computer scientist (1%). The remaining participants self-reported as NGO, government, policy, or industry (117 individuals, 8%) or other (87 individuals, 6%).

Of those reporting from *just* our core synthesis research programs (Pursuits, Workshops, and Foundations), there were 937 academic scholars, 211 knowledge users, and 13 participants who classified as both. Of the core participants classified as knowledge users, 48% came from the government sector, 44% from the NGO/non-profit sector, and 8% from business or industry. Of the core participants classified as academic scholars, the disciplinary diversity of those responding to the demographic survey is illustrated below. Participants are asked to describe their primary disciplinary area of expertise, which is used to assign them to one of the following research domains, aligned roughly with NSF's research areas:

- Life sciences: 30%
- Geosciences: 18%
- Non-Economic Social Sciences: 27%
- Economics: 5%
- Computer Science and Engineering: 3%
- Policy: 6%

- Humanities: 4%
- Public Health: 3%
- Other (education, business, etc.): 4%

As is clear from these numbers, SESYNC research cuts across many disciplines, yet we continue to be struck by the depth and breadth of intellectual diversity among our projects. For example, a Pursuit funded during this reporting period titled *Migration, Marginal Agricultural Land, and Tree-Cover Expansion in Low- and Middle-Income Countries* is co-led by an economist, a demographer, and ecologist. With participation from experts in fields ranging from sociology to silviculture and a panel of practitioner advisors, the team is using novel geospatial methods to understand the linked socio-economic and biophysical factors that influence tree cover expansion efforts. Another recently supported team composed of graduate students in public health, agro-ecology, and environmental justice are investigating the relationships between agricultural landscapes, wildfire, and the respiratory health of farmworkers. As a final example, the ongoing Pursuit *New Scenarios and Models for Climate Engineering* recently launched an online game called Survive the Century, which helps users explore alternative climate change pathways and scenarios via a choose-your-own-adventure format. The game was developed collaboratively by climate modelers, governance scholars, communications experts, and published science fiction authors. Designed as an engaging climate communications tool, the underlying decision-making scenarios in the game are informed by scientific research and climate models. The game will be accompanied by academic publications focused on these alternative decision-making pathways. Participants in these projects and others frequently remark that they would not have been able to engage with such seemingly distant, yet highly relevant, disciplines without SESYNC support.

Finally, during this reporting period, SESYNC's leadership has continued to advance the emerging field of interdisciplinary evaluation. In October 2020, Assistant Director for Interdisciplinary Science Dr. Nicole Motzer was invited to present at a virtual workshop convened by the National Academies: *Implications of 'Convergence' for How the National Center for Science and Engineering Statistics Measures the Science and Engineering Workforce*. The material she presented stemmed from a systematic literature review and corresponding database of the interdisciplinary evaluation field from 2000-2019 (publicly accessible via the Harvard Dataverse, DOI: 10.7910/DVN/6UCNKW). Presented advice focused on concrete actions and steps for evaluating interdisciplinarity more accurately and more frequently. Results were showcased via an interactive online visualization (developed with help from SESYNC's data science team), which was distributed to all workshop participants and organizers as a freely-available and practical tool. In addition to a formal Proceedings released to the wider scientific community, recommendations put forth during the workshop were synthesized into core recommendations to guide the thinking and actions of one of the most preeminent academic institutions in the United States. Two papers resulting from this collaborative work are also currently in review in the journal *Research Evaluation*.

Actionable Science. Actionable scholarship is often under-rewarded within academia, and academic researchers often lack the training and experience needed to productively interact with knowledge users and to address public policy questions, as opposed to purely academic questions. SESYNC helps the academic community develop the policy skills, research questions, and partnerships needed to produce innovative actionable scholarship. We provide this support both through support for research groups such as those described above and through more targeted skills training. We provide policy education to our graduate student and postdoc participants via seminars on institutions, laws and

regulations, and natural resource management applications. As a specific example, we provide a regular Policy Immersion unit as part of our Post-Doctoral Immersion Program, which includes a basic grounding in public policy issues, institutions, and approaches to collaboration between scientists and decision makers. It also includes a diverse set of speakers with deep practical knowledge of how science can matter to public discourse and decisions.

Interaction with knowledge users occurs across our programs and throughout our engagement with teams. From the proposal solicitation to proposal reviews and to facilitation and support of research teams, SESYNC actively encourages the engagement of non-academic experts in its work. We help recruit these participants and work with teams to integrate policy, institutional, and natural resource management insights into their research plans. Other teams undertake projects that potential knowledge users have identified as important to our mission. Participants from at least 130 non-academic institutions have come through the center during the first five years of this award. Of those in our core programs that reported demographic information from this award, 19% of SESYNC participants come from outside academia and 63% of the 92 reporting research teams include knowledge users.

SESYNC embraces a spectrum of actionable scholarship, from fundamental research needed before more applied research can move forward, to research on broad, global socio-environmental issues, to research that informs more specific policy questions. *Specific examples of policy-relevant scholarship are listed below under Societal Impact.*

Diversity, Equity, Inclusion, and Justice (DEIJ). During this reporting period, SESYNC expanded its efforts in this area in order to build and enhance human resources. First, internally, SESYNC Director Margaret Palmer organized an interactive series of DEIJ virtual forums offered for SESYNC staff, postdoctoral fellows and Graduate Research Assistants. The forums focused on topics such as 1) Exploring Implicit Bias; 2) Not post-racial, but post-racist; 3) Origin of racist beliefs; 4) What SESYNC can do and what more we need to do. Participation was very high. Each included a short presentation or thought-provoking film, a self-reflective activity, and a group discussion period. In addition to this, SESYNC's postdoctoral scholars requested additional activities focused on DEIJ that included informal discussions based on readings and lectures.

The second major activity during this reporting period was an extension of SESYNC's ongoing effort to engage underrepresented communities in SE and interdisciplinary science. Starting in the previous reporting period, Dr. Nicole Motzer led a team in a concerted effort to reach out to graduate students across a wide spectrum of diverse underrepresented communities in research institutions nationwide. A highly interactive workshop program was developed with the help of SESYNC postdoctoral fellows, which included SE skill building as well as sessions designed specifically to address the needs and challenges that students from underrepresented groups face in conducting research. While the original in-person workshop was canceled due to COVID-19, it was transitioned to a fully virtual format that concluded during this reporting period. As described in previous sections, the 8-week series of virtual workshops helped 21 participants build the skill set needed to undertake an interdisciplinary S-E research collaboration, while simultaneously advancing diversity, equity, inclusion, and justice. Of the 18 students in this program who submitted a demographic survey (response rate = 86%), 5 (28%) self-identified their ethnicity as Hispanic and 12 (67%) self-identified as a race other than white. 14 (67%) of participating students were women. The training sessions culminated in the release of a Request for Proposals for Pursuits intended solely for this student group.

Human Resources. Through this reporting period (as of May 2021), SESYNC has supported 1869 total individual participants under this cooperative agreement, representing 124 initiated projects (Pursuits, Foundations, Workshops, and Short Courses).

For those participants who filled out SESYNC's demographic survey, the following percentages illustrate SESYNC's cumulative impact from this award on the development of human resources (from September 2016 through May 2021). The response rate for the demographic survey is 83% for this award.

Of those reporting, SESYNC has supported 712 men, 910 women, and 8 non-binary people (44%, 56%, <1% respectively; note that the non-binary option was added to our survey only in March 2019). Approximately 79% of participants are from the United States (representing 48 states and Washington D.C.) and 21% of participants are international (representing 49 countries).

As mentioned in the previous section, we support participants from a wide range of disciplines and institutions. When asked to self-characterize, reporting participants from all SESYNC programs (including Pursuits, Workshops, Foundations, and Short Courses), responded as follows: 552 chose natural scientist (36%), 375 chose social scientist (24%), 386 reported as both natural and social scientist (25%), and 13 chose computer scientist (1%). The remaining participants self-reported as NGO, government, policy, or industry (117 individuals, 8%) or other (87 individuals, 6%).

The racial and ethnic diversity of all SESYNC participants on this award who responded to the question (76% response rate) is illustrated in the percentages below, versus All Biological Science Degrees, US Citizen and Permanent Resident (2012) from the National Science Board Science and Engineering Indicators in parentheses:

- White: 71% (67.6%)
- Asian or Pacific Islander: 11% (11.7%)
- Black: 5% (4.7%)
- Hispanic: 4% (5.8%)
- American Indian or Alaska Native: <1% (0.6%)
- Multi: 9% (Indicators category of "Other or Unknown Race or Ethnicity": 9.6%)

Societal Impact. A core aspect of SESYNC's mission is to foster actionable scholarship. Actionable scholarship is research with the potential to inform decisions within government, business, and households; improve the design or implementation of public policies; influence public or private sector strategies; and inform planning and behaviors that affect the environment. SESYNC takes a deliberate approach to fostering actionable research. Many of our synthesis teams directly engage non-academics who we refer to as "knowledge users." Knowledge users from the business community, government agencies, and the NGO sector enrich our scholarship in a variety of ways. They help frame research questions that emphasize solutions to socio-environmental problems, stimulate creativity by asking different kinds of questions, provide guidance on policies and institutions affecting environmental decision-making, and help communicate the work to broader audiences.

The following are current examples of policy-relevant actionable scholarship supported by SESYNC:

- *Pursuit: Global Dam Watch:* Across the globe, millions of dams influence freshwater availability, economic and agricultural development, sanitation, flooding, and in some cases power generation. They can also profoundly affect ecological systems and access to water across large watershed systems. Unfortunately, a lack of globally consistent and up-to-date dam data prevents

decision makers and researchers from fully understanding the impacts of dams, analyzing the efficacy of water scarcity mitigation, and monitoring of progress towards water-related policy goals. This project explores new remote sensing imagery technology and machine learning techniques in order to build a comprehensive global dam, reservoir, and river barrier database that covers dams of all sizes and that is fully georeferenced, consistent, and updated at regular intervals. A goal of the project is to provide policy makers with critical multi-scale information on dams so that dam impacts can be better evaluated and managed. It includes participants from the European Commission and the Nature Conservancy.

- *Graduate Pursuit: Wildfire Effects on Respiratory Health*: Increased wildfire frequency and intensity in the western U.S. overlaps with intensive agricultural production, often involving outdoor manual laborers exposed to air quality problems. By combining satellite imagery of wildfire extent and air quality data across Oregon and California – along with agricultural crop production cycles and labor demand – this group is developing a model to quantify the respiratory health risks faced by farmworkers as a consequence of fire events. The work is expected to have implications for fire suppression management and farmworker health protection initiatives, and to shed light on the relationship between fire, human health, and social equity outcomes.
- *Workshop: Indicators to Inform Climate Adaptation Planning.* There is a growing demand for national-scale indicators of climate change impacts to inform adaptation planning by government agencies. This group convened to assess the status of U.S. agency indicators, identify gaps, and propose deployable new indicator systems that integrate biophysical climate information with social metrics – with an emphasis on how they can support adaptation and resilience decisions. Attendees included participants from the Environmental Protection Agency, US Forest Service, and National Oceanic and Atmospheric Administration.
- *Workshop: Does Current Science Support the Management and Policy Needs of Cold-Water Refuges for Salmonids in a Changing World?* Fish such as salmonids are an important economic and cultural resource and are highly sensitive to thermal degradation. Many regulatory, management, and conservation organizations seek to protect and restore cold-water refuges in rivers, yet there is a disconnect between management policies and the scientific research on these refuges. This virtual workshop brought together ecologists, hydrologists, policy experts, and managers from multiple agencies to explore gaps in research and policy, co-develop shared definitions, and set an agenda for implementing cold water refuges in socio-environmental systems. Participants' organizations included USGS, NOAA, US EPA, Gespe'gewaq Mi'gmaq Resource Council, and Trout Unlimited. In addition to scholarly products in development, the group is planning webinars and meetings with stakeholders to continue their work.

DISSEMINATION OF RESULTS

During this reporting period, our communications team has taken new efforts to enhance the output and reach of SESYNC's research communications. These efforts have included developing a new collection of socio-environmental resources, designing a new website, and finding new means to connect with our audiences virtually.

Developing SESYNC's Resource Collection. During this reporting period, SESYNC has started producing its collection of resources designed to accelerate interdisciplinary socio-environmental (S-E) research. These resources are the result of S-E scholars' expertise, the experiences of SESYNC in facilitating interdisciplinary team science, and the knowledge produced by our funded researchers. Tackling a breadth of topics in a variety of formats, these resources aim to appeal to those at every stage of engaging with socio-environmental research and science, including students, educators, self-taught learners, and researchers.

For example, we launched a new tutorial and webcast series dedicated to explaining concepts inherent to socio-environmental modeling. Tutorials will include written material and videos. Thus far the videos within this series include an introduction to agent-based modeling in the context of socio-environmental systems; an overview of the grand challenges of modeling socio-environmental systems; an introduction to socio-ecological networks, and more. Other staff are currently developing curricula using new and existing materials on topics like environmental economics and team science, that educators and self-learners alike can use. Resources like our socio-hydrology and political ecology explainers provide a high-level introduction to complex S-E topics with questions to consider and recommended readings for further exploration. Additionally, three of SESYNC's seasoned facilitators recently wrote a guide to facilitating interdisciplinary meetings, based on approaches and practices used at SESYNC in facilitating synthesis meetings, trainings, and workshops to help improve teamwork processes. This guide has had nearly 900 downloads on our website in three months, and the journal *Socio-Ecological Practice Research* recently published a companion article to this guide on "The value of facilitation in interdisciplinary socio-environmental team research."

To create these products, SESYNC has tapped into the expertise of our staff including our core leadership team, and leaders of our graduate program, our Immersion program, our computational program, and our communications team, who has been responsible for designing, editing, and producing the resources. In addition to having SESYNC staff contribute content for products, SESYNC has asked and will continue to ask external scholars to contribute to the development of various resources. For example, Dr. Deana Pennington, of the University of Texas at El Paso, recently contributed to a series of videos on knowledge integration across disciplines, based on her scholarship and a workshop she presented to SESYNC's postdoctoral fellows. By including experts outside of SESYNC in developing our resource collection, we hope that these products will represent a range of disciplines, perspectives, experiences, and approaches to provide a complete picture of S-E research. Together, we believe this breadth of materials will help individuals confidently conduct their own interdisciplinary work at all scales.

For a comprehensive list of completed resources, please see the Products section of this report.

Redesigning SESYNC's Website. To better communicate SESYNC's research impacts and resource collection, the Center is currently in the process of redesigning our website. With the onset of the COVID-19 pandemic this past year, SESYNC has realized the value in being able to offer information and resources virtually. Our new site will reflect this need by primarily showcasing our new resources, as well as highlighting the achievements of our funded research teams, including their publications and research products. While our current site has mostly served those seeking opportunities to engage with SESYNC, this new site will offer greater information to the wider research community through a more accessible platform. An advanced search function and more filtering options will allow users to more easily navigate through the site and discover our resources and funded research. Users will also have the

ability to explore curated content under themes that exemplify typical S-E problems, access lessons and course curricula for the classroom, and find materials to improve their approaches to team science. The site will also feature an improved tagging system allowing users to more clearly see the connections between our funded research projects, our researchers, and their publications and results.

With a more modern and easier to navigate design, we believe this site will put our research impacts and resource collection at the forefront for our audiences, ultimately enabling us to accelerate interdisciplinary research beyond SESYNC's doors. We are continuing to work with the developer and hope to launch this new website by the end of 2021.

Communicating Virtually.

SESYNC Seminars. As a result of the COVID-19 pandemic, this past year we transitioned our in-person seminar series to an online format for both our fall 2020 and spring 2021 series. Hosting our speakers via webinar, we were able to not only draw a much larger audience than our in-person talks would typically allow, but we were also able to welcome participants from around the world. Through these virtual talks, we were happy to foster conversations among the wider research community and create connections—even while socially distanced. In addition to hosting these live talks online, we also recorded many of them and made them available on our YouTube channel, providing an additional means for our audiences to access the information. Due to the positive response we received to our virtual seminars (most drawing 50–100 participants), we've realized that there is a demand for seminars like these within our community, and we hope to continue to offer these events in the future.

Enhancing Our Newsletters. Despite the pandemic preventing teams from visiting our center, we have continued to connect with the wider SESYNC community via our newsletters. Reaching over 5,000 people per month, our newsletters have been providing regular updates about our upcoming virtual seminars, seminar recordings, newly released resources and videos, publications, postdoc accomplishments, research team accomplishments, cyber blogs, and other virtual events. Our newsletters continue to surpass average open rates with rates consistently in the high-20s to mid-30s percent range.

Increasing Our Digital Presence. We have continued to maintain a strong web and social media presence throughout this year of the award. To date in the current grant year, the SESYNC website received over 46,000 visits. SESYNC's social media channels—which include Facebook, Twitter, YouTube, and LinkedIn—have continued to be useful tools for reaching and engaging audiences within the scholarly community. From May 2020 to May 2021, our Twitter followers increased from 6,446 to 6,816 and our Facebook community stayed steady with over 1,300 followers. The SESYNC YouTube channel has grown considerably in followers from 3,385 subscribers to 5,802, and our videos have received a combined total of 573,887 views. We increased our activity on LinkedIn during this reporting period and now have 644 followers.

MAJOR ACTIVITIES

Newly Supported Research Projects.

SESYNCs previously funded synthesis teams and postdoctoral projects continued to receive strong support from SESYNC and our staff. Those teams granted support during the first three years of this 2nd NSF award have started wrapping up their meetings,

and we are now seeing the results of these synthesis efforts come to fruition in the form of academic publications, follow-on research proposals, targeted materials for decision-makers, and other products.

To date, over 170 peer-reviewed publications have been published from research supported under this cooperative agreement, including 50 papers published during this reporting period so far. These publications are listed in the "Products" section of this report. SESYNC researchers supported by this award have also given over 230 total presentations and submitted at least 55 proposals to external funders to follow up on their SESYNC work. SESYNC research is influencing stakeholders and policymakers across diverse arenas, including the UN Food and Agriculture Programme, the USDA Natural Resources Conservation Service, the Maine Climate Council, local governments, and grassroots urban agriculture and food security organizations. More details on these outcomes are included under the question on broader societal impacts.

In terms of new awards, SESYNC granted support to a limited number of new teams during this reporting period, all of whom have started their research projects remotely. The following new projects were granted support during this award period:

Pursuit Cohort 22: Collaborative & Interdisciplinary Team-Based Research Projects Granted support in September 2020:

- 2020C22-009: Mangrove science for action – how threats and national governance shape mangrove conservation outcomes. PIs: Dominic Andradi-Brown and Mischa Turschwell.
- 2020C22-012: Migration, Marginal Agricultural Land, and Tree-Cover Expansion in Low- and Middle-Income Countries. PIs: Jeffrey Vincent and Sara Curran.

Graduate Student Pursuits Cohort 8: Granted support in March 2021:

- 2020GS8-001: Impacts of wildfire on farmworker respiratory health in the Western USA. PIs: Kenzo Esquivel and Clara Qin.

Workshops Granted support in September 2020:

- 2020W-100: A socioecological systems view of urban green spaces for evaluating use and equity. PIs: Christopher Lepczyk and Charles Nilon.
- 2020W-101: Does current science support the management and policy needs of cold-water refuges for salmonids in a changing world? PIs: Francine Mejia and Valerie Ouellet.
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<u>Short Courses</u>

SESYNC continued to offer 3 highly successful and over-subscribed short courses during this reporting period, including a new short course on developing decision support tools. All short courses were offered virtually.

- 2020SC-034: Bayesian Modeling for Socio-Environmental Data. (December 2020; PIs: Mary Collins, Thompson Hobbs, Christian Che-Castaldo)
- 2020SC-035: Decision Support Tools in RShiny. (February – March 2021; PI: Denis Valle)
- 2021SC-039: Computational Summer Institute. (July 2021; led by SESYNC data science team)