Maine's Sustainability Science Initiative

Year 3 Annual Report

For EPSCoR award EPS-0904155

Covering the time period of:
July 1, 2011 to June 30, 2012

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YEAR 3 ANNUAL REPORT for the period July 1, 2011 to June 30, 2012

I) EXECUTIVE SUMMARY

A) RII Vision, Mission, & Goals:

The mission of the Maine EPSCoR Sustainability Solutions Initiative (SSI) is to connect knowledge with action in ways that promote strong economies, vibrant communities and healthy ecosystems in and beyond Maine. The vision is that this will lead to the creation of the Center for Sustainability Solutions (CSS) at the University of Maine, which will be a national and international center of excellence in sustainability science. The overall research goal is to focus on the dynamics of social-ecological systems (SES) with an understanding and strengthening of connections between knowledge and action (K-A), and to perform Organizational Innovation (OI) research to improve university-stakeholder partnerships. Other goals address diversity, workforce development, cyberinfrastructure, external engagement, evaluation and assessment, sustainability, and management objectives. During YR3 of this RII project, significant progress was made in establishing a strong research and education infrastructure for Maine in this sustainability area, which has positioned the project to solidify and strengthen the enterprise and have a major impact in the state.

B) Overview of Project Efforts:

1) Research:

Particular attention during YR3 focused on growing and integrating SSI's research capacity. Collaborations between research teams and institutions are on-going to address key problems of sustainability. The research supported by the project has produced substantial scholarly outputs, including 78 peer-reviewed publications, 11 technical reports, 200 technical presentations, and 204 participants at over 100 professional conferences. Internally, SSI's capacity was increased via 75 research presentations at SSI team activities. Opportunities for project-wide interaction and synthesis occurred through dozens of activities.

Another key aspect of SSI is collaboration with stakeholders via a dynamic, interactive approach to problem-solving. During YR3, SSI engaged in research collaborations with 267 individual collaborators at 145 stakeholder organizations. (Maine EPSCoR collaborated with an additional 53 individuals at 24 organizations in workforce development, education outreach and communication, and human resource development.) Participation included over 200 meetings between research teams and stakeholders involving non-SSI collaborators at 3 of the SSI institutions, 24 institutions of higher education, 19 private-sector organizations, 44 governmental agencies, 49 non-profit organizations, 5 K-12 schools and one private landowner. Fifty-one of those stakeholder groups represent national or international interests. SES or K-A models have been used in 34 public presentations and formal presentations of testimony. These activities have resulted in 30 researchers serving on external boards and scientific advisory committees, demonstrating SSI's long-term commitment to stakeholder engagement.

SSI continued to advance the theory and practice of sustainability science using landscape change as a model system. SSI examines both the coupled dynamics of social-ecological systems (SES) and the connections between SES knowledge and stakeholder actions (Knowledge to Action or K↔A). During YR3, faculty from the University of Maine, the University of Southern

Maine, and eight other primarily undergraduate institutions throughout the state continued to participate in SSI research and integrated education activities in sustainability science.

The SSI projects supported to be in the YR3 portfolio were selected through a three-stage process that included peer reviews from SSI researchers, an evaluation conducted by the SSI Advisory Board, and an assessment by the SSI Management Team (Eckardt, Hart, Nemeth). SSI began YR3 with a portfolio of 24 projects that included 10 core research projects at UM/USM, and an additional eight projects aimed at broadening participation and research capacity at primarily undergraduate institutions. During YR3, SSI made major advances in fostering the growth of research capacity. At least 100 SSI researchers collaborated across more than 30 academic disciplines to study key questions in sustainability science. In YR3, outputs included 78 peer-reviewed publications, 23 technical reports, 209 technical presentations, and 204 participants at over 100 professional conferences. In total, 54 graduate and 101 undergraduate students have been directly involved in SSI related research and classes. Team interactions that directly focus on research include monthly all-team meetings, monthly Research Council meetings, monthly Integrative Discussion Group meetings, topical special lectures, and an SSI retreat in May 2012 for all SSI members.

Efforts to understand and strengthen connections between scientific knowledge about SES and societal actions regarding landscape change are dependent on effective collaboration between researchers and diverse stakeholders. During YR3, SSI teams at 11 colleges and universities collaborated with additional non-SSI collaborators at 3 of the SSI institutions, 24 other institutions of higher learning, 19 private sector organizations, 44 governmental agencies, 49 non-profit organizations, 5 K-12 schools, and with one private citizen. SSI researchers also collaborated with 51 stakeholder groups that represent national or international interests. One aggregate indicator of SSI's continued progress in strengthening connections between knowledge and action is that outouts have been used in 34 public presentations and legislative hearings.

SSI's Organizational Innovation (OI) research is investigating the individual and institutional factors that facilitate and hinder collaborative, solutions-driven research, whether in the context of interactions among faculty and students participating on interdisciplinary research teams, or in the context of researcher-stakeholder partnerships. The goal of this research is to identify social, psychological, and institutional factors that predict interdisciplinary success. Parallel research was conducted to explore how disciplinary and institutional factors influence cooperative behavior of SSI faculty.

One of the greatest opportunities for innovative research in sustainability science is via the development of strategies that increase the ability to generalize from place-based case studies. In SSI, we have initiated research projects specifically designed to show how a portfolio of projects can be used to foster greater integration, facilitate efforts to evaluate the role of context in SES and K↔A processes, and maximize the potential for generalization.

One key step in this integrative process is to develop coordinated systems for data collection and management that provide a basis for comparative analyses among different SSI placed-based projects. Significant progress has been made in developing a typology of SES modeling approaches within and beyond the SSI to identify complementarities and gaps in the SES model portfolio and extract SES modeling best practices.

2) **Diversity:**

Maine EPSCoR continues to develop strategies for improvement, including a targeted effort to engage the Native American population through research that targets the emerald ash borer threat (affecting traditional basketmaking), and the Native STEM Scholarship Development

program for students. In YR3, of the total number of individuals directly supported by this project, 48% were female and 8% were from underrepresented groups. Of indirectly supported participants, 47% were female and 8% were from underrepresented groups. Diversity partnerships included: the National Girls Collaborative Project; Expanding Your Horizons program; the Native STEM Scholarship Development Program and tribal communities; UMaine Upward Bound; UMaine Center for Community Inclusion and Disability Studies; Camp CaPella.

This RII project was an important step for Maine EPSCoR, in that it represented the first opportunity to begin to really reach out statewide in a research theme that resonated will all institutions of higher education (University of Maine is the state's flagship research and PhD institution). This enabled 10 partner institutions (in addition to UMaine) to collaborate in the SSI project and includes: Bates College, Bowdoin College, Colby College, Unity College, University of New England, University of Maine Presque Isle, University of Maine Farmington, University of Maine Fort Kent, University of Maine Augusta, and University of Southern Maine. Two community colleges were also added in YR3 as workforce development partners.

Since the SSI research focus is strongly dependent on collaborations with stakeholders, SSI/SSP researchers engaged in 144 other institutional collaborations during YR3, and Maine EPSCoR collaborated with 25 additional partners in workforce development, education outreach and communication, and human resource development.

3) Workforce Development:

Maine EPSCoR's SSI Strategic Plan outlines a holistic approach to workforce development – education, employment, and economic development are all important components of the process of creating a STEM workforce to ensure Maine's future. During YR3 of this RII project, a total of 318 individuals were directly supported under this project (received salary/wages): 100 faculty, 6 postdocs, 54 graduate students, 101 undergraduate students, 21 high school students, and 36 professional/technical/administrative staff. An additional 6,348 participants were indirectly supported through various outreach, workforce development, and collaborative activities that were sponsored and supported by Maine EPSCoR. New courses were developed, conferences and workshops were offered, and related educational outreach programs targeted students at all levels.

4) Cyberinfrastructure:

During YR3 Maine EPSCoR continued to address the communication, collaboration, visualization, and data needs of the Maine EPSCoR SSI research and education teams. This included: 1) communication (videoconferencing, webcams); 2) visualization cyberinfrastructure (large-scale visualization walls); and 3) data management planning (SSI data plan and cloud compute capacity). In particular, the new SSI Communications Center will be completed in May 2012, and will feature large-scale videoconferencing capabilities that include large wall projection screens, multiple high-definition cameras and projectors, archiving/streaming capabilities, and audio systems

5) External Engagement:

Understanding and strengthening connections between knowledge and action is a key component of the SSI research project. As such, SSI teams at the 11 participating institutions have developed research partnerships with 145 collaborators, including academic, government, private sector and NGOs. In addition, the Maine EPSCoR team is collaborating with an additional 24 other partners in workforce development, educational outreach and communication, and human resource development. The Maine EPSCoR project as a whole engaged with 320 individual collaborators at 169 institutions/organizations during YR3.

Multiple levels of communication activities, which are also integral to the research and education focus, involved presentations, film and video productions, printed materials, websites, conferences and workshops, and a new collaboration with Maine Public Broadcasting Network.

6) Evaluation and Assessment:

The Management Team has a five-pronged approach to project evaluation and assessment that includes formative evaluation processes to improve the project's effectiveness, and summative evaluation processes to assess its impact in relation to its goals. All evaluations determine: 1) the appropriateness of the investment relative to accomplishments; 2) if the investment strategy yields substantial improvement in research and competitiveness; 3) if linkages between the project's research, education, and innovation efforts are effective; 4) if strategies increase participation. Findings enhance efficacy, identify obstacles, assist in developing corrective action plans as needed, and help plan improvements. The levels of evaluation include: 1) on-going annual external evaluation by two independent evaluators; 2) bi-annual AAAS assessment; 3) on-going SSI Advisory Board reviews; 4) NSF EPSCoR Reverse Site Visits and Site Visits; and 5) on-going internal project evaluation and assessment.

7) Sustainability:

Nine months into YR3, the Maine EPSCoR RII project has achieved the majority of its project output benchmarks for the year, including direct support of 318 individuals at 11 institutions throughout the state; 6,348 participants indirectly supported through various outreach, workforce development, and collaborative activities; 78 total publications; 14 websites; 72 grant proposals submitted ($32.5M) with 45 awards so far. Seed funding mechanisms supported faculty new hires, integration efforts, and 8 other NSF programs were leveraged.

During YR3, SSI continued to develop the research and education infrastructure to support a large project of this size, and also engaged in several other steps that will begin the process of building long-term sustainability for the project and enhancing research competitiveness. These included: 1) inter-institutional strategies; 2) University-stakeholder partnerships; 3) government and private sector support; 4) foundation and private support; 5) establishing Maine as a leader.

8) RII Project Management & Structure:

In recognition that a successful project of this compleixty and scope depends on a strong management team and sufficient staff and expertise to develop, implement, and oversee it, a strong project management structure has been put into place. The Maine EPSCoR office and the SSI research office at the Senator George J. Mitchell Center are both based at UMaine and operate under the aegis of the VP for Research (RII Project Director/PI), which provides a strong, synergistic foundation for success. The addition of a multi-level, parallel organizational structure also provides effective programmatic and administrative oversight and successful implementation. The Maine EPSCoR office is responsible for overall management and all non-research components, while the SSI research office is responsible for all research-related components. The Maine Innovation Economy Advisory Board serves as the State EPSCoR committee, and several other committees and advisory boards help to guide the project.

C) Overview of Key Accomplishments:

1) **Project highlights**:

Twenty four interdisciplinary research teams at 11 institutions of higher learning in Maine make up the integrated SSI research portfolio. Direct support of 318 individuals in YR3 included 100 faculty, 6 postdocs, 54 graduate students, 101 undergraduate students, 21 high school students, and 36 professional/technical/administrative staff. An additional 6,348 participants were indirectly supported through various outreach, workforce development, and collaborative

activities. Programs to increase diversity resulted in increased participation, and programs involving Maine's Native American tribes actively engaged them in research and education.

2) **Intellectual Merit:**

SSI is advancing the emerging field of sustainability science in three important and integrative ways: 1) examining the dynamics of coupled social – ecological systems (SES) as landscapes change in response to urbanization and forest management as well as changes associated with climate variability and energy needs, with a goal of expanding our understanding of SES thresholds, feedbacks, and resilience; 2) investigating how such SES knowledge affects, and is influenced by, the actions and decisions of diverse stakeholders, with a goal of strengthening connections between knowledge and action; 3) evaluating the factors that facilitate and impede interdisciplinary collaboration and university – stakeholder partnerships, with a goal of identifying and implementing individual and institutional best practices that are needed to support solutions-driven research programs in sustainability science. We believe that these three synergistic research efforts will make valuable contributions to NSF's increasing focus on advancing the theory and practice of sustainability science.

3) **Broader Impacts:**

This RII project is a fully integrated research and education program that advances discovery and understanding while promoting teaching, training, and learning. All aspects seek to broaden the participation of women and underrepresented groups, and includes a geographically and institutionally-diverse portfolio of projects. SSI has begun to generate a diverse set of broader impacts due to its innovative approach and integrative goals, including: 1) creating a research portfolio that includes more than 100 researchers representing over 30 fields of natural science, social science, and engineering; 2) engaging with over 200 stakeholder organizations (including members of Maine's tribal communities) to identify pressing problems for the state, define research needs, and develop effective solutions; 3) recruiting new faculty, postdoctoral fellows, and graduate students to enhance our culture of interdisciplinary research and practice; 4) launching a statewide collaboration of colleges and universities focused on the theory and practice of sustainability science that currently includes 11 different institutions; 5) initiating new courses and partnerships designed to advance workforce and economic development and help grow Maine's green innovation economy. Collectively, these activities are helping to increase Maine's research capacity and competitiveness at the same time as they enhance our ability to link scientific knowledge with improved actions and decisions.

D) Progress Towards Strategic Plan Goals and Milestones:

Nine months into YR3, the SSI project has met or exceeded goals and benchmarks for YR3 in almost all areas. We will continue to focus on building and improving integration and communication strategies across the research teams and on furthering understanding and knowledge in the areas of SES, K-A and OI. Strategies for increasing grant proposal development and publications were a major area of focus for YR3 and will continue.

E) Actions Taken in Response to Recommendations:

Recommendations made by AAAS, the SSI Advisory Board, and external evaluators have been taken under consideration by the Maine EPSCoR Management Team and the SSI Stewardship Council. These have primarily centered on strategies for dealing with the challenges presented by the complexity and interdisciplinarity of the SSI research project, and the multi-institutional nature and diversity of the project. These recommendations are being utilized to make revisions to the SSI Strategic Plan, which is being re-submitted to NSF EPSCoR April 2012.

II. DETAILED REPORT

II.A. RII Project Participants & Participating Institutions

This RII project for Maine EPSCoR is designed to have a significant impact for the state through the enhancement of research and education in sustainability science. In order to effectively accomplish this, there also is a corresponding investment in human resource infrastructure, workforce development, outreach and communication, and diversity and broadening participation.

The Maine EPSCoR SSI project is based at the University of Maine, which is the state's flagship research and Ph.D. education institution. In YR3, a total of ten other colleges and universities are also participating as Sustainability Solutions Initiative Partners (SSPs), and are receiving funding from Maine EPSCoR to be an integrated part of the SSI research and education enterprise. These include five private institutions: Bates College, Bowdoin College, Colby College, Unity College, and University of New England. It also includes five other campuses of the University of Maine System: University of Maine Augusta, University of Maine Farmington, University of Maine Fort Kent, University of Maine Presque Isle, and the University of Southern Maine. College of the Atlantic participated in YR1 and YR2, but elected not to continue during YR3, and the University of Maine at Machias elected not to utilize their YR2 planning grant and participate. In addition, two community colleges are involved as workforce development partners: Eastern Maine Community College and Southern Maine Community College.

During YR3 of this RII project, a total of 318 individuals were directly supported under this project (received salary/wages): 100 faculty, 6 postdocs, 54 graduate students, 101 undergraduate students, 21 high school students, and 36 professional/technical/administrative staff. Of those totals, 188 were continuing personnel who had also been supported on the SSI project during YR2: 85 faculty, two postdocs, 37 graduate students, 26 undergraduate students, 20 high school students, and 18 professional/technical/administrative staff. An additional 130 personnel were newly supported on the SSI project during YR3. Of that, 26 were existing institutional positions that were new to the SSI project for YR3 and included the addition of 14 faculty and 12 professional/technical/administrative staff. An additional 104 were newly hired positions and included: 1 faculty, 4 postdocs, 17 graduate students, 75 undergraduate students, 1 high school student, and 6 professional/technical/administrative staff.

(Note: Student research internships are very specifically not fellowships, and are considered employee positions at our universities and colleges, whether at the graduate, undergraduate, or high school level. All student positions include job descriptions specific to the SSI project.)

All of these personnel have been reported in NSF Fastlane as participants.

An additional 6,348 participants were indirectly supported through various outreach, workforce development, and collaborative activities that were sponsored and supported by Maine EPSCoR. (Note: These participants are considered indirectly supported because they did not directly receive funding support for salary/wages, but the activities they took part in were supported with Maine EPSCoR funding as part of its programming and external engagement efforts.) Participants included: 399 faculty at academic research institutions, 288 faculty at primarily undergraduate institutions, 25 postdocs, 225 graduate students, 290 undergraduate students at academic research institutions, 766 undergraduate students at primarily undergraduate institutions, 316 technical/professional/administrative staff, 205 K-12 teachers/pre-service teachers, 77 K-12 administrators/guidance counselors, 193 high school students, 262 middle school students, 68 elementary school students, 257 K-12 students reached via teacher training,

470 business/industry representatives, 1,004 NGO/government representatives, and 1,503 members of the general public through conferences and workshops.

II.B. PROGRAM/PROJECT DESCRIPTION

II.B.1 Research Accomplishments and Plans:

During this third year of our Maine's Sustainability Science Initiative (SSI) project, faculty from the University of Maine, the University of Southern Maine, and nine other primarily undergraduate institutions throughout the state continued to participate in SSI research and integrated education activities in sustainability science.

Following the editors of the Proceedings of the National Academy of Sciences (http://www.pnas.org/site/misc/sustainability.shtml), SSI has formally adopted the definition of sustainability science as "…an emerging field of research dealing with the interactions between natural and social systems, and with how those interactions affect the challenge of sustainability: meeting the needs of present and future generations while substantially reducing poverty and conserving the planet's life support systems."

Goal #1: Advancing the theory and practice of sustainability science with Landscape change as a model system

The overarching research goal of Maine's Sustainability Solutions Initiative (SSI) is to develop Maine's capacity to conduct world-class, solutions-driven research in sustainability science that is distinguished by its innovative approaches to interdisciplinary collaboration and deep commitment to diverse stakeholder partnerships. A central premise of SSI is that natural science and engineering are necessary but not sufficient for understanding and solving pressing sustainable development problems, which by definition have intersecting ecological, social, and economic dimensions. Using Maine as a laboratory, SSI examines both the coupled dynamics of social-ecological systems (SES) and the connections between SES knowledge and stakeholder actions (Knowledge to Action or K↔A). SSI's focus on landscape dynamics reflects a broad consensus that land change science is a critical research frontier as well as a pressing challenge for sustainable development.

Landscape change is an important nexus for sustainability science research, including the development of multi-scale complex systems models of urban, semi-urban, and rural regions. SSI's progress in understanding the causes and consequences of landscape change is also contributing to broad-based efforts in Maine to chart a more sustainable path for economic and community development. SSI's approach to landscape change research has two novel components. First, it focuses on interactions among three pressing drivers of landscape change (i.e. urbanization, forest ecosystem management, and climate/energy concerns), rather than examining each in isolation. By identifying the differing spatial, temporal, and institutional scales at which these drivers operate, we are developing a more coherent and integrative process for testing SES models. Second, information needs of individuals and institutions that transform and use scientific information shape our research. This integrative strategy facilitates the development of models to improve decision-making processes of individuals and institutions that vary in function, geography, and authority.

SSI is designed as a portfolio of research projects, where each project constitutes a place-based, multi-scale investigation of SES and K↔A processes, patterns, and interactions. While each project offers important learning opportunities in its own right, one of SSI's central goals is to create a quasi-experimental design in which particular groups of projects can be used to

compare and contrast the influence of different processes shaping SES and K↔A. This integrative strategy also increases the potential for drawing inferences about the role of contextual factors (e.g. biophysical, socioeconomic, and decision-making characteristics) and scale on system behavior.

SSI used two design principles to populate the portfolio with place-based, use-inspired interdisciplinary research projects. These principles are intended to promote sufficient among-project consistency to accelerate the solutions development process and increase opportunities for synthesis and learning via comparative analysis and rapid feedbacks. The first design principle is that research endeavors with a proactive stakeholder engagement process are likely to pre-select candidate problems that, if solved, will fill an important knowledge gap with an urgent societal context. The second design principle is that numerous sustainable development challenges are inherently complex and multi-faceted, thus necessitating team-based problem solving.

The integrative structure of SSI can be illustrated in two Venn diagrams. These diagrams show how the different collaborative teams are working to weave together the themes and arenas of SSI. Starting with the themes (Figure 1), most of the projects fall within the overlap of SES and K↔A. (Note that projects are identified by numbers as listed in Appendix 10.) This is reflective of a primary objective of SSI to integrate research into SES dynamics with actions (decision-making) on the human side of coupled human-natural systems. The small dispersion of projects in the diagram is indicative of the cohesive nature of the research question and to some degree, the location of the team (SSI involves 11 institutions across the state). The Organizational Innovation (OI) theme has fewer projects showing because in part the internal research is a longitudinal study of SSI as a whole and independence is necessary to derive valid results. Also, four projects do not plot onto this diagram because they are integration projects that are analyzing the whole SSI portfolio of projects to develop broad theory and methods for sustainability science.

SSI research projects can also be represented in terms of their emphasis on different arenas (or drivers) of landscape change, as shown in the second Venn diagram (Figure 2). As this diagram clearly shows, the majority of SSI projects examine the roles of all three drivers of landscape change in their place-based efforts to advance the theory and practice of sustainability science. This focus on multiple drivers of landscape change increases SSI's ability to evaluate the independent and interactive effects of different drivers. For the purposes of summarizing the research accomplishments of specific SSI research teams during YR3, however, the projects are grouped within specific arenas (see below). One consequence of this organizational arrangement is that it necessarily under-represents the extent to which SSI projects consider interactions among landscape change arenas. Please note that two projects do not plot well on this diagram but are referenced overall. These projects are working across all the arenas with the goal of applying uniform methods of data collection and analysis to develop analytical procedures that are broadly applicable to the emergent problem of generalization in sustainability science.

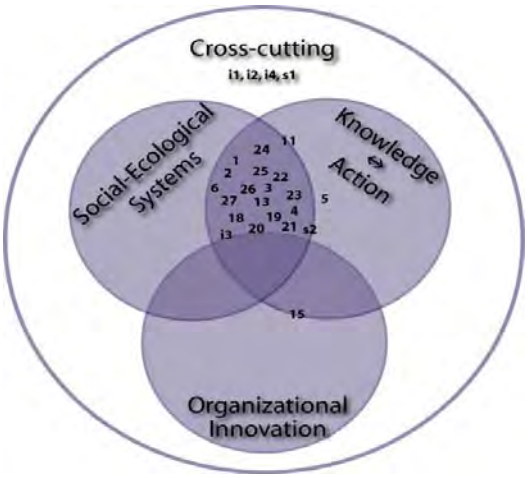

Figure 1. Venn Diagram of SSI's Cross-Cutting Themes.

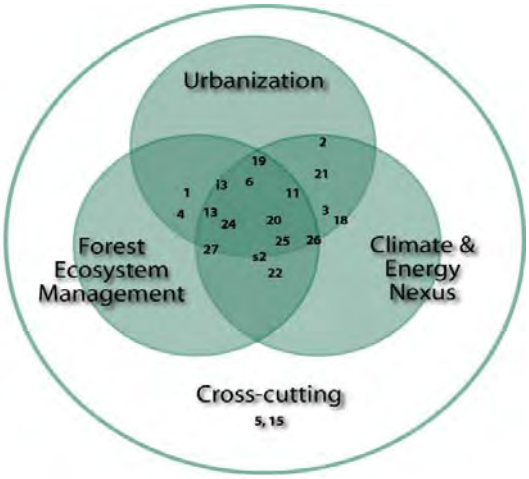

Figure 2. Venn Diagram of SSI's Arenas.

Research Progress in Cross-Cutting Themes and Arenas:

During YR3, SSI had a portfolio of 24 projects that included 10 core research projects at UM/USM and an additional eight projects aimed at broadening participation and research capacity at the primarily undergraduate institutions. SSI also continued four overarching integration projects as part of a voluntary cost contribution to the research portfolio (not funded by NSF), and two seed projects were funded for new faculty hired under SSI. (A listing of projects, their yearly status, and team members is included in Appendix 10.)

The SSI projects supported to be in the YR3 portfolio were selected through a three-stage process that included peer reviews from SSI researchers, an evaluation conducted by the SSI Advisory Board, and an assessment by the SSI Management Team (Eckardt, Hart, Nemeth). Three of the YR2 core research projects at UM/USM were retired after YR2 based on the on-going review, evaluation, and feedback processes built into SSI. Five core research projects from YR2 were integrated into another project to improve efficiency and meet broader SSI goals of increased integration across themes and arenas. College of the Atlantic elected not to continue their project into YR3, and University of Maine Machias elected not to utilize their YR2 Planning award and participate.

All research projects directly address the goals and objectives defined in the Strategic Plan for Maine's Sustainability Science Initiative. Projects are evaluated based on the plan's specific strategies, benchmarks, and timelines. (Details on benchmark progress for YR3 can be found in Appendix 2: Objectives, Strategies & Benchmarks.) All teams will continue to pursue the strategies, benchmarks, and timelines as detailed in the Maine EPSCoR SSI Strategic Plan for YR4.

The following summary of research progress highlights is organized by cross-cutting themes and arenas. For the sake of simplicity, projects are reported by the arena. Projects are identified (see project identification numbers in Appendix 10) to show the connections that weave across all of the component parts of SSI. Overall, significant progress has been made across SSI based on numerous metrics for interdisciplinary research, scholarly productivity, increased number of best practices, student education in STEM, cross-institutional collaboration, and increased effectiveness in stakeholder engagement and contributions to decision-making.

During YR3, SSI made major advances in fostering the growth of research capacity. A total of 100 SSI researchers collaborated across more than 26 academic disciplines to study key questions in sustainability science. In YR3, outputs included 78 peer-reviewed publications, 11 technical reports, 209 technical presentations, and 204 participants at over 100 professional conferences. In total, 54 graduate and 101 undergraduate students have been directly involved in SSI related research and classes. Team interactions that directly focus on research include monthly all-team meetings, monthly SSI Research Council meetings, monthly SSI Integrative Discussion Group meetings, topical special lectures, and an SSI retreat in May 2012 for all SSI members.

Efforts to understand and strengthen connections between scientific knowledge about SES and societal actions regarding landscape change are dependent on effective collaboration between researchers and diverse stakeholders. Interactions between SSI research teams and Maine stakeholders continued to grow in quality and quantity. During YR3, SSI research teams at the 11 colleges and universities collaborated with 27 other institutions of higher learning, 19 private sector organizations, 44 governmental agencies, 49 non-profit organizations, five K-12 schools, and with one private citizen (146 total). Of these stakeholder groups, 51 represented national or international interests.

One aggregate indicator of SSI's continued progress in strengthening connections between knowledge and action (symbolized as K↔A) is that SSI's research results (including results from both SES and K↔A models) have been used in 34 public presentations and formal presentations of testimony. Testimony to the Maine Legislature by SSI team members and partners was pivotal to the passage of LD1613, a bill that will help strengthen relationships between land owners and land users that are needed to sustain Maine's unique tradition of public use of private land for recreation.

Goal #2: Social-Ecological Systems (SES)

Research into the dynamics of coupled SES has advanced significantly during YR3. Overall, there has been project-wide success in analyzing SES to quantify thresholds and feedbacks. These analyses have contributed to the development of new models or improved existing models that explore the context-dependence of SES dynamics. A variety of model structures have been employed, such as discrete event simulation (agent based), probabilistic (Bayesian), continuous dynamic simulation (hydrological model), and stochastic (UrbanSim). The role of SES modeling in advancing both the theory and application of sustainability science has become a key focus of SSI graduate research and SSI-specific graduate courses. For example, one new course was built around the theory and application of participatory modeling (#I-4). During YR3, progress was made on related efforts to develop new best practices integrating stakeholders into model development and use. The Bayesian Belief Network model was built using substantial stakeholder and focus group input (#6, #7). This research provides rigorous data that are utilized to test theory and to develop into new methods for the growth of sustainability science.

a) Urbanization:

Urbanization represents an important frontier in SES research, an area of concern to many Maine stakeholders, and an essential element of 11 SSI projects (#1, #2, #3, #6, #7, #11, #19, #20, #25, #I-3, #SS-1). SSI's research models how social and ecological systems shape, interact with, and respond to changes in urban and urbanizing landscapes (#1, #2, #3, #6, #7, #11, #19, #SS-1). Particular attention has been given to the urbanization patterns in the Portland and Bangor Metropolitan Regions, with emphasis on interrelationships between transportation

infrastructure and energy use (#2, #6, #I-3). The Bayesian belief network (BBN) model developed to examine the dynamics of coupled SES within forested and urban arenas has been linked with spatial maps to show the effects of opinions and policy-decisions on land use in the Lower Penobscot River and Casco Bay regions (#6, #7, #I-3). This model provides a platform to examine future landscapes based on land-use policies and drivers affecting decision-making. The coupled BBN-Water Quality model is being generalized to derive a coupled land use-water quality model for use in settings with varying degrees of urbanization. Progress has also been made on a heuristic watershed model that can be easily manipulated by any user to show how lake level changes are mediated by the effects of urbanization on rainfall-runoff relationships (#3).

b) Forest Ecosystem Management:

The Forest Ecosystem Management arena is an essential component of 14 projects (#1, #3, #4, #6, #7, #8, #13, #19, #20, #22, #25, #26, #27, #I-3). Tremendous progress has been made in developing an Emergency Response Plan for the expected arrival of the emerald ash borer or EAB (#13). This invasive species has killed over 50 million trees in the Midwest. In Maine, ash trees are essential to Native communities as a cultural resource and source of basket-making materials. In addition to developing a response plan in partnership with tribes, federal and state agencies, and NGOs, SSI has collaborated with various partners to map critical habitat for brown ash and establish an early detection network for EAB. Work is underway to test different emergency response strategies to protect this resource, including depositing ash seeds in the National Center for Genetic Resources Preservation. The hemlock wooly adelgid is another invasive species that is attacking hemlock trees (#22). Experimental plots are being used to determine how the loss of hemlock will affect natural stands of timber. This forest ecosystem research is coupled to research on how the wood products industry perceives this threat to hemlock timber supply. In other SSI projects, economic drivers are being studied to define how the local social structure and economy is influenced by natural-resource based industries (#25). Competing demands for consumptive uses versus tourism are significant factors affecting long-term land-use decisions. The research is being coupled with biophysical monitoring sites and socioeconomic surveys to index how all the drivers of landscape change are interacting in the study area.

c) Climate & Energy Futures:

The role of climate and energy changes in SES dynamics is included in the focus of 13 SSI projects (#1, #2, #3, #6, #7, #19, #20, #21, #22, #24, #25, #26, #SS-1). The development of the first commercial ocean-floor turbines in the United States for generating electricity to the grid is happening in Maine. With significant input from local fishing communities, SSI researchers have made major progress in quantifying how fish assemblages are likely to respond to the presence of these tidal turbines. The success of this deeply collaborative approach has attracted global interest and resulted in a new collaboration with a Japanese public-private partnership seeking to reduce Japan’s reliance on nuclear power. In another SSI project, a module for Urban Sim is being used to test theories of the generation, delivery, and use of energy in urbanized areas (#2). This involved the creation of a set of computer simulation models to analyze and predict growth patterns and related energy use. The conversion of fallow agricultural land to energy crop production is an energy alternative for northern regions in Maine (#24, #26). Work completed in Year 3 includes a spatial analysis of cropland potential and assessment of stakeholder ability to convert land to new types of energy crops such as alfalfa, reed canary grass, and switchgrass (#24). Much progress has been made in linking models of climatic conditions to future weather

in communities vulnerable to sea-level rise and severe storms (#11). This work used multivariate statistical analysis of weather records, model climate scenarios, and community needs to co-produce decision support tools that can help communities adapt to future weather extremes. The graphical user interface for the lake hydrology model was improved to make it easier for stakeholders to use and learn how changing weather patterns affect lake level (#3). Historical data were collect from archival and oral sources to map historical climate change, development patterns, water resource uses, and the occurrence of new invasive species as well as the loss of native species (#6, #7, #19, #20, #22, #25, #27, #I-3).

Goal #3: Knowledge↔Action (K↔A)

Knowledge to Action (K↔A) research has progressed in YR3 via the analysis of factors that affect interactions between scientific knowledge and stakeholder actions. This includes a rigorous assessment of alternative methods for assessing stakeholder knowledge. Research has also evaluated how K↔A connections are affected by communication processes, social learning, and trust. SSI recognizes that K↔A is a reciprocal process, so research has focused on how individual and institutional actions can influence the process problem formulation and knowledge generation (#4, #5, #8, #14, #15, #17, #19, #20, #21, #22, #25, #I-1, #I3, #I-4, #SS-1, #SS-2). Collectively, this research represents over 200 meetings with 144 stakeholder entities which has been detailed through surveys and focus groups. The results of this research have been presented to peer groups at conferences and symposia (67 oral presentations and 30 poster presentations).

a) Urbanization:

K↔A outcomes in YR3 saw improvement in models of how urbanization as a major force in landscape change is affected by stakeholder needs (demands), the supply of knowledge, and individual and community decision-making (#2, #3, #4, #8, #I-3). UrbanSim is a computer-based simulation technology for the analysis of the complex interactions of SES in Maine's urban areas (#2). These simulation technologies are being tested with stakeholders to determine how to best present choices to stakeholders and decision makers. Other GIS-based models of landscape change related to land-use policies and stakeholder requirements have been applied to town-level concerns including transportation corridors, land suitable for development, and open space (#4, #6, #7, #8). The stakeholder demand for these data-intensive GIS and simulation models is high.

Several projects studied the utilization of knowledge systems to problems expressed along the urban to rural gradient. The need to derive replicable methods is recognized and progress has been made developing best practices for stakeholder engagement (#I-4), identifying behavior motivators (#5, #14, #17), and facilitating knowledge co-production (#SS-2). Particular effort was applied to define stakeholder typologies as a method to analyze the rational basis for stakeholder management of the consequences of urban landscape change (#19, #20, #21, #I-1). This approach has been used to build collaborative solutions to the management of land-uses in municipalities to conserve the landscape and ecological functions of vernal pools (#1).

b) Forest Ecosystem Management:

Significant K↔A progress has occurred in Year 3 in the Forest Ecosystem Management arena. New legislation that encourages improved relationships between landowner and land users (LD1613) was passed following important SSI testimony (#4, #8). This legislation is very important because of Maine’s unique tradition of encouraging public access to private lands for recreation. The Bayesian-belief network model was completed and successfully tested with applications to the 2.5 million-acre lower Penobscot River watershed (#6, #7). Stakeholder-

derived future scenarios now serve as potential endpoints for consideration in planning and policy formulation. Also, SSI research has contributed to finding solutions to the problems associated with invasive species that threaten forest integrity and diversity (#13, #22, #27). Particularly, work on the emerald ash borer and the hemlock wooly adelgid have resulted in key outputs for critical habitat mapping, emergency response plans, and outreach to landowners (#13, #22). Another important result was broader collaboration by researchers with stakeholders representing forest resource agencies, industries, and NGOs.

c) Climate- Energy Futures

The SSI program has produced several advances in the arena of climate-energy futures. In terms of energy, researchers have worked with stakeholders to map out the typology of needs and concerns using surveys and focus groups (#5, #14, #17, #24, #26, #I-4). This includes the completion of in-depth surveys for wind power attitudes and the completion of an energy-discourse media database that is used for the meta-analysis of the evolution of stakeholder issues and concerns (#5, #14, #17). SSI researchers have brought about a strong integration of stakeholder processes and perspectives into SSI's sea-floor tidal power project (#18). This has resulted in a strong SSI collaboration to study how information is used for decision-making by environmental and energy interests (#18). Specifically, shared information about fishing and power plant requirements resulted in turbine and cable locations being selected that minimized interference with local fishing operations. New original research based on combining land cover mapping, social choice options, environmental policies, and land uses is being used to derive a more detailed framework that maps the co-evolution of the landscape under natural and human drivers (#6, #7, #19, #20, #21, #25). Statistical analysis of climate time-series trends, extreme weather simulations, and user-friendly hydrological model interface have been developed to help communities understand consequences of a changing climate (#3, #11). As a direct outcome, climate knowledge from SSI has become an important decision-tool for municipalities in financing, maintaining, and replacing culverts (#3).

Goal #4: Organizational Innovation

SSI's Organizational Innovation (OI) research is investigating the individual and institutional factors that facilitate and hinder collaborative, solutions-driven research, whether in the context of interactions among faculty and students participating on interdisciplinary research teams, or in the context of researcher-stakeholder partnerships (#15, #16, #I-1, #I-4, #SS-1). Given this focus, the OI research does not conform to the same organizational structure (i.e., with respect to themes and arenas) as SES and K↔A research. In essence, this research uses SSI's collection of faculty, students, and external partners as a "research laboratory" to develop and test OI theories and identify OI best practices (#I-1).

Several OI researchers are using quantitative and qualitative methods to conduct longitudinal studies of SSI team members. The goal of this research is to identify social, psychological, and institutional factors that predict interdisciplinary success. For example, this research has identified the uncertainty associated with sustainability science research as a potential impediment to interdisciplinary success. Indeed, SSI researchers that have a high tolerance of ambiguity are more likely to express satisfaction with their participation in SSI than faculty with a low tolerance of ambiguity (#15, #16). Parallel research was conducted to explore how disciplinary and institutional factors influence cooperative behavior of SSI faculty through the use of experimental economics methodologies (#I-1).

OI research is designed not only to develop and test theories in organizational science and related fields, but also to identify strategies for enhancing SSI's organizational effectiveness. Research conducted in YR2 suggested that a major factor influencing interdisciplinary success is the degree to which researchers think that they have a "voice" in shaping SSI. OI research conducted in YR3 indicates that two organizational changes made in YR2 have been accompanied by an increased perception of "voice" by SSI team members, and thus, a greater likelihood of interdisciplinary success. Specifically, we created the SSI Research Council, a new decision-making body that includes representatives of all SSI project teams and committees. We also changed the process by which proposals submitted by SSI project teams for Year 3 funding were evaluated. Specifically, we added a step involving peer review by SSI team members. OI research in YR3 suggests that satisfaction with SSI has increased in response to these organizational interventions.

SSI Core Integration Projects:

One of the greatest opportunities for innovative research in sustainability science is via the development of strategies that increase the ability to generalize from place-based case studies. In SSI, we have initiated several research projects specifically designed to show how a portfolio of sustainability science projects can be used to foster greater integration, facilitate efforts to evaluate the role of context in SES and K↔A processes, and maximize the potential for generalization.

One key step in this integrative process is to develop coordinated systems for data collection and management that provide a basis for comparative analyses among different SSI placed-based projects. One project (#I-4) is building capacity in data collection and cross-project comparisons, particularly in the context of social science research. Data collection expertise was provided as a resource to all SSI projects and team members. SSI graduate students received training in conceptualization, research design, and instrument design. SSI's cyber-informatics project (#I-2) made progress in several areas, including surveying all teams regarding existing data and data needs, developing appropriate permissions and access on the DSpace storage server, inviting an external expert to consult on metadata concepts, and finalizing a data-sharing plan.

The two other integration projects have made progress in conducting comparative analyses of projects in the SSI portfolio to ensure that the whole of SSI is more than the sum of its parts. There are several key outputs for integration in YR3. A classification system was developed to collect data on the characteristics of each SSI project team (#I-1), including the SES systems being studied, the stakeholders involved, and the solutions context. This research resulted in a classification framework and network analysis of SSI to characterize the structure of the SSI research portfolio and identify major axes of project-specific variation. A second integration project (#I-4,) has focused on how best to employ SES models within a solutions-driven sustainability science program. Significant progress has been made in developing a typology of SES modeling approaches within and beyond the SSI to identify complementarities and gaps in the SES model portfolio and extract SES modeling best practices.

II.B.2 Diversity and Broadening Participation

II.B.2.a Broadening Participation:

While Maine traditionally fluctuates between the first or second least diverse state in the nation with minorities now consisting of around 4.8% of the population (2010 U.S. Census), Maine EPSCoR has a demonstrated track record of being committed to programs and activities

that will expand the participation of women and underrepresented groups in STEM fields. Maine EPSCoR continues to develop strategies for improvement, including a targeted effort to further engage Native American communities. While Maine EPSCoR is dedicated to exceeding the state's minority percentage in its programming, it is difficult to make huge gains in a short period of time. Therefore our focus is on steady improvement.

II.B.2.a.i. Outreach Connections with NSF Diversity Programs

Maine EPSCoR is a collaborating partner in the University of Maine's NSF ADVANCE project, and has been providing on-going support and administrative assistance to the UMaine ADVANCE Rising Tide Center as it got started. During YR3, SSI has collaborated with ADVANCE, as well as UMaine's Center for Excellence in Teaching and Assessment (CETA), on a Interdisciplinary Research (IDR) Workshop Series (see Workforce Development below for details.) In December 2011, we began the planning process to also assist them to implement their first annual networking conference for May 2012, which will involve all the campuses of the University of Maine System as well as the private colleges and universities that are participating in Maine EPSCoR's SSI project (SSI women faculty will be particularly targeted in this effort.) In particular, Maine EPSCoR has committed to providing travel support to women faculty at the private colleges and universities. We are also examining how to expand and modify our reporting database to be able to make information about statewide faculty expertise and research available to ADVANCE participants via a web portal.

Our partnership with the Institute for Broadening Participation (IBP) also continued. IBP, which is a nonprofit organization located in the state, is committed to supporting future scientists as they make their way through their education and careers, and in particular, focuses on making an education and career in science more accessible to women, people of color, and first generation college students. They are associated with the national Alliances for Graduate Education and the Proffessoriate (AGEP). IBP assists in our recruitment efforts at all levels, and Maine EPSCoR works with IBP as a partner in the Maine STEM Collaborative.

UMaine also continues participation with the Northeastern Alliance for Graduate Education and the Professoriate (NEAGEP); takes advantage of diversity strategies that have been developed under the university's past and current NSF IGERT and REU programs; and is looking at possible other NSF grant solicitations to encourage the participation of women and underrepresented groups.

II.B.2.a.i. Long-Term Institutional Partnerships

Maine does not have any predominantly female colleges, Historically Black Colleges and Universities (HBCUs), Tribal Colleges and Universities (TCUs), or Hispanic Serving Institutions (HSIs).

The Maine EPSCoR SSI project is based at the University of Maine, which is the state's flagship research and Ph.D. education institution. In YR3, a total of ten other colleges and universities are also participating as Sustainability Solutions Initiative Partners (SSPs), and are receiving funding from Maine EPSCoR to be an integrated part of the SSI research and education enterprise. These include five private institutions: Bates College, Bowdoin College, Colby College, Unity College, and University of New England. It also includes five other campuses of the University of Maine System: University of Maine Augusta, University of Maine Farmington, University of Maine Fort Kent, University of Maine Presque Isle, and the University of Southern Maine. College of the Atlantic participated in YR1 and YR2, but elected

not to continue during YR3, and the University of Maine at Machias elected not to utilize their YR2 planning grant and participate. In addition, two community colleges are involved as workforce development partners: Eastern Maine Community College and Southern Maine Community College. Additional community college partners are currently in the works.

II.B.2.a.iii. Programs and Activities for Broadening Participation

SSI Strategic Plan Goal #5 for diversity is to "Engage all aspects of the state's human and institutional resources in the achievement of the RII project goals and objectives." The following narrative details YR3 progress under the two main objectives for this goal. (Also see Appendix 2: Objectives, Strategies, & Benchmarks, Appendix 4: Project Personnel Diversity, and Reporting Templates B & D.)

Objective 5.1: Broaden Overall Participation

SSI Strategic Plan Objective 5.1 is to broaden overall participation through increased individual diversity. Strategies and actions encompass diversity in new hires, existing personnel, outreach activity participants, and special programs for Native Americans, women and girls, and disabled.

Maine EPSCoR has formed strong partnerships throughout the years in order to increase the participation of women and underrepresented groups, and these collaborations continued in YR3. With the maturing of the SSI research portfolio, SSI researchers and students are able to be more integrated into the Maine EPSCoR programs that broaden participation. All SSI researchers are directly involved in broadening participation through individual recruitment and mentoring activities, as well as institutional collaboration activities. (See Appendix 4: Project Personnel Diversity, and Template B: RII Participants.)

1) Directly Supported Participants & New Hires: In YR3, of the total number of individuals directly supported (318), 48% were female and 8% were from underrepresented groups. This is an increase over YR2 diversity figures of 45% female and 7% underrepresented groups, and exceeds our targeted benchmarks for YR3 of 35% female and 7% underrepresented.

2) ***Indirectly Supported Participants:*** Of indirectly supported participants in YR3 (6,348), 47% were female and 8% were from underrepresented groups. This is compared to YR2 diversity figures of 72% female and 8% underrepresented groups. Note that the drop in female indirectly supported is due primarily to the Expanding Your Horizons Conference being postponed, which is discussed in further detail below and involved 600 middle school girls. However, both YR3 figures exceed our targeted benchmarks for YR3 of 35% female and 7% underrepresented.

3) ***National Girls Collaborative Project:*** While Maine EPSCoR continues to partner with the Maine Girls Collaborative Project (MGCP) as they begin their second NSF award period (5 years), there has been a shift in focus to K-12 school counselors and an increased focus on girls from underrepresented groups. (Their previous mini-grant program has now ended.) Maine EPSCoR's Program Assistant and Diversity Specialist (Jennifer Dunham) serves as a member of MGCP's Leadership Team and has been participating in the strategic planning activities on how to best implement these new focuses, and where Maine EPSCoR involvement and support would be most strategic. Programming is anticipated to begin by fall 2012.

4) ***Expanding Your Horizons (EYH)***: During YR3, Maine EPSCoR participated in meetings with the University of Maine's Women's Resource Center as they re-examined their annual

EYH STEM conference for middle school girls. After much due diligence, and despite committed Maine EPSCoR support, University budget restraints unfortunately forced them to cancel this spring's conference. However, Maine EPSCoR is now working with collaborators through the Maine Girls Collaborative Project to re-develop the program and formulate a new model for 2013 and beyond.

5) ***NSF ADVANCE:*** see Outreach Connections with NSF Diversity Programs above.
6) ***Native American programs:*** During YR3, the Native STEM Scholarship Development Program, under the coordination of Darren Ranco, Director of Native American Programs and an SSI faculty member/team leader continued to impact the Native community, linking research and STEM education with cultural components significant to the Wabanaki people. Native American SSI faculty member John Daigle and the two Native American Collaborative Research Assistants continue to be key partners in broadening participation efforts. During fall 2011, the re-organization of UMaine's Native American programs and Wabanaki Center was finally completed, but the hiring of the Wabanaki Center's Director is still underway and has limited full implementation of our outreach programs. However, UMaine committed to making it a tenured faculty position (vs. administrative), which will greatly enhance the implementation of the Wabanaki Center's future collaborations with Maine EPSCoR. YR3 progress includes:
    a) During the summer of 2011, SSI Native Collaborative Research Assistant Natalie Michelle coordinated several STEM events for four tribes around the state. Michelle traveled to each of the four communities to teach K-12 students about the Native cultural significance of sweet grass and how to ensure its sustainability. They went into the field where she was able to show them how to plant the grass for sustainable harvesting and talk to them about what kind of environment the plant needs to grow. In addition, two undergraduate students attended one of these events to talk with the kids about STEM career choices for Native students and the importance of future management of tribal lands and resources. An additional 87 K-12 students took part in these events, on top of the 10 that were projected in the YR2 Annual Report. Michelle also developed a curriculum plan on the importance of sustainable harvest and distributed it to teachers in these communities for use in their classrooms. On November 17, 2011, Michelle also invited three members of the Penobscot Nation - the Cultural Historical Preservation Officer, a language instructor, and the GIS Specialist - to the University for an event titled, "Native American Place Names & GIS Mapping: The Penobscot River Watershed." This conversation centered on the merging of GIS mapping and the Penobscot language as a way of combining Native American land knowledge with traditional science. Eleven students, faculty, and community members attended. A second event is scheduled for April 7, 2012 entitled "Our Language, Voices for Mother Earth: A Native Woman's Perspective." This workshop will focus on linking language with different forms of environmental knowledge, thereby linking STEM education with culture and community needs, especially taking into account the role of Native women. The planning committee is also focused on leadership development for 6 Native women undergraduates. Approximately 70 Native women are scheduled to attend (including approximately 30 middle and high school students). This event in particular is garnering a big response from the Native community, impacting how they view the University of Maine and its support for Native people, cultures, and knowledge.

b) SSI Native Collaborative Research Assistant Anthony Sutton is doing community-based research with the Aroostook Band of Micmacs at the Micmac Farm. During the summer of 2011 he conducted several trips to the farm, working with the tribe on food sustainability. On November 21, 2011, he coordinated a panel discussion with two tribal administrators. The focus of the discussion centered on tribal-university partnerships, the Micmac Farm, and how native students can engage in research within their communities. This event was attended by 15 people both from within and outside the University community, including both Native and non-Native students. A few of the Native undergraduates who attended this event remarked that they would like to now do undergraduate research with an impact on their own community. He continues to work to expand this impact, planning to bring SSI research stories to the Boys and Girls Clubs at the Aroostook Band of Micmacs and Houlton Band of Maliseets in April. His goal is to link science and research with community needs for the middle and high school students from these tribes.

c) With the above two Native American Collaborative Research Assistants graduating in May, a search is currently underway for two new graduate students to continue their education and outreach efforts.

d) With support from the U.S. Environmental Protection Agency (EPA), the Houlton Band of Maliseets, and Maine EPSCoR, 5 Native undergraduate students in STEM majors will be traveling to the American Indian Alaskan Native Climate Change Working Group Spring Meeting at the Tohono O'odham Indian Nation in Arizona in April. Plans are to host a follow-up workshop at UMaine in the fall.

e) In collaboration with our NSF EPSCoR Track 2 Northeast Cyberinfrastructure Consortium project, Maine EPSCoR also supported a Native undergraduate student at the University of Maine at Presque Isle (UMPI) in a research assistantship. Rhonda Ireland worked with the Water Quality Department of the Houlton Band of Maliseet Indians, as well as with David Putnam, an SSI faculty researcher at UMPI, on studying the biophysical characteristics and water quality required for planting muskrat root, a medicinal plant for the Wabanaki tribes of Maine.

7) ***Disability programs***: Two programs were implemented in YR3:

a) *Camp CaPella:* In the summer of 2011, Maine EPSCoR piloted a partnership with Camp CaPella, a year-round recreational and educational program for children and adults with disabilities, to support SSI-related programs and activities for these participants. Over 7 weeks of summer camp programming, 138 campers with disabilities were introduced to topics in environmental sustainability in the natural outdoors setting of the camp. Planning is underway to expand this program for the summer of 2012.

b) *CCIDS:* Maine EPSCoR also was able to finally begin a pilot program with UMaine's Center for Community Inclusion and Disability Studies (CCIDS) to develop and evaluate a model for supporting the transition of Maine students with disabilities into STEM-related postsecondary educational opportunities. In December, CCIDS personnel began student recruitment, identifying and developing assessment instruments for measuring student progress, training curriculum development, and identification of STEM-related opportunities within the University of Maine System, including internships, mentorships, site visits, and summer camps. Development is also underway of a 3-day workshop series to being in May that will provide support for high school sophomores and juniors with disabilities interested in STEM careers.

8) ***Upward Bound:*** Maine EPSCoR is collaborating with UMaine's Upward Bound five-week math-science summer program in 2012, which will be fully centered around the SSI project and connect diverse students with SSI researchers, graduate students, and stakeholders. UMaine's Upward Bound students come from six schools in Maine and four in Massachusetts, and are considered at-risk and are almost all from low-income families and will be first-generation college graduates.

II.B.2.b. Institutional Collaborations

Objective 5.2: Institutional and Partner Diversity

SSI Strategic Plan objective 5.2 is to expand institutional and partner diversity in this project (type, geographic, disciplinary, etc.).

The Maine EPSCoR SSI project is based at the University of Maine, which is the state's flagship research and Ph.D. education institution. Maine EPSCoR created a formalized program called the "Sustainability Solutions Initiative Partners" (SSP) program to provide a mechanism for primarily undergraduate institutions in the state to participate in a fully integrated manner in the SSI research and education enterprise. This RII project was an important step for Maine EPSCoR in that it represented our first real opportunity to begin to reach out statewide in a research theme that resonated will all institutions of higher education.

In addition, since the SSI research focus is strongly dependent on collaborations with stakeholders, there is a substantial level of collaboration occurring within the research project.

The Maine EPSCoR project as a whole engaged with 320 individual collaborators at 169 institutions/organizations during YR3. (Note: Individuals at the 10 partner institutions involved in research projects are reported as participants on Template A and are not counted here as collaborators. However, partner institutions are counted here if they have individuals collaborating who are not participants on the SSI project.)

1) ***Institutional:*** In YR3, a total of ten other colleges and universities are also participating as Sustainability Solutions Initiative Partners (SSPs), and are receiving funding from Maine EPSCoR to be an integrated part of the SSI research and education enterprise. These include five private institutions: Bates College, Bowdoin College, Colby College, Unity College, and University of New England. It also includes five other campuses of the University of Maine System: University of Maine Augusta, University of Maine Farmington, University of Maine Fort Kent, University of Maine Presque Isle, and the University of Southern Maine. College of the Atlantic participated in YR1 and YR2, but elected not to continue during YR3, and the University of Maine at Machias elected not to utilize their YR2 planning grant and participate. In addition, two community colleges are involved as workforce development partners: Eastern Maine Community College and Southern Maine Community College. Additional community college partners are currently in the works.
2) ***SSI Research Stakeholder Partners:*** Since the SSI research focus is strongly dependent on collaborations with stakeholders, SSI researchers engaged with 267 of those individuals at 144 institutions during YR3:
   a) *SSI/SSP Institutions with additional collaborators (3):* University of Maine, University of Maine at Presque Isle, University of Southern Maine.
   b) *Institutions of higher education (24):* Aarhus University (Denmark), Acadia University, Arizona State University, City University of New York, Clark University, Harvard University, Leuphana University Lueneburg (Germany), Massachusetts Institute of Technology, Oregon State University, State University of New York, Texas Tech

University, University of California, Berkeley, University of California, Santa Barbara, University of Colorado, University of Connecticut, University of Guelph (Canada), University of Massachusetts, University of New Brunswick, University of New Hampshire, University of Rhode Island, University of South Carolina Beaufort, University of Vermont, University of Washington, Yale University.

c) *Industry/business partners (19)*: Belgrade Bassin', Caswell Forest Products, Creative Conservation LLC, E.D. Bessey and Sons, FB Environmental, Fish n Trips Charters, Great Gadzooks Tidewater Fishing, Halcyon Marine Hydroelectric, Maine Saltwater Outfitters and Guide Service, Ocean Renewable Power Company, Portland Water District, QSR International, Ridley Editorial LLC, S.W. Cole Engineering, Inc., Seven Islands Land Company, Tidewalker Associates, Water Words That Work, LLC, Waterview Consulting, Wright-Pierce.

d) *Governmental partners (44)*: Acadia National Park, Androscoggin Valley Council of Govts, Biddeford Conservation Commission and Open Space Committee, City of Bangor, City of Biddeford, City of Brewer, City of Saco, Eastern Maine Development Corporation, Greater Portland Council of Govts, Lamoine Conservation Commission, Maine Center for Disease Control, Maine Department of Economic and Community Development, Maine Department of Environmental Protection, Maine Department of Inland Fisheries and Wildlife, Maine Forest Service, Maine Geological Survey, Maine Municipal Association, Maine State Planning Office, Maine Technology Institute, Ministere des Ressources naturelles et de la Faune (Canada), National Aeronautics and Space Administration, New York State Department of Environmental Conservation, Orono Economic Development Corporation, Penobscot Nation, Rachel Carson National Wildlife Refuge, Readfield Conservation Commission, Saco River Corridor Commission, Southern Maine Regional Planning Council, St. Regis Mohawk Tribe, Town of Brunswick, Town of Hampden, Town of Hermon, Town of Milford, Town of Orono, Town of Topsham, U.S. Department of Energy, U.S. Environmental Protection Agency, US Army Corps of Engineers, US Fish and Wildlife Service, USDA Forest Service, USDA Natural Resources Conservation Service, USGS Conte Anadromous Fish Lab, USGS Maine Cooperative Fish and Wildlife Research Unit, Vermont Fish and Wildlife Department.

e) *Non-profit and other organizations (49)*: Acadia Learning, Androscoggin Land Trust, Bangor Area Storm Water Group, Belgrade Regional Conservation Alliance, Brunswick-Topsham Land Trust, Burke Environmental Associates, Center for Community GIS, Chewonki Foundation, Coastal Conservation Association-Maine, Cobscook Bay Resource Center, E2Tech, Frenchman Bay Partners, Friends of the Highland Mountains, Greater Lovell Land Trust, Gulf of Maine Research Institute, Indigenous Education Institute, iPlant Collaborative Web Portal, Island Institute, Kennebec Estuary Land Trust, Kennebec Homeowners' Association, Lakes Environmental Association, Maine Audubon Society, Maine Center for Invasive Aquatic Plants, Maine Congress of Lake Associations, Maine Indian Basketmakers Alliance, Maine Lakes Resource Center, Maine Mathematics & Science Alliance, Maine Rivers, Maine Salt Management Taskforce, Maine TREE Foundation, Manomet Center for Conservation Sciences, National Wild Turkey Federation, North Pond Association, Northern Maine Development Commission, Ocean Renewable Energy, Orange County Water Authority, Oregon Museum of Science and Industry, Orono Village Association, Rangeley Lakes

Heritage Trust, Rangeley Logging Museium, Saco River Salmon Club, Sheepscot Wellspring Land Alliance, Small Woodland Owners Association of Maine, Tanks But No Tank, The Nature Conservancy of Maine, Tidal Energy Device Evaluation Center, Trust for Public Land, Volunteer Lake Monitoring Program, Wells National Estuarine Research Reserve.

f) *K-12 institutions (5):* Deer Isle-Stonington High School, Ellsworth High School, Lamoine School, Preston High School, Rangeley Lakes Regional School.

g) *Private Landowners (1):* Jeff Plourde.

3) Maine EPSCoR Partners: Maine EPSCoR also collaborated with 53 additional partners at 24 institutions in general workforce development & STEM education (see note above concerning SSP institutions):

a) *SSI/SSP Institutions with additional collaborators (2):* Colby College, Unity College.

b) *Institutions of higher education (2):*Eastern Maine Community College, Southern Maine Community College.

c) *K-12 institutions (5):*Dedham School, Good Will-Hinckley School, Maine School of Science and Mathematics, Orono High School, Reeds Brook Middle School.

d) *Industry/business partners (5)*: Apple, Inc., Cianbro Institute, National Semiconductor, Maine, Tidemark Institute, Unum.

e) *State governmental partners (3)*: Maine Department of Education, Maine Department of Labor, State of Maine, House of Representatives.

f) *Non-profit and other organizations (7)*: Camp CaPella, Institute for Broadening Participation, Maine Engineering Promotional Council, Maine International Center for Digital Learning, Maine Mathematics and Science Alliance/REACH Center, Maine Space Grant Consortium, Mt. Desert Island Biological Lab.

II.B.3 Workforce Development:

With Maine ranking 50 out of 52 in 2009 in earned doctorates in science or engineering (http://www.nsf.gov/statistics/nsf11306/appendix/pdf/tab5.pdf), the workforce development goal to foster the current and next generations of sustainability science professionals is critical for the state. Maine EPSCoR's SSI Strategic Plan outlines a holistic approach to workforce development that will assist in the creation of a trained STEM workforce that can aid in ensuring Maine's future. Strategies occur at many different levels of the RII project, and span two goals for workforce development: one for workforce development and education embedded in the sustainability science research component, and one for more general workforce development and STEM education related to sustainability science.

Goal # 6: SSI Workforce Development in the Research component:

SSI Strategic Plan Goal #6 is specific workforce development & education embedded in the SSI research enterprise, and is aimed at fostering the next generation of sustainability science professionals through programs that are linked to the diverse challenges and opportunities in this emerging field.

Objective 6.1: Supporting SSI Participants

SSI Strategic Plan Objective 6.1 is to increase Maine's overall capacity for producing sustainability science professionals by directly supporting the involvement of SSI participants at all levels.

During YR3 of this RII project, a total of 318 individuals were directly supported under this project (received salary/wages): 100 faculty, six postdocs, 54 graduate students, 101 undergraduate students, 21 high school students, and 36 professional/technical/administrative staff. Of those totals, 188 were continuing personnel who had also been supported on the SSI project during YR2: 85 faculty, two postdocs, 37 graduate students, 26 undergraduate students, 20 high school students, and 18 professional/technical/administrative staff. An additional 130 personnel were newly supported on the SSI project during YR3. Of that, 26 were existing institutional positions that were new to the SSI project for YR3 and included the addition of 14 faculty and 12 professional/technical/administrative staff. An additional 104 were newly hired positions and included: one faculty, four postdocs, 17 graduate students, 75 undergraduate students, one high school student, and six professional/technical/administrative staff.

(Note: Student research internships are very specifically not fellowships, and are considered employee positions at our universities and colleges, whether at the graduate, undergraduate, or high school level. All student positions include job descriptions specific to the SSI project.)

Directly supported SSI positions in YR3 included:

1) ***SSI faculty:*** During YR3, 100 SSI faculty members at 11 collaborating institutions were directly supported to be part of 23 interdisciplinary research teams engaging in SSI portfolio research. All four planned SSI faculty new hires are now actively part of the project, with the final new faculty addition, Sean Smith, joining SSI in September 2011. Integration of the new faculty continues to be encouraged through funding of pilot projects, providing SSI graduate student support, providing opportunities for collaboration on integration and core projects, encouraging participation on committees and task forces, and having them present for SSI Integrative Discussion Groups.
2) ***SSI Postdocs:*** A total of six postdoctoral fellows were supported during YR3. Of the two original SSI postdoctoral fellows, one was recruited for a tenure track position at Cardiff University, Wales and left UMaine in December 2011; the second is scheduled to complete his two-year fellowship in May 2012. A search process to fill the four SSI postdoctoral position openings began June 2011, with five candidates brought to UMaine for interviews during the fall semester. Of these five, four accepted postdoctoral positions with SSI, with three joining the SSI team in January 2012; the remaining fellow will join the team in June 2012 (all are female). These positions are working in collaboration with various SSI project teams, and will provide mentorship to SSI graduate and undergraduate students.
3) ***SSI Graduate Students:*** A total of 54 graduate research internship positions were supported during YR3 at UMaine (48) and the University of Southern Maine (six). This included support of an incoming cohort of six PhD students at UMaine with SSI Research Assistantship positions in the fall of 2011 and spring of 2012, which were in addition to 14 continuing SSI PhD cohort students from YR1 and YR2 (these students were all recruited and admitted specifically as SSI students). An additional 34 graduate students were also supported during YR3: 23 continuing from YR2 and 11 newly hired. (Note that many departments provided other sources of funding for both graduate and undergraduate students to work on the SSI research.) Nine additional SSI PhD positions at UMaine were approved by the Graduate Recruitment Committee for a fall 2012 start date (YR4).
4) ***SSI Undergraduate Students:*** A total of 101 undergraduate students were supported as paid research interns (97) or other (four) in YR3 throughout the 11 collaborating institutions, and there is a continued focus on recruiting more undergraduate students to work directly with the SSI research teams (undergraduate participation is required for all SSI project teams).

SSI graduate students and postdoctoral fellows are actively involved in mentoring these undergraduate students, who are integrally involved in the sustainability science research.

5) ***High School Students:*** 21 high school students were supported in paid research internships through the Orono High School outreach program (20) and one at UMPI (see Objective 7.1 below.)
6) ***Other Professional/Technical Staff:*** 36 other professional, technical, or administrative staff were directly supported in YR3 at the 11 institutions.

Objective 6.2: Graduate & Undergraduate Programs

SSI Strategic Plan Objective 6.2 is to engage in formal graduate and undergraduate programs in sustainability science. The SSI Curriculum and Culture Committee (CCC) has made significant progress in developing a framework for SSI undergraduate and graduate programs that: a) builds on existing programs; b) pursues innovative approaches to combining course work across the breadth of sustainability science disciplines; c) ensures that careful attention is paid to the lessons learned from other institutional efforts to overcome the challenges of creating robust interdisciplinary programs; and d) attends to the feedback from current SSI undergraduate and graduate students. An internal IGERT pre-proposal is currently under review at UMaine and, if selected, the full proposal will be developed and submitted to NSF in July 2012. This effort has been coordinated across the CCC and IGERT committees as it assesses graduate curriculum needs during the proposal development process.

1) SSI Graduate Programs:

a) *Graduate Courses:* A two-course sequence has been approved by the SSI Stewardship Council for SSI graduate students each year:

- To support the incoming cohort of SSI PhD students, a fall semester introductory "Readings in Sustainability Science" course was co-taught by SSI faculty members Linda Silka, Shaleen Jain, and Brian McGill. This course followed a similar format to the fall 2010 Readings course. A highlight of the class was a group discussion with visiting decision and risk science scholar Baruch Fischhoff.
- The "Sustainability Science Research" course that was offered in YR1 is also scheduled to be repeated in YR4. Although the course topic will change, the overall strategy for this course is that it will provide unique opportunities for interdisciplinary student teams to work directly with key stakeholders.
- A specialized intensive course on "Boundary Spanning and Solutions-oriented Science" was also offered in January 2012. The course was team-taught by SSI faculty David Hart, Kathleen Bell, Laura Lindenfeld, and Brian McGill. This course immersed students in the study of boundary management and spanning research, and provided a unique opportunity for SSI students to gain service-learning experiences related to the roles that individuals and institutions play in spanning boundaries between science and policy, scientific and traditional knowledge, public and private sectors, and different disciplines. Key boundary spanners from across Maine worked with the students to explore the complexities of creating solutions to sustainability problems. Course-related activities included opportunities for students to "shadow" a Maine state senator, representatives of state resource agencies, and the project manager for a consortium of land trusts and conservation organizations. These experiences allowed students to learn first-hand some of the real-world challenges and opportunities involved in developing and using scientific and technical information to solve real-world problems with intersecting economic, social

and environmental dimensions. Each student will produce a final paper for the course, after which the class will meet as a group to discuss their shadowing experiences. Based on the lessons learned in this new course, we expect to develop additional service-learning opportunities specifically designed for SSI students. This will also assist in the continued development of the SSI-related IGERT proposal.

b) *SSI Graduate Certificate*: Both of the above courses were coordinated with the campus Ecology and Environmental Sciences (EES) program, which is an existing interdisciplinary program based at UMaine. SSI has established a relationship with the EES program structure to deliver coursework that supports SSI graduate students and EES students. Using this model, we have made significant progress on the design of a graduate certificate in sustainability science. The proposal is currently undergoing internal review across SSI and EES and will be submitted to the Graduate Certificate Review Process by summer 2012.

c) *Other Sustainability Courses*: In addition to these efforts to formalize and institutionalize curricular efforts, several SSI faculty members have offered fall and spring courses directly related to SSI graduate student needs. SSI-related courses offered by SSI faculty during YR3 include the following: *Principles of Town Design*, Yuseung Kim; *Fresh Water Flows*, Andy Reeve and Sean Smith (new faculty); *Rural Community Resilience (Forest Policy Problems)*, Jessica Leahy; *Coupled Natural Human Systems*, Jim Wilson; *Economics and Policy Applications of GIS*, Kathleen Bell; *Advanced Resource and Environmental Economics I*, Kathleen Bell; *Intro to Survey Research*, Charlie Colgan; *Modeling Sustainability*, Tim Waring (new faculty); *Environmental Communication*, Laura Lindenfeld; *Stakeholder-Researcher Partnerships*, Linda Silka.

d) *Graduate Travel Support*: 22 SSI graduate students received travel support to attend and present at regional and national conferences.

e) *SSI Graduate Participation:* there were 136 SSI graduate student attendees at 22 SSI-sponsored conferences, workshops and seminars. Highlighted examples include 11 students who presented (oral and poster) at the Maine Water Conference (March 2012), and 37 students who participated in the ME EPSCoR State Conference (September 2011).

f) *Graduate Mentoring*: Graduate students continue to meet on a regular basis with the SSI Graduate Coordinator, who provides on-going support and mentorship for the students. During YR3, a survey of students found that weekly meetings were too frequent given other SSI and departmental commitments, and that students are also at different places in their graduate careers requiring different levels of assistance from the Graduate Coordinator. Therefore the meetings were adjusted to take place on a monthly basis with the students as a group, and several times each semester with individual students. In addition, SSI faculty provide one-on-one mentorship, and will begin regular mentor group meetings in April with the Graduate Coordinator to discuss challenges, best practices, and opportunities.

g) *Other:* SSI was able to leverage additional professional development funding to give competitive awards to SSI graduate students during summer 2011 and spring 2012. The summer funding awards used funds made available by a private donor who provided $10,000 to be used "to support graduate student research expenses, including but not limited to the purchase of equipment and supplies, travel to scientific conference and other costs directly associated with conducting research with the Sustainability Solutions

Initiative (SSI)." SSI provided an additional $10,000 in spring 2012 to assist graduate students and postdoctoral fellows with funds for research expenses and travel to conferences. Twelve students took advantage of the summer funding program. A further nine graduate students and two postdoctoral fellows were awarded funds during the spring 2012 funding cycle.

2) SSI Undergraduate Programs:

a) *SSI Undergraduate Curriculum*: In the fall of 2011, the Director of the EES Program and SSI faculty member Aram Calhoun initiated a curriculum review and update of the undergraduate EES curriculum. EES is an interdisciplinary program that offers B.S., M.S. and Ph.D. degrees drawing on the mentorship and expertise of UMaine faculty across academic units. The curriculum update and the emerging need for a sustainability science curriculum for undergraduates that was identified by the CCC created a unique opportunity to address this gap in the undergraduate program. A new concentration has been drafted that addresses the mission of SSI to offer undergraduate training in sustainability science. The new concentration, entitled *Sustainability, Environmental Policy, and Natural Resource Management*, exposes students to courses in resource economics, ecology, natural resources, environmental policy, social sciences, and emerging issues in sustainability science. The concentration was developed and reviewed by faculty from the School of Economics, School of Biology and Ecology, School of Forest Resources, Department of Wildlife Ecology, Department of Plant, Soils, and Environmental Science, the Department of Anthropology, Department of Earth Sciences, the Climate Change Institute. Input was also provided from the Department of Communication and Journalism and the Department of Civil Engineering. The Committee met throughout fall 2011 and spring 2012 to come to consensus on concentrations and course content. All cooperating EES faculty are currently reviewing the draft concentration. Upon completion of review in April 2012, the new curriculum will be submitted for approval by the College of Natural Sciences, Forestry, and Agriculture. The updated curriculum will be in place by Spring 2013. As the Graduate Certificate in Sustainability Science is established and new course offerings relevant to sustainability science are available, the concentration will be updated.

b) *Statewide Sustainability Curriculum*: Maine EPSCoR Director Vicki Nemeth and Stephen Mulhey, President at Unity College (SSI Parnter), are currently working with a statewide group that is part of a multi-state collaborative project under a grant from SESYNC (National Socio-Environmental Synthesis Center), which is funded by NSF. This collaboration is focusing on transforming undergraduate STEM education in the state through a focus on sustainability curriculum and policy changes to support it.

c) *Undergraduate Travel Support*: Travel support was provided to one undergraduate student to attend a regional/national conference.

d) *Undergraduate Mentoring*: 161 undergraduate students were mentored by SSI faculty, postdocs, and graduate students in YR3. This includes the 97 undergraduate research interns paired with SSI graduate students (39) and postdoctoral fellows (four) who provide direct, on-going mentorship and research support. Additional supplemental funding in YR3 that was designated to directly support undergraduate students has encouraged these partnerships to develop and thrive. An excellent example of graduate-undergraduate student mentoring has been developed on the K-A team, where graduate students have created a formal K-A Undergraduate Research Assistant Mentoring

Program. This group continues to meet each week for one hour and provides support for research activities including library research training, reflective research practices such as journaling, research proposal development, and career guidance discussions. This program is being looked at to expand to other teams.

Objective 6.3: Faculty Development

SSI Strategic Plan Objective 6.3 is to support faculty development through various mentoring mechanisms.

1) ***Formal Mentoring:*** A formal SSI mentoring program continues to be developed. Research Project Director David Hart has taken an active role in providing formal mentoring to the three new faculty hires at UMaine, as well as several key SSI faculty leaders. SSI faculty member Charlie Colgan serves in this role for the new faculty hire at USM. Linda Silka, a key SSI faculty leader, directly mentors several of SSI's social science faculty.
2) ***Informal Mentoring:*** Many informal faculty mentoring partnerships continue to take place across the project. These have been somewhat difficult to track to date, and efforts are underway to formalize this process as we move into YR4. Multiple opportunities are provided that encourage networking and shared-learning across the teams, and these help lead to informal partnerships and collaborations. Examples include: team-taught SSI courses; co-mentoring of graduate students and postdoctoral fellows; committees and task forces; team meetings and discussion groups; and the annual research retreat.
3) ***Interdisciplinary Research Workshops:*** In fall 2011, SSI collaborated with other groups on campus, including the Center for Excellence in Teaching and Assessment (CETA) and the UMaine NSF ADVANCE Rising Tide project group, to establish an Interdisciplinary Research Workshop (IDR) series. This monthly series of interactive discussions is designed to build support to grow UMaine's interdisciplinary research strength through the following goals:
   - Promote interdisciplinary research on campus and highlight new research opportunities
   - Support campus-wide education to share experiences and strength across multiple research arenas and themes
   - Create new opportunities to network across disciplines
   - Enhance UMaine's ability to garner interdisciplinary research funding from a variety of sources

SSI faculty and students are actively participating in these discussions and presentations, bringing with them their experiences as members of SSI's interdisciplinary team and learning from the experiences of other interdisciplinary teams on campus. For example, at the IDR Collaborative Fair on March 23, there were posters/information displays covering a range of topics from agriculture, university-stakeholder partnerships, interdisciplinary research, public health, aquaculture, community-based, cross-cultural initiatives, and tidal power development. Of these, all but three presentations were by SSI faculty and students, clearly demonstrating SSI's impact on interdisciplinary collaboration. Seventy people attended the event, which was aimed at facilitating discussion and collaboration across disciplines.

Objective 6.4: Fostering Collaborative Learning

SSI Strategic Plan Objective 6.4 is to provide a team structure that fosters collaborative learning and development between faculty, postdoctoral fellows, and graduate and undergraduate students.

The following actions took place during YR3:

1) ***SSI Seminars:*** In summer 2011, the SSI Research Council established a formal SSI Seminar Committee with new faculty member Tim Waring as Chair. The committee's purpose is to provide a process for SSI faculty and students to request sponsorship to bring external speakers to campus for seminars and workshops. Suggested speakers must advance knowledge and learning of SSI goals and objectives. The committee then considers these requests and recommends appropriate speakers to the Stewardship Council. In general, speakers are co-sponsored by a department, which provides cross-connections and additional resources for SSI. YR3 SSI seminars and workshops have included: Phil Nyden (hosted by Linda Silka and co-sponsored by the Margaret Chase Smith Policy Center and Department of Sociology); Gil Pontius (hosted by Michelle Johnson and co-sponsored by School of Economics); Stan Temple (hosted by Britt Cline and co-sponsored by Department of Wildlife Ecology, Conservation Biology Seminar Series, and the Ecology & Environmental Sciences Program); Robert Jacobson (hosted by Sean Smith and co-sponsored by Department of Earth Sciences); Todd Norton (hosted by Hollie Smith and Laura Lindenfeld); David Sloan Wilson (hosted by Tim Waring and co-sponsored by School of Biology and Ecology), and Mark Schildhauer (hosted by the Cyber-informatics group).
2) ***SSI Workshops:***
   a) *SES capacity building:* Learning opportunities have included a one-day "Land Use Modeling" workshop taught by Gil Pontius, and a "Complex Adaptive Systems" workshop that meets weekly during fall and spring semester. New SSI faculty Brian McGill and Tim Waring are actively participating in hosting this on-going workshop. Several facilitated discussions on these topics have also taken place including at an SSI All-Team meeting (2/14), an SSI Research Council meeting (2/20) and several SSI Integrative Discussion Group meetings (3/27 and 5/1). A follow-up workshop is also planned for the 2012 Research Retreat in May. Recommendations from these activities are helping to shape the organization of this SSI focus.
   b) *Knowledge to Action (K-A) capacity building:* Following up on NSF's Communicating Science workshop held at UMaine in April 2011, and the subsequent "message triangle" workshop that took place at the SSI Research Retreat (May 2011), graduate student Bridie McGreavy and science writer Kim Ridley have been working with individual teams on developing communication strategies and message triangles. These team workshops have greatly enhanced each team's communication messaging and have been useful in preparing teams who have been selected to be featured in the Maine Public Broadcasting Network "Sustainable Maine" documentaries. Teams who have participated to date include #1, 13, and 20. A K-A workshop is also planned for the 2012 SSI Research Retreat in May, which will help shape further efforts in this area.
   c) *Other*: Graduate student Thomas Parr provided two workshops to train faculty and students on the reference management software *Mendeley*. These workshops attracted 22 people from across campus, with eight of them SSI team members.
3) ***State Conference:*** The 2011 Maine EPSCoR State Conference (Sept. 2011) provided unique opportunities for SSI team learning and integration. This included plenary presentations by core SSI faculty that provided a "big picture" view of the SSI project. Afternoon sessions included a "Pecha Kucha" session featuring SSI graduate student research, a presentation and discussion of "Interdisciplinary Collaboration and Organizational Innovation" led by SSI researchers Shannon McCoy and Susan Gardner, and a facilitated discussion on "Defining

Solutions" led by Brian McGill (new faculty). Sean Smith (new faculty) also presented in a "Research Frontiers in Sustainability" session. NSF EPSCoR Head Henry Blount and Program Officer Sian Mooney both participated in this event and were able to provide valuable feedback to the Maine EPSCoR Management Team and SSI faculty. In addition, Joan Ferrini-Mundy, Assistant Director, NSF Directorate for Education and Human Resources (EHR) was sponsored through NSF EPSCoR's outreach program to present on funding opportunities in EHR at this event. She also met individually with SSI researchers throughout the day. (163 participants)

4) ***National Conference:*** Maine EPSCoR supported 17 participants to attend the 2011 NSF EPSCoR National Conference in Idaho in October 2011. This included the three Maine EPSCoR Management Team members, four SSI faculty (two on SSI Stewardship Council), six SSI graduate students, three legislators, and one Maine EPSCoR staff member. SSI graduate student Karen Hutchins was awarded the Judge's Pick Runner-Up for her poster entitled, *Linking Knowledge with Action: Crossing University-Community Boundaries to Build and Study Solutions-Oriented Partnerships.* SSI graduate student Spencer Meyer received the grand prize for Student Networking, an activity designed to increase interactions among students, attendees, and invited speakers. SSI faculty member Kathleen Bell was invited to present on *Getting to Water and Environment Solutions Through Sustainability Science*, and Maine EPSCoR Director Vicki Nemeth was invited to be part of the Communicating Science panel. All participants had the chance to establish new collaborations by networking with colleagues from other jurisdictions, to learn about best practices, and to hear about what other EPSCoR states are doing.
5) ***SSI Research Retreat***: Planning is underway for the YR3 Research Retreat, which will take place May 15-16, 2012. The focus for the retreat is to provide creative opportunities for teams to learn from each other in major areas of SSI focus such as K-A, SES, OI, solutions, stakeholder engagement, etc. Three major areas of action that emerged from previous retreats were integration, team communication/collaboration and SES/K-A focused learning, and these have driven many of the YR3 action items reported in other sections.
6) ***SSI Team-Building:*** Efforts to establish and maintain activities and events to encourage informal networking and build integration and synergy across the team continued in YR3.
    a) *Integration Discussion Group (IDG)*: This series was kicked off over summer 2011 with a "Solutions Mash-Up" on July 14. Some of the key goals for the summer and fall meetings were to: explore and examine different definitions of solutions; develop a shared language and understanding of what SSI means by solutions; establish criteria for measuring progress towards solutions in SSI; and develop pathways for documenting progress. These discussions are on-going and will continue at the upcoming SSI Research Retreat (May 2012).
    b) *SSI All-Team Meetings:* Other on-going team activities include monthly SSI All-Team meetings, which have focused on team presentations on research progress. This is then followed by facilitated "Research Xchanges" designed to help connect teams to each other so they understand what other teams are working on and how others' research and activities fit within the broader context of what SSI is trying to do. These meetings also provide an opportunity to update team members on strategies and outputs of important meetings and evaluation processes (AAAS, Advisory Board, Research Retreat, etc) and allow for feedback and discussion.

c) *Other:* Other informal activities that have taken place in YR3 are designed to build team integration in a more relaxed environment, and included a fall welcome (September 2011), a holiday mixer (December 2011), and various networking socials.

7) ***Stakeholder Relationships:*** The intensive "Boundary Spanning and Solutions-oriented Science" graduate course (January 2012) provided an opportunity to develop deeper relationships with key SSI stakeholders. Invited participants included thought leaders representing a wide range of boundary spanning roles, including representatives of the legislative and executive branches of state government, tribal communities, non-governmental organizations including The Nature Conservancy, the University of Maine Cooperative Extension and Maine Sea Grant programs. The course's five topically-oriented stakeholder panels served as a creative forum in which students and faculty learned from stakeholders and vice versa. Discussion is underway on inviting selected stakeholders back to campus for longer periods so that they can immerse themselves more deeply with SSI's research teams.
8) ***Faculty Travel Support:*** Travel support was provided for 15 faculty, postdocs, and staff to attend and present at regional and national conferences and workshops.

Objective 6.5: Community Colleges

SSI Strategic Plan Objective 6.5 is to engage community colleges in related workforce development activities. Planning began in the fall of 2010 by researching some of the best practices throughout the nation that are utilized to engage community colleges, and by examining the mission and curriculum of each of the state's community colleges. The following were implemented during YR3:

1) ***Eastern Maine Community College:*** EMCC was selected as the first workforce development pilot project, as they are located close to UMaine and there was an existing relationship with SSI faculty members. After a meeting in March 2011 with Project Director Mike Eckardt and Associate Project Director Vicki Nemeth, EMCC administration submitted a proposal for a "Map the Bay" sustainability project. During YR3, EMCC students have participated in a special GIS course working with community partners from the Mount Desert Island Biological Laboratory (MDIBL) to produce maps and an atlas of Frenchman Bay that will assist in creating a conservation plan. Explorations of Frenchman Bay gave students a firsthand understanding of the geography of the bay and the major issues facing the bay, including the loss of eelgrass. Through class assignments and this trip, students gained greater understanding of the ecology of a marine estuary and watershed in general and of the importance of eelgrass in particular. Students have mapped areas of eelgrass loss and gain, marine habitats, and ocean floor bathymetry in the bay, and land cover, topography, conserved lands, soils, recent and projected population and housing growth, and surface geology in the surrounding watershed. The students won the poster competition at the 2012 Maine State GIS Championship with their eelgrass poster. In addition, Hope Rowan, Technology Education Specialist with the Island Institute, gave a presentation at EMCC on October 26, 2011. Her presentation focused on GIS and her use of it in her work with local communities. A group of 21 faculty, administrators and students attended, and many were introduced to GIS for the first time. As a result of the presentation, several students indicated interest in taking a GIS course and several faculty members indicated interest in learning how to incorporate GIS into their courses. Two students who learned of GIS for the first time at

that presentation are currently taking Introduction to GIS as a result. EMCC will be invited to submit a continuation proposal for YR4 to build on this project.

2) ***Southern Maine Community College:*** In March 2012, Project Director Mike Eckardt and Associate Project Director Vicki Nemeth met with SMCC President Ronald Cantor, and Vice President and Dean of Academic Affairs Janet Sortor. The result is that SMCC will be submitting a proposal to Maine EPSCoR for a workforce development project that is related to the SSI project focus.

3) ***Other:*** Meetings are currently being set up with other community colleges to explore opportunities for their participation.

Goal # 7: General Workforce Development & STEM Education

SSI Strategic Plan Goal #7 for general workforce development & STEM education addresses the need to prepare Maine's current and future STEM workforce through coordinated programs and opportunities, training, and knowledge dissemination.

Objective 7.1: Related STEM Programs

SSI Strategic Plan Objective 7.1 for this goal is to implement and support related STEM programs and opportunities that directly engage students and teachers at all levels. During YR3, this has included the following programs, in addition to the efforts detailed in the Broadening Participation section above.

***1) Maine EPSCoR High School Research Internship Program*:** This program provides research internships to high school students in order to allow them work with UMaine faculty and graduate students in STEM areas. The students are active participants on a research team, working in labs and in the field, assisting researchers and presenting the results of their collaborations in reports and public presentations. Dr. Barbara Cole serves as the Coordinator for this project, and students submit a formal application through their schools and are chosen in a selective process. In YR3, 20 high school students from Orono High School participated during July and August 2011. In addition, four students from the 2011 summer program continued their internships through this academic year (three as newly admitted undergraduates). Planning is currently underway for the summer of 2012 (application process will begin in April). This program provides high school students with the opportunity to directly participate in cutting-edge research with faculty teams at a time when they are thinking about and formulating their post-high school plans. Through interviews with these participants we have determined that many can develop or solidify an interest in studying a STEM field in college through their experience conducting what they consider relevant and beneficial "real-world" research. The program both expands their interests if they were not interested in STEM and focuses them if they already were. Each year many of these students subsequently enroll at UMaine, and several are able to continue their internships as undergraduate students, as faculty have actively taken on a mentor role with them.

2) The Reach Center: Maine EPSCoR is collaborating with the newly formed The Reach Center, which is a joint project of the Maine Mathematics and Science Alliance (MMSA) and the Maine School of Science and Mathematics (MSSM). Maine EPSCoR Director Vicki Nemeth participated in the Reach Center Design Conference in February, which brought together key leaders to collaboratively develop "STEM intensives" that will deeply engage

Maine students in STEM. Maine EPSCoR anticipates supporting the Reach Center's upcoming efforts in their energy/sustainability/environment strand.

3) ***Project Reach:*** Several SSI faculty, SSI Research Project Director David Hart, and Maine EPSCoR Director Vicki Nemeth are collaborating on this U.S. Department of Education National Professional Development Program. This innovative, comprehensive, statewide project will address the special needs of Maine's English Learner populations in regard to STEM education, with a particular focus on skills for sustainability science fields, by providing professional development for pre-service and in-service teachers. The initial project meeting was held in March 2012.
4) ***National Girls Collaborative Project:*** See Diversity & Broadening Particiation section.
5) ***Expanding Your Horizons:*** See Diversity & Broadening Participation section.
6) ***Native STEM Scholarship Development Program:*** See Diversity & Broadening Participation section.
7) ***Disability programs***: Camp CaPella & CCIDS (see Diversity & Broadening Participation section).
8) ***Upward Bound:*** See Diversity & Broadening Participation section.
9) ***Cyberinfrastructure:*** See Cyberinfrastructure section.
10) ***Other SSI Partner Institution Activities:*** The SSI partner institutions are taking part in a number of workforce development efforts in their regions. They are located across the state and thus, strategically placed to expand SSI's reach. In YR3, their efforts included:
    a) *Bates-Bowdoin-USM:* provided GIS training for stakeholder organizations and undergrad students; collaborating with Maine Coast Heritage Trust to provide GIS training as part of their annual conference; collaborating with local high school students through the Environmental Youth Leader Program; SSI team member Eileen Johnson presented at the Maine GIS Educators Meeting in November; presented on the high school submerged aquatic vegetation mapping project at Cathance River Education Alliance (CREA) lecture series. (45 HS, 33 teachers, 405 undergrads)
    b) *Colby College:* launched a series of watershed education activities for 180 local students in grades 5-8; two summer undergraduate research assistants worked with K-12 outreach activities, have been certified to be screeners for the Lake Smart program, and have consolidated important references online to promote best management practices for property owners in the Belgrade Lakes watershed; Colby College student volunteers are taking these activity modules into classrooms, helping students and teachers prepare for boat trips on Colby floating classrooms in May 2012. (300 middle school students)
    c) *University of Maine Farmington*: team member Mellisa Clawson is working with four undergraduates to develop place-based curricular materials for Rangeley area teachers; team member Matthew McCourt presented in a high school geography class with 10 students and recruited four of the students to assist in the collection of travel cost data at the Rangeley region Snodeo snowmobile festival. (16 undergrads, one teacher, 10 high school)
    d) *University of Maine Presque Isle:* team has begun to draft a high school presentation and plans to have a few presentations made by the end of the school year 2012. (One graduate student, one high school student)
    e) *University of New England*: a new GIS internship was created in the city of Biddeford for a UNE student; 91 undergraduate students took part in SSI activities.

f) *Unity College*: working with Project Learning Tree to develop curriculum based on hemlock-forest ecology; 217 undergraduate students took part in SSI activities.

Objective 7.2: Teacher Professional Development

SSI Strategic Plan Objective 7.2 is to promote educator professional and leadership development in STEM, and foster STEM approaches and activities that value prior learning across subjects. This was addressed through support of the following:

1) ***Maine Center for Research in STEM Education (RiSE):*** The RiSE Center has been an on-going partner with ME EPSCoR to provide STEM professional development opportunities for K-12 teachers and pre-service teachers. They received a $12M NSF MSP grant for the Maine Physical Sciences Partnership (PSP) program, and the Maine EPSCoR Director serves on the PSP Advisory Committee and works to find areas of synergy between the two programs. The RiSE Center Director also serves on the Maine STEM Collaborative Steering Committee. ME EPSCoR will be collaborating with them on their June 2012 teacher professional development workshop.
2) ***Biogeomon 2012 International Conference:*** Biogeomon 2012 - The 7th International Symposium on Ecosystem Behavior, is being hosted by UMaine's Climate Change Institute in July 2012 (several SSI researchers have joint appointments). Maine EPSCoR has partnered with the planning committee and the Acadia Learning project to add a teacher professional development component to this event. Approximately 20 K-12 teachers will be sponsored to attend at least one day of the Conference, and then they will take part in a teacher-focused workshop immediately following that will allow them the opportunity to work with conference scientists to develop data literacy skills using their authentic datasets. After the conference, teachers will also be paired with scientists as on-going "virtual mentors" throughout the school year.

7.3: STEM Baseline Studies & Strategic Planning

SSI Strategic Plan Objective 7.3 is to conduct statewide STEM baseline & impact studies and engage in statewide strategic planning that focuses on responding to identified needs.

During YR1, Maine EPSCoR, in alliance with the Maine STEM Collaborative, the Maine Department of Education, and the Maine Mathematics and Science Alliance, began a process to commission a comprehensive STEM landscape series of studies for the state. This was in response to a need identified by the State legislature, which pointed to a lack of meaningful baseline STEM data being available for the state.

These studies were finalized and completed by June 2011 and consisted of four components:

1) *Maine STEM Landscape Technical Assistance: Mathematics and Science in 5th, 8th, and 11th Grades,* from the Regional Educational Laboratory at the Education Development Center (EDC), written by Craig Hoyle, August 9, 2010
2) *Maine STEM Landscape Technical Assistance: K-12 Certification Endorsements, 2009-2010,* from the Regional Educational Laboratory at EDC, written by Peter Tierney-Fife, July 22, 2010
3) *Teachers of Science in Maine Schools, Grades 1-12: A Descriptive Study,* written by Bill Nave, Ed.D., Research and Evaluation Consultant, May 2011
4) *Briefing Paper on STEM Education in Maine,* from EDC, written by Nancy Richardson, Barbara Brauner Berns, and Lisa Marco, November 29, 2010

In January 2012, Maine EPSCoR commissioned an executive summary of these four studies, which pulls out the key challenges and opportunities that were identified in the full studies. This document is entitled *2012 STEM Education in Maine: An Executive Summary of Student Performance, Teacher Preparedness, and STEM Programs*, and is also available on the Maine STEM Collaborative website. It was also distributed to all of the participants at the 2012 Maine STEM Summit, to the Governor's new STEM Council, and will be used to inform other key policy and decision-makers in the state.

The Maine STEM Collaborative is working to finalize its strategic action plan based on the needs and priorities identified in the studies. In addition, they are looking at ways to correlate findings with Maine Department of Labor workforce data.

While it can be difficult to draw firm correlations between cause and effect when dealing with long-term issues such as student STEM participation, aspirations, and achievement, by having this baseline data, these studies now put Maine in a much better place to be able to potentially determine whether subsequent STEM efforts are having an impact. In addition, the Maine Department of Labor, in a collaboration with the Maine Department of Education, has begun a longitudinal study of K-12 students that will also assist in the ability to better identify trends and impacts.

Objective 7.4: Maine STEM Collaborative

SSI Strategic Plan Objective 7.4 is to work with the Maine STEM Collaborative, taking a leadership role in building, integrating, and implementing best practices in STEM across the state. In order to have a greater effect on statewide STEM workforce development and education, Maine EPSCoR is a key member of the Maine STEM Collaborative, which is a statewide partnership of education, research, business, government, and non-profit sectors who have come together to foster the improvement of STEM education in the state. (See Appendix 1 for Steering Committee membership.) Maine EPSCoR Director Vicki Nemeth is a founding member of the group and currently serves as its Chair. She works closely to assure that the RII workforce development and educational outreach efforts are aligned with the Collaborative's goals, objectives, and strategic plan, and that collaborations are utilized as much as possible to maximize resources and efforts. In addition, Maine EPSCoR plays a vital role in the state's overall STEM efforts by being able to provide resources in key areas for the Collaborative.

1) ***Maine STEM Summit:*** Maine EPSCoR partnered with the Maine STEM Collaborative to sponsor the 2012 Maine STEM Summit in March 2012, which had 311 participants from K-12, higher education, non-profits, government, and business and industry. This is the Collaborative's third Summit, and brought together stakeholders from diverse sectors to discuss and learn about how to further engage and collaborate to address STEM education in Maine.
2) ***Maine STEM Database:*** Maine EPSCoR, the Reach Center, and UMaine's Foster Student Center for Innovation are collaborating to create a statewide database that includes STEM organizations and opportunities. This database will be searchable in a variety of ways, and will address a critical need of knowing who is doing what throughout the state.
3) ***Other***: Maine EPSCoR continues to explore potential strategies based on Maine's Environmental Literacy Plan and the state Department of Education's STEM Strategic Plan. In addition, the Maine STEM Collaborative continues to play a lead role in educating the state's new Governor, Department of Education Commissioner, and legislators regarding the importance of STEM to the state.

II.B.4 Cyberinfrastructure

The SSI Strategic Plan Goal #8 for cyberinfrastructure is to "Utilize cyberinfrastructure to improve communication, collaboration, and visualization capabilities that enable innovation and competitiveness in the sustainability science focus area." The following narrative details YR3 progress under the three main objectives for this goal. (Also see Appendix 2: Objectives, Strategies & Benchmarks, and Appendix 8: SSI Data Management Plan.)

All Maine EPSCoR cyberinfrastructure (CI) activities continue to be implemented as part of a highly integrated, statewide Cyberinfrastructure plan for research and education. Partners in this plan include Maine EPSCoR, Maine INBRE, the University of Maine System, private colleges, state government, and the private business sector. CI efforts are also integrated and aligned with the Northeast Cyberinfrastructure Consortium (NECC) activities, the Northeast Education and Research Network (NEREN) objectives, and the Maine Cyber Security Cluster.

The Maine EPSCoR CI committee continues to be actively engaged in all of the above in order to maximize effectiveness and leveraging for the state. Committee members include: Vicki Nemeth, Maine EPSCoR Director; Jeffrey Letourneau, UMaine System Executive Director of the Maine Research and Education Network; Bruce Segee, Technical Director UMaine Supercomputer & Cloud; and Patricia Hand, Maine INBRE Director and Administrative Director of the Mt. Desert Island Biological Lab.

Objective 8.1: Videoconferencing & Bandwidth Cyberinfrastructure

SSI Strategic Plan Objective 8.1 for cyberinfrastructure is to expand statewide videoconferencing capabilities and upgrade high bandwidth fiber interconnections. Given the integrated, multi-disciplinary, and multi-institutional nature of this project, state-of-the art communication tools are an absolute necessity, and strategies to date have included the purchase and installation of equipment in this area.

During YR2, planning began to create an SSI Communications Center at the Mitchell Center at UMaine, which is the "home base" for SSI. This Center will now be completed by May 2012, and will feature large-scale videoconferencing capabilities that include large wall projection screens, multiple high-definition cameras and projectors, archiving/streaming capabilities, and audio systems. The room will accommodate 100 people in person, and the new system will allow up to 90 videoconference/webcam connections at one time, and will provide a much-needed ability for all SSI participants to effectively take part in interactive SSI workshops, meetings, discussion groups, classes, etc. With 318 individuals participating in SSI at 11 institutions, this new capability will dramatically enhance communications for research and education collaborations and training.

We have also begun to obtain Tandberg Movi licenses for faculty at all SSI institutions. Movi is an SIP-based videoconferencing software that allows multiple users to communicate with each other via webcam, and to also participate individually (vs. from a videoconference unit) in the large-scale videoconferences that will take place in the new SSI Communications Center or elsewhere.

With our NSF EPSCoR RII Track 2 project high bandwidth fiber now installed in the state, we now have all of the SSI Partner institutions (SSPs) connected on the Maine Research and Education Network (MaineREN). We therefore also purchased and installed Tandberg videoconferencing systems at the remaining two SSP institutions that did not have them: Colby

College and Unity College. This will put us ahead of our planned completion for our videoconferencing benchmarks, but communication was deemed too critical to delay this.

Once all of the above is in place, we will schedule additional training sessions for all SSI institutions that focus on how to utilize these new communications technologies.

We will also be purchasing and installing the planned six switchgears/modules by June 2012. These will be placed in six buildings at UMaine that house SSI researchers, and will facilitate virtual collaboration opportunities and take advantage of the upgraded high-speed bandwidth now available in the state.

Objective 8.2: Communication & Visualization Tools

The SSI Strategic Plan Objective 8.2 is to make new communication and visualization tools available. One of two SSI cyberinfrastructure research teams (Segee, Cousins, Koski, & graduate student King) therefore has a focus on tools for research and education collaborations at a distance, which will further assist the SSI teams to engage as a virtual organization.

1) Visualization/Communication Portals:

The team's primary strategy has been to create and deploy visualization/communication portals that can be used by SSI researchers, students, and stakeholders for data analysis and visualization through remote linkages. During YR1 and YR2, the focus was on successfully creating, deploying, testing, and refining prototype portals. During YR3, SSI graduate student Robert King, under the direction of SSI faculty member Bruce Segee, continued his research and development on the large-scale visualization wall that has now been installed in the new SSI Communications Center. It is pending final deployment by the May 2012 completion date.

King's work in YR3 focused on the use of newer multiple-head graphics cards to improve power usage; compatibility with Windows (as opposed to Linux only); dual booting (Windows and Linux); standards-based video conferencing (Ekiga and Movi); and remote control at a distance.

In YR1, Maine EPSCoR had purchased 20 Apple laptop computers that the CI research team configured for use in testing dynamic visualization walls for K-12 outreach efforts. This infrastructure leverages the team's NSF ITEST project that focuses on modeling and visualization in climate change using the UMaine supercomputer and the Maine Laptop Initiative (MLTI) laptops in middle schools. Real-world data is compared to model outputs, and teachers and students learn to deal with data, geographic information, and collaborative tools.

YR3 research in this area focused on usability and redesigning the web-based client using a Flash viewer that embeds directly into the web page (as opposed to the Java Applet that had been previously used), which allows true full screen operation of the laptops. The server application used for these tiled displays was also refined, as it was limiting performance. King discovered a way to utilize a multi-threaded code, and his results are being prepared for publication and will permanently be incorporated into the production code. Once finalized, this education technology will be used by Maine EPSCoR in to initiate SSI-specific pilot projects with K-12 schools.

This laptop visualization technology is utilized by this team as a training tool during the annual Maine Laptop Initiative (MLTI) conferences held in May (planning is underway for 2012), which is a professional development day at UMaine for over 1,000 middle and high school students and teachers. They are utilized in sessions that show teachers and students how they can easily put together their MLTI laptops to do direct, large-scale comparisons of different climate change scenarios.

In addition, in June 2011 this team utilized videoconferencing technology to sponsor an interactive (vs. just watching presentations at one site) IT conference for over 100 K-12 teachers.

Since every teacher had their MLTI laptop, pertinent material generated during the day was able to be posted and made available to all participants immediately. The team is looking at expanding this model for future virtual workshops, which would allow more Maine teachers to be reached than would otherwise be possible.

2) Cloud Cluster Development:

During the end of YR2, Maine EPSCoR purchased and deployed a 128 core HP Proliant Cluster (128 GB of RAM and 20 Gbps Infinaband) on the UMaine supercomputer to specifically provide initial cloud compute capabilities for the SSI project. This represented UMaine's first dedicated approach to utilizing cloud computing, and was very much driven by the complex and virtual organization nature of SSI, which encompasses institutions and participants across the entire state of Maine.

During YR3 there has been a two-fold focus for the utilization of the cluster: 1) communication and informational purposes (virtual organization); and 2) research purposes (data). For the communication focus, the "MeSSI" intranet was developed and continues to be expanded to allow both a public and a semi-private area on the cloud for SSI participants to share project information, updates, resources, videos, calendars, photos, etc. SSI is placing an emphasis on training in order to participants to utilize the SSI cloud services effectively.

For the research focus, the SSI Cyber-Informatics group has been working to ensure that the cloud computing services are effective for SSI teams, as the need for data handling and accessibility spans the entire statewide SSI portfolio. (See Objective 8.3 Data Handling below.) Under a project being funded by UMaine and a State of Maine bond, a new UMaine supercomputer is currently being installed as a scalable platform for high performance computing and cloud services. Combined with the other statewide cyberinfrastructure improvements under Maine EPSCoR's NSF EPSCoR RII Track 2 and C2, this will provide a fast, effective, reliable, and secure way for SSI members to utilize cloud computing capabilities.

3) Software Frameworks Research:

In an enterprise such as SSI where broad accessibility is important, SSI researchers need to be able to interact with stakeholders and each other effectively on the Web. However, a vast majority of current Web deployments suffer from a major problems that severely limit their positive impacts (sites do not work well or at all).

SSI undergraduate students have been working with the SSI CI team to develop, test, and deploy a software framework that makes it easy to create Web interfaces that are accessible using virtually any and all combinations of Web browsers, operating systems, and hardware. This is based on an interface system recently developed by UMaine researchers called the RESTful Framework for Dynamic Client Environments (RFDE), which is a system architecture that provides a means for designing applications and services in a way that, in general, behave in a manner that lends itself to scalability and generality. During YR3, significant improvements in the efficiency and robustness of the framework were made, while retaining its general design philosophy.

Objective 8.3: Data Handling

SSI Strategic Plan Objective 8.3 is to develop plans and systems for data handling across research projects and institutions. A second SSI cyberinfrastructure team (McGill, Segee,

Colgan, Beard, Jain.) was formed in YR2 to ensure a high-level focus on this cyberinformatics objective, and includes SSI scientists, engineers, and computer hardware/software specialists.

This Cyberinformatics team's major accomplishments during YR3 included:

1) Finalizing a detailed survey of existing data and data needs across all teams:

In YR2, SSI graduate student Melinda Neville conducted a preliminary survey of the data collected by each SSI project team. During YR3, she developed a more comprehensive survey instrument for in-person interviews, and then conducted interviews with all current SSI teams at UMaine. The objectives of the in-person interviews were to:

- Determine data holdings, data needs, and new data produced by team.
- Categorize common data sources or themes across teams that could facilitate collaboration, the use/reuse of data resources, and dissemination of value-added datasets
- Identify resource needs for individual groups as well as identify immediate actionable items such as server space or software licenses, workshops and training sessions on data management topics.
- Discover the level of expertise and implementation of data management tasks, including archiving, storage, sharing, and cataloging data for each team.

These surveys and interviews determined that some named data sets of general utility are being used by SSI teams and include: 1) National Aerial Imagery Program (NAIP); 2) National Land Cover Data; 3) SSURGO soils data; 4) National Hydrography Data (NHD); 5) National Elevation Dataset (NED); 6) National Wetlands Inventory (NWI); 7) FEMA floodplain data; 8) Air Toxics Data; 9) near real-time National Weather Service data; 10) National Climatic Data Center climate data; and 11) US Census data.

Specifically-named data slated for SSI-wide and public release are also being used. The first is a suite of coupled climate model simulations for the 20th and 21st century (based on the IPCC AlB scenario), statistically downscaled to produce a high-spatial resolution dataset for Maine and the New England region. An updated version based on the CMIP5 project climate simulations for the next IPCC assessment will dovetail the World Climate Research Program's 2012-2013 timetable regarding the availability of new simulations. Data standards will be consistent with the Unidata and Earthsystemgrid. The second is stream flow data from SSI's stream flow sensors in the Sebago Lake watershed, which will be updated every three months and made available through the SSI Data system in WaterML to ensure web service- based transmission and integration with the CUAHSI Hydrologic Information System (CUAHSI-HIS). A third is economic and demographic forecasts of Maine regions.

Data management methods and needs varied broadly, but some common themes among SSI teams were:

- Metadata standards for non-GIS datasets are largely unknown
- Time and expertise for data management are in short supply
- Graduation of students poses challenges to continuity for data retention
- Use of cloud computing and access to a common server (D-Space) is not well understood

A draft synthesis report of findings from the team interviews has been completed and a comprehensive data catalogue of team data collections is being compiled in collaboration with the SSI social science survey data integration team. A similar survey was administered to SSI partner institutions and follow up phone/in-person interviews are being conducted this spring. The final synthesis report that collates the data needs and lays out a pilot approach for sharing

the data within SSI will be made available through the *MeSSI* cloud server. Interim findings were also compiled and presented to the SSI Advisory board in November 2011.

2) Developing appropriate permissions and access on the DSpace storage server:

A D-Space server running on a 100 TB NAS disk array had been deployed in YR2 on the UMaine supercomputer, which provides a centralized repository for SSI teams to store and share their data, and allows for centralized high performance computing. The D-Space provides the benefits of backup, automated metadata management, continuity across changing members within a team, and the opportunity to share data within, and between, teams as well as to provide public access to data as appropriate. While the current D-space usage is still small, it is growing at a rate of ten times per year, and the above UMaine supercomputer replacement will provide a much-enhanced experience that will encourage users to adopt this platform.

Three additional results were achieved on the D-Space server in YR3. First, the Sustainable Urban Regions (SURP) SSI project team has loaded all of their data onto the D-Space server. This represents about 50 gigabytes of spatial data representing census data, GIS data, and town parcel maps (maps of each individual property) for the Bangor and Portland metropolitan regions. Second, the user and administrative privileges have been extended to only allow members of SSI teams to login in and access data. Third, the D-space environment has been made available to serve as a data commons for the Southern Maine Partnership for Sustainable Development, a HUD-funded project coordinated through the Greater Portland Council of Governments and incorporating over 50 communities.

3) Inviting an external expert to consult on metadata concepts:

In November 2011, this SSI CI team brought in Mark Schildhauer, Director of the National Center for Ecological Analysis and Synthesis at the University of California at Santa Barbara. He is a recognized as a leading expert in econinformatics, metadata and ontologies and he confirmed that there is no clear, uniform guidance across disciplines, national programs, and federal agencies for data sharing and management. He spent two days working with the SSI CI team on optimal cyberinfrastructure approaches for data sharing within SSI, and the team is using this input to refine their approach.

4) Finalizing and implementing the SSI Data Plan:

The SSI Cyberinformatics team developed an overall data sharing and management plan for the SSI project that is designed to support data management and access for: (a) the internal investigations of the SSI project, (b) support of the SSI Partner Institutions throughout the state, and (c) sharing data as relevant to related broader national and international scientific investigations including NEON, LTERs, NBII, and CZO, CUAHSI. This plan continued to be refined during YR3 and was re-submitted to NSF EPSCoR with our January 2012 quarterly report. (See Appendix 8: SSI Data Management Plan.)

During YR3, the SSI Cyberinformatics team determined that on the technological side for SSI:

- The D-Space server will be an optional data repository for teams that wish to use it.
- The D-Space metadata catalog will be mandatory for all data for all teams – thus metadata about every data set collected by SSI teams will be cataloged in D-Space. This will allow for a single central, searchable catalog, enabling data discovery by other teams. The metadata standard will be a customized extension of Dublin Core that includes temporal and spatial scoping of the data. ISO 19115 and FGDC metadata will also be collected for all GIS data. The D-Space metadata catalog will contain pointers to each data set. If the data is stored in D-Space the pointer will point directly to the data. If the

data is not stored in D-Space, the pointer will contain contact information of the maintainer of the data.

- The D-Space server will be used to share data with the public.
- The UMaine Library will provide the portal through which the public can access publically shared data and will maintain the data integrity after the end of the SSI EPSCoR funding.

On the personnel/implementation side, surveys with individual teams clearly highlight both lack of time and lack of expertise within teams for centralized data storage and metadata. Teams do, however, recognize benefits of a centralized approach over the now predominant approach of storage on individual laptops and desktops. Such benefits include regular backups, the ability to smoothly transition data from one team member to another as team members graduate, and the opportunity to search for and share data across teams. To address these challenges, the SSI management team has moved towards a model where an SSI data-integration specialist would be hired. This specialist would build on the existing survey of data, and work with each team to ensure that every dataset has a metadata entry in D-Space. This specialist would also help teams in transferring their data to the D-Space server and gain access to it from their desktop/laptop machines if they wish to use D-Space as a centralized repository. Maine EPSCoR is currently investigating how to support such a position, with the hope that it can be implemented by June 2012.

The SSI Cyberinformatics group is continuing to work to provide open access to project generated data to researchers, educators, students, policymakers and citizens to the extent allowable by law, regulation, and data confidentially requirements. On-going discussions with various stakeholder groups center on how to make SSI data available in user-friendly formats, and this process is complicated by local Institutional Review Board for the Protection of Human Subjects (IRB) restrictions, and by legal restrictions imposed by local, state, and private agencies and companies before agreeing to provide access to their data.

II.B.5 External Engagement

The SSI Strategic Plan Goal #9 for external engagement addresses the need to create and maintain an effective outreach & communication network through strategies that encompass all participants, stakeholders, and the general public. Objectives have a two-fold thrust: 1) engagement through the SSI research component, and 2) general outreach and communication. (Note that Objective 9.1 for internal communications has been moved to the Management goal.)

Outreach and communication are fully integrated throughout all aspects of this project, as it is a key component of the sustainability theme. Therefore, many relevant activities and programs may have already been mentioned in other sections. (See Research, Diversity, and Workforce Development.) All impacts are evaluated through the evaluation and assessment mechanisms discussed in that section.

SSI External Engagement in the Research Component

Objective 9.2: Stakeholder Networks

SSI Strategic Plan Objective 9.2 is to establish on-going communication networks with stakeholders. Strategies for increasing integration across teams and stakeholder groups require a robust communication plan. Details on YR3 achievements are outlined below.

1) ***Stakeholder/SSI Team Meetings*:** Building and maintaining partnerships with stakeholders is a major component of SSI research. As a result, faculty and students have held over 200

formal and informal meetings with stakeholders across the state to discuss the SSI project and related interests. In addition, SSI faculty and students have participated in numerous local and state activities to disseminate information about the project.

2) ***Branding:*** In summer 2011, an SSI "brand" and logo were established. These are now being used throughout the project including for publications, email communications, website (new), displays, etc.

3) ***Newsletter:*** The first edition of the SSI *Solutions* newsletter was published in September 2011. The newsletter was distributed in print to our mailing list and posted to the SSI website with notification to the email distribution list. All key stakeholders (stakeholders directly partnering with project teams) and team members received a copy of the newsletter. *Solutions* is also available to other interested stakeholders and is distributed at SSI seminars and events. The second edition is currently in preparation with a planned distribution date of April 2012.

4) ***News & Events Email Communications****:* In fall 2011, an email communications list was set up using MailChimp software (web-based). Our email list of over 1,800 contacts was entered into the MailChimp database and has significantly improved our ability to send short-term news and events items to our stakeholders and other interested parties. This is especially important for ensuring that people receive timely information on SSI seminars and conferences. Updates are scheduled to go out monthly, although a more frequent schedule is used prior to a major event.

5) ***Annual SSI Conference****:* SSI partnered with the Maine Water Conference (MWC) for a second year on March 14, 2012 to provide a forum for dissemination of research information and project progress. The MWC provides an opportunity for SSI teams to present and discuss their research with a diverse audience of stakeholders including representatives from academia, NGOs, private sector, and government. Over 45 SSI team members participated in the conference. Both conference co-chairs were SSI team members (1 faculty, 1 collaborator). Presentations (oral and poster) included 11 SSI graduate students and 6 SSI undergraduate students.

6) ***SSI External Website****:* The SSI website at http://www.umaine.edu/sustainabilitysolutions/ has general information and updates on SSI research projects and progress. A new SSI external website is under construction and is planned for completion in early summer 2012. The goal is to have the website be more accessible for the lay public while making sure that more in-depth information is still available to researchers and stakeholders if they "drill-down" into the site. This project is taking longer than anticipated as we continue to provide maintenance and updates for both the internal and external SSI websites.

7) ***Other websites:*** Several websites provide information to stakeholders and the general public regarding SSI research and education projects. Links to all are provided from the main SSI website and include:
   - Bowdoin College partner website: http://research.bowdoin.edu/rivers-estuaries-and-coastal-fisheries/
   - Vernal pool informational website: www.umaine.edu/vernalpools
   - MLRC Weather Data (Colby College): http://www.colby.edu/chemistry/Weather/Weather/MLRC_Weather.html
   - Belgrade Lakes Project website: http://web.colby.edu/epscor/
   - Many Rivers One Estuary Symposium website: http://www.bowdoin.edu/environmental-studies/symposia/many-rivers-one-estuary/schedule.shtml

- Web-GIS of non-motorized trails: www.goaroostookoutdoors.com/trails
- Saco River sampling website: http://faculty.une.edu/cas/szeeman/SacoRiversamplingsites/
- USM Environmental Science Senior Seminar class website
- UMPI project website: under construction
- Unity project website: http://www.unity.edu/AboutUnity/MeetOurFaculty/FacultyResearch/HEMS/Welcome.aspx
- UMF project website: under construction

8) ***Maine Policy Review****:* Maine Policy Review (ISSN 1064-2587) publishes independent analysis of public policy issues relevant to Maine by providing accurate information and thoughtful commentary. The Margaret Chase Smith Policy Center and the Margaret Chase Smith Library publish the journal. The spring issue of Maine Policy Review is a special issue focusing on Maine's Sustainability Solutions Initiative. Many SSI team members and Maine EPSCoR workforce development partners have made significant contributions to this edition. The journal is widely distributed to politicians and other thought leaders in Maine.
9) ***UMaine Today****:* The fall 2011 issue of *UMaine Today*, the University of Maine's magazine, featured an article on "Working Tidal" that included the work being conducted by SSI that will help inform responsible tidal energy development in the state. The article is available at: http://umainetoday.umaine.edu/past-issues/fall-2011/working-tidal/
10) ***Maine Townsman*****:** *Maine Townsman* is the official monthly magazine of the Maine Municipal Association and is sent to more than 4,500 elected and appointed officials and employees of member municipalities and others interested in municipal issues. An article outlining the results from the Maine Municipal Official Survey conducted by SSI's Knowledge to Action Collaborative was featured in the November issue of the magazine. The newsletter is available at http://www.memun.org/public/publications/townsman/Townsman.htm.
11) ***Mitchell Lecture:*** Baruch Fischhoff was the keynote speaker at the 2011 Senator George J. Mitchell Lecture on Sustainability that took place on October 13, 2011. This is an annual, top-level campus event which attracts over 450 people. A key goal is to attract external stakeholders to campus for the event. External participants represented 25% of attendees at the 2011 lecture.
12) ***Consultant:*** A freelance writer continues to assist the SSI team with various materials that are written for a public audience. This includes research project summaries, *Solutions,* and faculty and student profiles.
13) ***Other:*** Other on-going communication projects for YR3 include maintenance and expansion of the database, maintenance and update of the SSI website, and updates of printed materials for public distribution including faculty and student profiles. An SSI brochure is awaiting final approval before it goes to print and new and updated profiles of research projects are on-going. We have also hosted seven SSI seminars and the Mitchell Lecture on Sustainability. All of these events are open to the public and are widely advertized through our News & Events emails.

Objective 9.3: Scientific Community

SSI Strategic Plan Objective 9.3 is to disseminate & communicate research progress and results to the scientific community. (Information on research publications is included in Appendix 7.) In addition to the above, the following activities took place during YR3:

1) ***Fischoff Visit:*** Baruch Fischhoff visited campus for two-days in fall 2011. His visit included meetings with groups of researchers from across campus with mutual interests. These included faculty and students in climate change, communication, earth sciences, economics, psychology, Sea Grant and Cooperative Extension. Fischhoff also joined students in the "Readings in Sustainability Science" course for a discussion of his work and research interests. The culmination of his visit was his keynote address at the Mitchell Lecture on Sustainability.
2) ***SSI Seminar Series:*** As discussed in the Workforce Development section, the SSI Seminar Series has brought seven external speakers to campus in YR3. A key component of these visits is to provide an opportunity for speakers to spend two or three days on-campus so there are ample opportunities for faculty with shared interests to meet and learn with them. Professional development opportunities for graduate students and postdoctoral fellows are also built into these visits.
3) ***Maine EPSCoR State Conference***: this annual event was held in September 2011 for 163 participants from throughout the state. (See Workforce Development section.)
4) ***NSF EPSCoR National Conference***: Maine EPSCoR supported 17 participants to attend the 2011 NSF EPSCoR National Conference in Idaho in October 2011. This included the 3 Maine EPSCoR Management Team members, 4 SSI faculty (2 on SSI Stewardship Council), 6 SSI graduate students, 3 legislators, and 1 Maine EPSCoR staff member. Three graduate students presented posters at the conference. (See Workforce Development section.)
5) ***UMaine Presentations***: SSI faculty, postdoctoral fellows and graduate students have given over 15 talks to the UMaine campus community during YR3.
6) ***Living on Earth Conference:*** In February 2011, Maine EPSCoR sent four SSI faculty members to the "Living on the Earth" workshop in Alaska in February 2011. Building on this workshop, SSI elected a delegate (Lindenfeld) to represent Maine in strengthening ties with other sustainability science projects funded by EPSCoR. Since then, Lindenfeld has collaborated with representatives from Alaska, Wyoming, and the U.S. Virgin Islands to prepare a proposal to NSF EPSCoR to support a Living on Earth workshop in the U.S. V.I. that, if funded, will take place in fall 2013.
7) ***National Sustainability Science Conference:*** SSI is currently putting together a white paper for submission to NSF EPSCoR for consideration to sponsor a national sustainability science conference in spring 2013.

General Outreach & Communication

Objective 9.4: General Public & K-12

SSI Strategic Plan Objective 9.4 is to build scientific literacy in sustainability science for the general public and K-12 community. Activities in addition to those outlined above include:

1) ***MPBN Documentaries***: Maine EPSCoR partnered with the Maine Public Broadcasting Network (MPBN) in YR2 to produce and air 2-3 documentaries annually that focus on SSI research. As a result of this partnership, the first two MPBN documentaries on "Sustainable Maine" aired during YR3 on September 27, 2011. The documentaries are accessible from MPBN's website at http://video.mpbn.net/program/sustainable-maine/ as well as the Maine

EPSCoR and SSI websites. MPBN is currently working on three new documentaries that will air in fall 2012. Accompanying activities include additional videocasts and links to research project materials and faculty profiles. Maine EPSCoR will also develop related K-12 curriculum that would make use of the Maine Laptop Initiative capacity to involve middle and high school students.

a) "The Triple Bottom Line" provides an introduction to SSI and sustainability science and brief introductions to the team's work on tidal power and family forestry.

b) "Desperate Alewives" focuses on the collaborative research of three partner institutions - Bates College, Bowdoin College, and the University of Southern Maine.

c) "Saving Our Lakes" demonstrates Colby College's SSI team's extensive collaborations with stakeholder partners in the Belgrade Lakes region (air fall 2012)

d) "Basket Trees" showcases the importance of the SSI Emerald Ash Borer team's collaborative work Maine's tribal communities (air fall 2012).

e) "Maine's Vernal Pools" is currently being filmed, and will show the importance of this SSI team's work (air fall 2012).

2) ***Videocasting***: At the NSF communicating science workshop held in Maine in April 2011, the importance of utilizing video to tell your story was emphasized by the presenters. We had previously begun an effort to create videos that showcase Maine EPSCoR, SSI, and Maine STEM Collaborative programs and activities, and are now in the process of putting this in place on a much more comprehensive scale. Videos are posted on Maine EPSCoR's YouTube site, which is directly linked to the Maine EPSCoR and SSI websites. While SSI stakeholders and other EPSCoR jurisdictions have commented that the videos helped them to find out more about Maine EPSCoR programming, our intent is to eventually create more "buzz" for informing the general public audience as well. In addition, SSI is videocasting other major events which are posted to their Vimeo website (accessed via the SSI website) for general public viewing, and the Maine EPSCOR Vimeo site hosts the MPBN and other videos.
3) ***Printed media***: Maine EPSCoR produced a fall 2011 newsletter, and a spring 2012 issue is pending. General Maine EPSCoR brochures, presentations, posters, exhibits, etc. have also been produced and utilized in numerous venues.
4) ***Public presentations***: These play an important role in communicating SSI research to the public, and in YR3 SSI team members carried out over 30 presentations to a wide variety of public audiences. In addition, several presentations on STEM Education and Workforce Development were made to stakeholder organizations.
5) ***General websites***: Several other websites are geared towards the general public and include:
   - Maine EPSCoR: www.umaine.edu/epscor (being re-developed)
   - Maine STEM Collaborative website: http://www.umaine.edu/epscor/STEMCollab.htm
   - CCIDS project website: http://ccids.umaine.edu/research-projects/epscor-stem/
6) ***Social Media:*** Maine EPSCoR had also created an initial Facebook page with the assistance of one of our New Media students. This student graduated and we are still in the process of recruiting someone new who can fully populate this page with information and keep it updated. As reinforced by the presenters at the April 2011 NSF communicating science workshop, social media needs to be part of an effective communication strategy, and Maine EPSCoR will utilize its Facebook site as another outlet for informing the general public, other EPSCoR jurisdictions, and potential stakeholders. We will also continue to investigate

how Twitter could be utilized to assist statewide collaborations and efforts, and also be another informational tool for the general public.

7) ***Maine STEM Summit:*** Maine EPSCoR partnered with the Maine STEM Collaborative and its members to sponsor the 2012 Maine STEM Summit in March 2012, which had 311 participants from K-12, higher education, non-profits, government, and business and industry.
8) ***Maine STEM Collaborative:*** Maine EPSCoR worked with the Maine STEM Collaborative to produce the following reports and documents, all of which are posted on the website at http://www.umaine.edu/epscor/STEMCollab.htm and have been widely distributed via e-mail and print:
    5) 2011 STEM Talking Points
    6) 2012 STEM Education in Maine: An Executive Summary of Student Performance, Teacher Preparedness, and STEM Programs
    7) Maine STEM Landscape Technical Assistance: Mathematics and Science in 5th, 8th, and 11th Grades, from the Regional Educational Laboratory at the Education Development Center (EDC), written by Craig Hoyle, August 9, 2010
    8) Maine STEM Landscape Technical Assistance: K-12 Certification Endorsements, 2009-2010, from the Regional Educational Laboratory at EDC, written by Peter Tierney-Fife, July 22, 2010
    9) Teachers of Science in Maine Schools, Grades 1-12: A Descriptive Study, written by Bill Nave, Ed.D., Research and Evaluation Consultant, May 2011
    10) Briefing Paper on STEM Education in Maine, from EDC, written by Nancy Richardson, Barbara Brauner Berns, and Lisa Marco, November 29, 2010
9) ***Other Collaborators:*** In addition, Maine EPSCoR also collaborated with 53 additional partners at 24 institutions/organizations in general workforce development, STEM educational outreach and communication, and human resource development. Other educational outreach activities have been detailed in other sections and include: 1) National Girls Collaborative Project; 2) Expanding Your Horizons; 3) NSF ADVANCE; 4) Native STEM Scholarship Development Program; 5) Cyberinfrastructure activities; 6) Orono High School Research Internship Program; 7) Upward Bound; 8) Maine Center for Research in STEM Education programs; 9) Biogeomon 2012; and 10) Maine STEM Collaborative activities.

Objective 9.5: NSF & Other Jurisdictions

SSI Strategic Plan Objective 9.5 is to maintain outreach and communications with the NSF EPSCoR office and other EPSCoR jurisdictions. This is done through newsletters, press releases, highlights, reports, evaluations, site visits, and attendance at national EPSCoR events, as well as on-going e-mail and phone communication with our NSF EPSCoR Program Director and colleagues at other EPSCoR jurisdictions.

II.B.6 Evaluation and Assessment

SSI Strategic Plan Goal #10 addresses evaluation and assessment tools that allow us to "Utilize multiple formative and summative evaluation processes to improve the project's effectiveness and assess its impact in relation to its goals."

To achieve this, the Maine EPSCoR Management Team has taken the following five-pronged approach to project evaluation and assessment. Formative evaluation processes will improve the

project's effectiveness, and summative evaluation processes will assess its impact in relation to its goals. All evaluations will determine: 1) the appropriateness of the investment relative to accomplishments; 2) if the investment strategy yields substantial improvement in research and competitiveness; 3) if linkages between the project's research, education, and innovation efforts are effective; and 4) if strategies increase participation. Findings are used by the Maine EPSCoR Management Team and SSI Stewardship Council to enhance efficacy, identify obstacles, assist in developing corrective action plans as needed, and helping to plan for sustainability and improvements.

Specific progress towards the YR3 Strategic Plan goals, objectives, and benchmarks can be found in detail in Appendix 2: Objectives, Strategies, Benchmarks, and Progress.

Objective 10.1: External Evaluators

SSI Strategic Plan Objective 10.1 is to contract with experienced external evaluators to annually assess the project's performance, with a particular focus on the evolution and outcomes of collaborative relationships, student integration in the research process, and external stakeholder interaction. To accomplish this, Maine EPSCoR has continued to work with experienced external evaluators Drs. Eric Welch, University of Illinois Chicago, and Julia Melkers, Georgia Institute of Technology, to annually assess the project's performance.

During YR2, the external evaluators continued their assessment through site visits to conduct faculty and student interviews (November 2010 and May 2011), attending the Maine EPSCoR State Conference (November 2010), and conducting an on-line survey for all SSI participants (April 2011). The formal report was completed in July 2011 (YR3), disseminated to SSI participants via the MeSSI intranet, and submitted to NSF EPSCoR. Their recommendations were reviewed by the Maine EPSCoR Management Team & SSI Stewardship Council, with subsequent actions integrated into the SSI Strategic Planning process and implemented during YR3.

Current on-going YR3 evaluation activities include a site visit to the 2011 Maine EPSCoR State Conference (September 2011), a follow-up participant survey (March 2012), and a bibliographic analysis, with the final report due June 2012.

YR2 Key External Evaluator Observations:
1) Maine EPSCoR SSI has matured institutionally: the group of supported faculty and students has grown, as has number of partner institutions; shows important progress toward developing stronger ties across the state.
2) The project has developed clear programmatic structure for ongoing communication and interaction with faculty and students across the state.
3) Maine EPSCoR took important steps to restructure the relationship with the SSI Partner institutions, with on-site visits an important step in developing stronger ties.
4) Impressive progress in hiring students across institutions; both graduate and undergraduate students are highly motivated and acquiring new research skills.
5) It is clear that there is significant activity in the number of stakeholder interactions underway as part of the Maine EPSCoR SSI project.
6) Overall assessment is that while programmatically Maine EPSCoR is successfully establishing its structure and processes in an institutionalized fashion, it faces the considerable challenges that come with being a complex and distributed research group.

YR2 Key External Evaluator Recommendations:	Maine EPSCoR Response/Action:
1) **Faculty Production:** Given the wide range of institutional types involved and the complexity and interdisciplinarity of the SSI research, new strategies may be required for publications and grants, as some faculty may not be well-prepared for these types of new efforts. Maine EPSCoR can provide important guidance and resources.	- hosted 3 grant-writing workshops at SSI partner institutions; will continue - Management Team provides seed-funding to SSI teams to support the writing of collaborative publications and grants - NSF Program Officers present on funding opportunities at the annual Maine EPSCoR State Conference - SSI Stewardship Council has taken a lead role in collaborative publications
2) **Interaction with SSI Partner (SSP) Institutions:** Cross-institutional and cross-disciplinary collaboration are each challenging in their own right; conducting both at the same time is particularly complex, especially given the range of different universities and colleges in this project. Attention to these challenges should be explicit and on-going.	- Management Team & Stewardship Council are very aware of the need for diligence in this area and are addressing challenges on an on-going basis for continuous improvement - SSI has examined many organizational models for best practices and will continue to do so - SSP Coordinator & Maine EPSCoR Director act as primary mentors for SSP organizations
3) **Faculty-Student Collaboration:** continue to actively encourage the participation of students in research-related activities, including the Statewide Conference, and in the writing and submission of journal articles.	- All SSI students will continue to be strongly encouraged to participate in all SSI activities, and to remain actively involved in SSI research, discussions, planning, presentations, publications, grant-writing, etc.
4) **Communication:** encourage and facilitate communication among faculty across institutions, and increase the use of videoconferencing as a means of communication and coordination.	- New SSI Communications Center will be ready May 2012, and will greatly enhance ability to bring all participants together virtually - All institutions now have high-speed bandwidth and videoconferencing - Continue training in webcam and videoconference use

5) Administrative Issues: project requires high level of administrative effort that can be burdensome; especially at smaller SSI-Partner institutions. Develop ways to streamline the administrative effort required, provide additional training or resources.	- SSP Coordinator position established to assist partner institutions more - Maine EPSCoR streamlined reporting procedures for YR3 as much as possible (but the high level of input needed for NSF EPSCoR information requirements cannot change) - Videoconference trainings & administrative consultations implemented for SSI Partners in YR3
6) Stakeholder-Related Data: make sure to maintain a complete set of information on stakeholder contacts and interactions (centralized database).	- All SSI project information is captured in the SSI database system that faculty use; in YR3, additional fields were implemented to ensure that complete stakeholder interaction data is there
7) State Conference: include sessions designed to facilitate cross-institutional collaboration, and highlight successful stakeholder interactions to help less-experienced faculty.	- The 2011 Maine EPSCoR State Conference (Sept. 2011) did address these areas, and we will continue to build on this for 2012

Objective 10.2: AAAS Assessment

SSI Strategic Plan Objective 10.2 is to utilize the American Association for the Advancement of Science (AAAS) Research Competitiveness Service to provide a scientific peer review to help ensure high quality program delivery. The two-day YR2 review took place May 23-24, 2011 at the University of Maine. AAAS recruited a panel of 4 experienced professionals with relevant expertise, and the project site review included one-on-one interactions with the management teams, key administrators, project personnel (faculty, postdocs, graduate & undergraduate students), outreach participants, industry/small business, and stakeholders. The panel examined focal questions on the project objectives to help ensure continued success, and produced an assessment report in August 2011. The report was disseminated to SSI participants via the MeSSI intranet, and forwarded to NSF EPSCoR. Their recommendations were reviewed by the Maine EPSCoR Management Team & SSI Stewardship Council, with subsequent actions integrated into the SSI Strategic Planning process and implemented during YR3.

YR2 Key AAAS Observations:
1) SSI is diverse and challenging to conceptualize. It involves a new and emerging discipline that combines researchers and stakeholders from diverse backgrounds, working together to define both problems and solutions. To accomplish this, SSI has engaged an impressive diversity of participants.
2) ME EPSCoR has engaged nearly all of higher education in the state of Maine. This level and type of involvement is an incredible and perhaps unique achievement. Importantly, the engagement is not only broad and active, but 'real' and function
3) ME EPSCoR and SSI has been exceptional in strengthening the education pipeline in its activities.

4) Clear sense that the group of researchers involved is excited by their work, has fundamentally embraced interdisciplinary approaches to their research, and imparted their enthusiasm for working in collaborative interdisciplinary teams with their graduate students. In turn, their students seem to share a similar enthusiasm and regard for team science.	
5) The SSI approach and the scale of activities have the potential to result in significant changes in the way that researchers and stakeholders engage to address societal needs. However, they also present challenges, such as maintaining effective and focused organizational and research structures.	
6) One of the most impressive things about SSI is that interdisciplinarity is truly central to this initiative; nothing is forced. Furthermore, the administration, management, faculty, post-docs, and students are part of this program <u>because</u> of the interdisciplinarity -that element that is so hard for many programs to address. Indeed, the interdisciplinary nature of the initiative seems to be one of the central elements that draws people to SSI.	
7) The 'solutions' focus of the project is excellent. There is a palpable commitment to making the world - the world of Maine in this case - a better place to live and to work through promoting economic development in an environmentally sustainable way.	
8) The subsequent layers of organization and management have also been very active and appear to be fulfilling the needs of the initiative. Importantly, the leadership is aware of the challenges in managing such a comprehensive initiative and has taken steps to assess and, where necessary, modify its structure.	
9) Overall, the panel was impressed by the progress that has been demonstrated by SSI in such a short time. Much of that success is due to the dedicated, thoughtful, experienced, and selfless nature of the participants we interacted with during the site visit, including both the leadership of the ME EPSCoR and SSI components.	
YR2 Key AAAS Recommendations:	**Maine EPSCoR Response/Action:**
1) Research: - Further strengthen SSI by strategically re-visiting allocation of scientific effort and consider focusing more on fewer high-impact projects that offer the most promise; - consider expanding problemscape to "landscape and coastal dynamics"; - consider rebalancing SSI portfolio to increase the social science and economics contributions to the overall effort	- Management Team & Stewardship Council are very aware of the need for focused effort; examining ways to allocate additional resources to high impact project teams; need to balance with commitments to faculty and students - Semantic interpretation; for our purposes, landscape includes broad land & adjacent water - Social science is a mandatory part of each team's focus; SSI Economic Task Force has proposed several studies of economic underpinnings of each project in existing portfolio (quantify & understand)

2) Diversity: - focus on women and minority hires for planned post-doctoral recruitments - continue efforts to engage minorities, with particular focus on ethnic, economic, and gender - coordinate with i.e. McNair and NSF ADVANCE Programs.	- All four new postdocs are female - Diversity efforts continue and are expanded as possible - Maine EPSCoR is already a partner with UMaine's NSF ADVANCE; UMaine has not submitted a recent McNair, but Maine EPSCoR is positioned to partner for future
3) Workforce Development: - guard against spreading too thin; make sure there is a rationale for understanding the contributions of each strategy/partner - Implement a more formal program for mentoring post-doctoral new hires - Continue to work to develop a STEM database for the state - consider partnering with industry to offer SSI-related internships	- workforce development efforts are highly targeted for maximum benefit; many worthwhile other efforts are not engaged in because it would spread us too thin - looking at resources from the National Postdoctoral Association; new hire postdocs all have individual formal mentoring plans - STEM database is currently under development with several partners - Maine EPSCoR works with the new REACH Center and UMaine's Foster Student Center for Innovation, both of which implement these internships
4) Cyberinfrastructure & Data Planning: - utilize a combination of carrot (speed/storage, multiple projects that all use or contribute to data management, etc.) and stick (require) approaches to encourage transition to centralized cloud system - use established formats for data/metadata to standardize holdings and leverage existing resources	- making data available is not an option for teams supported in YR4 - Redeveloped data management plan & implementing it through Cyberinformatics committee - Visit by Mark Schildhauer, Director of the National Center for Ecological Analysis and Synthesis at the University of California at Santa Barbara; consulted with CI team on optimal data management
5) Outreach & Communication: Many of the problems Maine faces span its borders and may require unique expertise not found within its borders; build on impressive set of in-state partnerships with key out-of-state partnerships.	- submitted NSF SRN pre-proposal w/ Univ. New Hampshire - SESYNC network proposal - visiting researchers from MIT, Harvard - networked new collaborations at NSF EPSCoR National Conference

6) Sustainability: continue to pursue possibilities for funding through foundations as well as federal grant programs (i.e. NSF IGERT).	- 72 grant proposals were submitted by SSI researchers in YR3 ($32.5M) - IGERT is a limited competition for institutions (SSI not selected last year; pending this year) - High focus on foundations right now - planning teams underway for several collaborative large grants (i.e. NSF CNH)
7) Management/Organizational Structure: - increase the available expertise in economic and social areas (e.g., environmental sociology and environmental economics) on SSI Advisory Board - consider how to reduce the significant amount of time devoted to attending meetings in order to avoid burnout	- SSI Advisory board felt they had adequate expertise as is - Worked in YR3 to decrease frequency of meetings as much as possible

Objective 10.3: SSI Advisory Board

SSI Strategic Plan Objective 10.3 is that an SSI Advisory Board provides on-going assessment and guidance to the research project team. During YR1, the Advisory Board was formed in the fall of 2009, and is comprised of 10 members who represent state, regional, and national experts in fields of relevance to the SSI research mission (see Appendix 1 for membership). Their primary focus is on the scientific research foundation of SSI.

SSI Research Project Director David Hart confers with Advisory Board Chair Robert Kates on at least a monthly basis, and board members attend SSI events whenever possible, such as the 2011 Mitchell Lecture, where they have a chance to talk with SSI members. The Board also meets via conference calls as needed.

During YR3, the Board met in person for two days at UMaine on November 15-16, 2011, where SSI leadership and teams presented updates on the research portfolio of projects. The teams also addressed a specific set of questions that the Advisory Board had posed prior to the meeting. The Board also met with members of the SSI Research Council and the Maine EPSCoR Management Team.

Their recommendations were reviewed by the Maine EPSCoR Management Team & SSI Stewardship Council, with subsequent actions integrated into the SSI Strategic Planning process for implementation during the rest of YR3 and beyond.

YR2 Key SSI Advisory Board Observations:
1) SSI encouraged to "keep their eye on the prize" with a primary focus on the dual goals of advancing the field of sustainability science and making useful contributions to problem solving.
2) A third key goal, ensuring the sustainability of SSI via a stable revenue stream, requires success in these first two areas.
3) Other goals should be secondary, e.g., creating a common culture based on shared values; building a critical mass of team members; mentoring and supporting new leaders; engaging effectively with diverse stakeholders; establishing a compelling academic program.

4) A valued development has been the remarkable partnerships with most Maine institutions. Part of the organizational structure should include a creative means to maintain and advance these partnerships.	
5) SSI has created a research portfolio, which is the collection of different place- and problem-based projects on which various teams are working. SSI continues to wrestle with various challenges about how best to maximize any potential benefits of this portfolio strategy (e.g., the ability to compare and contrast different projects, evaluate the roles of local context, develop and test "general theory", or address larger issues facing the State etc.).	
6) The Board readily agreed that problems and solutions need to be co-developed by researchers, practitioners , and stakeholders, which is often a complex process.	
7) What are some key strategies for positioning SSI within Maine as well as the international academic community?	
8) The Board was generally impressed with the cyberinfrastructure.	
YR2 Key SSI Advisory Board Recommendations:	**Maine EPSCoR Response/Action:**
1) Research: - important to accelerate and finish basic research in existing portfolio of projects. - develop more examples of integration of the SSI projects and of methods - having more faculty from a larger number of disciplines working on a project does not mean that research results are more integrative. - develop example presentations of instances that integrate between trends in the portfolio of projects or integrate projects dealing with a single trend. - consider incorporating an agenda based on broader problem statements as reflected in Brookings Institution's report on Charting Maine's Future, or the Measure of Growth benchmarks (e.g., cost of energy, conservation, sustainable forest lands).	- SSI Research Project Director, Stewardship Council, and Research Council are all working to ensure that these SSI Advisory Board concerns are addressed. - Each project in SSI portfolio constitutes a place-based, multi-scale investigation of SES and K↔A processes, patterns, and interactions. While each project offers important learning opportunities in its own right, one of SSI's central goals is to create a quasi-experimental design in which particular groups of projects can be used to compare and contrast the influence of different processes shaping SES and K↔A. This integrative strategy also increases the potential for drawing inferences about the role of contextual factors (e.g. biophysical, socioeconomic, and decision-making characteristics) and scale on system behavior. - SSI used two design principles to populate the portfolio with place-based, use-inspired interdisciplinary research projects. These principles are intended to promote sufficient among-project consistency to accelerate the solutions development process and increase opportunities for synthesis

	and learning via comparative analysis and rapid feedbacks. The first design principle is that research endeavors with a proactive stakeholder engagement process are likely to pre-select candidate problems that, if solved, will fill an important knowledge gap with an urgent societal context. The second design principle is that numerous sustainable development challenges are inherently complex and multi-faceted, thus necessitating team-based problem solving. - Working to create examples that show how the different collaborative teams are working to weave together the themes and arenas - The Economic Task Force has proposed several studies of economic underpinnings of each project in existing portfolio (quantify & understand)
2) **Publications:** - produce high-visibility publications in high quality peer-reviewed journals; give priority to preparing a few key synthesis papers; next priority is to support publications on specific high profile projects in SSI portfolio. - More effort should be given to documenting how practitioners and stakeholders in Maine are contributing to shape solutions. This is another area where SSI can have impact through well-targeted high quality publications. - develop case studies of successful efforts of practitioners engaged in solving sustainability problems in Maine or resolving environment-development conflicts	- SSI Stewardship Council has put a high priority on preparing a few key synthesis papers, and has dedicated part of their weekly meetings to this effort - The Maine EPSCoR Management Team issued RFPs to support the development of high-profile collaborative publications; two teams funded to date - SSI is looking at developing case studies
3) Cyberinfrastructure: - Concern was expressed that projects need to pay immediate attention to catching up with their data archiving. If only one-quarter of the data has been archived (the estimate we heard), projects are considerably behind.	- making data available is not an option for teams supported in YR4 - Redeveloped data management plan & implementing it through Cyberinformatics committee; includes working with UM library

- SSI might work more closely with the university library and consider if the UM library might eventually house the SSI database and make it available to users.	- Visit by Mark Schildhauer, Director of the National Center for Ecological Analysis and Synthesis at the University of California at Santa Barbara; consulted with CI team on optimal data management - Considering hiring a Data Integration specialist
4) Workforce Development: - develop distinctive academic certificate and degree programs that build on the interdisciplinary experience and stakeholder relationships of SSI - How are new faculty being mentored by senior faculty involved in SSI and by senior faculty from their home departments who are not involved in SSI to ensure that they qualify for tenure regardless of SSI's future?	- Graduate certificate developed and pending approvals - Vice President for Research Mike Eckardt & SSI Research Project Director David Hart have worked during YR3 to ensure that new faculty tenure mentoring and tenure process is successfully negotiated
5) Outreach & Communication: - Position SSI nationally and internationally through a biennial conference and extended workshops on efforts to resolve environment-development conflicts. - maintain databases using a common web portal	- SSI is submitting a workshop proposal to NSF EPSCoR in May 2012 for a national sustainability science conference in spring 2013 - Common databases are in use and available through MeSSI intranet
6) Organizational Structure: - For post-EPSCoR sustainability, look at the UMaine Climate Change Institute model on how to create a balance between multiple department involvement within the University and a distinctive state, national, and international program - rename Mitchell Center to Mitchell Sustainability Solutions Institute	- SSI has examined many organizational models for best practices and will continue to do so - UMaine Senior Administration has approved formal creation of SSI as a UMaine research center; pending approval of Senator Mitchell

Objective 10.4: NSF EPSCoR Reverse Site Visit and Site Visits:

SSI Strategic Plan Objective 10.4 is to participate in NSF EPSCoR reverse site visits, site visits, conferences, and workshops, and to host NSF EPSCoR program officers and directors in visits to the Maine EPSCoR project sites. Information obtained through all of the following activities has been utilized as part of the project's feedback loop to continually refine our planning, strategies, actions, managament, and evaluation activities.

1) ***NSF EPSCoR Reverse Site Visit:*** There was no RSV in YR3 – we are scheduled for September 11, 2012 (YR4).
2) ***Maine EPSCoR State Conference*** (September 2011): NSF EPSCoR Head Henry Blount and Program Officer Sian Mooney both participated in this event and were able to provide valuable feedback to the Maine EPSCoR Management Team and SSI faculty. In addition,

Joan Ferrini-Mundy, Assistant Director, NSF Directorate for Education and Human Resources (EHR) was sponsored through NSF EPSCoR's outreach program to present on funding opportunities in EHR at this event. She also met individually with SSI researchers throughout the day.

3) ***NSF EPSCoR National Conference*** (October 2011): Maine EPSCoR supported 17 SSI participants to attend this event in Idaho to learn about best practices, hear about what other EPSCoR states are doing, and to engage in networking for potential collaborations. Participants included all of the Maine EPSCoR Management Team and two members of the SSI Stewardship Council, who were able to utilize the information gained in subsequent planning, management, and evaluation activities.
4) *NSF EPSCoR Project Directors/Project Administrators Meeting* (January 2012): Maine EPSCoR Director Vicki Nemeth participated in this event in Arkansas to learn about NSF EPSCoR updates, clarifications, and best practices. Information was brought back to the Maine EPSCoR Management Team to use in planning, management, and evaluation activities.

Objective 10.5: Internal Project Evaluation, and Assessment Feedback Loops

SSI Strategic Plan Objective #10.5 is for the Maine EPSCoR Management Team and the SSI Stewardship Council to engage in on-going evaluation and assessment review to ensure that the project achieves its goals, objectives, and benchmarks.

The Maine EPSCoR Management Team consists of Mike Eckardt (Project Director/PI), Vicki Nemeth (Associate Project Director/Co-PI/Maine EPSCoR Director), and David Hart (SSI Research Project Director/Co-PI). During YR3 they met at least monthly in person to plan and oversee activities, address issues, review administrative and programmatic progress, and make decisions on needed changes and solutions. On-going communications between them also took place at least weekly via phone, e-mail, or webcam conferencing.

In addition, the SSI Stewardship Council met weekly to address research-related progress and issues, recommend changes and solutions, and plan and coordinate SSI research programs and activities. The Maine EPSCoR Management Team is also part of these meetings.

All recommendations resulting from evaluation and assessment activities are reviewed and acted upon by these teams, with final decisions on actions being incorporated into the SSI Strategic Plan. Both teams also review the specific progress on the SSI Strategic Plan Strategies and Benchmarks metrics (See Appendix 2 for specific progress in YR3 on these metrics). Different evaluation mechanisms frequently offer widely different recommendations, and the Management Team and SSI Stewardship Council carefully consider and weigh the pros and cons of all in relation to the realities of the project, and make decisions accordingly.

In September 2011, Maine EPSCoR formally reported on progress to the Maine Innovation Economy Advisory Board (MIEAB), which acts as the state's EPSCoR Committee. The Maine EPSCoR Project Director, who is a member of the MIEAB, also provides on-going updates throughout the year, and brings MIEAB feedback to the Maine EPSCoR Management Team for action.

All SSI teams in the Center for Sustainability Solutions are managed/organized in a holistic, comprehensive matrix system, with a hierarchy of evaluation and decision-making mechanisms to ensure on-going monitoring and success. The SSI goals, objectives, and benchmarks detailed in the SSI Strategic Plan apply to every research project in the Center's integrated portfolio, and all projects are evaluated using a common set of metrics for the sustainability science focus. The

Maine EPSCoR Management Team oversees the SSI research review and funding process. (See Management section for additional detail.)

SSI research progress is monitored, evaluated, and reported at three levels:

- Overall SSI project progress on the main goals and objectives for the three cross-cutting research themes of SES, K-A, and OI.
- Overall progress on project-wide integration in the model problem set being studied.
- Other individual team project progress as applicable.

All SSI teams in the Center for Sustainability Solutions are part of year-round, multiple mechanisms for monitoring and evaluation of research progress, the results of which are then utilized by the various layers of management and advisory teams in decision-making. The schedule of mechanisms is detailed in the following table.

SSI research teams progress review schedule:	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Progress reports												
Team/site visits				UM/ USM					SSPs			
AAAS assessment												
SSI Advisory Board												
SSI Advisory Board Chair updates (on-going)												
Peer critique & feedback (on-going)												
SSI Research Director review (on-going)												
Maine EPSCoR Management Team review (on-going)												

II.B.7 Sustainability and Project Outputs

The SSI Strategic Plan Goal #11 for sustainability is to "Sustain the SSI infrastructure, impacts, and achievements through the continued integration of scientific entrepreneurship, institutional and external support, partnerships, education, workforce development, and constituency outreach."

The May 2011 (YR2) retreat focused on long-term planning for SSI, including capacity building in and beyond the EPSCoR grant. Action items coming out of the retreat included: long-term planning for the Sustainability Solutions Center; additional focus on cross-team research; building/maintaining long-term collaborative relationships with stakeholders; doing more to incentivize external grant proposals and synthesis papers; and continued strengthening of internal network and integration structure. During YR3, the SSI Stewardship Council has worked on addressing these items in collaboration with the Maine EPSCoR Management Team and the SSI Research Council.

The following details YR3 progress under the five main objectives for this goal.

Project Outputs:

Specific YR3 outputs are detailed in other sections as well as Appendix 2 – SSI Objectives, Strategies and Benchmarks, and the NSF EPSCoR Reporting Template E - Outputs. A summary is provided below.

1) ***Positions supported****:* During YR3 of this RII project, a total of 318 individuals were directly supported under this project (received salary/wages): 100 faculty, 6 postdocs, 54 graduate students, 101 undergraduate students, 21 high school students, and 36 professional/technical/administrative staff. Of those totals, 188 were continuing personnel who had also been supported on the SSI project during YR2: 85 faculty, two postdocs, 37 graduate students, 26 undergraduate students, 20 high school students, and 18 professional/technical/administrative staff. An additional 130 personnel were newly supported on the SSI project during YR3. Of that, 26 were existing institutional positions that were new to the SSI project for YR3 and included the addition of 14 faculty and 12 professional/technical/administrative staff. An additional 104 were newly hired positions and included: 1 faculty, 4 postdocs, 17 graduate students, 75 undergraduate students, 1 high school student, and 6 professional/technical/administrative staff.
2) ***Participants in supported activities*****:** an additional 6,348 participants were indirectly supported through various outreach, workforce development, and collaborative activities that were sponsored and supported by Maine EPSCoR. These included: 399 faculty at academic research institutions, 288 faculty at primarily undergraduate institutions, 25 postdocs, 225 graduate students, 290 undergraduate students at academic research institutions, 766 undergraduate students at primarily undergraduate institutions, 316 technical/ professional/administrative staff, 205 K-12 teachers/pre-service teachers, 77 K-12 administrators/guidance counselors, 193 high school students, 262 middle school students, 68 elementary school students, 470 business/industry representatives, 1,004 NGO/government representatives, and 1,503 members of the general public through conferences and workshops.
3) ***Publications:*** Publications: SSI faculty published 78 total publications; eight scientific journal articles with primary NSF EPSCoR support, 26 with partial NSF EPSCoR support; one book chapter with partial NSF EPSCoR support; six abstracts with primary NSF EPSCoR support, five with partial NSF EPSCoR support; four proceedings with primary NSF EPSCoR support, three with partial NSF EPSCoR support; 10 technical reports with primary NSF EPSCoR support, one with partial NSF EPSCoR support; one editorial with primary NSF EPSCoR support, one with partial NSF EPSCoR support; four newsletters with primary NSF EPSCoR support, one newsletter with partial NSF EPSCoR support; and four other publications with primary NSF EPSCoR support, three with partial NSF EPSCoR support. (See NSF Fastlane and Appendix 7: Publications for detailed listing.)
4) ***Proposals submitted*****:** During YR3, 72 grant proposals were submitted by SSI researchers ($32.5M), 45 awards were received in YR3 ($2.9M), 37 are still pending ($18.4M), and 6 were rejected ($4.8M). (A complete list of grants submitted/awarded in YR3 can be found in Appendix 6.)

Objective 11.1: Inter-institutional Synergy

SSI Strategic Plan Objective 11.1 is to use the Center for Sustainability Solutions (CSS) as a catalyst for building inter-institutional synergy in solving sustainability-related problems. YR3 strategies and actions for this are detailed in the RII Participants, Research, Workforce Development, External Engagement, and Management sections.

It is significant for the state that undergraduate educational institutions from across Maine have become active participants in the SSI project through the SSI Partners program. Site visits by the Maine EPSCoR Management Team continue to assist with how this program can be further refined to maximize participation and integration.

Objective 11.2: University-Stakeholder Partnerships

SSI Strategic Plan Objective 11.2 is to build an interconnected, state-wide network of university-stakeholder partnerships. All SSI research projects are required to have stakeholder participation. As a result, researchers are collaborating with over 267 individuals in 146 stakeholder groups across the SSI project. Teams have strengthened this network as their research projects have developed with over 203 researcher-stakeholder meetings in YR3. Additional information on strategies being used to support university-stakeholder partnerships is discussed in the Research and External Engagement sections. (Also see Appendix 5: Collaborators.)

Objective 11.3: Government and Private Sector Support

SSI Strategic Plan Objective 11.3 is to seek external grants and contracts from government and the private sector. The long-term sustainability of SSI will depend on many sources of funding, and SSI project teams have made significant progress on competitive proposals to other federal agencies, state government, and private entities that can sustain the SSI research and education enterprise. During YR3, 72 grant proposals were submitted by SSI researchers ($32.5M), 45 awards were received in YR3 ($2.9M), 37 are still pending ($18.4M), and 6 were rejected ($4.8M). (A complete list of grants submitted/awarded in YR3 can be found in Appendix 6.) In YR3 and beyond, additional emphasis continues to be placed on the following:

1) ***Management Team Seed Funding***: The Management Team is committed to providing seed funding (as a voluntary cost contribution) for team members seeking to develop SSI external collaborative proposals. (See Seed Funding below.)
2) ***Specialized Support***: SSI is committed to providing support for SSI researchers to meet with Program Officers; to form proposal action teams; and to provide proposal organizational support, including finding appropriate RFPs (on-going).
3) ***External Funding Inventory***: An inventory of state agencies and contacts has been created and meetings with agency partners are taking place opportunistically across the project. For example, several meetings between SSI team members and federal and state representatives took place during Robb Jacobson's visit to campus in Feb. 2012. A scoping meeting was also organized with The Nature Conservancy and state agency representatives to discuss SSI involvement in river restoration projects. Meetings and discussions also take place on a regular basis across individual teams who work directly with state and federal agencies, for example #1 and #2.
4) ***Funding Opportunities Database***: An undergraduate student in the Maine EPSCoR office maintains the UMaine Funding Opportunities Database, which currently has over 7,500 records. This is available on-line for anyone in the state to search for potential external

funding opportunities (through the UMaine Office of Sponsored Research website), and SSI researchers are encouraged to utilize it.

5) ***SSI Integration Projects:*** Funding was awarded to four integration projects in YR2. The goal of these projects was to assist the team in strengthening integrative strategies for its work in sustainability science and help increase competitiveness for national-level funding in a variety of programs especially those that address transformative and broadly interdisciplinary topics. Details of research outcomes for these projects are included in other sections of this report.

Objective 11.4: Foundation and Private Support

SSI Strategic Plan Objective 11.4 is to develop a base of foundation and private support for SSI. Identification of foundations whose mission and goals align closely with SSI has continued in YR3 and we have also been working to cultivate relationships with these foundations both directly and through our other contacts. This is a slow process, but we continue to make progress.

We are also continuing our work to identify potential private donors through our network of contacts and have also made progress in this area during YR3.

Objective 11.5: Establishing Maine as a Leader

SSI Strategic Plan Objective 11.5 is to establish Maine as a leader in solutions-driven sustainability science, clean technology, and a green economy. This is being accomplished through several mechanisms:

1) ***External Engagement:*** The specific marketing of SSI and its capabilities to various audiences is on-going, and details are provided in the External Engagement section.
2) ***New Facilities and Capabilities:*** Major progress has been made this year on the design and construction of the new Social Science Lab which is housed in the Innovative Media Research and Commercialization (IMRC) building, and which will be utilized by SSI researchers (supported through a voluntary cost share). The new SSI Communications Center at the Mitchell Center will be completed in May 2012, and will greatly assist in establishing an active communication network to increase research collaboration and improve integration and synergy between institutional partners.
3) ***Economic Development Taskforce (EDT)***: This task force includes four SSI economists. The EDT has focused YR3 efforts on considering how to best tap into Maine's existing development infrastructure and private sector networks to facilitate the transfer and exchange of ideas and help form new networks under the umbrella theme of sustainability science. SSI research, grounded as it is in stakeholder-involved models of investigation, is of a highly applied nature and thus is more closely connected to potential uses and users than many research projects. During YR3, the EDT undertook the following:
    a) Recognition that a number of research projects have already developed substantial private sector relationships has led the EDT to consider processes for quantifying these project level economic interactions, and extending them. In addition, SSI has the opportunity to contribute to Maine's knowledge economy. Maine's ability to achieve sustainable economic growth will depend on the strength of its knowledge assets –particularly the skills and knowledge available in the state's businesses and workforce. SSI may have the opportunity to provide information, curriculum and student-preparation in underserved

parts of Maine's economy. The EDT is in the progress of considering how SSI can best leverage these opportunities.

b) The EDT has also worked to identify and develop relationships with University of Maine System resources that may share SSI's economic development objectives. These entities may play a role in the continued efforts to introduce SSI to Maine businesses and decision-makers consistent with the EDT's own efforts. An important strategy the task force pursued was to solicit ideas and proposals from these entities that would assist SSI in meeting its long-term economic development goals. These proposals are currently under review by the Management Team for further consideration, assessment, and feedback.

c) An important YR3 output for the EDT was contribution of an economic implications article to the *Maine Policy Review* issue dedicated to SSI (Spring 2012), in an effort to introduce policy makers to the economic aspects of the research.

d) YR3 saw the completion of the SSI stakeholder database and steps towards hosting a networking event with key entities already engaged in economic development in Maine. It is anticipated that this meeting will take place in summer 2012.

II.B.7.a. Seed Funding and Emerging Areas:

The Maine EPSCoR SSI project utilizes several seed funding mechanisms to be able to quickly address areas of new opportunity. During YR3, this included:

1) ***Integration Projects:*** In January 2011, four integration projects were funded (through a voluntary cost share) following a competitive RFP that was designed to attract proposals that could provide integration and synergy across the SSI project. The selected projects addressed multi-method frameworks for coupled-systems research, cyber-informatics development, integrative decision support tools and spatial modeling, and integration of socio-economic data collection. These projects have continued through YR3 and are subject to the same review process as the regular SSI research projects for YR4 support.
2) ***New Faculty Seed Funding:*** Seed funding was also provided in YR2 to two of the new faculty hires for projects on SES Synergy (Waring) and ECCO: Effects of Climate Change on Organisms (McGill). These projects continued through YR3 and are subject to the same review process as the regular SSI research projects for YR4 support.
3) ***Maine EPSCoR Management Team Awards:*** The Maine EPSCoR Management Team began a seed funding program at the end of YR2 (voluntary cost share) to support the development of high-profile SSI collaborative publications and grants. During June 2011, the Maine EPSCoR Management Team worked with the SSI Stewardship Council to develop an RFP that provides up to $100,000 in financial support for teams to develop collaborative proposals. During YR3, three awards were given to support collaborative grants development, and two awards were given to support collaborative publications development. All of these are still actively in progress. The Management Team just issued another round of these RFPs in March in order to support additional projects in YR4.
4) ***Maine EPSCoR Travel Scholarships:*** Another funding mechanism that is utilized by Maine EPSCoR is that of travel scholarships. These allow faculty and students throughout the state to take advantage of conferences, workshops, or collaboration opportunities that they would normally not have the funding to participate in. In YR3 9 travel scholarships were awarded to faculty and graduate students to attend the National NSF EPSCoR Conference in Coeur d'Alene, Idaho in October 2011. The Maine EPSCoR office has also committed to providing

travel scholarships to STEM faculty at the private higher education institutions around the state to attend the ADVANCE conference in May 2012. Travel scholarships were also available to members of the STEM community to attend the 2011 Maine EPSCoR State Conference in September; however, no applications were received.

II.B.7.b. Human Resources Development:

There are two main areas of human resources development: 1) in the SSI research component, and 2) general. Both are fully addressed in the RII Participants, Research, and Workforce Development sections, but a portion is repeated here. Objectives and benchmarks for YR3 human resources development have been met or exceeded (see Appendix 2).

1) ***SSI faculty:*** During YR3, 100 SSI faculty members at 11 collaborating institutions were directly supported to be part of 23 interdisciplinary research teams engaging in SSI portfolio research. This is more than double the YR3 benchmark of 40 faculty supported.
2) ***Faculty new hires:*** The four planned new hires are now actively involved in the SSI project. The final new faculty member, UMaine Assistant Professor of Watershed Modeling Sean Smith, joined the team on September 1, 2011 (YR3). He is jointly appointed in the Dept. of Earth Sciences and SSI. Integration of new faculty continues to be encouraged through funding of pilot projects, providing SSI graduate student support, providing opportunities for collaboration on integration and core projects, encouraging participation on committees and task forces, and scheduling presentations at SSI Integrative Discussion Groups.
3) ***Postdocs:*** A total of six postdoctoral fellows were supported during YR3 (exceeds benchmark of 4). Of the two original SSI postdoctoral fellows, one was recruited for a tenure track position at Cardiff University, Wales and left UMaine in December 2011; the second is scheduled to complete his two-year fellowship in May 2012. A search process to fill the four SSI postdoctoral position openings began June 2011, with five candidates brought to UMaine for interviews during the fall semester. Of these five, four accepted postdoctoral positions with SSI, with three joining the SSI team in January 2012; the remaining fellow will join the team in June 2012 (all are female). These positions are working in collaboration with various SSI project teams, and will provide mentorship to SSI graduate and undergraduate students.
4) ***Graduate students:*** A total of 54 graduate research internship positions were supported during YR3 at UMaine (48) and the University of Southern Maine (6) (greatly exceeds YR3 benchmark of 28 students). This included support of an incoming cohort of six PhD students at UMaine with SSI Research Assistantship positions in the fall of 2011 and spring of 2012, which were in addition to 14 continuing SSI PhD cohort students from YR1 and YR2 (these students were all recruited and admitted specifically as SSI students). An additional 34 graduate students were also supported during YR3: 23 continuing from YR2 and 11 newly hired. (Note that many departments provided other sources of funding for both graduate and undergraduate students to work on the SSI research.) Nine additional SSI PhD positions at UMaine were approved by the Graduate Recruitment Committee for a fall 2012 start date (YR4). None of the SSI cohort has graduated yet, but 3 graduate students who were previously admitted and then received SSI Research Internships are set to graduate in May.
5) ***Undergraduate students:*** A total of 101 undergraduate students were supported as paid research interns (97) or other (four) in YR3 throughout the 11 collaborating institutions. (Slightly below YR3 benchmark of 110 students due to College of the Atlantic and University of Maine Machias no longer participating.)

6) ***High school students:*** 21 high school students were supported in paid research internships, which is slightly below the YR3 benchmark of 30. This was due to some difficulties in recruiting mentors for the students; specific strategies have been put in place to ensure that 2012 will be on track.
7) ***Consultant:*** A freelance writer continues to assist SSI with written materials for external stakeholders. This association has been vitally important in improving SSI communication strategies and materials.
8) ***Other:*** During YR3, 204 SSI core faculty, postdoctoral fellows and graduate students expanded their knowledge base in this research focus by attending/presenting at over 100 regional, national, and international workshops, conferences, and symposiums.
9) ***General:*** See the Diversity and Workforce Development sections for detail. Maine EPSCoR supported multiple workforce development and outreach strategies that involved 6,348 individuals. All of these activities assisted in the development of the state's human resource infrastructure in this area. (Also See Appendix 4 and Template D – Outreach.)

II.B.7.c. Leveraging NSF Programs:

During YR3, the Maine EPSCoR SSI project also partnered with the following NSF proposals and funded projects in order to more effectively leverage resources and programs, and enhance research and education competitiveness for the SSI project.

1) ***NSF CAREER:*** Shaleen Jain, a key SSI faculty member and a member of the SSI Stewardship Council, received an NSF Career award during this period for work related to his Maine EPSCoR SSI research. A second CAREER proposal has been submitted by Brian McGill (SSI new faculty hire).
2) ***NSF Partnerships for International Research and Education (PIRE):*** SSI faculty have collaborated on a proposal that would support SSI research in tidal energy.
3) ***NSF Informal Science Education (ISE):*** SSI faculty have submitted a proposal that would support the extension of SSI Knowledge to Action research to informal science education opportunities through partners engaged in citizen science.
4) ***NSF CNH RUI*****:** SSI faculty collaborated on a proposal to support SSI research in river restoration.

Maine EPSCoR has also continued on-going collaborations with the following UMaine NSF projects:

1) ***NSF ADVANCE*** - Rising Tide Center: (See Diversity section)
2) ***NSF Math Science Partnership (MSP):*** UMaine's Center for Research in STEM Education's (RiSE). (See Workforce Development section.)
3) ***NSF National Girls Collaborative Project (NGCP)***: See Diversity section.
4) ***NSF ITEST:*** See Cyberinfrastructure section.

In addition, Maine EPSCoR's NSF EPSCoR RII Track 1, Track 2 (high-speed fiber network), and C2 (last-mile connectivity) projects (and an NIH INBRE supplement providing equipment to "light up" the dark fiber) are all very closely integrated with regard to the development of cyberinfrastructure capabilities for the state. This coordination allows us to effectively implement an overall Cyberinfrastructure plan for the state in a manner that thoroughly leverages funding sources and activities that build on each other. To ensure this, all of these projects are under the oversight of the Maine EPSCoR Cyberinfrastructure Committee.

II.C Management Structure

There are two goals for the management of this RII project; one for overall project management and one for management of the research component.

Goal #12: Overall RII Project Management

SSI Strategic Plan Goal #12 is to implement an effective management plan that will support and ensure the overall success of the Maine EPSCoR RII project.

The Maine EPSCoR Office at UMaine has been formally established under a Memorandum of Understanding with the State of Maine Office of Innovation, and acts as the fiscal agent/proposing organization for the state's NSF EPSCoR programs; coordinates responses to NSF EPSCoR funding solicitations; is responsible for the implementation, administration, and evaluation of funded projects; and is the liaison to the NSF EPSCoR Office.

Objective 12.1: Management Systems

SSI Strategic Plan Objective 12.1 is to have management systems that allow for effective coordination, communication, and integration of all RII program components at all institutions. To that end, Maine EPSCoR fully recognizes that a successful project of this magnitude and complex scope depends on a strong management team, as well as sufficient staff and expertise to develop, implement, and oversee it, and has implemented several layers to ensure this.

The overall RII project management includes:

1) ***State EPSCoR Governing Committee:*** The Maine Innovation Economy Advisory Board (MIEAB) serves as the EPSCoR governing committee for the state (see Appendix 1 for members and affiliation), and is under the Maine Office of Innovation, whose Executive Director serves as the state's EPSCoR/IDeA Director (position is currently unfilled). The MIEAB is responsible for oversight and coordination of the state's EPSCoR portfolio to ensure synergy with the Maine Science and Technology Plan. In 2010, the MIEAB developed a revised S&T Action Plan for the state that places an even greater emphasis on the areas that this Maine EPSCoR SSI project addresses. In addition, STEM education and workforce development strategies were added for the first time at the urging of Maine EPSCoR. While the MIEAB's primary role is to oversee the selection process for NSF RII and other federal EPSCoR/IDeA proposals, RII Project Director Mike Eckardt serves on the MIEAB, which meets quarterly, and he provides updates on the progress of Maine EPSCoR projects. There were no recommendations during YR3 from this committee.
2) ***Maine EPSCoR Management Team:*** The Maine EPSCoR Management Team consists of: a) NSF EPSCoR Project Director/PI Michael Eckardt (UMaine Vice President for Research); b) Associate Project Director/Co-PI Vicki Nemeth (UMaine Director of Research Administration & Maine EPSCoR); and c) SSI Research Project Director/Co-PI David Hart (Director, Senator George J. Mitchell Center, UMaine). This team formally meets at least monthly, but interacts via phone, e-mail, webcam, and in person several times a week. The Management Team also participates in the weekly SSI Stewardship Council meetings, the monthly SSI Research Council meetings, monthly SSI All-Team meetings, monthly SSI Integration Discussion meetings, annual SSI Research Retreat, and most other SSI activities. Their main actions during YR3 have centered around the further development of the SSI organizational structure, policies, and procedures; strengthening the research focus and integration; addressing research team progress and funding allocations; monitoring the new

hire processes; reviewing evaluation and assessment recommendations; revising the SSI Strategic Plan; and addressing issues.

3) ***Other Advisory Boards/Committees:*** In addition to the MIEAB, three other groups serve in an advisory capacity for this project. The SSI Advisory Board (see Evaluation section and Appendix 1) provides scientific assessment and guidance to the research project and is comprised of 10 members who represent state, regional, and national experts in fields of relevance to the SSI sustainability science research mission. (Note: SSI Advisory Board recommendations can be found in the Evaluation section.) The Maine STEM Collaborative (see Workforce Development section and Appendix 1) is a statewide partnership of education, research, business, government, and non-profit sectors who have come together to foster the improvement of STEM education in the state. Maine EPSCoR Director Vicki Nemeth currently serves as Chair of the Collaborative and seeks input from the group to ensure that the RII STEM education and workforce development efforts are aligned with Maine's overall STEM efforts. Also, during the proposal-writing process for this SSI project, Maine EPSCoR created a Cyberinfrastructure Committee that developed a cyberinfrastructure plan to address the needs of the state's research and education communities (see Cyberinfrastructure section and Appendix 1). Members of this committee are integrally involved with this NSF EPSCoR Track 1 RII project, as well as NSF EPSCoR Track 2 RII and C2 projects and a corresponding NIH IdeA supplement for cyberinfrastructure. All four projects are administered by the Maine EPSCoR office (NIH is through a sub-contract), which ensures effective coordination and leveraging of efforts in this area.

Objective 12.2: Project Integrity

SSI Strategic Plan Objective 12.2 is to ensure administrative, programmatic, and fiscal integrity for all project components and institutions.

This RII project utilizes a multi-level, parallel organizational structure that provides effective programmatic and administrative oversight and contributes to successful implementation. (See Appendix 9: Organizational/Management Matrix.) This parallel organizational structure consists of 1) the Maine EPSCoR office, and 2) the SSI office at the Senator George J. Mitchell Center. Both are based at UMaine and operate under the aegis of Michael Eckardt, Vice President for Research and NSF EPSCoR Project Director/PI. This provides a strong, synergistic foundation for success, and allows for the application of the appropriate technical or administrative expertise as needed, with strong on-going coordination between both offices.

NSF EPSCoR Project Director Eckardt provides overall scientific, technical, and administrative leadership for the RII project. Maine EPSCoR Director Vicki Nemeth is responsible for the overall administration and implementation of the RII project, provides day-to-day oversight, serves as the primary liaison to the NSF EPSCoR office, and is also responsible for the implementation of the non-research components of the RII project. She works closely with UMaine's Office of Research and Sponsored Programs to ensure adherence to NSF policies and procedures, and with other relevant offices such as Purchasing, Human Resources, and Equal Opportunity. She also attends relevant national workshops to keep abreast of changes and clarifications in federal program requirements and policies. Eckardt and Nemeth have served as Maine's NSF EPSCoR Project Director and Assistant Director for over nine years, and both bring over 30 years of experience each in implementing and managing large-scale programs.

All SSI financial, purchasing, and human resource transactions for all six of the University of Maine System campuses are done through the Maine EPSCoR office. This allows for a high level of oversight to ensure fiscal responsibility. The five private colleges are under formal sub-contracts, and as such submit quarterly invoices and detail to UMaine's Office of Research and Sponsored Programs for approval.

The Maine EPSCoR office staff currently consists of: a) Cindy Growe, Financial Administrator; b) Jennifer Dunham, Program Assistant and Diversity Specialist; c) Adam Kuykendall, Media Production Coordinator (part-time); d) Heather Small, graduate student (Media Assistant); and e) one to two undergraduate students. Due to special circumstances, the search process has still been temporarily on hold to add an Outreach and Program Coordinator (PA) and a Communications Coordinator, but has now resumed. All staff work closely with: a) the SSI Research office personnel on a daily basis; b) other administrative departments at UMaine (i.e. Sponsored Research); and c) the other collaborating institutions to ensure compliance and effective management.

SSI Research Project Director David Hart oversees the sustainability science research and integrated education component, which is based at UMaine's Senator George J. Mitchell Center. The SSI office staff includes: 1) John Peckenham, SSI Research Project Operations Coordinator; 2) Ruth Hallsworth, Strategic Program Manager; 3) Kim Raymond, Outreach & Communication Coordinator; 4) Carol Hamel, Administrative Assistant; and 4) one to two undergraduate students or temporary employees.

All SSI participants directly report on progress and outputs through several mechanisms. These include: 1) the SSI Faculty/Staff Profile Database, which all faculty, professionals, and graduate students report into through a web portal; 2) formal Interim Progress Reports; 3) formal Final Progress Reports; and 4) annual Goals, Objectives, and Benchmark tables for each research team. Information from all of these is reviewed and utilized by the Management Team, Maine EPSCoR office, SSI office, the SSI Stewardship Council, and the project's external evaluators.

Objective 12.3: Communication and Coordination

SSI Strategic Plan Objective 12.3 addresses the need to foster effective communication and coordination between all project components and institutions.

As noted above, there is a high level of communication, coordination, and synergy between the staff of the Maine EPSCoR office and the SSI office, which allows for the appropriate technical or administrative expertise to be applied in any situation. For example, the SSI Research office engages directly with the SSI research faculty and students, while the Maine EPSCoR office handles administrative responsibilities and engages with collaborators for other program components.

Vicki Nemeth, Maine EPSCoR Director, serves as the administrative liaison for all of the SSI institutions, and John Peckenham, SSI Research Project Operations Coordinator, also serves as the SSI Partner Institution (SSP) Coordinator, addressing programmatic and research issues. They work in tandem, and with the remaining management personnel, to ensure effective communication and coordination among the 11 partner institutions. There is a designated research leader contact for each project team, and a designated administrative contact at each institution, which assists in ensuring effective lines of communication.

The Maine EPSCoR Management Team members and SSP Coordinator have implemented a regular schedule of conducting site visits with each team and institution, with the result that each participating campus and team is visited at least once in person per year, and via videoconference

and phone consultations more often. In addition, regular contact via phone, e-mail, and webcam is on-going with all participants. These visits and communications encompass areas such as discussions of research progress and review panel comments; strategic planning; grants and publications information; project sustainability; financial and administrative procedures; and assisting with any special issues.

Goal #13: SSI Research Project Management

SSI Strategic Plan Goal #13 addresses the broad coordination of management and decision-making that results in a shared vision for SSI research and integrated education, effective interdisciplinary outcomes, and participatory project management.

Objective 13.1: Organizational Structure and Processes

SSI Strategic Plan Objective 13.1 is to establish a new organizational structure and processes that allow for effective communication, coordination, and exchange among SSI research teams and SSI management committees. SSI Research Project Director, David Hart, is responsible for all aspects of the research enterprise, which encompasses all 11 participating institutions. He is supported by the SSI Stewardship Council, SSI Research Council, various SSI committees, and a staff of four in the SSI office at the Senator George J. Mitchell Center at UMaine.

The SSI research project management includes:

1) ***SSI Stewardship Council:*** This council continues to have oversight and responsibility for management of the SSI research and integrated education project. It consists of seven SSI members with SSI Research Director David Hart chairing. A position was added to the council during fall 2011 to include the chair of the SSI Research Council. The council continues to meet weekly, and also sets the agenda for, and participates in, the monthly SSI All-Team meetings, monthly SSI Integration Discussion sessions, annual SSI Research Retreat, and most other SSI activities
2) ***SSI Research Council:*** This council was established in YR2 and continues to meet monthly, and is chaired by new SSI faculty member Brian McGill. The council provides recommendations about important research-related decisions for the SSI project, and ensures continued discussion and involvement in important decisions that guide how research is being managed and conducted. The council consists of 24 members, including one representative from each SSI research team, committee chairs, two postdoctoral representatives, and one graduate student representative. Among other YR3 actions, at its October 2011 meeting, the SSI Research Council approved the SSI Governance Structure document that was developed by the SSI Stewardship Council.
3) ***SSI committees:*** Several SSI faculty committees continued to provide guidance and recommendations to the SSI Stewardship Council and SSI Research Council in specific areas. These include: 1) Graduate Recruitment Committee; 2) Curriculum and Culture Committee; 3) Economic Development Task Force; and 4) Cyberinformatics/Data Management Committee. In addition, three new committees have been formed. A new postdoctoral search committee was convened in summer 2011 to conduct a search for four SSI postdoctoral position openings. This committee has now made its recommendations and concluded its work. In summer 2011, the Research Council established a formal SSI Seminar Committee. Tim Waring (new faculty) chairs the committee. The committee's purpose is to provide a process for SSI faculty and students to request sponsorship to bring external speakers to campus for seminars and workshops. Suggested speakers must advance

knowledge and learning of SSI goals and objectives. The committee then considers these requests and recommends appropriate speakers to the Stewardship Council. In general, speakers are co-sponsored by a UMaine department which provides cross-connections and additional resources for SSI. An IGERT committee has also been set-up in response to UMaine's internal pre-proposal process. Kathleen Bell leads this committee. The committee submitted a pre-proposal in Feb. 2012 and is waiting for a response from the internal review committee. If the pre-proposal is approved, the committee will continue its preparation of a full IGERT proposal for submission to NSF.

4) ***SSI Advisory Board***: This group also plays an important role in providing guidance to the SSI management team. Details of YR3 activities are outlined in the Evaluation section.

Objective 13.2: Communication and Feedback Loops

SSI Strategic Plan Objective 13.2 is to establish communication and feedback loops for modifying management systems and practices in ways that lead to more effective organizational processes. This also includes providing technical assistance opportunities as applicable.

As discussed above, the SSI Research Council and SSI committees all provide feedback to the SSI Stewardship Council. The SSI Research Council Chair sits on the SSI Stewardship Council, which also facilitates communication between the two councils. Project Director Michael Eckardt and Associate Project Director Vicki Nemeth participate in Stewardship Council meetings, and in SSI Research Council meetings when requested. Committee chairs can request to join an SSI Stewardship Council meeting, or are invited to participate as issues arise.

Avenues continue to be advanced that create and maintain an effective internal communication network among SSI team members at all participating institutions. The goal is to continue to further enable information sharing, refine organizational and management systems, and foster further collaboration and the development of interdisciplinary teamwork.

All SSI research team members (including all SSI students) are encouraged to attend the monthly SSI All-Team meetings, monthly SSI Integration Discussion Groups, the annual SSI Research Retreat, and SSI workshops and seminars. Participation of members at the partner institutions will be made easier once the SSI Communication Center is completed in May 2012, allowing for more effective virtual participation. The SSI newsletter doSSIer continues to be published on a bi-weekly basis and is distributed to all SSI team members via the listserv (see below).

New SSI internal communication, feedback, and technical assistance approaches implemented in YR3 include:

1) SES capacity building*:* See Workforce Development Objective 6.4.

2) ***Knowledge to Action (K-A) capacity building****:* See Workforce Development Objective 6.4.

3) ***Data management capacity building****:* Please see Goal #8 Cyberinfrastructure for progress on data management capacity building.

4) ***Visiting scholars****:* The SSI Seminar Committee provides a process for SSI faculty and students to request sponsorship to bring external speakers to campus for seminars and workshops. A key component of these visits is to provide an opportunity for speakers to spend two or three days on site, allowing ample opportunities for SSI team members to meet and learn with them. Professional development opportunities for SSI graduate students and postdoctoral fellows are also built into these visits.

5) ***Web site (internal*)**: The internal MeSSI website is up and running and provides a central location for team members to share information, access important documents, locate

resources, retrieve contact information for other team members, and find information on upcoming meetings and events. The site is password protected for access by team members only. Work continues on increasing use of the site by team members so it becomes the "go-to" place for team information.

6) ***SSI listserv:*** In fall 2011, an SSI listserv was set-up using the UMaine System's listserv software. Team members can post to the listserv, thus providing an easy and convenient tool for inter-team communications. Postings are restricted to SSI-related topics.

Objective 13.3: Interdisciplinary Collaboration Challenges

SSI Strategic Plan Objective 13.3 is to engage in activities to advance understanding of challenges and opportunities related to interdisciplinary collaboration and effective teamwork in large-scale projects. Research undertaken by SSI team members that advances our understanding of interdisciplinary collaboration and effective teamwork is outlined in the Research section of this report. Results from their findings are presented in various formats to the SSI Stewardship Council, SSI Research Council, and SSI members at large, and all are reviewed for possible strategic action changes.

In fall 2011, SSI collaborated with other groups on campus, including the Center for Excellence in Teaching and Assessment (CETA) and the UMaine NSF ADVANCE Rising Tide project group, to establish an Interdisciplinary Research Workshop (IDR) series. This monthly series of interactive discussions is designed to build support to grow UMaine's interdisciplinary research strength SSI faculty and students are actively participating in these discussions and presentations, bringing with them their experiences as members of SSI's interdisciplinary team and learning from the experiences of other interdisciplinary teams on campus.

Objective 13.4: Portfolio Management

SSI Strategic Plan Objective 13.4 is to establish a system for managing the interdisciplinary research projects.

Maine EPSCoR perhaps operates somewhat differently from other EPSCoR jurisdictions in that it strategically utilizes the NSF EPSCoR RII Track 1 opportunity to build infrastructure that creates specialized research centers for the state. Therefore the main goal for this RII project was to put the infrastructure into place that would allow the creation of a statewide Center for Sustainability Solutions at the University of Maine.

Since the beginning of this RII project, the Maine EPSCoR Management Team (PI Eckardt, Co-PIs Hart & Nemeth) has been very aware that the on-going management of a project of this scope, size, and complexity would require a different organizational structure, and would need a high level of diligence to ensure success. Therefore this has been a primary focus for the Management Team and SSI Stewardship Council throughout the project, with hundreds of hours of time devoted to on-going review and feedback, and strategic actions adjusted accordingly.

The integrated, multi-faceted nature of the SSI portfolio necessitates that SSI teams are organized and managed in a holistic, comprehensive matrix system, with a hierarchy of evaluation and decision-making mechanisms to ensure on-going monitoring and success. This system has been refined over the award period with input from our evaluation and assessment feedback loops, and the mechanisms and strategies that were put into place during YR2 have allowed for an effective portfolio approach during YR3.

In addition, SSI is currently in the process of obtaining formal status as a University of Maine research center, and its portfolio approach is consistent with the University's model for

research centers. Having a portfolio of thematic projects under a common overarching conceptual framework allows the center to respond more effectively to changing opportunities and challenges. It also requires a strong commitment to on-going organizational assessment and innovation, which has been a central component of SSI's management systems since the onset of our RII award

Please see Appendix 9: Organizational/Management Matrix for additional information and graphics that portray this system.

As detailed in the Research section, SSI is designed as a portfolio of research projects, where each project constitutes a place-based, multi-scale investigation of SES and K↔A processes, patterns, and interactions. While each project offers important learning opportunities in its own right, one of SSI's central goals is to create a quasi-experimental design in which particular groups of projects can be used to compare and contrast the influence of different processes shaping SES and K↔A. This integrative strategy also increases the potential for drawing inferences about the role of contextual factors (e.g. biophysical, socioeconomic, and decision-making characteristics) and scale on system behavior.

The SSI goals, objectives, and benchmarks detailed in the SSI Strategic Plan apply to every research project in the SSI integrated portfolio, and all projects are evaluated using a common set of metrics for the sustainability science focus.

SSI research progress is monitored, evaluated, and reported at three levels:

- Overall SSI project progress on the main goals and objectives for the three cross-cutting research themes of SES, K-A, and OI.
- Overall progress on project-wide integration in the model problem set being studied.
- Other team project progress as applicable.

One of the unique strengths of SSI is that the teams are integrated with each other, in that they are continuously brought together to share their research results, learn from each other, examine ways for cross-team collaborations, and develop comparative analyses and new strategies for generalization. This happens through monthly SSI All-Team meetings, monthly SSI Integration Discussion meetings, monthly SSI Research Council meetings, monthly Knowledge-to-Action (K-A) group meetings, a seminar series, the annual SSI Research Retreat, the annual Maine EPSCoR State Conference, and 1-2 annual training workshops. Team members also participate in each other's meetings as applicable, and the SSI Stewardship Council meets weekly to monitor progress and implement strategies to move the common sustainability agenda forward.

All SSI teams take part in a year-round, comprehensive, on-going monitoring and evaluation review of their progress, which is detailed in the Evaluation section. Feedback loops are in place to apply mentoring or mitigation actions where needed, and several layers of management and advisory groups are involved in these review and evaluation processes. On-going peer critique and feedback also plays an important role.

During YR3, a new review process for research teams was developed and approved at an SSI Research Council meeting in Feb. 2012. This new process was based on feedback from evaluations and assessments, which indicated a need to continue to ensure that the SSI research portfolio was as targeted as possible. All SSI teams have normally submitted interim progress reports for the current grant year along with a proposal for continued support in the next year - these went through several layers of review, and this will continue. The new process adds an initial review by the Maine EPSCoR Management team, who will identify specific areas that need a more detailed assessment. This will be followed by a review conducted by a committee

consisting of eight SSI Research Council members. They will evaluate each team's progress and proposal, focusing particular attention on those aspects noted by the Maine EPSCoR Management Team. Each SSI research team will also have a site visit with the Maine EPSCoR Management Team to discuss their review results and funding recommendations. Lastly, the SSI Advisory Board will be given an opportunity to provide input before final selection and funding of YR4 projects is approved.

Because of the local nature of the biophysical, socioeconomic, and stakeholder contexts, the very nature of the sustainability project ensures that team efforts are not duplicative. Through the on-going evaluation of team research efforts and progress, plus the growing collaboration and combination of teams through project-wide integration, there has been a decrease in the number of SSI teams. In YR1 there were 18 core projects at UM/USM & 5 at the partner institutions; this was reduced in YR2 to 16 core teams (UM/USM), and 10 partner institution teams in YR2 (the increase reflects the proposal mandate to broaden statewide participation). In YR3, there has been a further reduction to 10 core teams (UM/USM) and 8 partner institution teams, predominantly through combining teams for greater effectiveness and retiring projects.

Another key component of the RII project management is that the Maine EPSCoR Management Team members (Eckardt, Hart, Nemeth), SSP Coordinator (Peckenham), and the SSI Stewardship Council all play a very hands-on role. As an example, Eckardt and Hart regularly conduct in-person site visits with the UM/USM core teams, and their findings are documented for use in helping to gauge progress.

Members of the Maine EPSCoR Management Team and SSP Coordinator also conduct site visits with the teams at the SSI Partner institutions on a regular basis (last review was fall 2011). These meetings help the partners further align their projects with broad SSI goals, work plans and progress are reviewed, and ideas are solicited as to how SSI management can help further facilitate their SSI research and education activities. Common themes that have emerged from these discussions included: the need for more expertise sharing across SSI, institutional support for collaborating faculty, opportunities to interact with SSI faculty at other campuses, integration of graduate students into research at small colleges, and more efficient ways to communicate within SSI. All of these issues have been taken under consideration by the Maine EPSCoR Management Team, and many new actions have been undertaken.

Another key management focus during YR3 has been on continuing to improve data management integration across the project (see the Cyberinfrastructure section for additional detail). In one area, an SSI team working on the integration of socio-economic data collection is assisting other SSI project teams to ask the 'right questions' to their appropriate sample body, to help ensure that the resulting data supports the testing of relationships between the desired constructs. They have also interacted with multiple SSI teams on a project-by-project basis to assist with the development of focus group moderator guides, the actual moderation of focus groups, and the development of survey data collection (from sampling to end instrument). This team is also building an SSI social science database which includes information about data collected by SSI research teams including: theoretical constructs/hypothesis, time of collection, spatial distribution, team topic, and population sampled.

An on-going concern from various evaluation and assessment mechanisms has been the diversity and management of the SSI research portfolio. Maine is unusual in that it is only one of two states with a single Ph.D. granting institution in STEM, and the University of Maine fulfills that role as the state's flagship research institution. Therefore a formalized mechanism was needed to be able to include the Primarily Undergraduate Institutions (PUIs) in the state in

this sustainability project, and to truly make this a state-based award. For most of these institutions, this was the first time they had ever collaborated in research with the University of Maine (much less in an EPSCoR project), and for some it was their first foray into having research opportunities at their institution. Therefore there necessarily has been a progression in the involvement level of these institutions, with some farther along than others. Maine EPSCoR considers it part of its mission to bring those who are more advanced into greater synergy with the SSI core teams, and to mentor those who are in the beginning stages of research and cultivate infrastructure that will allow them to grow.

Given the predominantly teaching focus of most of these institutions, different processes had to be put into place for project review and funding cycles (research is predominantly in the summer vs. year-round for core projects). However, timing is the only significant difference between these teams and the core teams; all of them go through the same multi-layer evaluation processes and are held to the same benchmarks. All SSI institutional partners do interact and collaborate with the core UM/USM project faculty, as well as each other, in an on-going manner, and are considered an integral part of the SSI "center." All SSI personnel, regardless of institution, are encouraged to participate in All-Team meetings, discussion groups, speaker seminars, workshops, & other activities. Such participation will be easier when the SSI Communications Center is completed in May 2012, which will allow for virtual attendance by anyone in the project.

For the partner institutions, the need is even greater to have their projects be place-based around their respective communities, as well as sensitive to the faculty expertise that may be available at their smaller institutions. Thus, we purposely assisted the PUIs in developing their own sustainability science projects, which are in addition to the UM/USM projects in the SSI portfolio. One of these teams is a collaborative project between Bates, Bowdoin, and the University of Southern Maine; another is a collaboration between Colby and the University of Maine Farmington; and we have recently fostered a collaboration between the University of Maine Fort Kent and the University of Maine Presque Isle. In addition, several of the PUI teams have members on their teams who are also current SSI graduate students at UMaine.

In the summer of 2011, the SSI Operations Coordinator (John Peckenham) was also given the responsibility of being the SSI Partner Institution Coordinator, and for now he represents SSI partner concerns on the SSI Stewardship Council and brings any concerns to the SSI Research Council. When the Communications Center is complete, representation by SSI partners on the Stewardship Council is set to be discussed. In addition, the Maine EPSCoR Director (Co-PI Vicki Nemeth), SSI Research Director (Co-PI David Hart), and SSI Operations Coordinator (John Peckenham) play active roles in mentoring faculty at these partner institutions.

II.D Jurisdictional and Other Support

Additional resources available to the Maine EPSCoR SSI project include:

1) **Advisory boards/committees:** members of the Maine Innovation Economy Advisory Board (MIEAB), SSI Advisory Board, the Maine STEM Collaborative, and the state's Cyberinfrastructure Committee are all an invaluable resource for directly providing expertise and guidance to the SSI project.

2) **Maine EPSCoR office, Corbett Hall, UMaine:** four offices are dedicated for Maine EPSCoR use in Corbett Hall, and staffing is primarily supported as a voluntary cost share. Maine EPSCoR's communications capabilities include full media services such as film,

photography, graphic-design, editing, etc. A large conference room is also available, and is outfitted with a state-of-the-art videoconferencing system.

3) **SSI office at the Mitchell Center, Norman Smith Hall, UMaine:** all facilities in the building are available for SSI-related use, including a large seminar/workshop room, three conference rooms, and offices and workspaces for faculty, postdoctoral, and student use. All Mitchell Center staff directly support the SSI, primarily as a voluntary cost contribution to the project. The Mitchell Center's database of over 3,000 external constituents is also available for SSI-related use. A portable state-of-the art videoconferencing system is also available.

4) **Faculty offices and labs:** SSI faculty and students have access to additional state-of-the-art research facilities and equipment at the University of Maine and SSP institutions, including special research space for students at most.

5) **Students**: Many departments at the SSI institutions are supporting additional SSI student participation on SSI research teams (graduate, undergraduate, and high school) through departmental or other funds.

6) **Collaborations:** access to other expertise as needed throughout the state through collaborations with stakeholders, and research, education, and outreach partners.

7) **Cyberinfrastructure**: All aspects of Maine's integrated plan for enhancing broadband connectivity directly benefits all SSI team members.

8) **Maine STEM education organizations:** there is an existing network of informal STEM education organizations and programs in the state, which facilitates collaborative efforts.

II.E Planning Updates

Maine EPSCoR submitted a revised SSI Strategic Plan to NSF EPSCoR in March 2011, and in January 2012 we received recommendations for further revision. We are in the process of finalizing the incorporation of those recommendations into the plan, which center around clarification and simplification. SSI's vision, mission, goals, objectives, and strategies remain the same, but the emphasis on low level benchmark details has been changed to be more generalized.

We have also added which members of our team are responsible for the major activities in the plan, and clarified the SSI portfolio concept. This overall re-formatting, clarifying, and simplifying should help to make the plan easier to utilize i.e. in the evaluation of our annual reports, by the Reverse Site Visit team, by NSF EPSCoR staff, outside reviewers, and all SSI team members. This revised Strategic Plan will be submitted to NSF EPSCoR by April 9, 2012.

In 2010, the Maine Innovation Economy Advisory Board revised the state's Science and Technology Plan, which can be found at the Maine Office of Innovation website: http://www.maine.gov/decd/innovation/reports_and_publications/pdfs/2010_S&T_Plan.pdf
The Maine EPSCoR Project Director and Associate Project Director were instrumental in providing input in this planning process, and this RII project is fully in alignment with this revised plan. In particular, workforce development is now a specific objective in the state plan.

II.F Unobligated Funds

As of March 31, 2012, $3,848,000 (96%) in YR3 NSF funds have been obligated, which means that they meet NSF's definition by having been actually expensed, encumbered through a purchase order, or otherwise contractually obligated. The remaining $152,000 (4%) in YR3 NSF funds has been committed to specific purposes and activities that should occur between now and June 30, 2012, but by NSF's definition is unobligated. These funds are budgeted to support

outreach, travel, conferences and workshops, printing, and new hire advertising costs over the next months.

In addition, an amount of $632,000 (16%) had been carried over from YR2 into YR3 and is still technically unobligated by NSF's terms. However it is committed to support the SSI Communications Center videoconferencing and other cyberinfrastructure equipment, and should be spent out by June 2012. These two carry-over amounts put the total project at 93.46% obligated for all three years.

Maine EPSCoR has met the required YR3 20% cost share of $800,000 in obligated funds, and will have contributed an additional $1,148,000 in voluntary cost contributions towards this project during YR3 from all 11 institutions.

II.G Progress with Respect to the RII Track-1 Strategic Plan

Maine EPSCoR submitted a revised SSI Strategic Plan to NSF EPSCoR in March 2011, and in January 2012 we received recommendations for further revision. We are in the process of finalizing the incorporation of those recommendations into the plan, which center around clarification and simplification.

Since all activities during YR3 continued to be implemented and evaluated around the previous strategic plan, this report has continued to be organized around that format. In the new pending version (to be submitted April 2012), SSI's vision, mission, goals, objectives, and strategies remain the same, but the emphasis on low level benchmark details has been changed to be more generalized. The revised plan changes center on overall re-formatting, clarifying, and simplifying, which should help to make the plan easier to utilize by all.

The Maine EPSCoR SSI project has 13 goals:

1) Create a world-class, solutions-driven sustainability science research center recognized for its innovative approaches to interdisciplinary research and deep commitment to collaboration with diverse stakeholders.
2) Investigate the dynamics of social-ecological systems, with particular emphasis on SES resilience.
3) Examine connections between scientific knowledge regarding SES dynamics and stakeholder actions that potentially affect SES resilience.
4) Test models from organizational science to understand and improve interdisciplinary collaboration and university-stakeholder partnerships.
5) Engage all aspects of the state's human and institutional resources in the achievement of the RII project goals and objectives.
6) Foster the next generation of sustainability science professionals through K-20 programs that are linked to the diverse challenges and opportunities in the emerging field.
7) Prepare Maine's current and future STEM workforce through coordinated programs and opportunities, training, and knowledge dissemination.
8) Utilize cyberinfrastructure to improve communication, collaboration, and visualization capabilities that enable innovation and competitiveness in the sustainability science focus area.
9) Create and maintain an effective outreach and communication network through strategies that encompass all participants, stakeholders, and the general public.
10) Utilize multiple formative and summative evaluation processes to improve the project's effectiveness and asses its impact in relation to its goals.

11) Sustain the SSI infrastructure, impacts, and achievements through the continued integration of scientific entrepreneurship, institutional and external support, partnersips, education, workforce development, and constituency outreach.
12) Implement an effective management plan that will support and ensure the overall success of the Maine EPSCoR RII project.
13) Broad coordination of management and decision-making results in a shared vision for SSI research and integrated education, effective interdisciplinary outcomes, and participatory project management.

All of these goals are directly tied to the specific NSF EPSCoR components that are required to be reported on, and this YR3 report format utilizes the goals and their specific objectives under each one of those sections to detail the strategies, actions, and progress for YR3. In addition, progress towards the specific benchmarks is also detailed in Appendix 2: Objectives, Strategies, and Benchmarks. Overall, the Maine EPSCoR SSI project met or exceeded almost all benchmarks during YR3. Minor exceptions were usually in the case of circumstances beyond our control (i.e. outreach project partners delaying programs).

II.H. Jurisdiction Specific Terms and Conditions

Specific terms and conditions in the RII agreement have been met and include:

1) Cost sharing provided at the required amount of $800,000 plus significant voluntary cost contributions (see reporting templates G & H).
2) Participant support is utilized only for activities falling under that category, and funds are tracked separately, with written policies and procedures in place.
3) General Programmatic Terms and Conditions: all terms and conditions have been met, with no key personnel changes or changes in project scope. All reporting requirements have been addressed in the sections above, in the supplementary tables provided, or in Fastlane.

II.I Reverse Site Visit (RSV) Recommendations

Maine EPSCoR did not have an NSF EPSCoR Reverse Site Visit in YR3 – we are scheduled for September 11, 2012 (YR4).

II.J Experimental Facilities

While the SSI project does not have an emphasis on acquiring major equipment, there are several important facilities and equipment aspects of the project.

A key goal of SSI is to increase UMaine's capacity for conducting experimental social science research (e.g. experimental economics, strategic message testing and design, virtual-reality simulation experiments). To that end, UMaine committed to creating a 320 sq. ft. experimental communication laboratory, which will include observation, experiment, and interview rooms that will be used by SSI faculty and students. Major progress has been made during YR3 on the design and construction of this Social Science Lab which will be housed in the new Innovative Media Research and Commercialization (IMRC) building on campus. Over the course of the summer and early fall 2011, the final design work was completed with a representative of SSI (faculty member Shannon McCoy), other stakeholders involved in the design, and the architect Bruner/Cott. Final designs were completed in October and the bid solicitation process was initiated at the end of October 2011. A construction firm has now been

selected and demolition and construction began in January 2012. The renovation should be completed by October 2012. SSI is supporting part of the costs of this lab as part of a cost share to this project.

During YR2, planning began to create an SSI Communications Center at the Mitchell Center at UMaine, which is the "home base" for SSI. This Center will now be completed by May 2012, and will feature large-scale videoconferencing capabilities that include large wall projection screens, multiple high-definition cameras and projectors, archiving/streaming capabilities, and audio systems. The room will accommodate 100 people in person, and the new system will allow up to 90 videoconference/webcam connections at one time, and will provide a much-needed ability for all SSI participants to effectively take part in interactive SSI workshops, meetings, discussion groups, classes, etc. With 318 individuals directly participating in SSI at 11 institutions, this new capability will dramatically enhance communications for research and education collaborations and training.

Additional upgraded cyberinfrastructure is also available to SSI teams throughout the state, from dedicated space on UMaine's supercomputer (cloud) to broadband connectivity enhancements (see Cyberinfrastructure section) that will allow SSI researchers greater access for research and education collaborations.

II.K Publications and Patents

During YR3, SSI faculty published 78 related total publications: eight scientific journal articles with primary NSF EPSCoR support, 26 with partial NSF EPSCoR support; one book chapter with partial NSF EPSCoR support; six abstracts with primary NSF EPSCoR support, five with partial NSF EPSCoR support; four proceedings with primary NSF EPSCoR support; three with partial NSF EPSCoR support; 10 technical reports with primary NSF EPSCoR support, one with partial NSF EPSCoR support; one editorial with primary NSF EPSCoR support, one with partial NSF EPSCoR support; four newsletters with primary NSF EPSCoR support, one newsletter with partial NSF EPSCoR support; and four other publications with primary NSF EPSCoR support, three with partial NSF EPSCoR support. (See NSF Fastlane and Appendix 7: Publications for detailed listing.)

There was no patent activity during YR3.

II.L Honors and Awards

The following honors and awards were received by seven faculty and seven graduate students during YR3:

SSI Member:	Honor/Award:
Kathleen Bell	Elected President-Elect NAREA
Brittany Cline	Maine Association of Wetland Scientists (MAWS) 2011 Scholarship Award Winner
Stacia Dreyer	Australian Government Endeavour Research Fellowship Award Winner
Kathleen Dunckel	Environmental Professionals Award at the Unity College Student Conference for her undergraduate students' multi-media presentation of their work with stakeholders.
Haley Engelberth	Maine EPSCoR State Conference Graduate Poster Competition, 1st Place Recipient

Haley Engelberth	2012 Maine Water Conference Graduate Poster Competition, 1st Place Recipient
Christine Feurt	US Water Prize for her work with the Salmon Falls Watershed Collaborative (2/2012)
James Fleming	Best-book prizes in two separate disciplines for “Fixing the Sky: The Checkered History of Weather and Climate Control (Columbia University Press, 2010)”. 1) The 2011 Sally Hacker Prize of the Society for the History of Technology. 2) The 2012 Louis J. Battan Author's Award of the American Meteorological Society
Karen Hutchins	NSF, ESPCoR National Conference, Judge's Pick Runner-Up, Poster Competition: "Linking Knowledge with Action: Crossing University-Community Boundaries to Build and Study Solutions-Oriented Partnerships," October 2011
Karen Hutchins	Graduate Student of the Year Award, Department of Communication and Journalism
Shaleen Jain	Received prestigious NSF CAREER Award
Spencer Meyer	Received NASA-MSU Professional Enhancement Award through International Association of Landscape Ecology
Natalie Michelle	Completion of Leadership Maine program
Peter Milligan	Awarded Maine Economic Improvement Fund (MEIF) Small Campus Initiative grant, October 2011
Noah Perlut	Invitation to present to the University of New England Board of Trustees on “Mentoring with Successful Science”
Megan Wibberly	Recipient of 2011 Precourt Energy Efficiency Fellowship (Behavior, Energy and Climate Change Conference)

Maine NSF EPSCoR Research Infrastructure Award EPS-0904155
Maine's Sustainability Science Initiative

Research and Education Highlight # 1

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Helping Basketmakers and Regulators Better Prepare for an Emerald Ash Borer Invasion

A team of University of Maine researchers, in collaboration with the Maine Indian Basketmakers Alliance, is helping Native American basketmakers, tribes, and state and federal regulators prepare for the arrival of the Emerald Ash Borer (EAB) in Maine. This devastating invasive beetle from China kills virtually all ash trees, which Maine tribes have used for centuries to make their baskets.

This Maine EPSCoR Sustainability Solutions Initiative (SSI) team has created the first partnership in the nation to bring together university researchers, tribes, basketmakers, and state and federal governments to develop coordinated, proactive responses to a potential emerald ash borer invasion before the insect arrives. The researchers have developed recommendations to help agencies create state and tribal emergency response plans based on lessons learned in other states and previous collaborations between the tribes, basketmakers, the University of Maine, and the Maine Forest Service.

The team's findings contribute to improved policy and implementation, which have been shown to lower the cost of responding to an Emerald Ash Borer invasion. More proactive planning also has the potential to improve communication and coordination and broaden the diversity and number of stakeholders involved, all of which can contribute to more rapid and effective responses to this invasive insect.

Originally brought to the Detroit area in 2002, the Emerald Ash Borer has now spread to 14 states and two Canadian provinces, spreading much faster than originally thought, largely due to the movement of infected firewood. Maine Indians, known internationally for their fine art tradition of basketmaking with brown ash and sweetgrass, are particularly concerned about the health of brown ash for economic, spiritual, social, and cultural reasons. A cultural keystone species, the brown ash tree is an important feature in Maine Indian traditional environmental knowledge, SSI researchers and tribal members are now collaborating to help map and protect the species.

The SSI research team uses interdisciplinary sustainability science methods and mapping techniques that place an emphasis on Indian basketmakers' uses and knowledge of the brown (or black) ash tree. The collaborative nature of this research is a hallmark of the emerging field of

sustainability science, which seeks to address the urgent social, political, and scientific needs of the public. Moreover, this project will serve as a model for bringing together multiple stakeholders, methods and forms of knowledge to address an urgent need: to protect ash trees in Maine for use by future generations.

Support for this project was provided by National Science Foundation award #EPS-0904155 to Maine EPSCoR at the University of Maine.

Photo by Maine EPSCoR at the University of Maine

Maine NSF EPSCoR Research Infrastructure Award EPS-0904155
Maine's Sustainability Science Initiative

Research and Education Highlight # 2

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Helping Communities Weather the Storms

A Maine EPSCoR Sustainability Solutions Initiative (SSI) team is developing new tools to help Maine communities better understand and prepare for the potential local impacts of climate change. Led by Shaleen Jain, University of Maine Assistant professor of Civil and Environmental Engineering, and Esperanza Stancioff, Extension Associate Professor, University of Maine Cooperative Extension and Sea Grant, the team's findings could save communities millions of dollars in infrastructure replacement and repair due to extreme weather.

Increasingly intense and frequent storms are striking Maine and New England, causing millions of dollars in damage and threatening fragile ecosystems. Maine's coastal communities are particularly vulnerable to extreme weather, which can damage infrastructure and property, ecosystems, and local economies that rely on tourism, the state's largest industry. For instance, the Patriot's Day Storm of 2007 caused an estimated $45 million in damage to roads and other infrastructure.

Managing increased storm water runoff is a prime example of the challenges communities face in coping with climate change. Infrastructure improvements to address these problems, such as the installation of appropriately sized culverts, are expensive and complex. Culvert work, for instance, is regulated and governed by various local, state and federal agencies that often have very different governance structures. These differences may impede the ability of neighboring communities similarly affected by extreme weather to work together on effective solutions.

In addition, current climate science and models are often too vague to be useful to local decision makers, little place-based information exists, and rural and urban communities face very different kinds of challenges from extreme weather. As a result of these and other factors, municipalities often lack the information and resources necessary to make key decisions that could help prevent or minimize damage and economic losses from future storms.

Through surveys, focus groups and interviews, the SSI research team has been utilizing interdisciplinary sustainability science methods in their work with coastal communities from Kittery to Eastport to learn more about stakeholders' needs.

The researchers have found that extreme weather causes different kinds of damage in rural and

urban communities, and that municipal officials need better information in two key areas: the potential local effects of more severe weather, and the interconnections between government agencies at all levels overseeing the installation and repair of culverts and other infrastructure.

The SSI team has also found that communities exhibit variation in their decision and planning calendars related to culvert maintenance and replacement. Furthermore, the disruptions caused by culvert malfunction and failures have serious consequences for the local economy—Maine's coastal counties account for 78% of the state's total employment. To this end, an alignment of culvert-related decision support at all levels of governance (ranging from regional emergency management agencies, state government, and federal emergency management agency) has the potential to improve community-level preparedness and planning in a changing climate.

Support for this project was provided by National Science Foundation award #EPS-0904155 to Maine EPSCoR at the University of Maine.

Photo by Maine EPSCoR at the University of Maine

Maine NSF EPSCoR Research Infrastructure Award EPS-0904155
Maine's Sustainability Science Initiative

Research and Education Highlight # 3

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Unique Course Trains Students in Managing Boundaries to Advance Sustainability Solutions

Creating solutions to sustainability challenges demands high levels of collaboration, coordination, and knowledge exchange. Engineers and scientists from diverse fields have built collaborative research teams through the Maine EPSCoR Sustainability Solutions Initiative (SSI) to facilitate comprehensive assessments of problems important to Maine. In addition, they are working with institutions and individuals beyond the walls of universities to identify relevant problems and deploy creative solutions to these problems. Working across disciplinary and institutional boundaries is central to this mode of sustainability science. Yet, few academic programs train students for these research experiences.

UMaine faculty Kathleen Bell, David Hart, Laura Lindenfeld, and Brian McGill, who are part of SSI, recently created a unique graduate course that prepares students for the challenges and opportunities of conducting sustainability science research.

Bell, an economist, Hart, a watershed scientist, Lindenfeld, a communication scholar, and McGill, an ecologist, designed the course to teach students about managing boundaries to advance sustainability solutions. Students learned about working collaboratively with researchers from different fields and with stakeholders from beyond the university's walls, gained knowledge about science and decision support, heard first-hand from researchers and decision-makers engaged in sustainability science, and received training in communicating science to public audiences.

While students benefited from reading articles on these themes, the content came to life through interactions with science practitioners and users. Panels of invited speakers allowed the students to engage with researchers, decision-makers, and other stakeholders about the boundary work necessary to address sustainability challenges. For example, Maine legislators encouraged students to think about how their research could inform pressing public policy issues. Staff from non-government organizations shared their experiences as boundary workers, navigating interactions between the public, private, and academic sectors. Collaborative research teams shared on-the-ground experiences including innovative research partnerships focused on tidal energy, bioenergy, and forest management issues.

The course challenged students to recognize and appreciate disciplinary and institutional boundaries. By linking academic scholarship with the real-world experiences of engineers, researchers, and stakeholders, students were encouraged to compare and contrast their interests and experiences with those of others.

Throughout the course, participants stressed the importance of dexterity to boundary management, which requires wearing multiple hats to be successful. Courses such as this innovative University of Maine model offer a valuable tool that helps prepare students for the dynamic and complex research environments demanded by sustainability challenges.

Support for this project was provided by National Science Foundation award #EPS-0904155 to Maine EPSCoR at the University of Maine.

Photo by Maine EPSCoR at the University of Maine

Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

APPENDIX 1: Governing and Advisory Boards and Committees

State EPSCoR Committee: Maine Innovation Economy Advisory Board	
Member Name:	**Affiliation:**
Dr. Andrew Anderson	University of Southern Maine
Dr. Pam Baker	Bates College
John Burns	Small Enterprise Growth Fund
Dr. Habib Dagher	Advanced Engineered Wood Composites Center
Dr. Chris Davis	Pemaquid Oyster Co., Inc.
Dr. Michael Eckardt	University of Maine
John Ferland	Ocean Renewable Power Company
Dr. Tim Ford, Chair	University of New England
Jill Goldthwait	Jackson Laboratory
Karin Gregory	Furman, Gregory, Hahn
Dr. Patricia Hand, Vice Chair	Mount Desert Island Biological Laboratory, National EPSCoR Committee
Rita Heimes, JD	University of Maine School of Law
Dr. Whitney King	Colby College
Dr. Robert Lad	University of Maine
Dr. Samantha Langley-Turnbaugh	University of Southern Maine
Peter Merrill	WahlcoMetroflex, Inc.
Peter Murray	Quantrix
Captain Robert Peacock	R.J. Peacock Canning Co.
Dr. Hemant Pendse	University of Maine
Dr. Don Perkins	Gulf of Maine Aquarium
Jane Sheehan	Foundation for Blood Research
Dr. Graham Shimmield	Bigelow Laboratory for Ocean Sciences
Dr. Donald St. Germain	Maine Medical Center Research Institute
Dr. Dale Syphers	Bowdoin College
Miles Theeman	Affiliated Healthcare System
Stephen Von Vogt	Maine Marine Composites
Dr. John Wise, Sr.	University of Southern Maine
Dr. Betsy Biemann	*ex officio member, Maine Technology Institute*
SSI Advisory Board	
Board Member:	**Affiliation:**
Robert Kates, Chair	Presidential Professor of Sustainability Science, University of Maine
Nancy Dickson	Senior Researcher, Kennedy School of Government, Harvard University
J. Morgan Grove	USDA Forest Service
Susan Hanson	Research Professor, Clark University
George Jacobson	Professor Emeritus, University of Maine and Maine State Climatologist
Ted Koffman	Executive Director, Maine Audubon
Thomas M. Parris	Vice-President for Sustainability, ISciences, LLC
Pam Person	Climate Change Task Force, League of Women Voters
Tarla Rai Peterson	Professor & Boone and Crockett Chair, Dept. of Wildlife and Fisheries Science, Texas A&M University
Ken Young	Executive Director, Kennebec Valley Council of Government

Maine STEM Collaborative	
Executive Committee:	**Affiliation:**
Vicki Nemeth (chair)	Director of Research Administration & Maine EPSCoR, University of Maine
Anita Bernhardt (chair-elect)	State Science & Technology Specialist & Regional Representative, Maine Department of Education
Jan Mokros (past chair)	Executive Director, Maine Mathematics and Science Alliance
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Christopher Boudreau	Director, Maine Department of Labor, Center for Workforce Research & Information
Anne Gauthier	Manager, Public Affairs, National Semiconductor, Maine
Christy Johnson	HHMI Grant Coordinator, Colby College
Susan McKay	Professor & Director, UMaine Center for Research in STEM Education
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Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

Appendix 2: YR3 Objectives, Strategies, Benchmarks, & Progress

Goals #1, 2, 3 and 4: Summary of Common Strategies & Benchmarks for All Research Teams (see below for strategies & benchmarks specific to each goal)			
Goals 1-4 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
1) Improved understanding and capacity across all objectives	a) Integration and collaboration between all interdisciplinary members of the team.	On-going (see goals #6 & #13)	On-going (See goals #6 & #13)
	b) Collaboration/ integration with other research teams/institutions.	1-2 per team; 36 project-wide (June 2012)	90 collaborations with other teams
	c) Development of new research method or adoption of best practice.	1 per team; 24 project-wide. (June 2012)	35 new research methods or best practices adopted
	d) External collaborative proposals and/or support submitted.	1-2 proposals/$50K per team; 25 proposals/2.1M project-wide. (June 2012)	72 proposals submitted for $32,499,490; 45 awards received for $2,882,696.
	e) Peer-reviewed publications submitted/accepted/published.	2-3 per team; 55 project-wide. (June 2012)	144 total: 3 abstracts, 9 book chapters, 127 journal articles, 2 proceedings, 3 other
	f) Technical publications completed or in process.	3 per team; 65 project-wide. (June 2012)	23 technical reports completed or in process
	g) Technical presentations.	1-2 per team; 35 project-wide. (June 2012)	209 technical presentations
	h) Participation in relevant professional conferences.	2 per team; 40 project-wide. (June 2012)	204 participants at 100+ professional conferences.

Goals #1, 2, 3 and 4: Summary of Common Strategies & Benchmarks for All Research Teams (see below for strategies & benchmarks specific to each goal)			
Goals 1-4 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
	i) Participation in relevant training activities or workshops in SES, K↔A, or OI.	3 per team; 60 project-wide. (June 2012)	44 have participated in workshops to date. All team members will participate at the Research Retreat (May 2012)
	j) Presentations at SSI activities.	2 per team; 50 project-wide. (June 2012)	75 team members have presented at SSI activities
	k) Development of media pieces (print, web, multimedia, etc.) for public information dissemination purposes.	2 per team; 40 project-wide. (June 2012)	2 MPBN documentaries (3 in production); 12 websites; 2 videos; 1 webinar; 1 newsletter; 1 data CD; 1 social marketing site; 1 multi-media; 1 web slide-show, 12 videocasts; 1 issue of Maine Policy Review
2) Commitment to stakeholder involvement	a) Active collaborations with stakeholder organizations.	2 per team; 50 project-wide. (June 2012)	145 collaborations with stakeholder organizations
	b) Stakeholder/team meetings	3 per team; 80 project-wide. (June 2012)	203 meetings with stakeholders
	c) Breadth of stakeholder collaboration (private sector, government, NGO sector, other research institutions, K-12).	10+ stakeholders per group project-wide. (June 2012)	19 private sector; 44 government; 49 NGOs; 5 K-12
	d) Primary focus on local/state stakeholder scale, secondary regional/ national/international.	45 local/state; 5 reg/nat/intnl project-wide. (June 2012)	51 stakeholder groups represent nat/intnl interests
	e) Research models/processes framed and modified by stakeholder input.	1-2 per team; 30 project-wide. (June 2012)	33 research models/processes with stakeholder input

Goals #1, 2, 3 and 4: Summary of Common Strategies & Benchmarks for All Research Teams (see below for strategies & benchmarks specific to each goal)			
Goals 1-4 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
	f) Stakeholder decision-making process or policy informed/changed through research.	1 per team; 25 project-wide. (June 2012)	32 processes/policies informed by research
	g) Formal related public presentations or public testimony.	1-2 per team; 25 project-wide. (June 2012)	34 public presentations/public testimony
	h) Serving on related external committee, task force, board, etc.	1 per team; 25 project-wide. (June 2012)	30 team members serve on related external committees, etc.
	i) Collaborative team and stakeholder effort/output (surveys, co-authored publications, grant collaborations, involvement in public media & information dissemination, etc.)	1 per team; 15 project-wide. (June 2012)	46 collaborative team/stakeholder outputs

Goal #1: Overall Research Goals - Summary of Strategies & Benchmarks (see above for strategies & benchmarks common to this goal and all three research goals)			
Goal #1 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
1) Increase research capabilities through an inter-disciplinary, multi-institutional collaborative project	a) Create the Center for Sustainability Solutions	Develop Intent to Plan for formal Research Center status; secure post-award funding. Establish K-A resource base. (June 2012)	Development of Intent to Plan is on-going; planning for post-award funding across all areas is being actively pursued; K-A resource base has been established.

Goal #1: Overall Research Goals - Summary of Strategies & Benchmarks (see above for strategies & benchmarks common to this goal and all three research goals)			
Goal #1 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
	b) Funding Opportunities database for grants	5% increase in listings. (June 2012)	7,500 records in YR3
2) Increase Maine's competitive-ness & funding in this focus area	a) Support state PUI involvement	14 collaborations. (June 2012)	11 collaborations
	b) National & international R&D collaborations.	10 additional collaborations. (June 2012)	17 additional national/international R&D collaborations (total 51)
	d) Faculty collaborators.	85 (June 2012)	100 project participants; 57 collaborations with faculty external to SSI
	e) Breadth of expertise (disciplines)	20 (June 2012)	26 disciplines represented

Goal #2: Dynamics of Coupled Social-Ecological Systems – Summary of Specific Strategies & Benchmarks (see above for strategies & benchmarks common to all three research goals)			
Goal #2 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date:**
1) Improved understanding and capacity across all objectives:	a) Development of model(s) of SES dynamics for a specific SES context.	1 per team; 15 project-wide. (June 2012)	17 SES models developed
	b) Identification and analysis of the thresholds, feedbacks, and indicators for a specific SES context.	1 per team; 10 project-wide. (June 2012)	21 thresholds, feedbacks and indicators identified and analyzed
	c) Informing stakeholder(s) mitigation or adaptation strategy.	1 per team; 10 project-wide. (June 2012)	Informed stakeholder strategies 20 times

Goal #2: Dynamics of Coupled Social-Ecological Systems – Summary of Specific Strategies & Benchmarks (see above for strategies & benchmarks common to all three research goals)			
Goal #2 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date:**
	d) Evidence of linkage of SES model with K↔A research.	1 per team; 10 project-wide (June 2012)	25 linkages of model with K-A research
	e) Participation in OI research.	All team members participate. (June 2012)	All team members have participated as requested

Goal #3: Knowledge to Action - Summary of Specific Strategies & Benchmarks (see above for strategies & benchmarks common to all three research goals)			
Goal #3 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
1) Improved understanding and capacity across all objectives:	a) Develop model(s) that assesses reciprocal interactions among biophysical, socioeconomic, and stakeholder contexts in affecting K↔A interactions.	1 per team; 15 project-wide. (June 2012)	19 models developed to assess reciprocal interactions
	b) Develop methodological framework & best practices for achieving a closer coupling between the societal demand for, and supply of, science products.	1 per team; 15 project-wide. (June 2012)	15 frameworks/best practices developed
	c) Evidence of linking K↔A research with SES.	1 per team; 15 project-wide. (June 2012)	30 links evidenced for K-A / SES research
	d) Participation in OI research.	All team members participate. (June 2012)	All team members have participated as requested
	e) Identify best practices for strengthening K↔A interactions in the 3 targeted problem areas.	1 BP per team; 10 project-wide. (June 2012)	20 best practices identified

Goal #3: Knowledge to Action - Summary of Specific Strategies & Benchmarks (see above for strategies & benchmarks common to all three research goals)			
Goal #3 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
	f) Presentation of evidence-based strategy for communicating complex scientific information.	1 per team; 10 project-wide. (June 2012)	22 evidence-based strategies presented
	g) K↔A model that is both internally and externally-oriented for stakeholder and research purposes.	1 per team, 10 project-wide (June 2012)	15 K-A models

Goal #4: Organizational Innovation - Summary of Specific Strategies & Benchmarks (also see above for strategies & benchmarks common to all three research goals)			
Goal #4 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to date**
1) Improved understanding and capacity across all objectives:	a) Develop model(s) of OI that examines interdisciplinary collaboration in university-stakeholder partnerships.	1 per team; 3 project-wide. (June 2012)	3 OI models developed
	b) Develop methodological framework & best practices for promoting interdisciplinary collaboration and university-stakeholder partnerships.	1 per team; 3 project-wide. (June 2012)	8 frameworks/best practices developed
	c) Presentations and technical reports on OI research findings, suggested implementation, and recommendations for improvement.	2 presentations/ 1-2 technical reports per team; 6 presentations/ 4 technical reports project-wide. (June 2012)	11 presentations or technical reports completed
	d) Mechanisms developed for external stakeholders to be informed of relevant results of i.e. surveys.	1 per team; 6 project-wide. (June 2012)	29 mechanisms developed to inform stakeholders of relevant research results.

Goal #5: Diversity Strategies & Benchmarks			
Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date:**
5.1 Individual diversity	a) Diversity in new hires (% of total)	Women: 35% Diverse: 7% (June 2012)	Women: 58% Diverse: 6%
	b) Diversity in existing personnel	Women: 35% Diverse: 7% (June 2012)	Women: 44% Diverse: 8%
	c) Diversity in outreach activity participants	Women: 35% Diverse: 7% (June 2012)	Women: 47% Diverse: 8%
	d) Native Scholars Program	50 participants. (June 2012)	358 participants
	e) programs for women & girls	500 participants (June 2012)	199 participants
	f) STEM Disability program	10 participants (June 2012)	104 participants
5.2 Institutional and partner diversity	a) # collaborating institutions	14 institutions (June 2012)	11 institutions
	b) # stakeholder collaborators	80 stakeholders (June 2012)	267 individuals at 145 organizations
	c) breadth of stakeholders	10 stakeholders per group (June 2012)	19 private sector; 44 government; 49 NGOs; 5 K-12

Goal #6: SSI Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #6 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
6.1 Directly support SSI participants	a) New faculty hired	Retained & supported. (June 2012)	4 faculty hired. 3 retained and supported. 1 joined team in Sept 2011.
	b) SSI core faculty supported	40 faculty supported. (June 2012)	52 faculty supported
	c) SSP faculty supported	40 faculty supported. (June 2012)	48 faculty supported
	d) Postdoctoral associates hired (2-3 yr. appointments)	Retained & supported. (June 2012)	Six postdocs supported. 1 left for tenure track position Dec. 2011, 1 done May 2012. 3 joined team Jan. 2012, 1 will join June 2012.
	e) Provide graduate students research assistantships	28 graduate students supported. (June 2012)	54 graduate students supported
	f) Provide undergraduate student research assistantships	110 undergrad. students supported. (June 2012)	101 undergraduate students supported
	g) Provide high school student research assistantships	30 high school students supported. (June 2012)	21 high school students supported
	h) Professional/ technical/ administrative staff hired/supported	10 positions supported. (June 2012)	30 positions supported
	a) Graduate research internships on SSI teams	20 cohort/20 additional	20 SSI cohort PhD Research Assistantships supported/34 additional
	b) Graduate student mentoring	Weekly student meeting with	On-going monthly group meetings. 1-2 times

Goal #6: SSI Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #6 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
		Graduate Coordinator (on-going)	individually with Coordinator/semester.
	c) Develop/ implement new graduate & undergraduate courses & curriculum	Provide 2 interdisciplinary grad. courses; 2 undergrad. intro. course; 2 modeling courses. (June 2012).	Grad courses: Readings in Sustainability Science, Boundary Spanning. Modeling (grad): Coupled Natural Human Systems, Modeling Sustainability. UG courses: Citizens, Energy & Sustainability, Human Population & the Global Environment; Sustainable Solutions in a Developing World Grad & UG curriculum in process.
	d) Investigate feasibility of establishing UG program in sustainability science between UMS institutions.	Engage in discussions to explore interest and feasibility. (Aug. 2011)	Collaborating with statewide SESYNC grant group charged with exploring sustainability curriculum
	e) Investigate feasibility of offering UG curriculum in sustainability science among partners.	Engage in discussions to explore interest and feasibility. (Dec. 2011)	above
	f) Student involvement in SSI activities	Students participate in monthly SSI team meetings and events (on-going)	Graduate and undergraduate students have actively participate in team meetings and events throughout the year
	g) Travel support	20 graduate, 15 undergraduate students supported.	22 graduate, 1 undergraduate students supported

Goal #6: SSI Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #6 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
	h) Undergraduate research internships on SSI teams	30 research internships supported (June 2012)	97 internships on SSI teams
	i) Coordinated graduate curriculum development	IGERT proposal submitted (Fall 2011)	Graduate Certificate program in process. IGERT proposal submitted in internal competition (Feb. 2012)
	j) Participation in conferences & activities	Undergraduate research conference. ME EPSCoR Conf. (Sep. 2011); SSI Conf. poster competition (Mar. 2012)	ME EPSCoR Conf - 7 grad Pecha Kucha presentations, 10 grad & 10 UG poster presentations. Maine Water Conf. - 11 graduate and 6 undergraduate student presentations (poster and oral).
6.3 Support faculty development through "Mutual Mentoring" program	a) Support peer mentorship networks through formal faculty partnerships.	20+ formal mentorship partnerships. (June 2012)	15 formal mentorship partnerships
	b) Support peer mentorships through informal networking and collaboration.	2 co-taught SSI course, 20 co-mentored graduate students and post-docs, 8 SSI committees and task forces. (June 2012)	2 co-taught courses, 16 co-mentored grad students & postdocs, 7 SSI committees & task forces.
	c) Enhance existing mentorship structures through regular full team meetings, Research Council, and annual retreat.	10+ all team meetings, 10+ Research Council meetings, 1 annual retreat. (June 2012)	8 All Team meetings, 8 Research Council meeting, 1 Research Retreat

Goal #6: SSI Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #6 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
	d) Host "traveling workshops" on key topics identified in a 2010 survey.	Offer 2-3 workshops (June 2012)	Traveling workshops were not offered for YR3. Other workshops were offered (see details below)
	e) Build strategic partnerships with the Center for Excellence in Teaching and Assessment and the NSF ADVANCE grant	Co-host 1 event with CETA and 1 event with NSF ADVANCE (June 2012)	Co-sponsored IDR workshop series with CETA and ADVANCE – 8 workshop series
	f) Promote interdisciplinary mentorship and conversations.	15+ IDG Workshops (June 2012)	8 IDR co-sponsored workshops, 6 IDG workshops.
6.4 Foster collaborative learning and development	a) Sponsor research-related seminars and workshops	4 seminars/ workshops for 100 participants. (June 2012)	7 SSI seminars, 242 participants. 5 postdoc candidate seminars, 75 participants
	b) Sponsor technical assistance workshops	3 workshops for 60 participants. (June 2012)	Land Use Change Workshop (24), Complex Adaptive Systems Workshop (15), 3 Team Message Triangle Workshops (30) 2 Mendeley Training Workshops (22)
	c) Sponsor annual statewide EPSCoR conference	Fall 2011 for 150 participants. (June 2012)	163 participants
	d) Provide travel support for core project participants to conferences/ workshops	Travel for 30 participants. (June 2012)	38 participants
	e) Provide travel scholarships for statewide participants	10 scholarships awarded. (June 2012)	9 scholarships awarded; additional scholarships committed to ADVANCE conference (May 2012)

Goal #6: SSI Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #6 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
	f) Implement team building activities	Monthly all-team meetings, annual research retreat, IDG workshop, other team conferences, workshops and events. (June 2012)	On-going – monthly team meetings, discussion group. Research Retreat (May 2012), MWC (March 14), various workshops (see technical workshops)
	g) New faculty hires enhance project synergies	Integrate new faculty into all aspects of SSI project. (June 2012)	On-going pilot projects for new faculty, graduate student support, opportunities for collaboration on projects, participation on committees, presentations at team-meetings & discussion groups.
	h) Develop/ implement service learning opportunities	Offer course. Offer minimum of 2 summer internships at partners NGOs. (June 2012)	Service learning course offered - Boundary Spanning and Solutions-oriented Science. Course included “shadowing” opportunities for students
	i) Provide learning opportunities for stakeholders/partner org.	Provide 1 research opportunity for visiting fellows. (June 2012)	Developing plans to bring key stakeholders to campus for 2-3 day “intensive learning” visits.
	j) Provide professional industry internships for students	(see goal #11 Sustaining Infrastructure)	(See goal #11 Sustaining Infrastructure)
6.5 Community colleges	Engage in sustainability-related workforce development activities	Establish one new community college collaboration (June 2012)	Piloted EMCC YR3; adding SMCC & exploring others

Goal #7: General Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #7 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
7.1 Related STEM programs for students and teachers	a) Provide related STEM opportunities for K-6 students	75 participants (June 2012)	68 participants
	b) Provide related STEM opportunities for middle school students	500 participants (June 2012)	262 participants
	c) Provide related STEM opportunities for high school students	35 participants (June 2012)	193 participants
	d) undergraduate & graduate opportunities	(Please see Goal # 6 SSI Workforce Development)	1,281 participants
7.2 Teacher professional development and curriculum development	a) Provide related STEM opportunities for K-12 & pre-service teachers	40 participants (June 2012)	205 participants
	b) undergraduate & graduate curriculum development	(Please see Goal # 6 SSI Workforce Development)	(See Goal 6 SSI Workforce Development)
7.3 Baseline & impact studies & strategic planning	a) conduct STEM studies	1 additional Completed (June 2012)	All four studies completed & Executive Summary reported completed
	b) work with statewide groups in strategic planning	ME STEM Collaborative plan; ME DOE STEM plan & Env. Literacy plan; RISE Center MSP (June 2012)	All completed
7.4 Maine STEM Collaborative	a) serve on Executive & Steering Committees; lead strategic planning; advocate for STEM	Monthly meetings (on-going)	On-going; Maine EPSCoR Director serves as Collaborative Chair

Goal #7: General Workforce Development & STEM Education – Strategies & Benchmarks			
Goal #7 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
leadership	b) support & participate in Maine STEM Summit	Winter 2012 Summit	Provided support for and participated in winter 2012 STEM Summit; 311 participants
	c) support & participate in STEM best practices	1-2 programs (June 2012)	Pending new Reach Center programs

Goals #8: Cyberinfrastructure - Strategies & Benchmarks			
Goal #8 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date**
8.1 Statewide videoconferencing capabilities	a) Install Media Control Unit (MCU) & videoconferencing equipment at SSI partner locations	On-going webcam and videoconferencing trainings (June 2012)	Pending completion of SSI Communications Center May 2012
	b) Install bandwidth switchgears/ modules in CSS researcher buildings	6 switchgears/ modules installed (June 2012)	On target to be completed June 2012
8.2 New communication and visualization tools	Deploy prototype visualization & communication portals	Test Mitchell Center portal in actual use and modify (June 2012)	On target to be completed in new SSI Communications Center May 2012
	Create large audience participation capabilities	Create a Communications Center at Mitchell Center (June 2012)	On target to be completed May 2012
8.3 Data sharing	Create plans & systems for data handling	Implement data sharing plan on cloud services (June 2012)	Data Management Plan completed and implementation begun

Goal #9: Outreach and Communication – Strategies & Benchmarks			
Goal #9 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
9.1: Internal SSI communication	Moved to section 13.2		
9.2: SSI Communication with stakeholders	a) SSI Communication tools – mailing list, newsletter, press releases, articles and publications, Web site, presentations	Bi-annual newsletter; maintain/expand mailing list; maintain & update Web site; press releases for major activities; media articles and presentations to the public; print materials updated. (on-going)	Brand and logo established; set-up web-based email communications list; 1 newsletter published Sept. 2011, 2nd newsletter in process (anticipated Apr. 2012); mailing list maintenance & expansion on-going; website maintenance and update on-going; new website in process; 34 public presentations; brochure in final review.
	b) SSI events – conferences, workshops, seminars	4 seminars/ workshops. Annual conference. (June 2012)	7 seminars, 1 workshop, 1 lecture. Conference held in partnership with Maine Water Conference with 275 participants (May 14, 2012). Maine EPSCoR State Conference held for 163 participants (Sept. 26, 2011)
	c) Research communication networks to foster improved interactions with stakeholders	(see Goals 1-4, Research)	(See Goals 1-4, Research)
9.3: Communicate with scientific community	Publications, presentations, conferences, Web sites.	4 major publications, 15 technical presentations, 1 award; host national	78 major publications, 209 technical presentations, 13 awards; plans underway for national conference (spring 2013); website maintained, new website under

Goal #9: Outreach and Communication – Strategies & Benchmarks			
Goal #9 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
		conference on Sustainability Science; provide research updates and progress on Web site; host 2 visiting scholars. (June 2012),	construction; 2-day visits by Baruch Fischhoff. (June 2012), Todd Norton, Mark Schildhauer, Phil Nyden, Robb Jacobson, David Sloan Wilson.
9.4 Build scientific literacy in sustainability science. a) General public b) K-12	a) General public: Web sites, newsletters, articles and publications, printed materials, press releases, podcasts, videocasts, social networking sites.	Update Web site; bi-annual newsletter; video/audio events for podcasting; update printed materials. (June 2012)	Weekly updates of current website, new website under construction; 1 newsletter published (Sept. 2011), 2nd in process; set-up of SSI Vimeo site, 12 videocasts posted; printed materials and displays updated to new SSI "brand".
	b) MPBN collaboration	Produce 3 SSI documentaries & 3 podcasts (June 2012)	2 documentaries aired Sept. 2011; 3 more in preparation; 9 additional videocasts.
	c) Presentations to NGO's, govt., community orgs, etc.	1-2 formal presentations to (June 2012)	34 public presentations.
9.5 Outreach and communications with the NSF EPSCoR community	NSF EPSCoR Office program officer & staff communications; other jurisdictions	Newsletters, press releases, highlights, site visits, reports, evaluations, outreach visits, attendance at national EPSCoR events (on-going)	All completed

Goal #10: Evaluation & Assessment - Strategies & Benchmarks			
Goal #10 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date:**
10.1 External evaluation by independent reviewers	a) Annually assess overall project performance	Year-round review & Fall 2011 site visit. (June 2012)	On target to be completed by June 2012
	b) Utilize qualitative investigations	Follow-up survey (April 2012); document analysis; case studies; produce report June 2012	Survey administered March 2012; document analysis on-going; report due June 2012
	c) Utilize quantitative analysis	Report on analysis of attitudinal, network, productivity, and other behavioral data (June 2012)	Report due June 2012
	d) Feedback loop	Disseminate report to SSI teams; Management review & recommendations (August 2012)	On track for August 2012
10.2 AAAS assessment	a) AAAS on-site assessment	NA	NA for YR3
	b) AAAS report & feedback loop	Disseminate report to SSI teams; Management review & recommendations (August 2011)	

Goal #10: Evaluation & Assessment - Strategies & Benchmarks			
Goal #10 Objectives:	**Strategies:**	**Year 3 Benchmarks**	**YR3 Progress to Date:**
10.3 SSI Advisory Board	a) On-going evaluation & assessment	1-3 phone or videoconference meetings.	
	b) SSI research project review	Projects/proposals reviewed by SSI Advisory Board. Recommendations to ME EPSCoR Mgt Team for final funding decision. (May 2012)	
10.4 NSF evaluation & assessment	a) NSF EPSCoR Reverse Site visit	NA	
	b) NSF program officer visit	Fall 2012	Maine State Conference Sept. 2011
	C) Attend NSF EPSCoR national conferences & workshops	NSF EPSCoR National Conference, 2-3 PD/PA meetings, 2 special EPSCoR training workshops (on-going)	All completed
	d) NSF EPSCoR reporting	Annual report filed on time. (April 2012)	completed
10.5 Maine EPSCoR management	a) ME EPSCoR & SSI management	(see Goals 12 & 13 Management)	Completed
	b) MIEAB reporting (state committee)	September 2011	completed

Goal #11: Sustainability Beyond the RII - Strategies & Benchmarks			
Goal #11 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
11.1 Inter-institutional synergy.	Increase networking and communication between collaborating institutions	(see Goal 13 Research Project Mgt)	(See Goal 13 Research Project Mgt)
11.2 Statewide network of university & stakeholder partnerships.	Expand and strengthen university & stakeholder partnerships	(see Goal 9 External Engagement)	(See Goal 9 External Engagement)
11.3 External government grants	a) Provide grant development support for research teams.	1-2 grant-writing workshops; 1-2 Program Officer meetings; SSI proposal action support. (June 2012)	Seed funding RFP issued for Collaborative Grant Proposal Development by Mgt Team
	b) Build stronger relationships with state and federal agencies.	Host 4 scoping meetings; make 2 new agency contacts. (June 2012)	3 scoping meetings with agency contacts; 2 new agency contacts added to database
11.4 Foundation and private support.	a) Develop foundation relationships and support.	Maintain foundation listing; cultivate relationships with 4 foundations. (June 2012)	Foundation listing maintained, continue to seek out new foundations that fit with SSI mission and goals; continue to build and cultivate relationships with foundations.
	b) Build SSI endowment.	Identify and cultivate relationships with 2 additional potential donors. (June 2012)	Continue to develop relationships with potential donors and work with partners to identify new contacts.

Goal #11: Sustainability Beyond the RII - Strategies & Benchmarks			
Goal #11 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
11.5 Establish Maine as leader in sustainability science	a) Market the value of CSS for solving a wide range of sustainability-related problems.	(see Goal 9 External Engagement)	(See Goal 9 External Engagement)
	b) Provide physical infrastructure to support R&D agenda	Completion of new social science research lab; begin renovation of Mitchell Center Communications Center (June 2012)	Social Science Lab - scheduled completion Oct. 2012. Communications Center – scheduled completion May 2012
	c) enhanced cyberinfrastructure to support collaborations	(See Goal #8 CI)	(See Goal #8 CI)
	d) Engage in activities to foster private sector involvement.	Regular meetings of EDTF; host larger meeting of economic development stakeholders; invest in economic development efforts at UMaine/USM. (June 2012)	Stakeholder database completed; planning underway for networking event (summer 2012); proposed investment efforts in development.

Goal #12: Overall ME EPSCoR RII Project Management – Strategies & Benchmarks			
Goal #12 Objectives:	**Strategies:**	**Year 3**	**YR3 Progress to Date:**
12.1 Systems for effective coordination, communication	a) Maine EPSCoR Management Team	Monthly meetings; review progress & issues,	Monthly formal meetings; Weekly informal contact

Goal #12: Overall ME EPSCoR RII Project Management – Strategies & Benchmarks			
Goal #12 Objectives:	**Strategies:**	**Year 3**	**YR3 Progress to Date:**
, integration of all program components		provide recommendations, strategic planning, etc. (on-going)	
	b) advisory to SSI Core Management Team	Bi-weekly meetings. (on-going)	On-going
	c) advisory to SSI Stewardship Council	Bi-weekly meetings. (on-going)	Attend weekly SSI Stewardship Council meetings
	d) advisory to SSI Research Council	Monthly meetings (on-going)	Attend monthly SSI Research Council meetings upon request
	e) advisory to SSI All-Team meetings	Monthly meetings (on-going)	Attend monthly SSI All-Team meetings
	f) MIEAB State committee	Provide updates (September 2012)	Completed
12.2 Ensure administrative, programmatic, and fiscal integrity for all project components and institutions.	a) SSP program institutions have designated leadership and guidelines to follow.	Communications with project leadership; formal training provided 1-2 times. (on-going)	completed
	b) outline & clarify project requirements to ensure understanding	Meet with SSI staff monthly & SSP institutions 1-2 times; provide on-going assistance. (June 2012)	completed

Goal #12: Overall ME EPSCoR RII Project Management – Strategies & Benchmarks			
Goal #12 Objectives:	**Strategies:**	**Year 3**	**YR3 Progress to Date:**
	c) Maine EPSCoR staff keep abreast of federal & program requirements and policies.	attend 1-2 relevant regional and national conferences and workshops (June 2012)	June 2012 national STEM conference
	d) Fiscal responsibility	NSF unobligated funds <20%, with match met. (June 2012)	Unobligated NSF funds at 6.54%; match met
12.3 Foster effective communication and coordination.		SSP coordination	completed

Goal #13: SSI Research Project Management – Strategies & Benchmarks			
Goal #13 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
13.1 New SSI organizational structure	a) Integrated matrix management system	Utilize OI research results to refine mgt. system; track progress or mgt. system through team collaboration & project integration across matrix. (June 2012)	Refinement of mgt system and matrix is on-going as feedback is received from OI research team.
	b) SSI Stewardship Council	Bi-weekly meetings (on-going)	Weekly meetings (on-going)

Goal #13: SSI Research Project Management – Strategies & Benchmarks			
Goal #13 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
	c) SSI Research Council	Monthly meetings (on-going)	Monthly meetings (on-going)
	d) SSI committees	Committees meet regularly. Timeframe determined by required tasks. (on-going)	Culture & Curriculum: sub-committees – UG curriculum, Grad curriculum/IGERT; Economic Dev. – 2 full, 5 sub-groups; Data Mgt. – 2 full, 6 sub-groups, Postdoc search committee – 8, Seminar committee – 3. All committees communicate regularly via email.
	e) SSI Advisory Board	1-3 phone or videoconference meetings.	December 2011 site visit; on-going meetings with Chair
	f) Maine EPSCoR Management Team	Monthly meetings. (June 2012)	Formal monthly meetings; weekly informal contact
	g) CSS Core Management Team	Bi-weekly meetings. (June 2012)	Weekly meetings
13.2 and 9.1 Communication & feedback loops	a) Team events and publications – meetings; workshops; research retreats; visiting scholars; seminars; conferences; discussion groups; internal newsletter.	Monthly team meetings; 2 workshops; annual SSI conference; 6 seminars; host 1 visiting scholar; annual research retreat; bi-weekly discussion group; bi-weekly doSSIer.(June 2012)	Set-up team listserv; 8 all-team meetings (monthly), 6 Integrative Discussion Groups (moved to monthly), 7 seminars, Maine Water Conference co-sponsor, 1 lecture, on-going bi-weekly newsletter, annual retreat, 6 visiting scholars (Todd Norton, David Sloan Wilson, Baruch Fischhoff, Robb Jacobson, Phil Nyden, Stan Temple, Mark Schildhauer).

Goal #13: SSI Research Project Management – Strategies & Benchmarks			
Goal #13 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
	b) videoconferencing, web cams, internal Web site, data sharing networks	Update internal Web site; establish data sharing network 15 videoconf. meetings; update internal SSI Web site; establish data sharing network implement SSI cloud computer (June 2012)	Maintenance and update of internal website (on-going); video-conferencing available for all meetings and used regularly (over 15 meetings and seminars). (See Goal #8 for data sharing and network)
13.3 OI research	a) OI research	(see Goal 4 Organizational Innovation)	(See Goal 4 Organizational Innovation)
	b) Best practices	(see Goal 4 Organizational Innovation)	(See Goal 4 Organizational Innovation)
13.4 Research project management	a) RFP process - SSI	Create & issue a formal YR4 RFP to solicit SSI proposals (Feb. 2012)	YR4 RFP created using document established and approved by RC in YR2. YR4 RFP issued Jan. 2012.
	b) RFP process - SSP	See SSI YR3 RFP process. (Jul. 2011)	RFP issued July 2011; review process; 10 SSP institutions supported YR3.
	c) Review process - SSI	Proposals screened by SSI Res. Council panel; reviewed by SSI Advisory Board. Final decision by Mgt Team. (May 2012)	Initial screening by Mgt. Team (early April 2012); RC committee review (April 2012); Mgt. Team final recommendations & meetings with teams (May 2012); SSI Advisory Board input on recommendations (May 2012)

Goal #13: SSI Research Project Management – Strategies & Benchmarks			
Goal #13 Objectives:	**Strategies:**	**Year 3 Benchmarks:**	**YR3 Progress to Date:**
	d) Review process - SSP	See SSI YR3 review process. (Aug. 2011)	SSI review committee reviewed 8 YR3 proposals August 2011 & made recommendations to the Mgt. Team
	e) Project reporting	SSI annual reports (Feb. 2012) SSP annual reports (Jul. 2011)	15 UM/USM SSI annual reports received Mar. 2012. Used in YR4 funding process. 9 SSP annual reports received July 2011 for YR3 funding.
	f) On-going review	SSI interim progress reports (Nov. 2011/Jun. 2012) SSP interim progress reports (Nov. 2011/Feb. 2012). (See also Goals 1, 2, 3, 4)	Site visits of UM/USM SSI teams by Mgt Team in summer/fall 2011. SSP interim progress reports (Mar. 2012). Site visits by Mgt Team and SSP Coordinator (fall 2011).

Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

APPENDIX 3: SSI Project Personnel

Type	Last Name	First Name	Department	YR1	YR2	YR3
University of Maine						
Faculty	Amirbahman	Aria	Civil & Environmental Engineering	x	x	
Faculty	Anderson	Mark	School of Engineering	x	x	x
Faculty	Beard-Tisdale	Kate	Spatial Information Science & Engineering		x	x
Faculty	Bell	Kathleen	School of Economics	x	x	x
Faculty	Blackstone	Amy	Sociology			x
Faculty	Calhoun	Aram	Wildlife Ecology	x	x	x
Faculty	Chawathe	Sudarshan	Computer Science			x
Faculty	Cole	Barbara	Chemistry	x	x	x
Faculty	Cronan	Christopher	School of Biology & Ecology	x	x	x
Faculty	Daigle	John	School of Forest Resources	x	x	x
Faculty	Drummond	Francis	School of Biology & Ecology	x	x	x
Faculty	Elliott	Catherine	Cooperative Extension		x	x
Faculty	Emanetoglu	Nuri	Electrical & Computer Engineering			x
Faculty	Fernandez	Ivan	Plant, Soil, & Environmental Science	x	x	
Faculty	Gallandt	Eric	Plant, Soil, & Environmental Science	x	x	x
Faculty	Gardner	Susan	Education	x	x	x
Faculty	Hakola	Judith	English	x		
Faculty	Halteman	William	Mathematics & Statistics	x		
Faculty	Hart	David	Senator George J. Mitchell Center	x	x	x
Faculty	Hiebeler	David	Mathematics & Statistics	x		x
Faculty	Hornsby	Stephen	Canadian-American Center	x	x	
Faculty	Hunter	Malcolm	Wildlife Ecology	x	x	x
Faculty	Jain	Shaleen	Civil & Environmental Engineering	x	x	x
Faculty	Johnson	Teresa	School of Marine Sciences	x	x	x
Faculty	Judd	Richard	History	x	x	
Faculty	King	Roger	Philosophy			x
Faculty	Kuykendall	William	New Media	x	x	
Faculty	Leahy	Jessica	School of Forest Resources	x	x	x
Faculty	Lilieholm	Robert	School of Forest	x	x	x

Type	Last Name	First Name	Department	YR1	YR2	YR3
			Resources			
Faculty	Lindenfeld	Laura	Communication & Journalism/Margaret Chase Smith Policy Center	x	x	x
Faculty	Livingston	William	School of Forest Resources			x
Faculty	Loftin	Cynthia	Wildlife Ecology	x	x	x
Faculty	Maasch	Kirk	Earth Sciences	x		
Faculty	MacRae	Jean	Civil & Environmental Engineering	x	x	x
Faculty	McCoy	Shannon	Psychology	x	x	x
Faculty	McGill	Brian	Sustainability Solutions Initiative		x	x
Faculty	Noblet	Caroline	School of Economics	x	x	x
Faculty	Norton	Steve	Earth Sciences	x	x	
Faculty	Olsen	Brian	School of Biology & Ecology			x
Faculty	Peckenham	John	Senator George J. Mitchell Center	x	x	x
Faculty	Peterson	Michael	Mechanical Engineering		x	x
Faculty	Porter	Terry	School of Business	x		
Faculty	Ranco	Darren	Anthropology/Senator George J. Mitchell Center	x	x	x
Faculty	Reeve	Andrew	Earth Sciences	x	x	x
Faculty	Sader	Steve	School of Forest Resources	x	x	
Faculty	Saros	Jasmine	School of Biology & Ecology	x		
Faculty	Scott	Michael	New Media	x	x	x
Faculty	Segee	Bruce	Electrical & Computer Engineering	x	x	x
Faculty	Silka	Linda	Margaret Chase Smith Policy Center	x	x	x
Faculty	Simon	Kevin	School of Biology & Ecology	x	x	
Faculty	Smith	Sean	Sustainability Solutions Initiative			x
Faculty	Stancioff	Esperanza	Cooperative Extension	x	x	x
Faculty	Teisl	Mario	School of Economics	x	x	x
Faculty	Vaux	Peter	Senator George J. Mitchell Center	x	x	
Faculty	Waring	Timothy	Sustainability Solutions Initiative		x	x
Faculty	Weiskittel	Aaron	School of Forest Resources	x	x	x
Faculty	Wilson	James	School of Marine Sciences	x	x	x

Type	Last Name	First Name	Department	YR1	YR2	YR3
Faculty	Wilson	Jeremy	School of Forest Resources	x	x	x
Faculty	Zhu	Yifeng	Electrical & Computer Engineering	x	x	x
Faculty	Zydlewski	Gayle	School of Marine Sciences	x	x	x
Grad Student	Albee	Emily	Education	x		
Grad Student	Andrle	Katie	Wildlife Ecology	x		
Grad Student	Bacon	Linda	School of Biology & Ecology	x	x	
Grad Student	Beyene	Mussie	Civil & Environmental Engineering			x
Grad Student	Bourgoin	Nathan	Electrical & Computer Engineering	x		
Grad Student	Brown	Vance	Communication & Journalism/School of Forest Resources	x	x	
Grad Student	Budzinski	Colleen	Communication & Journalism	x	x	x
Grad Student	Call	Erynn	Wildlife Ecology	x	x	
Grad Student	Cline	Brittany	Sustainability Solutions Initiative/ Wildlife Ecology	x	x	x
Grad Student	Colby-George	Judy	Ecology & Environmental Sciences		x	x
Grad Student	Cooper	George	Earth Sciences			x
Grad Student	Cosley	Brandon	School of Business/Psychology	x		
Grad Student	Ditzler	Kristin	Ecology & Environmental Sciences		x	
Grad Student	Dreyer	Stacia	Economics		x	x
Grad Student	Engelberth	Haley	Economics			x
Grad Student	Fisher	Meaghann	Modern Languages & Classics	x		
Grad Student	Girouard	Maria	Wabanaki Center	x		
Grad Student	Goff	Sandra	Ecology & Environmental Science			x
Grad Student	Gorczyca	Erika	School of Forest Resources	x		x
Grad Student	Gray	Alex	Civil & Environmental Engineering	x	x	x
Grad Student	Groff	Luke	Wildlife Ecology		x	x
Grad Student	Harris	Megan	Biochemistry, Micriobiology, & Molecular Biology		x	
Grad Student	Hassett	Katherine	Resource Economics & Policy	x		
Grad Student	Hawthorne	Lauren	Psychology			x
Grad Student	Hayden	Anne	School of Marine	x		

Type	Last Name	First Name	Department	YR1	YR2	YR3
			Sciences			
Grad Student	Hill	Jack	Mathematics & Statistics	x		
Grad Student	Hoffmann	Kristine	Wildlife Ecology			x
Grad Student	Hutchens	Stan	Sustainability Solutions Initiative/ Wildlife Ecology	x	x	
Grad Student	Hutchins	Karen	Sustainability Solutions Initiative/ Communication & Journalism	x	x	x
Grad Student	Jansujwicz	Jessica	Sustainability Solutions Initiative/ Wildlife Ecology/ School of Forest Resources	x	x	x
Grad Student	Johnson	Eileen	Economics		x	x
Grad Student	Johnson	Michelle	School of Forest Resources		x	x
Grad Student	King	Robert	Electrical & Computer Engineering		x	x
Grad Student	Kus	Evan	Sustainability Solutions Initiative		x	
Grad Student	Lannan	Andrew	Plant, Soil, & Environmental Science			x
Grad Student	Letarte	Danielle	School of Economics	x		
Grad Student	Levesque	Vanessa	Sustainability Solutions Initiative/School of Economics	x		x
Grad Student	Lizotte	Molly	Parks, Recreation, & Tourism			x
Grad Student	Lorion	Kara	School of Forest Resources			x
Grad Student	Lyons	Patrick	School of Forest Resources	x	x	x
Grad Student	Marrinan	Sarah	Economics		x	x
Grad Student	Martin	Danielle	Earth Sciences			x
Grad Student	McGreavy	Bridie	Communication & Journalism		x	x
Grad Student	McGuire	Julia	Ecology & Environmental Science			x
Grad Student	Meyer	Spencer	School of Forest Resources		x	x
Grad Student	Michelle	Natalie	Public Administration		x	x
Grad Student	Morgan	Dawn	Wildlife Ecology		x	
Grad Student	Mullen	Amanda	Education	x		
Grad Student	Neville	Melinda	Ecology & Environmental Science			x
Grad Student	Newell	Ellen	Psychology/Education	x	x	x
Grad Student	Parr	Thomas	Ecology & Environmental Science		x	x

Type	Last Name	First Name	Department	YR1	YR2	YR3
Grad Student	Pickering	Ryan	School of Economics	x	x	x
Grad Student	Plowden	Jennifer	School of Economics	x	x	x
Grad Student	Quartuch	Michael	School of Forest Resources		x	x
Grad Student	Quigley	Erin	School of Forest Resources		x	x
Grad Student	Ravis	Charles	Sustainability Solutions Initiative		x	
Grad Student	Ryan	Kevin	Wildlife Ecology	x	x	x
Grad Student	Sapiel	Minquansis	Wabanaki Center	x		
Grad Student	Saros	Misa	Civil & Environmental Engineering		x	
Grad Student	Seitz	Eleanor	Communication & Journalism	x		
Grad Student	Shrum	Jenny	Ecology & Environmental Science			x
Grad Student	Silva	Bernardita	Economics		x	
Grad Student	Small	Heather	Intermedia	x	x	x
Grad Student	Smith	Hollie	Communication & Journalism		x	x
Grad Student	Spencer	Erin	Sustainability Solutions Initiative	x	x	
Grad Student	Springsteen	Anna	Ecology & Environmental Sciences		x	x
Grad Student	Sutton	Anthony	Communication & Journalism		x	x
Grad Student	Titterington	Meredith	Ecology & Environmental Science			x
Grad Student	Trosper	Stacy	Sustainability Solutions Initiative		x	
Grad Student	Truesdell	Samuel	School of Marine Sciences	x		
Grad Student	Utley	Lindsay	Communication & Journalism		x	x
Grad Student	Vanderlugt	Blair	Resource Economics & Policy			x
Grad Student	Vieser	Jeffrey	School of Marine Sciences			x
Grad Student	Wellman	Joseph	Psychology/Education	x	x	x
Grad Student	West	Andrea	Education	x		
Grad Student	Wibberly	Megan	School of Economics			x
Grad Student	Willett	Sara	Wabanaki Center	x		
Grad Student	Withee	Jason	Electrical & Computer Engineering	x		
Grad Student	Zimmerman	Jacquelyn	School of Forest Resources	x	x	
High School Student	Balaban-Garber	Rachel	Orono High School	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
High School Student	Benoit	Philip	Orono High School	x	x	x
High School Student	Bird	Norah	Orono High School	x	x	x
High School Student	Brewer	Addison	Bangor High School		x	
High School Student	Bulteel	Alex	Orono High School	x	x	x
High School Student	Caron	Zachary	Orono High School	x	x	
High School Student	Chase	Samuel	Orono High School		x	x
High School Student	Chasse	Taylor	Orono High School		x	x
High School Student	Claar	Joseph	Orono High School		x	x
High School Student	Cole	Avery	Orono High School	x	x	
High School Student	Foster	Andria	Orono High School	x	x	x
High School Student	Guo	Mengting	Orono High School	x	x	x
High School Student	Harrity	Siobhan	Orono High School	x	x	x
High School Student	Hecker	Olivia	Orono High School		x	x
High School Student	Innis	Nicholas	Orono High School		x	x
High School Student	Koehler	Benjamin	Orono High School	x	x	x
High School Student	Koehler	Karl	Orono High School	x	x	
High School Student	Landis	Audrey	Orono High School		x	x
High School Student	Lesser	Daniel	Orono High School	x	x	
High School Student	Mares	Ruth	Orono High School		x	x
High School Student	Mayfield	Lillie	Orono High School		x	x
High School Student	Ohno	Paul	Orono High School	x	x	
High School Student	Pasquine	Laura	Bangor High School		x	
High School Student	Perry	Daniel	Orono High School		x	x
High School Student	Richards	Jessica	Orono High School	x	x	x
High School	Robinson	John	Orono High School	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student						
High School Student	Robinson	Paul	Orono High School	x	x	x
High School Student	Rowe	Mark	Orono High School	x	x	
High School Student	Tozer	Caroline	Orono High School		x	x
High School Student	Walton	Allison	Orono High School	x	x	
High School Student	Weigang	Anna	Orono High School		x	x
Postdoc	Capps	Krista	Sustainability Solutions Initiative			x
Postdoc	Hall	Damon	Sustainability Solutions Initiative	x	x	x
Postdoc	Jansujwicz	Jessica	Sustainability Solutions Initiative			x
Postdoc	Kim	Jong-Suk	Sustainability Solutions Initiative/Civil & Environmental Engineering	x		
Postdoc	Lamanna	Christina	Sustainability Solutions Initiative			x
Postdoc	Lazarus	Eli	Sustainability Solutions Initiative		x	x
Postdoc	Straub	Crista	Sustainability Solutions Initiative			x
Staff	Bartlett	Christopher	Sea Grant	x	x	x
Staff	Dunham	Jennifer	Maine EPSCoR Office	x	x	x
Staff	Eckardt	Michael	Office of the Vice President for Research	x	x	x
Staff	Growe	Cynthia	Maine EPSCoR Office	x	x	x
Staff	Hallsworth	Ruth	Senator George J. Mitchell Center	x	x	x
Staff	Hamel	Carol	Sustainability Solutions Initiative	x	x	x
Staff	Hermann	Michael	Canadian-American Center	x		
Staff	Homerding	Margaret	School of Marine Sciences	x		
Staff	Isherwood-Iobst	Jennifer	Maine EPSCoR Office			x
Staff	Kuykendall	Adam	Maine EPSCoR Office	x	x	x
Staff	McIntyre	Andrew	Senator George J. Mitchell Center			x
Staff	Mitchell	John	Wabanaki Center	x		
Staff	Morgan	Dawn	Wildlife Ecology		x	x
Staff	Nemeth	Vicki	Maine EPSCoR Office	x	x	x
Staff	Peckenham	Emily	Senator George J.			x

Type	Last Name	First Name	Department	YR1	YR2	YR3
			Mitchell Center			
Staff	Pelletier	Kayla	Wildlife Ecology			x
Staff	Raymond	Kim	Senator George J. Mitchell Center	x	x	x
Staff	Smith	Hollie	Sustainability Solutions Initiative		x	
Staff	Zollitsch	Brenda	Sustainability Solutions Initiative	x	x	
Technician	Cousins	Stephen	School of Marine Sciences			x
Technician	Crocker	Robin	Research & Sponsored Programs			x
Technician	Finlayson	Christy	Sustainability Solutions Initiative/Anthropology	x		
Technician	Kormendy	Zsolt	Sustainability Solutions Initiative/Wildlife Ecology	x		
Technician	Lake	Bjorn	Sustainability Solutions Initiative/School of Biology & Ecology	x		
Technician	Legaard	Kasey	Sustainability Solutions Initiative/School of Forest Resources	x		
Technician	McCloskey	Jon	Sustainable Solutions Initiative/School of Forest Resources	x		
Technician	Melanson	Jesse	Maine EPSCoR Office	x		
Technician	Mercier	Wilfred	Sustainability Solutions Initiative/School of Forest Resources	x		
Technician	Post	Dylan	Sustainability Solutions Initiative		x	x
Technician	Simons	Erin	School of Forest Resources	x		
Technician	Staines	Garrett	School of Marine Sciences			x
Technician	Tremblay	Jill	Sustainability Solutions Initiative	x		
Technician	Wilbur	Clifford	Research & Sponsored Programs			x
Technician	Yan	Liying	School of Marine Sciences	x		
Undergrad Student	Amatya	Jyoti	Chemical & Biological Engineering			x
Undergrad Student	Armfield	Robert	Wabanaki Center	x	x	x
Undergrad Student	Armstrong	John	Biology			x
Undergrad	Arsenault	Chad	New Media		x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student						
Undergrad Student	Baughman	Jessica	School of Economics	x		
Undergrad Student	Becker	Amy	Communication & Journalism/School of Forest Resources			x
Undergrad Student	Beckwith	Walter	School of Marine Sciences		x	
Undergrad Student	Bird	Norah	School of Forest Resources			x
Undergrad Student	Bouchard	Dylan	Economics			x
Undergrad Student	Buckley	Karl	Communication & Journalism/School of Forest Resources	x		
Undergrad Student	Bussell	Mallory	Communication & Journalism/School of Forest Resources	x		
Undergrad Student	Carle	Brittany	Recreation, Parks, & Tourism		x	
Undergrad Student	Chasse	Taylor	School of Nursing			x
Undergrad Student	Chavis	Emily	Wabanaki Center	x		
Undergrad Student	Churchill-Vogt	Zoe	Psychology		x	
Undergrad Student	Co	Aileen	Chemical & Biological Engineering		x	
Undergrad Student	Daigle	Kristyn	Sustainability Solutions Initiative		x	
Undergrad Student	Drown	Peter	Sustainability Solutions Initiative		x	
Undergrad Student	Dulac	Ryan	Psychology		x	
Undergrad Student	Dulin	Nathaniel	Ecology & Environmental Sciences		x	
Undergrad Student	Dunn	Christopher	School of Economics	x	x	
Undergrad Student	Dyer	Kristine	English		x	x
Undergrad Student	Engelmann	Nichole	Ecology & Environmental Sciences		x	
Undergrad Student	Finer	Matthew	School of Business			x
Undergrad Student	Finnemore	Luke	Economics			x
Undergrad Student	Fisher	Susannah	Economics			x
Undergrad	Fitch	Matthew	New Media	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student						
Undergrad Student	Fournier	Maria	Economics		x	
Undergrad Student	Godin	Hilary	Sustainability Solutions Initiative			x
Undergrad Student	Grant	Jonathan	Wildlife Ecology	x	x	
Undergrad Student	Gray	Kristy	Biology			x
Undergrad Student	Han	Chuck	Electrical & Computer Engineering		x	x
Undergrad Student	Haskins	Thomas	History			x
Undergrad Student	Hecker	Lee	Wildlife Ecology	x	x	x
Undergrad Student	Helmke	Scott	Wildlife Ecology	x	x	
Undergrad Student	Hoyt	Margaret	Natural Sciences, Forestry, & Agriculture			x
Undergrad Student	Huang	Kang	Electrical & Computer Engineering		x	
Undergrad Student	Hubbard	Malissa	Ecology & Environmental Sciences		x	
Undergrad Student	Hutchinson	Sean	Communication & Journalism/School of Forest Resources	x		
Undergrad Student	Jordan	Mira	Communication & Journalism			x
Undergrad Student	Judd	Lillian	School of Forest Resources		x	
Undergrad Student	Kacer	Nikita	Academic and Career Exploration		x	x
Undergrad Student	Kennedy	Cody	Wildlife Ecology	x	x	
Undergrad Student	Kent	Sarah	History		x	
Undergrad Student	Lajoie	Caitlyn	School of Economics	x		
Undergrad Student	Lamond	William	Liberal Arts & Sciences			x
Undergrad Student	Landry	Nicole	Ecology & Environmental Science			x
Undergrad Student	Lankist	Amanda	Chemistry		x	
Undergrad Student	Ledoux	Annie	Economics			x
Undergrad Student	Ledoux	Haylea	Chemical & Biological Engineering		x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Undergrad Student	Legere	Matthew	Earth Sciences	x	x	x
Undergrad Student	Li	Bo	Civil & Environmental Engineering		x	
Undergrad Student	Lizotte	Molly	Parks, Recreation, & Tourism		x	
Undergrad Student	Lyden	John	Chemistry			x
Undergrad Student	Manning	Joshua	School of Marines Sciences		x	x
Undergrad Student	Marcroft	Robert	Psychology		x	
Undergrad Student	Mattos	Emily	School of Business		x	
Undergrad Student	Mauricette	Eric	School of Forest Resources		x	
Undergrad Student	McGuire	Timothy	Mechanical Engineering		x	
Undergrad Student	McIntyre	Andrew	School of Biology & Ecology			x
Undergrad Student	McMullan	Barrett	Economics			x
Undergrad Student	Melanson	Jesse	New Media	x		
Undergrad Student	Moore	Zeraph	Ecology & Environmental Science			x
Undergrad Student	Morrow	Danielle	School of Biology & Ecology			x
Undergrad Student	Ortiz	Anthony	School of Forest Resources		x	
Undergrad Student	Parkhill	Nathaniel	Wildlife Ecology			x
Undergrad Student	Peavey	Lauren	Sustainability Solutions Initiative		x	
Undergrad Student	Peckenham	Phoebe	Sustainability Solutions Initiative			x
Undergrad Student	Pelletier	Kayla	Wildlife Ecology		x	
Undergrad Student	Perkins	Randy	Earth Science			x
Undergrad Student	Petrakovich	Joseph	Liberal Arts & Sciences			x
Undergrad Student	Porter	Sarah	Psychology			x
Undergrad Student	Post	Dylan	Communication & Journalism		x	
Undergrad Student	Price	Kevin	School of Economics	x	x	
Undergrad	Purinton	Karen	School of Economics	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student						
Undergrad Student	Reeves	Lauren	Liberal Arts & Sciences			x
Undergrad Student	Rideout	Sarah	Psychology			x
Undergrad Student	Ross	Brittany	School of Forest Resources		x	
Undergrad Student	Rounds	Alan	Economics			x
Undergrad Student	Shank	Elijah	School of Forest Resources		x	x
Undergrad Student	Sherman	Dane	School of Engineering Technology			x
Undergrad Student	Stewart	Nicholas	New Media			
Undergrad Student	Stickney	Matthew	Computer Science		x	
Undergrad Student	Stiles	Benjamin	Sustainability Solutions Initiative		x	
Undergrad Student	Thomas	Erin	Communication & Journalism			x
Undergrad Student	Thornbrough	Lauren	Communication & Journalism			x
Undergrad Student	Tomes	Andrew	School of Biology & Ecology	x		
Undergrad Student	Tooher	Alexander	Electrical & Computer Engineering		x	
Undergrad Student	Tremblay	Jill	Anthropology	x		
Undergrad Student	Veitch	Eric	Natural Sciences, Forestry, & Agriculture			x
Undergrad Student	Vo	Giang	School of Business	x	x	
Undergrad Student	Walus	Brandon	Wabanaki Center	x		
Undergrad Student	Wibberly	Megan	School of Economics	x	x	
Undergrad Student	Wolfe	Kristine	Psychology			x
University of Maine Other Institution Participants						
Faculty	Maclean	David	Forestry	x	x	
Staff	Donahue	Charlene	State of Maine Insect & Disease Laboratory	x		
Staff	Drummond	Marjorie	GrowSmart Maine	x		
Staff	Meadow	Curtis	TreFoil Corporation	x		
Staff	Neptune	Jennifer	Maine Indian Basketmakers Alliance		x	x
Staff	Secord	Theresa	Maine Indian		x	x

Type	Last Name	First Name	Department	YR1	YR2	YR3
			Basketmakers Alliance			
University of Southern Maine						
Faculty	Briggs	David	Computer Science	x	x	x
Faculty	Colgan	Charles	Muskie School of Public Service	x	x	x
Faculty	Kartez	Jack	Muskie School of Public Service	x	x	x
Faculty	Kim	Yuseung	SSI/Muskie School of Public Service		x	x
Faculty	Owen	David	School of Law	x	x	x
Faculty	Pavri	Firooza	Geography & Anthropology	x	x	x
Faculty	Wilson	Karen	Environmental Science & Policy	x	x	x
Grad Student	Bojarski	Slawomir	Muskie School of Public Service	x	x	x
Grad Student	Capponi	Randa	School of Law	x	x	
Grad Student	D'Alessandro	Daniel	School of Law			x
Grad Student	Dailey	Abraham	Geology			x
Grad Student	Dikeman	Barry	Muskie School of Public Service		x	
Grad Student	Glaser	Peter	School of Law	x		
Grad Student	Goff	Sandra	Muskie School of Public Service	x	x	
Grad Student	Lloyd	Sadie	Muskie School of Public Service			x
Grad Student	Payne	Molly	Biology			x
Grad Student	Riley	Jennifer	Muskie School of Public Service		x	
Grad Student	Workman	Scott	Community Planning & Development			x
Grad Student	Youngs	Thea	Muskie School of Public Service	x	x	
Staff	Ives	Barbara	Muskie School of Public Service		x	x
Staff	Thurston	Scott	Sustainability Solutions Initiative			x
Staff	Valentine	Vinton	Geography/Anthropology			x
Technician	Willis	Theodore	Adjunct Faculty	x	x	x
Technician	Workman	Scott	Sustainability Solutions Initiative			x
Undergrad Student	Barajas	Miguel	Environmental Science			x
Undergrad Student	Bartlett	Todd	Environmental Science			x
Undergrad Student	Begin	Leonora	Geology		x	
Undergrad	Bourget	Paul	Geography/Anthropology			x

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student						
Undergrad Student	Bullis	Meghan	Muskie School			x
Undergrad Student	Carroll	Shannon	School of Law	x		
Undergrad Student	Dailey	Abraham	Geography/Anthropology	x	x	
Undergrad Student	Glaser	Peter	School of Law	x		
Undergrad Student	Keene	Matthew	Geology/Anthropology			x
Undergrad Student	Monroe	Joshua	Environmental Science			x
Undergrad Student	Ogren	Meghan	School of Law	x		
Undergrad Student	Pappas	Shane	Environmental Science			x
Undergrad Student	Pooler	William	Muskie School of Public Service		x	x
Undergrad Student	Sanford	Cole	Geography & Anthropology	x		
Undergrad Student	Shuttle	Shannon	Environmental Science		x	x
Undergrad Student	Thurston	Scott	Muskie School of Public Service		x	x
Undergrad Student	Wood	Richard	School of Law	x	x	
Bates College						
Faculty	Johnson	Beverly	Geology	x	x	x
Faculty	Lewis	Lynne	Economics	x	x	x
Technician	Dostie	Phil	Chemistry	x		x
Technician	Locke	Bill	Biology			x
Technician	Ross	Zach	Economics			x
Undergrad Student	Lindelof	Jennifer	Geology	x		
Undergrad Student	Ross	Zach	Economics	x		
Undergrad Student	Sandstrom	Ursula	Economics/Environmental Studies			x
Undergrad Student	Thompson	Lindsay	Environmental Studies			x
Undergrad Student	Wool	Dava	Geology	x		
Bowdoin College						
Faculty	Camill	Phil	Environmental Studies & Biology	x	x	x
Faculty	Herrera	Guillermo	Economics	x	x	x
Faculty	Johnson	Eileen	Environmental Studies	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Faculty	Lichter	John	Biology	x	x	x
Faculty	Vail	David	Economics			x
Staff	Ames	Ted	Biology		x	x
Undergrad Student	Bell	Andy	Biology	x		
Undergrad Student	Berghoff	Henry	Biology	x		
Undergrad Student	Elowe	Cory	Biology	x		
Undergrad Student	Hinman	Paul	Economics	x		
Undergrad Student	Jacobson	Holly	Biology	x		
Undergrad Student	Johnston	Catherine	Biology	x		
Undergrad Student	McFarlane	Alithea	Environmental Studies			x
Undergrad Student	Towne	Ben	Biology	x		
Colby College						
Faculty	Bevier	Catherine	Biology	x	x	x
Faculty	Cole	Russell	Biology	x	x	x
Faculty	Donihue	Michael				x
Faculty	Fleming	James	Science, Technology, and Society	x	x	x
Faculty	King	Whitney	Chemistry	x	x	x
Faculty	Nyhus	Philip	Environmental Studies	x	x	x
Faculty	Rueger	Bruce	Geology		x	x
Faculty	Wilson	Herbert	Biology	x	x	
Staff	Elliott	Alice	Goldfarb Center for Public Affairs & Civic Engagement	x		
Staff	Lessing	Lauren	Museum of Art	x		
Undergrad Student	Bittler	Kim	Chemistry	x	x	
Undergrad Student	Bradley	Sharonda	Biology	x		
Undergrad Student	Bruno	Jasmine	Biology	x	x	
Undergrad Student	Chang	Anne	Biology	x		
Undergrad Student	Hoyt	Eleanor	Biology	x	x	
Undergrad Student	Kawamura	Malia	Chemistry		x	
Undergrad Student	Martin	Corey	Biology	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Undergrad Student	McCullough	Ian	Environmental Studies	x		
Undergrad Student	Murray	Katherine	Chemistry		x	
Undergrad Student	Schnettler	Erin	Science, Technology, Society	x	x	
Undergrad Student	Sheppard	Danielle	Science, Technology, Society	x	x	
Undergrad Student	Theile	Josie	Chemistry		x	
Undergrad Student	Todd	Alexandra	Biology	x	x	
Undergrad Student	Westhafer	James	Science, Technology, Society	x		
Colby College Other Institution Participants						
Staff	Baeder	Charles	Belgrade Regional Conservation Alliance		x	
Staff	Kallin	Peter	Belgrade Regional Conservation Alliance	x	x	x
Staff	Shannon	Maggie	Maine Congress of Lakes Association	x	x	x
Staff	Wall	Katherine	Maine Lakes Resource Center			x
University of Maine at Farmington						
Faculty	Barton	Drew	Biology		x	x
Faculty	Bennett	Chris	Computer Science		x	x
Faculty	Buckley	Daniel	Natural Sciences	x	x	x
Faculty	Butler	Ron	Biology		x	x
Faculty	Clawson	Mellisa	Education		x	x
Faculty	Daly	Julia	Geology		x	x
Faculty	Harper	Wendy	Economics	x	x	x
Faculty	Heroux	David	Chemistry		x	x
Faculty	McAnneny	Cathleen	Geography		x	
Faculty	McCourt	Matthew	Geography	x	x	x
Undergrad Student	Abrams	Robert	Environmental Science			x
Undergrad Student	Adams	Sara	Geology			x
Undergrad Student	Angelides	Michael	English		x	x
Undergrad Student	Bond	Christopher	Computer Science			x
Undergrad Student	Buys	John	Education		x	x
Undergrad Student	Colbry	Dustin	Environmental Planning & Policy		x	x
Undergrad Student	Corson	Hunter	Biology		x	x

Type	Last Name	First Name	Department	YR1	YR2	YR3
Undergrad Student	Durant	Nathan	Biology			x
Undergrad Student	Ferrari	Tom	Biology		x	x
Undergrad Student	Lavorgna	Sarah	Geology			x
Undergrad Student	Littlefield	Emily	Biology			x
Undergrad Student	Masse	Rebeca	Education		x	x
Undergrad Student	Ottman	Kelsey	Biology			x
Undergrad Student	Plancon	Dora	Geography			x
Undergrad Student	Scott	Jediah	Environmental Planning & Policy		x	
Undergrad Student	Skoog	Dimitri	Biology		x	
Undergrad Student	Small	Cassidy	Visual Arts		x	x
Undergrad Student	Wilson	Tyler	Natural Sciences	x	x	
Undergrad Student	Winter	Daniel	Education			x
Unity College						
Faculty	Arnett	Amy	Ecology	x	x	x
Faculty	Bibles	Brent	Wildlife Biology			x
Faculty	Dunckel	Kathleen	Computers & Geographic Information Systems	x	x	x
Faculty	Latty	Erika	Botany	x	x	x
Faculty	Remsburg	Alysa	Biology	x	x	x
Undergrad Student	Anderson	Deborah	Wildlife Biology			x
Undergrad Student	Arsenault	Arielle	Biology	x	x	
Undergrad Student	Barber	Kelly	Sustainability and Global Change	x	x	
Undergrad Student	Bell	Nils	Biodiversity	x	x	
Undergrad Student	Crowe	John	Biodiversity			x
Undergrad Student	Dowler	Elizabeth	Wildlife Biology			x
Undergrad Student	Follette	Taylor	Wildlife Biology			x
Undergrad Student	Greer	Jasmine	Biology	x	x	
Undergrad Student	Lamppa	Thomas	Biology	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Undergrad Student	Leach	Arianna	Resource Management	x	x	x
Undergrad Student	Michaud	Jennifer	Wildlife Biology			x
Undergrad Student	Miller	Andrea	Biodiversity	x	x	
Undergrad Student	Moran	Jennifer	Wildlife Biology			x
Undergrad Student	Nolan	Katherine	Wildlife Biology			x
Undergrad Student	Orcutt	Elizabeth	Biodiversity			x
Undergrad Student	Salvino	Cayce	Biodiversity	x	x	
Undergrad Student	Tway	Courtney	Biology		x	x
Undergrad Student	Wanham	Constant	Biology		x	x
Undergrad Student	Zukas	Alison	Resource Management	x	x	
University of Maine at Presque Isle						
Faculty	Johnston	Jason	Math & Science	x	x	x
Faculty	Putnam	David	Math & Science	x	x	x
Faculty	Sebold	Kimberly	History		x	x
Faculty	Wang	Chunzeng	Math & Science	x	x	x
Faculty	Whittington	Anja	Rec. & Leisure Studies		x	
High School Student	Day	Elizabeth	Liberal Arts & Sciences			x
Staff	Delahunty	Krista	Biology			x
Undergrad Student	Belair	Scott	Math & Science		x	
Undergrad Student	Bennett	Logan	History			x
Undergrad Student	Crandall	Matthew	Environmental Studies		x	
Undergrad Student	Ellis	Chelsey	Math & Science		x	
Undergrad Student	Emery	Robert	Rec. & Leisure Studies		x	
Undergrad Student	Filimonow	Ashley	Math & Science		x	
Undergrad Student	Gerrish	Brianna	History		x	x
Undergrad Student	Grivois	Keith	Math & Science	x	x	
Undergrad Student	Parent	Gary	Math & Science		x	
Undergrad Student	Paul	Angie	Math & Science	x	x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
Undergrad Student	Ryan	Sarah	Math & Science	x	x	
Undergrad Student	Sirois	Gary	Outdoor Recreation		x	
University of New England						
Faculty	Daley	Michael	Management	x	x	x
Faculty	Feurt	Christine	Environmental Studies	x	x	x
Faculty	Morgan	Pamela	Environmental Studies	x	x	x
Faculty	Perlut	Noah	Environmental Studies		x	x
Faculty	Steen-Adams	Michelle	Environmental Studies			x
Faculty	Sulikowski	James	Marine Science Academic	x		x
Faculty	Zeeman	Stephan	Marine Sciences	x	x	x
Faculty	Zogg	Greg	History & Politics	x	x	x
Staff	Davis	Jenna	Office of the Vice President for Research	x		
Technician	Carlson	Amy	Environmental Studies	x		
Undergrad Student	Almeida	William	Environmental Studies	x	x	
Undergrad Student	Amaio	Chelsea	Environmental Studies	x		
Undergrad Student	Bergeron	Jessica	Marine Sciences	x	x	
Undergrad Student	Carlson	Amy	Chemistry & Physics	x	x	
Undergrad Student	Crettien	Chloe	Sustainability Solutions Initiative		x	
Undergrad Student	Hammond	Marissa	Environmental Studies/Marine Sciences	x	x	
Undergrad Student	Johnson	Samantha	Marine Sciences	x		
Undergrad Student	Kelly	Lindsay	Environmental Studies	x	x	
Undergrad Student	Loesher	Gale	Sustainability Solutions Initiative	x	x	
Undergrad Student	Madore	Justine	Environmental Studies	x		
Undergrad Student	Ouillette	Amanda	Sustainability Solutions Initiative		x	
Undergrad Student	Sargent	Deidra	Environmental Studies	x		
Undergrad Student	Simon	Matt	Sustainability Solutions Initiative		x	
Undergrad Student	Smith	Kayla	Sustainability Solutions Initiative		x	
Undergrad	Wright	Derek	Sustainability Solutions	x		

Type	Last Name	First Name	Department	YR1	YR2	YR3
Student			Initiative			
University of New England Other Institution Participants						
Staff	Dionne	Michele	Wells Nat. Estuarine Research Reserve		x	x
University of Maine at Augusta						
Faculty	Lage	Christopher	Biology		x	x
Faculty	Milligan	Peter	Biology		x	x
Faculty	Szakas	Joseph	Computer Information Systems		x	x
Undergrad Student	Bansmer	Jacob	Biology			x
Undergrad Student	Bean	Amanda	Biology			x
Undergrad Student	Couture	Amanda	Biology			x
Undergrad Student	Davis	Cali	Biology			x
Undergrad Student	Dyer	Heather	Biology			x
Undergrad Student	Gray	Kristy	Biology			x
Undergrad Student	LaClaire	Nathaniel	Computer Information Systems			x
Undergrad Student	Theberge	Karen	Biology			x
University of Maine at Augusta Other Institution Participants						
Faculty	Lichtenwalner	Anne	Animal & Veterinary Sciences			x
Staff	Fitzgerald	Caragh	UM Cooperative Extension		x	
Technician	Allen	Brad	Maine Department of Inland Fish & Wildlife			x
Technician	Shively	Kirk	US Department of Agriculture			x
Technician	Sullivan	Kelsey	Maine Department of Inland Fish & Wildlife			x
University of Maine at Fort Kent						
Faculty	Borges-Therien	Kim	Natural & Behavioral Sciences		x	x
Faculty	Cardenas	Soraya	Natural & Behavioral Sciences		x	x
Faculty	Hicks	Bruno	Education		x	
Faculty	Hobbins	Dave	Natural & Behavioral Sciences		x	x
Faculty	Holzhausen	Kurt	Natural & Behavioral Sciences			x
Staff	Bjerklie	JR	Institutional Research & Assessment		x	
Staff	Kermath	Brian	Center for Rural		x	

Type	Last Name	First Name	Department	YR1	YR2	YR3
			Sustainable Development			
Staff	Trudel	Julie-Ann	Forestry		x	
Undergrad Student	Aldrich	Patrick	Environmental Studies			x
Undergrad Student	Allen	Steven	Environmental Studies			x
Undergrad Student	Berube	Shannon	Natural & Behavioral Sciences		x	
Undergrad Student	Garrison	Amber Skye	Nat		x	
Undergrad Student	Jerkins	Martin	Environmental Studies		x	
Undergrad Student	Lebroke	Ryan	Natural & Behavioral Sciences			x
Undergrad Student	McDermott	Timothy	Environmental Studies			x
Undergrad Student	McIntosh	Gregory	Environmental Studies			x
Undergrad Student	Michaud	Bernice	Environmental Studies			x
Undergrad Student	Michaud	Charles	Environmental Studies		x	
Undergrad Student	Mosquera	Sandy	Environmental Studies		x	
Undergrad Student	Nadeau	Travis	Environmental Studies		x	
Undergrad Student	Ouellette	Greg	Forest Management		x	
Undergrad Student	Petrashune	Maxwell	Environmental Studies			x
Undergrad Student	Planchet	David	Environmental Studies			x
Undergrad Student	Sutton	Lisa	Behavioral Sciences			x
Undergrad Student	Theriault	Kristin	Behavioral Sciences			x
University of Maine at Machias						
Faculty	Otto	William	Environmental & Biological Science		x	

Staff = Professional/Technical

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APPENDIX 4: YR3 Project Personnel Diversity

Directly Supported Personnel:	YR3 Benchmarks						
	Total	**Males**	**Females**	**Blacks or African Americans**	**Hispanics**	**Other Ethnic**	**Persons with Disabilities**
Faculty	100	64	36	1	2	5	3
Postdocs	6	2	4	0	0	0	0
Graduate students	54	20	34	1	1	3	1
Undergraduate students	101	50	51	1	1	1	4
High school students	21	8	13	0	0	1	0
Tech/Professional/ Administrative staff	36	20	16	1	0	0	0
TOTALS:	318	164	154	4	4	10	8
Direct Overall %:		52%	48%	1%	1%	3%	3%
Indirectly Supported Participants:	**YR3 Benchmarks**						
	Total	**Males**	**Females**	**Blacks or African Americans**	**Hispanics**	**Other Ethnic**	**Persons with Disabilities**
ARI Faculty	399	210	189	5	0	9	2
PUI Faculty	288	153	135	0	7	4	0
Postdocs	25	12	13	0	0	2	0
Graduate students	225	90	135	2	1	19	2
ARI Undergrad students	290	161	129	2	3	34	2
PUI Undergrad students	766	371	395	6	6	5	0
K-12 teachers & pre-service teachers	205	92	113	0	1	19	2
K-12 admin & guidance counselors	77	37	40	0	0	0	1
High school students	193	95	98	0	1	48	12
Middle school students	262	122	140	1	0	0	62
Elementary school students	68	39	29	1	0	23	45
K-12 students reached via teacher training	257	125	132	0	0	81	0
Tech/Professional/ Administrative staff	316	144	172	0	1	8	4
Business/Industry	470	346	124	1	1	0	0
NGO/Government	1004	569	435	0	1	30	1
General Public	1503	792	711	1	4	119	22
TOTALS:	6348	3358	2990	19	26	401	155
Indirect Overall %:		53%	47%	.3%	.4%	6%	2%

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APPENDIX 5: YR3 Project Collaborators

SSI Research Collaborations

Institution/Organization	SSI Collaborator	Title/Position
Aarhus University (Denmark)	John Thogersen	Professor
Acadia Learning	Bill Zoellick	National Park Service Educator
Acadia National Park	Abraham Miller-Rushing	Senior Scientist
Acadia University	Anna Redden	Director
Androscoggin Land Trust	Michael Auger	Director of Land Protection and Stewardship
Androscoggin Valley Council of Govts	Fergus Lea	Planning Division Director
	Robert Thompson	Executive Director
Arizona State University	Alan Murray	Professor
	Allen Lee	Assistant Research Professional
	Marco Janssen	Director
Bangor Area Storm Water Group	Chris Brewer	Penobscot Soil and Water Conservation District
Belgrade Bassin'	John Blais	Owner
Belgrade Regional Conservation Alliance	Clark Freeman	Conservation Corps Program Manager
	Mel Croft	President
Biddeford Conservation Commission and Open Space Committee	Bill Durkin	Chair
Brunswick-Topsham Land Trust	Angela Twitchell	Executive Director
Burke Environmental Associates	David Burke	President
Caswell Forest Products	Richard Latty	Owner
Center for Community GIS	Stephen Engle	Director
Chewonki Foundation	Peter Arnold	Sustainability Coordinator
City of Bangor	Sean Gambrel	GIS, Planning Staff
	Wendy Warren	Environmental Coordinator
City of Biddeford	Greg Tansley	Planner
	Tom Milligan	Stormwater Manager
City of Brewer	Tracy Drew	Collections Systems Supervisor
	Vicki Proulx	Assessor/Planning Staff
City of Saco	Bob Hamblen	City Planner
City University of New York	Jonathan Munoz	Graduate Student
	Tarendra Lakhankar	Research Assistant Professor
Clark University	Robert Johnston	Director

Institution/Organization	SSI Collaborator	Title/Position
	Verna DeLauer	Research Professor
Coastal Conservation Association-Maine	Jeff Verrill	Board Member
	Mac McKeever	Board Member
Cobscook Bay Resource Center	Heidi Leighton	Director
	Will Hopkins	Executive Director
Creative Conservation LLC	Jerry Bley	Owner
Deer Isle-Stonington High School	Cindi Heanssler	Teacher
E.D. Bessey and Sons	Chip Bessey	Owner
E2Tech	Harry Brown	Director
	Jeffrey Thaler	President
Eastern Maine Development Corporation	Mike Aube	Executive Director
Ellsworth High School	J.F. Burns	Teacher
FB Environmental	Forrest Bell	Owner
Fish n Trips Charters	Ethan Debery	Owner
Frenchman Bay Partners	Jane Disney	Staff Scientist
	Molly Miller	Americorps Volunteer Leader
Friends of the Highland Mountains	Alan Michka	Board Member
Great Gadzooks Tidewater Fishing	Johan Brouwer	Owner
Greater Lovell Land Trust	Burgess Smith	Chair Properties Commission
	Tom Henderson	Executive Director
Greater Portland Council of Govts	Aaron Shapiro	CD Director, Cumberland County Government
	Gerry Mylroie	Planning Director
	Gordon Billingsworth	Town Manager, Standish
	Neal Allen	Executive Director
Gulf of Maine Research Institute	Christine Voyer	Community Specialist, Vital Signs ME
	Sarah Kirn	Vital Signs Project Director
Halcyon Marine Hydroelectric	Ramex Atiya	Project Coordinator
Harvard University	David Foster	Professor
	James Levitt	Director, Program on Conservation Innovation, Harvard Forest
Indigenous Education Institute	David Begay	Vice President and Founder
	Nancy Maryboy	President and Founder
Individual	Jeff Plourde	Landowner
iPlant Collaborative Web Portal	Martha Narro	Program Manager
Island Institute	Brooks Winner	Staff Community Energy Program
	Hope Rowan	GIS associate
	Suzanne MacDonald	Director Community Energy

Institution/Organization	SSI Collaborator	Title/Position
Kennebec Estuary Land Trust	Alicia Heyburn	Outreach Coordinator
	Becky Kolak	Special Projects
	Carrie Kinne	Exeutive Director
	Erin Witham	Special Projects
	Jack Witham	President
	Jeffrey Pierce	Proprietor
	Nate Gray	Anadromous Fish Specialist
Kennebec Homeowners' Association	Dot Kelly	President
Lakes Environmental Association	Colin Holme	Field Services Director
	Peter Lowell	Executive Director
	Sean Dundon	Board President
Lamoine Conservation Commission	Bob Pulver	Member
	Carol Korty	Member
Lamoine School	Carol Duffy	Teacher
Leuphana University Lueneburg (Germany)	Harald Heinrichs	Professor
Maine Audubon Society	Ted Koffman	Executive Director
Maine Center for Disease Control	Andrew Smith	State Toxicologist
	Eric Frohmberg	Toxicologist
Maine Center for Invasive Aquatic Plants	Roberta Hill	Program Director
Maine Congress of Lake Associations	Phil Mulville	Lake Educator
Maine Department of Economic and Community Development	Cathy Renault	Former Director of Innovation
Maine Department of Environmental Protection	Angela Dubois	Section Leader, Marine Unit, Bureau of Land and Water Quality
	Douglas Suitor	GIS Coordinator
	Jeff Dennis	Watershed Planning
	Kathy Hoppe	Environmental Specialist
	Kristin Feindel	Watershed Assessment and Planning
	Linda Bacon	Aquatic Ecologist
	Malcolm Bursom	Office of the Commissioner

Institution/Organization	SSI Collaborator	Title/Position
	Mike Mullen	Land and Water Quality acting Bureau Director
	Stephenie MacLagan	Environmental Specialist
Maine Department of Inland Fisheries and Wildlife	Beth Swartz	Wildlife Biologist
	Brad Allen	Biologist
	Kelsey Sullivan	Biologist
	Philip deMaynadier	Biologist
	Steven Walker	Beginning with Habitat Program Manager
Maine Forest Service	Alison Kanoti	Forest Entomologist
	Coleen Teerling	Entomologist
	Dave Struble	State Entomologist
	Ken Laustsen	Biometrician
	Kevin Doran	Educator
Maine Geological Survey	Peter Slovinsky	Coastal Geologist
Maine Lakes Resource Center	Kathi Wall	Executive Director
	Tom Klingenstein	Chair
Maine Mathematics & Science Alliance	Tom Keller	Co-Director
Maine Municipal Association	Eric Conrad	Director of Communication and Citizen Education
Maine Rivers	Dylan King	Outreach Coordinator
Maine Salt Management Taskforce	Barbara Arter	Consultant
	Brenda Zollitsch	Group Facilitator
Maine Saltwater Outfitters and Guide Service	Forrest Faulkingham	Owner
Maine State Planning Office	Elizabeth Hertz	Planner
Maine Technology Institute	Betsy Biemann	President
Maine TREE Foundation	Patricia Maloney	Maine PLT Coordinator
	Sherry Huber	Executive Director
Manomet Center for Conservation Sciences	Jackie Sartoris	Program Manager, Climate Change and Energy
Massachusetts Institute of Technology	Herbert Aumann	Professor
Ministere des Ressources naturelles et de la Faune (Quebec, Canada)	Philippe Beaupre	Wildlife Technician

Institution/Organization	SSI Collaborator	Title/Position
	Pierre Blanchette	Biologist
National Aeronautics and Space Administration	Rama Nemani	Research Scientist
National Wild Turkey Federation	Bob Eriksen	Biologist
New York State Department of Environmental Conservation	Michael Schiavone	Biologist
North Pond Association	Rick Watson	President
Northern Maine Development Commission	Bob Dorsey	President, Aroostook Partnership for Progress
	Dan Vaillancourt	Member
	Ken Murchinson	GIS Coordinator
	Mark Power	Owner, Alternative Energy of Maine
	Matthew R. Bray	Sales Director, Maine Energy Systems
	Mike Eisensmith	Director of Regional Planning
	Robert Clark	Executive Director
Ocean Renewable Energy	John Ferland	Director
Ocean Renewable Power Company	Chris Sauer	President and CEO
	Herb Scribner	Director, Environmental Affairs
	Jarlath McEntee	Vice President of Technology & Engineering
Orange County Water Authority	Ed Helbig	Conservation Education Coordinator
Oregon Museum of Science and Industry	Lori Erickson	Curator
	Victoria Coats	Manager of Exhibit Research and Development
Oregon State University	Anita Morzillo	Research Assistant Professor
	Eric White	Research Assistant Professor
	Jeff Kline	Economist
	Tom Spees	Professor / Research Scientist
Orono Economic Development Corporation	Stevenson Sheppard	President
Orono Village Association	Michele Goldman	Chair
Penobscot Nation	Charlie Baeder	Director, Penobscot River Restoration Trust
	Dan Kusnierz	Water Quality Director
	George Aponte Clarke	Deputy Director, Penobscot River Restoration Trust
	John Banks	Penobscot Nation
Portland Water District	Kirsten Ness	Watershed Protection

Institution/Organization	SSI Collaborator	Title/Position
Preston High School	Gina DeMarco	Teacher
QSR International	Stacey Penna	Business Development Manager, Americas
Rachel Carson National Wildlife Refuge	Ward Feurt	Refuge Manager
Rangeley Lakes Heritage Trust	Nancy Perlson	Director
	Rebecca Kurtz	Director Ecoventures Program
Rangeley Lakes Regional School	Kelsey Orestes	Teacher
Rangeley Logging Museum	Peggy Yocom	Curator
Readfield Conservation Commission	Tim Sniffen	Member
Ridley Editorial LLC	Kim Ridley	Science Writer/Editor
S.W. Cole Engineering, Inc.	Johanna Szillery	Soil and Wetland Scientist
Saco River Corridor Commission	Dennis Finn	Director
Saco River Salmon Club	R. J. Mere	President
Seven Islands Land Company	Ken White	Ashland East Unit Manager
Sheepscot Wellspring Land Alliance	Anna Fiedler	Executive Director
	Buck O'Herin	Board Member
	Jim Reed	Member, Land Owner
Small Woodland Owners Association of Maine	Tom Doak	Executive Director
Southern Maine Regional Planning Council	Paul Schumacher	Executive Director
St. Regis Mohawk Tribe	Les Benedicts	Environment Division
State University of New York	Robin Kimmerer	Professor
Tanks But No Tank	Steve Hinchman	Counsel
Texas Tech University	Katharine Hayhoe	Professor
The Nature Conservancy of Maine	Alex Mas	Director of Strategic Partnerships
	Josh Royte	Conservation Planner
	Michael Tetreault	Executive Director
Tidal Energy Device Evaluation Center	Rick Armstrong	Director
Tidewalker Associates	Normand Laberge	Director
Town of Brunswick	Anna Breinich	Director of Planning
	Tom Farrell	Director of Recreation
Town of Hampden	Gretchen Heldemann	Assessor/Planning Staff
Town of Hermon	Beth Bowdoin	Town of Hermon, Assessor/Planning Staff
Town of Milford	Jana Wood	Code Enforcement Officer
Town of Orono	Evan Richert	Town Planner
Town of Topsham	John Shattuck	Economic Development Director

Institution/Organization	SSI Collaborator	Title/Position
	Rich Roedner	Town Planner
	Rod Melanson	Natural Resources Planner
	Victor Langelo	Citizen Commmittee Member
Trust for Public Land	Jessica Sargent-Michaud	Director of Economic Benefits
	Wolfe Tone	Maine State Director
U.S. Department of Energy	Andrea Copping	Research Scientist
U.S. Environmental Protection Agency	Mark Kern	Environmental Biologist
	Matthew Liebman	Environmental Biologist
University of California, Berkeley	Liming Wang	Post Doctoral Researcher
	Paul Waddell	Professor
University of California, Santa Barbara	Benoit Parmentier	GIS Scientist, National Center for Ecological Analysis & Synthesis
	Jim Regetz	Econformatics, National Center for Ecological Analysis & Synthesis
University of Colorado	Robert Guralnick	Associate Professor
University of Connecticut	Glenn Warner	Professor
University of Guelph (Canada)	James P. Bogart	Professor Emeritus
University of Maine - ADVANCE Rising Tide Center*	Mary Madden	Director
University of Maine – Advanced Structures & Composites Center	Habib Dagher	Professor
University of Maine – Animal & Veterinary Sciences	Anne Lichtenwalner	Assistant Professor
University of Maine – Chemical & Biological Engineering	Clayton Wheeler	Professor
	Hemant Pendse	Professor
University of Maine – Cooperative Extension	Caragh Fitzgerald	Extension Educator, Kennebec & Waldo counties
	John Rebar	Director
	Leslie Forstadt	Cooperative Extension Professor
University of Maine – Fogler Library	Joyce Rumery	Director
University of Maine – History	Stephen Miller	Professor
University of Maine – Industrial Cooperation	Jake Ward	Assistant Vice President for Research, Economic Development & Government Relations
University of Maine – Maine Sea Grant	Paul Anderson	Director
University of Maine – Mathematics & Statistics	Andre Khalil	Assistant Professor

Institution/Organization	SSI Collaborator	Title/Position
University of Maine – Plant Soil & Environmental Sciences	Ivan Fernandez	Professor
University of Maine – School of Biology & Ecology	Kevin Simon	Associate Professor
University of Maine – School of Ecology & Environmental Science	Fred Servello	Professor
	Jasmine Saros	Associate Director, Climate Change Institute
University of Maine – School of Economics	Gary Hunt	Professor
	George Criner	Professor and Director
	Hugh Stevens	Graduate Student
	Jonathan Rubin	Professor
	Sharon Wagner	Assistant Professor
	Todd Gabe	Professor
University of Maine – School of Forest Resources	Teresa Thornton	Graduate Student
	Timothy Paradis	Undergraduate Student
University of Maine – School of Marine Sciences	Huijie Xue	Professor
University of Maine – Senator George J. Mitchell Center	Sarah Nelson	Assistant Research Professor
University of Maine – Wildlife Ecology	Judith Rhymer	Associate Professor
University of Maine at Presque Isle	Phillip Boody	UMPI undergraduate student
University of Massachusetts	Ellen Douglas	Associate Professor
	John Saltmarsch	Professor
	Paula Rees	Research Professor
	Suzanne Cashman	Professor
University of New Brunswick	Chris Hennigar	Post Doc
	David MacLean	Professor
University of New Hampshire	Cameron Wake	Research Professor
	Jennifer Jacobs	Professor
	Jo Sias Daniel	Associate Professor
	Paul Kirshen	Research Professor
	William McDowell	Professor
University of Rhode Island	Leon Thiem	Professor
University of South Carolina Beaufort	Brandon Cosley	Assistant Professor
University of Southern Maine	Sam Merrill	Director

Institution/Organization	SSI Collaborator	Title/Position
	Terry Theodose	Associate Professor
University of Vermont	William Bowden	Professor
University of Washington	Brian Polagye	Research Assistant Professor, Mechanical Engineering
	John Horne	Research Assistant Professor, School of Fisheries
US Army Corps of Engineers	Greg Penta	Policy and regulatory
	Jay Clement	Maine Enforcement
	Ruth Ladd	Policy and regulatory
US Fish and Wildlife Service	Susan Adamowicz	Land Management Research & Demonstration Biologist
USDA Forest Service	Marla Emery	Research Geographer
	Nathan Seigart	Research Entomologist
USDA Natural Resources Conservation Service	Kirk Shively	Wildlife Disease Biologist
USGS Conte Anadromous Fish Lab	Adria Elskus	Research Scientist
USGS Maine Cooperative Fish and Wildlife Research Unit	Joseph Zydlewski	Research Biologist
Vermont Fish and Wildlife Department	Eric Sorenson	Community Ecologist
Volunteer Lake Monitoring Program	Scott Williams	Executive Director
Water Words That Work, LLC	Erik Eckle	President
Waterview Consulting	Peter Taylor	Founder & Principal
Wells National Estuarine Research Reserve	Jacob Amman	Research Associate
	Jeremy Miller	Research Associate
	Michele Dionne	Research Director
	Tin Smith	Stewardship Coordinator
Wright-Pierce	Jon Edgerton	Vice President
Yale University	Walter Jetz	Associate Professor

*****University of Maine counted once as an institution

Maine EPSCoR Office – Other Collaborators (STEM Education & Workforce Development, External Engagment, Cyberinfrastructure, etc.)

Institution/Organization	EPSCoR Collaborator	Title/Position
Apple, Inc.	Jim Moulton	K-12 Education Development Executive
Camp CaPella	Dana Mosher	Executive Director
Cianbro Institute	Steve Pound	Associate Director, Workforce Development/ME STEM Collaborative

Institution/Organization	EPSCoR Collaborator	Title/Position
Colby College	Christy Johnson	HHMI Grant Coordinator/ME STEM Collaborative
	Tom Berger	Professor Emeritus/ME STEM Collaborative
Dedham School	Beth Smyth-Handley	Teacher
Eastern Maine Community College	Brad Haskell	Instructor/Student
	Felicia Graham	Student
	Mike Houlsen	Student
	Pam Proulx-Curry	Academic Dean
	Robb Freeman	Instructor
	Tom Graham	Student
Good Will-Hinckley School	Glenn Cummings	President & Executive Director
Gulf of Maine Research Institute	Alan Lishness	Chief Innovation Officer/ME STEM Collaborative
Institute for Broadening Participation	Susie Valaitis	Associate Director
Maine Department of Education	Anita Bernhardt	State Science & Technology Specialist & Regional Representative/ME STEM Collaborative
Maine Department of Labor	Christopher Boudreau	Director, Center for Workforce Research & Information/ME STEM Collaborative
Maine Engineering Promotional Council	Peter Mickelson	Education Chairman/ME STEM Collaborative
Maine International Center for Digital Learning	Bette Manchester	President
	John Newlin	Executive Director
Maine Mathematics and Science Alliance/REACH Center	Jan Mokros	Executive Director/ME STEM Collaborative
	Jo Gates	Project Manager, REACH Center
	Tom Keller	REACH Co-Director
Maine School of Science and Mathematics	Catherine Reilly	Director of Advancement
	Jerry Pieh	MSSM Board Chair/REACH Center Co-Director
	Luke Shorty	Executive Director
Maine Space Grant Consortium	Terry Shehata	Executive Director/ME STEM Collaborative
Mt. Desert Island Biological Lab	Mike McKernan	Director of Education & Conferences

Institution/Organization	EPSCoR Collaborator	Title/Position
National Semiconductor, Maine	Anne Gauthier	TI Manager, Public Affairs/ME STEM Collaborative
Orono High School	Jim Chasse	Principal
Reeds Brook Middle School	Emily Albee	Teacher
Southern Maine Community College	Janet Sortor	Vice President & Dean of Academic Affairs
	Ronald Cantor	President
State of Maine, House of Representatives	Mary Pennell Nelson	Representative, District 112/Member, Joint Standing Committee on Education and Cultural Affairs
Tidemark Institute	Jean Moon	Founder & Principal
Unity College	Stephen Mulkey	President
University of Maine - Center for Community Inclusion & Disability Studies	Alan Kurtz	Coordinator of Education & Autism
	Ann Zielinski	Administrative Assistant
	Billie Taylor	Research Associate
	Janet May	Coordinator of Transition & Adults
University of Maine - Center for Research in STEM Education (RiSE)	Susan McKay	Professor & Director
University of Maine - Chemistry	Raymond Fort, Jr.	Professor
	Sara Knowles	Graduate Student
University of Maine - Earth Sciences	Bess Koffman	Graduate Student
	Christopher Gerbi	Assistant Professor
	Karl Kreutz	Professor
University of Maine - Plant Soil & Environmental Sciences	Ellen Mallory	Assistant Professor & Sustainable Agriculture Extension Specialist
University of Maine - School of Biology & Ecology	Eleanor Groden	Professor
	Tamara Levitsky	Research Assistant
University of Maine - Upward Bound	Kelly Ilseman	Assistant Director
University of Maine - Women's Resource Center	Sharon Barker	Director

Institution/Organization	EPSCoR Collaborator	Title/Position
University of Southern Maine	Michael Wing	Director of External Programs, College of Science, Technology, and Health/ME STEM Collaborative
Unum	Marcia Leander	Assistant Vice President of Staffing/ME STEM Collaborative

Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

APPENDIX 6: YR3 Grant Proposals Submitted & Awarded

SSI Grant Proposals Submitted in Year 3

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
7/1/11	Willis, T.	University of Southern Maine	Exploratory Larval Fish Sampling: Kennebec River, ME	Maine Dept. of Marine Resources	$20,000	$20,000
7/14/11	Hunter, M.	University of Maine	Holt Woodlands 2011 Part 2	Holt Woodlands Research Foundation	$40,106	$40,106
7/20/11	Jain, S.	University of Maine	Prototype Development of SimStream	US Dept of the Interior	$900	$900
7/20/11	Peckenham, J.	University of Maine	FY2011 WRRI Annual Application-Information Transfer	US Dept of the Interior	$22,038	$22,038
7/20/11	Teisl, M.	University of Maine	Evaluate Fish Consumption Surveys	US Dept of Health & Human Services through Center for Disease Control	$5,000	$5,000
7/27/11	McGill, B.	University of Maine	CAREER: The Biogeography of Climate Change: Towards a Predictive Theory of Speci	National Science Foundation	$419,605	Rejected
8/4/11	Lindenfeld, L., McGreavey, B.	University of Maine	The COLLECTS Project: Citizen Observations Leading to Learning	National Science Foundation	$1,029,960	Pending
8/10/11	Weiskittel, A.	University of Maine	Workshop on Improved Biomass and Carbon Database for US Tree Species	US Dept of Agriculture through National Council of the Paper Industry for Air & Stream Improvement	$30,000	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
8/18/11	Leahy, J.	University of Maine	Small Woodland Owner Research Project	Small Woodland Owners Association of Maine	$28,000	$28,000
9/1/11	Fleming, J.	Colby College	Undergraduate work study from Colby	Colby College	$1,200	$1,200
9/1/11	Weiskittel, A., Wilson, J.	University of Maine	Forecasting & Managing the Wood Supply Impacts of Deer Wintering Area Expansion	Maine Outdoor Heritage Fund	$22,343	Pending
9/1/11	Lindenfeld, L., Hutchins, K.	University of Maine	Maine Salt Management Scoping Project	Water Resources Research Institute and USGS	$6,000	$6,000
9/1/11	Milligan, P.	University of Maine, Augusta	Maine Economic Improvement fund: Small campus initiative	MEIF	$9,610	$9,610
9/9/11	Beard-Tisdale, K.	University of Maine	Informatics Approaches for Reuse and Modeling of Heterogeneous Mercury Data	US Dept of the Interior	$23,680	$3,380
9/9/11	Lindenfeld, L.	University of Maine	Maine Salt Management Scoping Project	US Dept of the Interior	$6,000	Pending
9/9/11	Lindenfeld, L., Silka, L.	University of Maine	Orono Village Association Project 2011-2012	Town of Orono	$27,500	$27,500
9/12/11	Weiskittel, A.	University of Maine	An Improved Biomass and Carbon Database for U.S. Tree Specie +$	US Dept of Agriculture	$18,000	$18,000
9/13/11	Peckenham, J.	University of Maine	Improving Data to Build Trust for Community Generated Knowledge of Groundwater	US Dept of the Interior	$7,644	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
9/15/11	Feurt, C.	University of New England	Integrating Science Into Policy: Adaptation Strategies for Marsh Migration	NOAA	$199,389	$199,389
9/16/11	Daigle, J.	University of Maine	Mobilizing Planning Around Climate Change: Developing a Framework	US Dept of Agriculture	$50,000	$45,000
9/20/11	Johnston, J.	University of Maine, Presque Isle	Creation of a Biotechnology Teaching and Research Laboratory for Biology Students and Researchers at University of Maine Presque Isle	University of Maine System (Maine Economic Investment Fund)	$70,000	$70,000
9/20/11	Teisl, M.	University of Maine	IGERT: Adaptation to Abrupt Climate Change (A2C2)	National Science Foundation	$3,272,214	Pending
9/25/11	Wibberly, M.	University of Maine	Student Travel Grant	University of Maine Graduate Student Government	$685	$685
9/28/11	Parr, T.	University of Maine	Travel grant to present at BES	Graduate Student Government	$500	$500
10/1/11	Marrinan, S.	University of Maine	Precourt Energy Fellowship	Precourt Energy Efficiency Center	$375	$375
10/7/11	Engelberth, H.	University of Maine	Graduate Student Government Degree Related Grant	Univeristy of Maine	$850	$850
10/7/11	Sutton, A.	University of Maine	Graduate School Grant	University of Maine	$800	$800
10/10/11	Pickering, R.	University of Maine	Graduate Student Government Travel Grant	Graduate Student Government	$550	$550

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
10/19/11	Noblet, C., Zydlewski, G., Johnson, T., Teisl, M., jansujwics, J., Teisl, M.	University of Maine	PIRE: Integrated Approaches to Securing a Sustainable Future for Tidal Energy [Pre-Proposal under review]	NSF-PIRE	$4,000,000	Pending
10/28/2011	Lindenfeld, L., Johnson, T., Silka, L.	University of Maine	The Seafood Links Project	US Dept of Commerce	$46,299	Pending
10/28/11	Zydlewski, G.	University of Maine	Fish distribution in relation to tidal hydropower in Downeast Maine	US Dept of Commerce	$73,203	Pending
11/1/11	Hutchins, K.	University of Maine	Travel to Present - National Communication Association Annual Convention	Bailey Funds, Bailey Professor, Nathan Stormer, University of Maine	$244	$244
11/7/11	Goff, S.	University of Maine	Fall 2012 EPA Science To Achieve Results (STAR) Fellowships For Graduate Environmental Study	US EPA	$126,000	Pending
11/10/11	McGreavy, B.	University of Maine	Community Sustainability Fisheries Plan	National Fish and Wildlife Service	$180,000	Rejected
11/15/11	Parr, T.	University of Maine	East Asia and Summer Pacific Institute	National Science Foundation	$5,000	Pending
11/15/11	Willis, T.	University of Southern Maine	CNH: RUI: Dynamic Linkages, Divergent Outcomes, and the Prospective Benefits of Restoration in Maineâ€™s Rivers, Estuaries, and the Nearshore Marine Environment	National Science Foundation	$219,453	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
11/16/11	McGuire, J.	University of Maine	NSF Graduate Research Fellowship Program	National Science Foundation	$40,500	Pending
11/18/11	Jain, S.	University of Maine	Sea Grant Climate Adaptation 2011: City of Ellsworth, ME	US Dept of Commerce	$100,000	Pending
12/5/11	Willis, T.	University of Southern Maine	Continuing River Herring Restoration in the Kennebec River	National Fish and Wildlife Foundation	$317,000	Pending
12/6/11	Meyer, S.	University of Maine	NASA-Michigan State University Professional Enhancement Award	Michigan State University	$700	$700
12/9/11	Zydlewski, G.	University of Maine	Fish distribution in relation to tidal hydropower in Downeast Maine- ORPC	Ocean Renewable Power Company	$38,675	$53,675
12/14/11	Wilson, J.	University of Maine	Land Use Implications in Producing Forest-based Biofuels Production: An Integrat	US Dept of Agriculture	$498,293	Pending
12/21/11	Jansujwicz, J.	University of Maine	Strengthening Community Capacity for Sustainable Development of Tidal Energy Resources in Maine	Elimina B. Sewall Foundation	$47,342	Rejected
1/1/12	McGill, B.	University of Maine	Pursuit: Rural forest communities at a tipping point? trends and actionable research opportunities	SESYNC (Socio-Ecological Synthesis Center)	$100,000	Pending
1/3/12	Noblet, C. , Teisl, M.	University of Maine	Sustainability and Maine's Local Food Systems	Elmina B. Sewall Foundation	$80,000	Rejected

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
1/9/12	Calhoun, A.	University of Maine	Understanding the factors driving amphibian population dynamics in altered landscapes	National Science Foundation	$2	Pending
1/10/12	Calhoun, A., Lindenfeld, L., Leahy, J., Silka, L., McGreavy, B.	University of Maine	COLLECTS Informal Science Education	National Science Foundation	$1,122,842	Pending
1/13/12	Peckenham, J.	University of Maine	Investigating the Impact of Pollutants in Street Dust on the Long Creek	US Dept of the Interior	$18,983	Pending
1/13/12	Peckenham, J.	University of Maine	Maine Water Resources Research Institute-Information Transfer	US Dept of the Interior	$21,208	Pending
1/15/12	Lilieholm, R.	University of Maine	Maine Community Mapper	NSRC - Theme III	$35,000	Pending
1/17/12	Johnson, M.	University of Maine	Travel to Present at International Association of Landscape Ecology Annual Symposium, April 4-8, 2012, Newport, RI	University of Maine Graduate Student Government	$698	$698
1/17/12	Hart, D., Lilieholm, R., Meyer, S.	University of Maine	The Maine Futures Community Mapper: Fostering Economic Growth and Healthy Landscapes	Elmina B. Sewall Foundation	$86,861	Pending
1/26/12	Blackstone, A.	University of Maine	Gender Differences in the Career Continuity of Science and Engineering Professionals	National Science Foundation	$20,625	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
1/26/12	Marrinan, S.	University of Maine	Travel to Present Grant	University of Maine Graduate Student Government	$850	$850
1/27/12	Goff, S.	University of Maine	Spring 2012 GSG Travel to Present Grant	University of Maine Graduate Student Government (GSG)	$850	$850
1/27/12	Meyer, S.	University of Maine	UMaine Graduate Student Government Travel Award	UMaine Graduate Student Government	$773	Rejected
1/30/2012	Hunter, M.	University of Maine	Holt Woodlands 2012 Part 1	Holt Woodlands Research Foundation	$44,631	$44,631
1/31/12	Parr, T.	University of Maine	Travel Grant to SFS meeting in Louisville Kentucky	Graduate Student Government	$800	$800
2/1/12	Bell, K.	University of Maine	Rural forest communities at a tipping point ?	National Socio-Environmental Synthesis Center	$200,000	Pending
2/1/12	Teisl, M., Noblet, C.	University of Maine	New England Research in Sustainable Energy (NERSE) Network	National Science Foundation	$10,000,000	Pending
2/1/12	Teisl, M.	University of Maine	Integrated National Framework for Cellulosic Drop-in Fuels:	National Science Foundation	$4,000,000	Pending
2/1/12	Teisl, M.	University of Maine	Social Science Equipment Grant	UMaine Equipment grant	$35,000	Pending
2/3/12	Kartez, J.	University of Southern Maine	RCN-SEES: Engineering Research Collaboratory on Infrastructure in a Changing Climate	National Science Foundation	$750,000	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
2/4/12	Wilson, K.	University of Southern Maine	Using Natural Tags to Determine Marine and Freshwater Habitat Usage by Juvenile Blueback Herring (Alosa aestivalis)	Maine Sea Grant	$9,124	Rejected
2/14/12	Ranco, D.	University of Maine	People and Place: Cultural Sustainability and the Environmental Humanities from Walden to the Digital History Trail	National Endowment for the Humanities	$160,000	Pending
2/15/12	Arnett, A.	Unity College	Forest Pests and Conservation Practices in Maine	Conservation and Research Foundation	$25,000	Pending
2/15/12	Ranco, D.	University of Maine	Creating Model Multi-level Policy Interventions to Address Obesity in Tribes	National Institutes of Health, Center of Biomedical Research Excellence	$1,200,000	Pending
2/27/12	Bell, K.	University of Maine	Preparing the next generation of engineers and scientists to advance energy solutions through boundary spanning and management	National Science Foundation	$3,300,000	Pending
3/9/12	Meyer, S.	University of Maine	Potential Impacts of Alternative Future Land Use on Forest Management and Wood Supply Across Maine	Northeastern State Research Cooperative, U.S. Forest Service	$41,765	Pending

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
3/9/12	Meyer, S.	University of Maine	The Maine Futures Community Mapper: Fostering Economic Growth and Healthy Landscapes for Maineâ€™s Communities	Northeastern State Research Cooperative, U.S. Forest Service	$60,820	Pending
3/13/12	Arnett, A.	Unity College	Understanding management in hemlock-forests in Maine	NRCS and NFWF	$150,000	Pending
3/15/12	Bevier, C.	Colby College	Belgrade Lakes Watershed Sustainability Project	Dorr Foundation	$28,000	Pending
TOTAL SUBMITTED YR3:				**72 proposals**	**$32,499,490**	
SUBTOTAL AWARDED YR3 TO DATE:				**29 awards**	**$602,331**	

SSI Grant Proposals Submitted YR2 – Awarded YR3

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
7/14/10	McGill, B.	University of Maine	Integrating Global Species Distribution Data	National Aeronautics & Space Administration through Yale University	$31,069	$31,069
11/10/10	Eckardt, M., Nemeth, V., Segee, B,	University of Maine	Maine EPSCoR: End-to-End Connectivity for Sustainability Science Initiative	National Science Foundation	$1,000,000	$1,000,000
12/10/10	Reeve, A.	University of Maine	Using Temperature & Flow Profiling to Evaluate Groundwater Interaction With Surface Water in Maine	Maine Agricultural & Experiment Station	$20,000	$9,000
1/14/11	Calhoun, A., Hart, D	University of Maine	Planning for Development &Natural Resources	Elmina B. Sewall Foundation	$98,060	$35,000

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
1/28/11	Daigle, J., Lilieholm, R., Livingston, W.	University of Maine	Improving Emerald Ash Borer Monitoring and Management Prioritization	US Dept of Agriculture through Forest Service	$181,902	$181,902
2/17/11	Hunter, M.	University of Maine	Maine River Bird Project	Maine Outdoor Heritage Fund through ME Dept of Inland Fisheries & Wildlife	$11,059	$11,059
3/15/11	Colgan, C.	University of Southern Maine	University Center for Innovation Economy	U.S. Economic Development Administration	$750,000	$500,000
4/15/11	Daly, J.	University of Maine, Farmington	Support for undergraduate research on Maine's high elevation ponds	Quimby Family Foundation	$16,000	$15,000
4/26/11	Daigle, J.	University of Maine	Mobilizing Planning Around Climate Change: Developing a Framework	US Dept of Agriculture	$50,000	$45,000
5/3/11	Weiskittel, A.	University of Maine	How Silvicultural Treatments Affect Carbon Storage in a Northern Conifer Forest	US Dept of Agriculture	$55,041	$55,041
5/5/11	Lindenfeld, L., Leahy, J.	University of Maine	Project Reach	US Dept of Education	$1,831,097	$332,919
5/15/11	Wang, C.	University of Maine, Presque Isle	Aroostook Non-Motorized Trail GPS/GIS Mapping and Web-GIS Project	Quimby Family Foundation	$29,000	$29,000
5/15/11	Daly, J.	University of Maine, Farmington	MeLT: Database development for high-resolution water temperature data in Maine	NECC NSF EPSCoR Track II - RACER	$10,000	$10,000

Submit	Name	Institution	Title	Sponsor	Sponsor Request	Award
5/25/11	Teisl, M.	University of Maine	Fish Consumption Survey Development	US Dept of Health & Human Services through Center for Disease Control	$5,000	$5,000
6/1/11	Wibberly, M.	University of Maine	Precourt Energy Efficiency Center Student Grant	Precourt Energy Efficiency Center	$375	$375
6/2/11	Weiskittel, A.	University of Maine	An Improved Biomass and Carbon Database for U.S. Tree Species	US Dept of Agriculture	$60,000	$20,000
SUBTOTAL AWARDED YR3:				**16 awards**		**$2,280,365**

Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

APPENDIX 7: YR3 SSI Publications

Institution	Type	Citation	SSI-Related
Belgrade Regional Conservation Alliance	Newsletter	**Kallin, P.L.** Summer 2011. Get Ready for the Maine Lakes Resource Center. BRCA Newsletter.	Primary
Belgrade Regional Conservation Alliance	Other	**Kallin, P.L.** August 12, 2011. Watershed Wisdom-Ancient Wisdom. Summertime in the Belgrades. Vol. 13, No. 10.	Partial
Bowdoin College	Journal Article	**Camill P.**, M. Hearn, K. Bahm, **E. Johnson**. 2012. Using a boundary organization approach to develop a sea level rise and storm surge impact analysis framework for coastal communities in Maine. Journal of Environmental Studies and Sciences http://www.springerlink.com/content/n281607485u2w4n6/	Partial
Colby College	Abstract	Beck, E.N. and **B.F. Rueger**. 2011. A Google Earth Flyover Illustrating the Geology and Topography of Arnold's March on Quebec, 1775, Geological Society of America Abstracts with Programs, Vol. 43, No. 5, p. 476.	Partial
Colby College	Abstract	**Love, E.A.**, **J.R. Fleming**, and **B.F. Rueger**. October 2011. Sense of Place in the Belgrade Lakes Region, Central Maine, Abstract No. 197029, Geological Society of America Annual Meeting, Minneapolis, MN, 9-12 October 2011.	Primary
Colby College	Abstract	**Love, E.A.**, **J.R. Fleming**, and **Rueger**. 2011. Encouraging Stakeholder Engagement by Defining, Creating, and Sharing a Sense of Place in the Belgrade Lakes Region of Central Maine, Geological Society of America Abstracts with Programs, Vol. 43, No. 5, p. 75.	Primary
Colby College	Abstract	Morgan, B.J., **B.F. Rueger**, and M. Croft. 2011. Virtual Geologic Field Guide to the Kennebec Highlands, Central Maine, Geological Society of America Abstracts with Programs, Vol. 43, No. 5, p. 476.	Primary

Institution	Type	Citation	SSI-
Colby College	Journal Article	Burns, J., W. Cooper, J. Ferry, **D.W. King**, B. DiMento, K. McNeill, C. Miller, W. Miller, B. Peake, S. Rusak, A. Rose, and T.W. Waite. 2012. Methods for reactive oxygen species (ROS) detection in aqueous environments. Aquatic Sciences - Research Across Boundaries Issn: 1015-1621 http://dx.doi.org/10.1007/s00027-012-0251-x Doi: 10.1007/s00027-012-0251-x	Partial
Unity College	Newsletter	**Remsburg, A**. 2011. Midcoast hemlock forests in the spotlight. Sheepscot Wellspring Land Alliance Newsletter. Issue 24:5.	Primary
University of Maine	Abstract	Sharik, T.L., and **R.J. Lilieholm**. 2011. Undergraduate Enrollment Trends in Natural Resources in the United States: An Update. Abstract in the Proceedings of the 17th International Symposium on Society and Resource Management, Madison, WI.	Partial
University of Maine	Abstract	Tessema, M.E., **R.J. Lilieholm**, D.J. Blahna, and L.E. Kruger. 2011. Measuring Community-forest Resource Use, Dependency, and Vulnerability in Southcentral and Southeast Alaska. Abstract in the Proceedings of the 17th International Symposium on Society and Resource Management, Madison, WI.	Partial
University of Maine	Abstract	**Lilieholm, R.J.**, **S. Sader**, R. Boone, R. Reid, M. Said, J. Worden, S. Kifugo, D. Nkedianye, and J. Stabach. 2011. Alternative Futures Modeling in Kenya's National Parks and Reserves. Journal of Forestry 109(8):580.	Partial
University of Maine	Abstract	**Daigle, J.**, **E. Quigley**, **R.J. Lilieholm**, **D. Ranco**, T. Secord, J. Neptune, **W. Livingston**, and **M. Lizotte**. 2011. Mobilizing Diverse Interests to Address the Emerald Ash Borer. Journal of Forestry 109(8):582.	Primary
University of Maine	Abstract	**Legere, M.**, **A.S. Reeve**, **M. Scott**. 2011. Using Lumped Parameter Drainage-Basin Models to Assess Lake Level in a Managed Lake System. Abstract 41-8 presented at the GSA Northeastern (46th Annual) and North-Central (45th Annual) Joint Meeting (20-22 March 2011).	Primary
University of Maine	Abstract	**Gorczyca, E.**, **J. Leahy**, **J. Wilson**, **K.P. Bell**, and **W. Mercier**. 2011. Exploring Family Forests using an Agent-Based Model. Journal of Forestry. 109(8): 526.	Primary

Institution	Type	Citation	SSI-
University of Maine	Book Chapter	Johnson, J., **D.J. Ranco**. 2011. Risk Assessment and Native Americans at the Cultural Crossroads: Making Better Science or Redefining Health?. Technoscience and Environmental Justice: Transforming Expert Cultures through Grassroots Engagement. Gwen Ottinger and Benjamin Cohen, eds, MIT Press.	Partial
University of Maine	Editorial	**Teisl, M.F.**, **C. Noblet**, and **S. McCoy**. 2011. Maine Voices: Offshore wind has role in Maine's future Maine Sunday Telegram. June 26. http://www.pressherald.com/opinion/offshore-wind-has-role-in-maines-future_2011-06-26.html	Primary
University of Maine	Journal Article	**Beard, K.** and P. Smitherman. 2011. Creating residential and tenure histories from Multi-year White Pages. Transactions in GIS. 15(6) pp 811-828.	Partial
University of Maine	Journal Article	Freeman, R.C. and **K.P. Bell**. 2011. Conservation versus cluster subdivisions and implications for habitat connectivity, Landscape and urban planning 101, 1, 30-42.	Partial
University of Maine	Journal Article	Popescu, D., **M.L. Hunter**, D. Patrick, **A.J.K. Calhoun**. 2012. Predicting the response of amphibian communities to disturbance across multiple temporal and spatial scales. Forest Ecology and Management. 270: 163-174(31-34%, 1.950).	Partial
University of Maine	Journal Article	**Daigle, J.**, **L. Utley**, L.C. Chase, W. Kuentzel, and T. Brown. 2012. Does New Large Landownership and Their Management Priorities Influence Public Access in the Northern Forest. Journal of Forestry. published online January 23, 2012.	Partial
University of Maine	Journal Article	**Teisl, M.F.**, E. Frohmberg, A.E. Smith, K.J. Boyle, **H.M. Engelberth**. 2011. Awake at the switch: Improving fish consumption advisories for at-risk women, Science of the Total Environment 409 (18) 3257-3266.	Partial
University of Maine	Journal Article	Gilbertz, S., E.A. Austin, J. Norton, C. Horton, and **D.M. Hall**. 2011. Wicked wisdoms: Illuminations of conceptual capacities among local leaders of the Yellowstone River. Studies in Sociology of Science 2 (2).	Partial
University of Maine	Journal Article	**Lazarus, E.**, D. McNamara, M. Smith, S. Gopalakrishnan, and A.B. Murray. 2011. Emergent behavior in a coupled economic and coastline model for beach nourishment, Nonlinear Processes in Geophysics, 18, 989-999.	Partial

Institution	Type	Citation	SSI-
University of Maine	Journal Article	Danielson, T.J., **C.S. Loftin**, L. Tsomides, J.L. DiFranco, and B. Connors. 2011. Algal bioassessment metrics for wadeable streams and rivers of Maine, USA. J. North American Benthological Society 30:1033-1048.	Partial
University of Maine	Journal Article	White, P.J.T**., B.J. McGill**, and M.J. Lechowicz. 2011. Human-disturbance and caterpillars in managed forest fragments. Biodiversity and Conservation 20(8):1745-1762.	Partial
University of Maine	Journal Article	Michelson, G**., B.J. McGill**, S. Beaulieu, and P. Beukema, L. Patrick. 2011. Multiple links between species diversity and temporal stability of bird communities across North America. Evolutionary Ecology Research 13(4):361-372.	Partial
University of Maine	Journal Article	White, P., **B.J. McGill**, M.J. Lechowicz. 2012. Detecting changes in forest floor habitat after canopy disturbance. Ecological Research 27(1):1-10.	Partial
University of Maine	Journal Article	**McGill, B.J.** 2012. Trees are rarely most abundant where they grow best. Journal of Plant Ecology 5(1):46-51.	Partial
University of Maine	Journal Article	**McGreavy, B.**, T. Webler, and **A.J.K. Calhoun**. 2012. Science communication and vernal pool conservation: Local decision maker attitudes in a Knowledge Action System. Journal of Environmental Management. 95 (1): 1-8.	Partial
University of Maine	Journal Article	Siriwardena, S., G. Hunt, **M.F. Teisl**, and **C. Noblet**. 2012. Effective environmental marketing of green cars: A nested-logit approach. Transportation Research Part D: Transport and Environment 17 (3): 237-242.	Partial
University of Maine	Journal Article	**Peckenham, J.M.**, H. Paterson, C. Roesler, J. Pinto, and C. Proctor. 2011. Real-Time Algae Monitoring For Drinking Water Security, Lakelines, Dec. 2011.	Partial
University of Maine	Journal Article	**Peckenham, J.M.**, T. Thornton, and P. Peckenham. 2011. Validation of Student Generated Data for the Assessment of Groundwater Quality, Journal of Science Education and Technology, DOI 10.1007/s10956-011-9317-0.	Partial
University of Maine	Journal Article	**Ranco, D.J.**, C. O'Neill, J. Donatuto, and B.L. Harper. 2011. Environmental Justice, American Indians and the Cultural Dilemma: Developing Environmental Management for Tribal Health and Well-being. Environmental Justice 4(4): 221-230.	Partial

Institution	Type	Citation	SSI-
University of Maine	Journal Article	Marette, S., B. Roe and **M.F. Teisl**. 2012. The Welfare Impacts of Food Pathogen Vaccines Food Policy 37(1):86-93.	Partial
University of Maine	Journal Article	**Waring, T.M.** and P.J. Richerson. 2011. Towards Unification of the Socio-Ecological Sciences: The value of coupled models. Geografiska Annaler: Series B, Human Geography, 93(4).	Partial
University of Maine	Journal Article	Briedis, J.I., **J.S. Wilson**, J.G. Benjamin, and R.G. Wagner. 2011. Biomass retention following whole tree, energy-wood harvests in Central Maine: Compliance to five state guidelines. Biomass and Bioenergy. 35:3552-3560.	Partial
University of Maine	Journal Article	Briedis, J.I., **J.S. Wilson**, J.G. Benjamin, and R.G. Wagner. 2011. Logging residue volumes and characteristics following integrated roundwood and energy-wood whole-tree harvesting in Central Maine. Northern Journal of Applied Forestry. 28(2)66-71.	Partial
University of Maine	Journal Article	**Cronan, C.S.** 2011. Biogeochemistry of the Penobscot River watershed, Maine, USA: nutrient export patterns for carbon, nitrogen, and phosphorus. Environmental Monitoring and Assessment: DOI 10.1007/s10661-011-2263-8.	Primary
University of Maine	Journal Article	Popescu, V.D. and **M.L. Hunter.** 2011. Clearcutting has a long-lasting effect on habitat connectivity for a forest amphibian by decreasing permeability to juvenile movements. Ecological Applications 21:1283-1295.	Primary
University of Maine	Journal Article	Gomben, P.C., **R.J. Lilieholm**, and M.J. Gonzalez-Guillen. 2012. Impact of Demographic Trends on Future Development Patterns and the Loss of Open Space in the California Mojave Desert. Environmental Management 49(2):305-324.	Primary
University of Maine	Journal Article	**McCloskey, J.T.**, **R.J. Lilieholm**, and **C.S. Cronan**. 2011. Using Bayesian Belief Networks to Identify Future Compatibilities and Conflicts between Development and Landscape Conservation. Landscape and Urban Planning 101(2011):190-203.	Primary
University of Maine	Journal Article	**Lindenfeld, L.A.**, **D.M. Hall**, **B. McGreavy**, **L. Silka**, and **D. Hart**. 2012. Creating a place for Communication Research in Sustainability Science. Environmental Communication. A Journal of Nature & Culture. Volume 6 (March), pp. 23-43.	Primary

Institution	Type	Citation	SSI-
University of Maine	Journal Article	Samson, J., D. Berteaux, **B.J. McGill**, and M. Humphries. 2011. Geographic disparities and moral hazards in the predicted impacts of climate change on human populations. Global Ecology and Biogeography 20(4):532-544.	Primary
University of Maine	Journal Article	Hennigar, C.R., **J.S. Wilson**, D.A. MacLean, and R.G. Wagner. 2011. Applying a spruce budworm decision support system to Maine: Projecting spruce-fir volume impacts under alternative management and outbreak scenarios. Journal of Forestry. 109(6):332-342.	Primary
University of Maine	Newsletter	**Lilieholm, R.J.** ed. 2012. School of Forest Resources Spring Newsletter, 6 pages.	Partial
University of Maine	Newsletter	**Hallsworth, R.**, **K. Raymond**, and K. Ridley. 2011. SSI Fall Newsletter. University of Maine. Solutions Vol. 1 No. 1.	Primary
University of Maine	Other	**Silka, L.** and R. Toof. Co-Editors. 2011. International Perspectives on Community-University Partnerships. Metropolitan Universities: An International Forum, 22(2), Full Issue.	Partial
University of Maine	Other	Jemison, J., S. Welcomer, **D.M. Hall**, and J. Haskell. 2012. Assessing Maine's Agricultural Future - 2025. Summary of Research Findings, University of Maine Cooperative Extension. 2 page summary of findings.	Primary
University of Maine	Other	**Hutchins, K.** and **L.A. Lindenfeld**. November, 2011. Concerns, opportunities cited in survey. Maine Townsman: The Magazine of the Maine Municipal Association.	Primary
University of Maine	Other	**Jansujwicz, J.S.** 2011. Challenges and Opportunities for Conserving Vernal Pools on Private Land Using Regulatory and Voluntary Approaches. PH.D. dissertation, University of Maine, Orono.	Primary
University of Maine	Other	**McGreavy, B.** and **D. Hart**. 2012. Interview with Robert Kates. Maine Policy Review Special Issue on Sustainability Solutions Initiative.	Primary
University of Maine	Proceedings	**McCloskey, J.T.**, **R.J. Lilieholm**, R. Boone, R. Reid, D. Nkedianye, **S. Sader**, M. Said, and J. Worden. 2011. A Participatory Approach for Modeling Alternative Future Land Use Scenarios around Nairobi National Park using Bayesian Belief Networks. Ecology and the Environment 144:43-57.	Partial

Institution	Type	Citation	SSI-
University of Maine	Proceedings	**Peckenham, J.**, L. Wilson, A. Tolman, J. Jemison, and P. Peckenham. 2011. Fluoride, arsenic, and chloride in private water wells in eastern Maine, Private Well Symposium, Southbury, CT, November 15, 2011.	Partial
University of Maine	Proceedings	**Peckenham, J.** and T. Thornton. 2011. Validation of Student Analyses of Drinking Water, Citizen Scientist Symposium, University of Maine, Orono, ME, May 12, 2011.	Partial
University of Maine	Proceedings	**Johnson, M.L.**, **S.R. Meyer**, **R.J. Lilieholm**, and **C.S. Cronan**. 2012. Co-developing place-based scenarios of alternative futures with stakeholder. Proceedings of the American Association of Geographers Annual Meeting, February 23-28, 2012, New York, NY.	Primary
University of Maine	Proceedings	**Peckenham, J.** and **S. Jain**. 2011. Defining typology for Source Water Protection in Maine, New England Water Works Association Source Water Protection Symposium, Boxborough, MA, Oct. 27, 2011.	Primary
University of Maine	Proceedings	**Peckenham, J.** and **S. Jain**. 2011. Typology of Source Water Protection in Maine, American Water Works Association Annual Conference and Exposition, Washington, DC, June 13, 2011.	Primary
University of Maine	Proceedings	**Ranco, D.** 2011. Kolunkayowan Wikpiyik II: Protecting the Ash for Future Generations Symposium. George Mitchell Center, University of Maine.	Primary
University of Maine	Technical Report	**Ranco, D.**, **R.J. Lilieholm**, **J. Daigle**, J. Neptune, **E. Quigley**, T. Secord and **M. Lizotte**. 2011. Kolunkayowan Wikpiyik II: Protecting the Ash for Future Generations Symposium Report. Sustainability Solutions Initiative, University of Maine. 21 pages.	Primary
University of Maine	Technical Report	**Meyer, S.R.** (Ed.) 2011. Center for Research on Sustainable Forests Annual Report - 2011. University of Maine. Orono, Maine. 91 p.	Partial
University of Maine	Technical Report	**Hall, D. M.**, C. Lozier, S. MacDonald, and E. Viselli. 2011. Public Voices in Maine's Deepwater Offshore Wind Research & Development. Bureau of Ocean Energy Management, Maine Renewable Energy Task Force member brief. 5 pages.	Primary
University of Maine	Technical Report	**Hutchins, K.**, **L.A. Lindenfeld**, **L. Silka**, **J. Leahy**, and **K.P. Bell**. August, 2011. Maine Municipal Official Survey Technical Report.	Primary
University of Maine	Technical Report	**Hutchins, K.** and A. Foster. July, 2011. Non-Point Source Pollution Communication Intercept Survey Final Report: Bangor Area Stormwater Group.	Primary

Institution	Type	Citation	SSI-
University of Maine	Technical Report	**McGreavy, B.**, J. Disney, **N. Kacer**, **L.A. Lindenfeld**, and **L. Silka**. 2011. Stakeholder Perspectives in Frenchman Bay Planning. Frenchman Bay Partners Conservation Action Planning Retreat, Schoodic Education and Research Center, October 16-17, 2011.	Primary
University of Maine	Technical Report	**Utley, L.**, **L.A. Lindenfeld, L. Silka**, and K. Welch. 2011. Downtown Orono Marketing & Communications Action Plan. University of Maine.	Primary
University of Maine	Technical Report	**Budzinski, C.**, **L.A. Lindenfeld,** and **L. Silka**. 2011. Maine EPSCoR Sustainability Solutions Initiative Sustainability Solutions Partners Survey. University of Maine.	Primary
University of Maine	Technical Report	**Johnson, M.L.** and **S.R. Meyer.** 2011. New Tool for Involving Stakeholders in Regional Scenario Planning. Planning and Technology Today. American Planning Association. Issue 101:3. 1 p.	Primary
University of Maine at Farmington	Abstract	**Daly, J.F.**, S. Adams, R. Abrams, and B. Engel. 2011. Ice duration, winter stratification, and mixing behavior of subalpine lakes in western Maine, abstract H53Q-07 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.	Partial
University of Southern Maine	Editorial	**Colgan, C.S.** and G. Hunt. February 19, 2012. Getting the Economics of Wind Right. Portland, ME: Maine Sunday Telegram.	Partial
University of Southern Maine	Journal Article	**Owen, D.** 2012. Critical Habitat and the Challenge of Regulating Small Harms, 64 Florida L. Rev. 141.	Partial
University of Southern Maine	Journal Article	**Pavri, F.** and T. Lynch. 2011. Assessing Land Use and Riparian Buffers along Maine's Presumpscot Watershed using Landsat Thematic Mapper. Northeastern Geographer, V3: 22-34.	Partial
University of Southern Maine	Journal Article	**Pavri, F.**, **A. Dailey** and **V. Valentine**. 2011. Integrating multispectral ASTER and LiDAR data to characterize coastal wetland landscapes in the northeastern United States. Geocarto International (special issue on Remote Sensing of Coastal System Dynamics), V26 (8): 647-661.	Partial
University of Southern Maine	Journal Article	**Kim, Y.** 2011. Integrated Land Use-Transportation Models: Model Development and Modeling Activity Trends. Road Policy Brief, Korea, 2011, 47.	Primary
University of Southern Maine	Newsletter	**Colgan, C.S.** 2012. Energy and the City: Envisioning a More Sustainable Future. Connections: The Newsletter of Community Planning and Development, Muskie School of Public Service, University of Southern	Primary

Institution	Type	Citation	SSI-
		Maine.	
University of Southern Maine	Other	Lessels, B. and **D. Owen**. 2012. Potential Liabilities for Salt Use Reduction. http://www.thinkbluemaine.org/docs/municipal/good_housekeeping/winter_maintenance/salt_reduction_liabilities_paper.pdf	Partial
University of Southern Maine	Technical Report	**Colgan, C.S.** 2012. Changing Maine: Pictures from the 2010 Census Portland, ME: Maine Center for Business & Economic Research University of Southern Maine. Maine Center for Business and Economic Research.	Primary
University of Southern Maine	Technical Report	**Colgan, C.S.** 2011. Population and Employment Projections for the Central York County Connections Study: Methodology and Summary Results. Phase 1 Technical Report. Augusta, ME: Maine Department of Transportation.	Primary

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APENDIX 8: Revised Maine EPSCoR SSI Data Management Plan

Data-related challenges stem from diversity, volume, formats, streaming, and versioning, and undergird efforts that seek to model, diagnose, and predict the trajectory of complex, coupled natural-human systems. The Data Management Plan is pursuing an integrative research strategy that involves: (a) efforts to maximize the efficacy of computational resources for data-related research to enhance and complement the current research portfolio within the SSI; (b) proactive coordination and initiation of collaborative efforts across various research projects within SSI and the state of Maine to lower the threshold related to data search, access, processing (format, resolution etc.), and archiving; (c) development, testing, and implementation of a database management backbone using appropriate database software and hardware; (d) development of a metadata catalog and data curation tools that will aid metadata generation; (e) development of a project-wide ontology that seeks to systematize the relationships between knowledge across various domains and their linkages to data; (f) support for scientific workflows that will allow SSI projects to link various data to high-performance computational and analytical tools; and (g) investigate the potential for web-based modeling, data analysis, and visualization tools that allow user interaction, gaming, and shared vision planning.

Data Inventory:

SSI teams were surveyed in January 2011 to identify data sets currently in-hand as well as data sets to be developed and how data are currently stored and managed. The range in data types is very broad, e.g., imagery, streaming sensor data, time series, geospatial data sets, model results, and results from survey questionnaires. Taken together, the themes (ecological, climatic, social, economic, and legislative) mirror the range of social science and biophysical research areas being pursued within SSI's research portfolio. Many of the data sets of interest are federal- or state-generated data sets. In some cases, these have been customized or value-added. The heterogeneity assures that there is not a one size fits all data-base management or metadata standard solution.

Data Format and Metadata Content:

The overall data sharing and management plan for the SSI project is designed to support data management and access for: (a) the internal investigations of the SSI projects; (b) support of the Sustainability Science Partner teams throughout Maine; and (c) sharing data as relevant to related broader national and international scientific investigations including NEON, LTERs, NBII, and CZO, CUAHSI.

Some named data sets of general utility are being used and include National Aerial Imagery Program (NAIP), National Land Cover Data, SSURGO soils data, National Hydrography Data (NHD), National Elevation Dataset (NED), National Wetlands, Inventory (NWI), FEMA floodplain data, Air Toxics Data, near real time National Weather Service data, National Climatic Data Center climate data, and US Census data.

Specifically named data slated for SSI-wide and public release are also being used and include (a) a suite of coupled climate model simulations for the 20th and 21st century (based on the IPCC AlB scenario), statistically downscaled to produce a high-spatial resolution dataset for

Maine and the New England region. An updated version based on the CMIP5 project climate simulations for the next IPCC assessment will dovetail the World Climate Research Program's 2012-2013 timetable regarding the availability of new simulations. Data standards will be consistent with the Unidata and Earthsystemgrid; (b) stream flow data from SSI's stream flow sensors in the Sebago Lake watershed will be updated every three months and made available through SSI Data system in WaterML to ensure web service-based transmission and integration with the CUAHSI Hydrologic Information System (CUAHSI-HIS); and (c) economic and demographic forecasts of Maine regions.

Access and Sharing Data:

To be accessible across teams within the SSI projects, with the wider scientific community, and the public, standard formats are required that can be easily shared across the web and the need for associated metadata that is compliant with metadata standards. Several metadata standards exist (Z39.50, FGDC, Dublin-Core, Darwin-Cor9, EML, ISO-19ll5, DDI) and given the range of data types currently identified in SSI, a range of metadata options will be used. The Ecological Metadata Language (EML) used primarily in the ecology community is being used for some project data sets. Similarly the ~BII Biological Data Profile, which has extensions for information on taxonomies, sampling methodology, and analytical tools has been employed for other data sets. ISO 19115 and the North American Profile (NAP) provide logical metadata standards for geospatial data sets. The Data Documentation Initiative (DDI) metadata standard is being used for social science survey data. The State of Maine uses FGDC. DSpace supports many standard bibliographic data resources and provides community access and as such provides a good general option. Another option is the Mercury-l portal. Mercury, developed by Oak Ridge National Laboratory (ORNL), manages distributed scientific data and metadata and provides cataloguing services for several metadata standards including FGDC, Dublin-Core, DarwinCore, EML, and ISO-19ll5 and retrieval of associated data.

Data sharing requires effective data access and discovery and an ability to search on several dimensions that include spatial, temporal, thematic, project specific, or principal investigator specific. Therefore, access portals provide intuitive search support on these dimensions. DSpace supports search on Dublin Core elements. Mercury, which supports several metadata standards, supports search on the elements of these various standards including taxonomic, spatial, temporal, sampling parameters, etc. The NBII Clearinghouse and LTER sites, among a range of other participants, currently use Mercury. DSpace and extensions like Geoserver are currently used where appropriate, but approaches like DDI may ultimately maximize the usability and discovery of social, behavioral, and economic data

Plans for Archiving Data, Re-Use, and Preservation:

The UMaine Fogler Library is the official Maine Science Library and will be the portal for access to all SSI data to be stored at the UMaine supercomputer center. There is adequate storage capacity to house these data for five years after completion of the SSI project. Access to data will be limited to SSI researchers until publication of the main findings. Data referenced in publications will be identified. PIs responsible for raw data, analytics, and modeling are identified and should be acknowledged in any subsequent use.

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APPENDIX 9: Maine EPSCoR SSI Organizational/Management Matrix

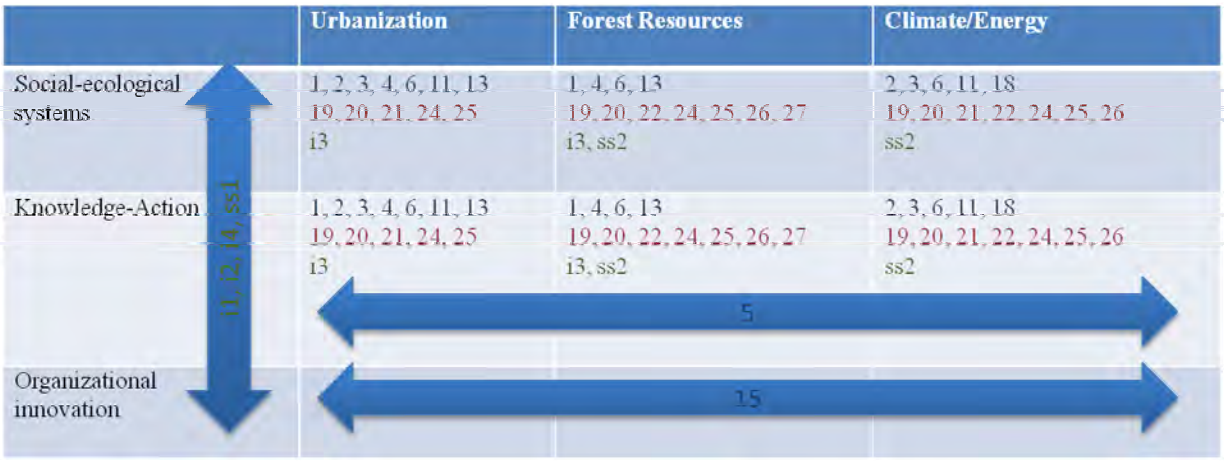
Maine's Sustainability Science Initiative research rests on three critical components:
1) Social-ecological systems research (SES)
2) Knowledge-to-action research (K-A)
3) Organizational Innovation (research on interdisciplinary integration) (OI)

The model system being utilized for Maine's Sustainability Science Initiative focuses on interacting drivers of landscape change:
1) Urbanization
2) Forest ecosystem management
3) Climate change & Energy

The Maine EPSCoR SSI research portfolio focus is on the integration and interaction of the above, which makes it difficult to portray clearly in a two-dimensional manner. Therefore, two representations are offered here.

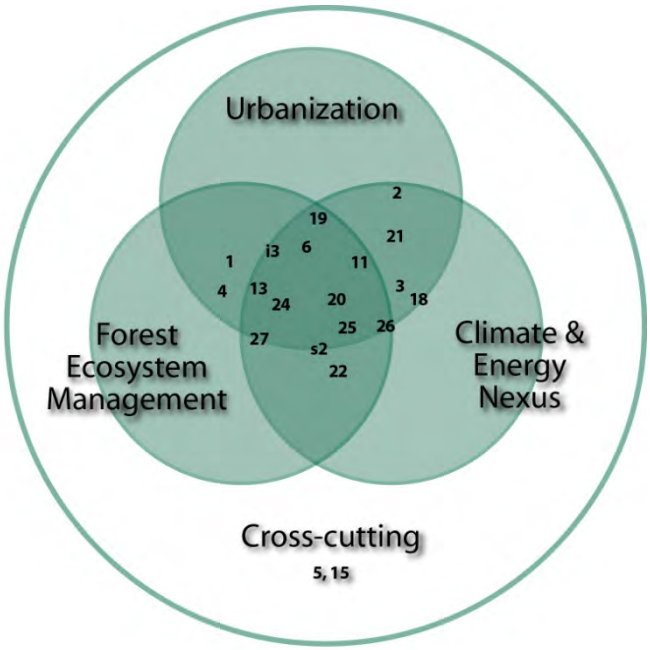
Maine EPSCoR SSI Organizational/Management Matrix of projects in the SSI Research Portfolio

This diagram represents where SSI project teams fit in the organizational/management system, but does not reflect the true research processes in which integration occurs across themes and arenas and between projects. (Numbers refer to the project team table below.)

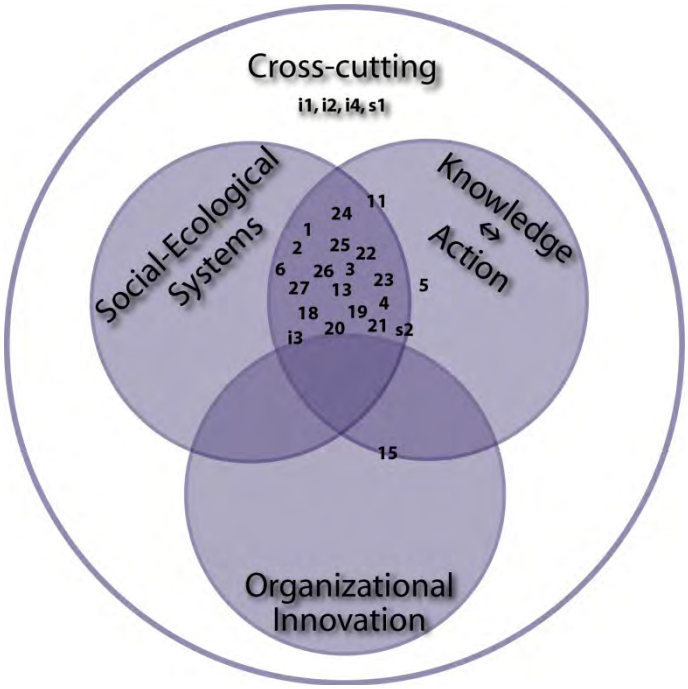


Maine EPSCoR SSI Research Integration & Confluence in the SSI Research Portfolio

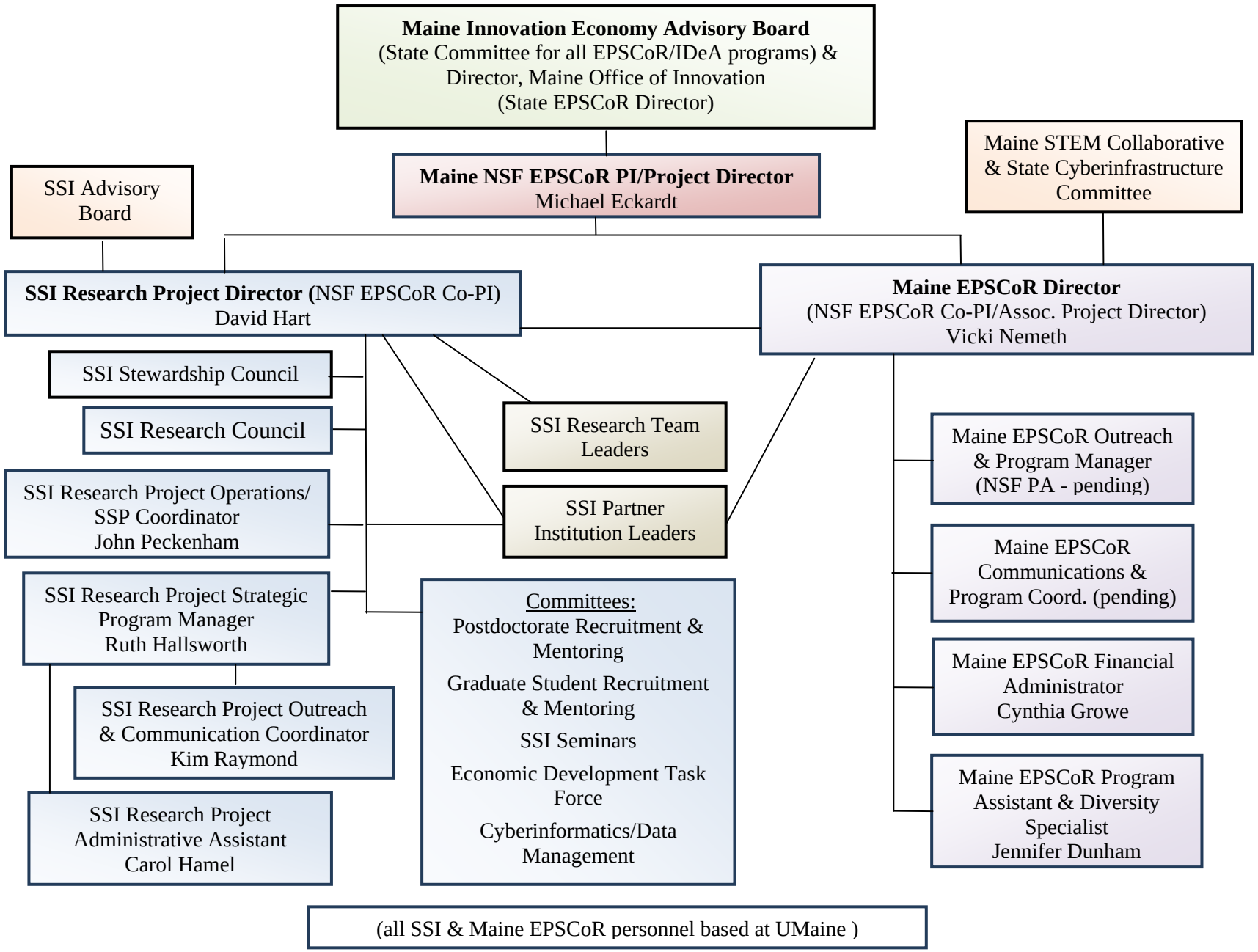
Research organization of SSI projects within the three SSI arenas:



Research organization of SSI projects within the three SSI themes:



Maine EPSCoR NSF EPSCoR RII Project - Maine's Sustainability Science Initiative



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APPENDIX 10: Maine EPSCoR SSI RII Research Portfolio Teams

Maine EPSCoR SSI Core Research Projects at UM/USM (NSF support)					
STATUS: A=active; NA=not active; C=combined with another project					
Proj	**YR3**	**YR2**	**YR1**	**Project Title:**	**Institutions & Principal Team Members:**
#1	**A**	**A**	**A**	**Protecting Natural Resources at the Community Scale: Using Population Persistence of Vernal Pool Fauna as a Model System to Study Urbanization, Climate Change and Forest Management**	UMaine: Aram Calhoun, Kathleen Bell, Mac Hunter, Cyndy Loftin
#2	**A**	**A**	**A**	**Sustainable Urban Regions Project (SURP)**	USM: Charles Colgan, Jack Kartez, Yuseung Kim UMaine: Kathleen Bell, Rob Lilieholm, Jim Wilson
#3	**A**	**A**	**A**	**Decision Tools to Support Water Resources Sustainability of Managed Lake Systems**	UMaine: Andrew Reeve, Shaleen Jain, Jean MacRae, John Peckenham, Michael Scott USM: Firooza Pavri
#4	**A**	**A**	**A**	**Ecological and Social Change: Adaptation, Place, and Evaluation (ESCAPE)**	UMaine: Jessica Leahy, Kathleen Bell
#5	**A**	**A**	**A**	**The Knowledge-Action Collaborative**	UMaine: Laura Lindenfeld, Linda Silka, Mario Teisl, Shannon McCoy, Mark Anderson, Caroline Noblet
#6	**A**	**A**	**A**	**Analysis of Alternative Futures in the Maine Landscape using Spatial Models of Coupled Social and Ecological Systems**	UMaine: Rob Lilieholm, Chris Cronan, Kevin Simon UMaine School of Law: Dave Owen
#7	**C**	**A**	**A**	**(Combined with #6 for YR3) Sustaining and Restoring Urban Stream Resources in Maine**	UMaine School of Law: Dave Owen UMaine: Chris Cronan, Laura Lindenfeld, Kevin Simon, Peter Vaux.
#8	**C**	**A**	**A**	**(Combined with #4 for YR3) Spatial Forest Planning to Meet Multiple Natural Resource Goals: Developing geospatial tools to forecast management outcomes across a diverse**	UMaine: Jeremy Wilson, Steven Sader, Jessica Leahy

				landscape of ownership types and stakeholder interests	
#9	**NA**	**A**	**A**	**(YR1 & YR2 project only) Linking Knowledge with Action: Refining Maine's Mercury Fish Consumption Advisory**	UMaine: Aria Amirbahman, Kathleen Bell, Linda Bacon, Kevin Simon, Steve Norton, Ivan Fernandez
#10	**NA**	**NA**	**A**	**(YR1 project only) Development of a Spatial Landscape Simulation Suite**	UMaine: David Hiebeler, Frank Drummond, Jim Wilson, Charlene Donahue
#11	**A**	**A**	**A**	**Adaptation Strategies in a Changing Climate: Maine's Coastal Communities and the Statewide Stakeholder Process**	UMaine: Shaleen Jain, Esperanza Stancioff
#12	**NA**	**NA**	**A**	**(YR1 project only) A Complexity-based Approach to Research-on-Research and Enhanced Systems Outcomes**	UMaine: Terry Porter
#13	**A**	**A**	**A**	**Mobilizing Diverse Interests to Address Invasive Species Threats to Coupled Natural/Human Systems: The Case of the Emerald Ash Borer in Maine**	UMaine: Darren Ranco, John Daigle, Rob Lilieholm MIBA: Jennifer Neptune, Theresa Secord
#14	**C**	**A**	**A**	**(Combined with #5 for YR3) Modeling Stakeholder Acceptance of Solutions to Environmental Problems**	UMaine: Mario Teisl, Shannon McCoy, Caroline Noblet, Laura Lindenfeld, Jessica Leahy, Linda Silka, Mark Anderson
#15	**A**	**A**	**A**	**Systems Analysis of SSI: Navigating Perspectives, Paradigms, and Problemscapes (OI)**	UMaine: Susan Gardner, Shannon McCoy
#16	**C**	**A**	**A**	**(Combined with #15 for YR3) Perceptions of the System and Interdisciplinary Success (RoR)**	UMaine: Shannon McCoy
#17	**C**	**A**	**A**	**(Combined with #5 for YR3) Developing a Framework for Linking Researcher and Stakeholder Values with Knowledge to Action Effectiveness (RoR)**	UMaine: Mark Anderson, Mario Teisl, Caroline Noblet
#18	**A**	**A**	**A**	**Maine Tidal Power Initiative: Linking Knowledge to Action for Responsible Development of Tidal Power**	UMaine: Teresa Johnson, Gayle Zydlewski

SSI Partner Institution (SSP) Research projects for broadening participation and research capacity at Primarily Undergraduate Institutions (NSF support)					
SSP #19	**A**	**A**	**A**	**Ecological and Economic Recovery and Sustainability of the Kennebec and Androscoggin Rivers and Their Common Estuary and Nearshore Marine Environment**	Bates: Lynne Lewis & Beverly Johnson Bowdoin: John Lichter, Phil Camill, Guillermo Herrera USM: Theodore Willis & Karen Wilson
SSP #20	**A**	**A**	**A**	**Modeling Resilience and Adaptation in the Belgrade Lakes Watershed**	Colby: Whitney King, Russell Cole, Philip Nyhus, James Fleming, Herbert Wilson, Catherine Bevier, Bruce Rueger UMF: Wendy Harper
SSP #21	**A**	**A**	**A**	**Sustaining Quality of Place in the Saco River Estuary through Community Based Ecosystem Management**	UNE: Pamela Morgan & Christine Feurt
SSP #22	**A**	**A**	**A**	**Understanding the Relationships Among Biodiversity, Forest Management, and Invasive Species Disturbance in a Forested New England Landscape**	Unity: Amy Arnett, Erika Latty, Alysa Remsburg, Kathleen Dunckel
SSP #23	**NA**	**A**	**A**	**(Elected not to participate in YR3)** **Developing our Energy Future: A Community-based Research Project**	CoA: J. Gray Cox, Davis Taylor, Don Cass, John Anderson
SSP #24	**A**	**A**	**A**	**Modeling Evolving Ecological, Cultural, and Economic Systems of the Aroostook River Watershed of Northern Maine for Sustainable Development**	UMPI: Jason Johnson, David Putnam, Kimberly Sebold, Chunzeng Wang, Anja Whittington
SSP #25	**A**	**A**	**A**	**Promoting Watershed-Based Sustainable Development through Ecological and Socio-Economic Research and Educational Initiatives**	UMF: Wendy Harper, Matt McCourt, Dan Buckley, Ron Butler, Julia Daly, Drew Barton, David Heroux, Chris Bennett, Cathleen McAnneny, Mellisa Clawson
SSP #26	**A**	**A**	**A**	**Biomass Energy Resources in the St. John Valley, Aroostook County, Maine: Development Potential, Landscape Implications, and Replication Possibilities**	UMFK: Soraya Cardenas, Kim Borges-Therien, Bruno Hicks, Dave Hobbins, JR Bjerklie

SSP #27	**A**	**A**	**A**	**Evaluating the Effects of Turkeys on Maine Agriculture**	UMA: Christopher Lage, Peter Milligan, Joseph Szakas
SSP #28	**NA**	**NA**	**NA**	**(Elected not to participate)**	UMM
SSI Core Integration Projects (non-NSF support – leveraging a UMaine voluntary cost contribution)					
#I-1	**A**	**A**	**NA**	**Lessons from a diverse portfolio: Building applicable knowledge through a multi-method framework for coupled-systems research**	UMaine: Kathleen Bell, Brian McGill, Tim Waring, Jim Wilson
#I-2	**A**	**A**	**NA**	**An SSI Cyber-Informatics Development Plan**	UMaine: Kate Beard, Shaleen Jain, Brian McGill, Bruce Segee USM: Charles Colgan
#I-3	**A**	**A**	**NA**	**Application of an Integrative Decision Support Tool and Spatial Modeling to Assess the Implications of Future Growth Scenarios on Sensitive Aquatic Resources in Maine**	UMaine: Rob Lilieholm & Chris Cronan UMaine School of Law: David Owen
#I-4	**A**	**A**	**NA**	**Building Capacity and Coherence: Integration of Socio-Economic Data Collection**	UMaine: Mario Teisl, Caroline Noblet, Shannon McCoy, Mark Anderson, Linda Silka, Laura Lindenfeld, Teresa Johnson, James Acheson, Kathleen Bell USM: Charlie Colgan, Jack Kartez
Maine EPSCoR SSI Seed Funding Research Projects (NSF support - newly hired faculty start-up projects)					
#SS-1	**A**	**NA**	**NA**	**SES synergy: Finding and applying best practices in socio-ecological systems modeling and outreach**	UMaine: Tim Waring
#SS-2	**A**	**NA**	**NA**	**ECCO (Effects of Climate Change on Organisms)**	UMaine: Brian McGill

(Note: Projects also include significant stakeholder collaborations with government, non-profits, business & industry, etc. as well as additional faculty at the participating institutions.)

Maine NSF EPSCoR Research Infrastructure Award EPS 09-04155
Maine's Sustainability Science Initiative

APPENDIX 11: Glossary of Acronyms

Acronym	Definition
AAAS	American Association for the Advancement of Science
ADVANCE	An NSF-wide program to increase the participation and advancement of women in academic science and engineering careers
AFRI	Agriculture and Food Research Initiative
AGEP	Alliance for Graduate Education and the Professoriate
AIB	Association of Issuing Bodies
BBN	Bayesian Belief Network
C2	Inter-Campus and Intra-Campus Cyber Connectivity
CAREER	NSF-wide faculty early career development program
CCC	Curriculum and Culture Committee
CCIDS	Center for Community Inclusion & Disability Studies
CETA	Center for Excellence in Teaching and Assessment
CI	Cyber-Informatics
CMIP5	Coupled Model Intercomparison Project Phase 5
CNH	Dynamics of Coupled Natural Human Systems
CSS	Center for Sustainability Solutions
CTE	Career and Technical Education
CUAHSI	Consortium of Universities for the Advancement of Hydrologic Sciences
CZO	Critical Zone Observatories
D-Space	Open source software package that provides the tools for management of digital assets
EAB	Emerald Ash Borer
ECCO	Effects of Climate Change on Organisms
EDC	Education Development Center
EDT	Economic Development Taskforce
EES	Ecology and Environmental Sciences
EHR	Education and Human Resources
EMCC	Eastern Maine Community College
EPA	Environmental Protection Agency
EPSCoR	Experimental Program to Stimulate Competitive Research
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FVS	Forest Vegetation Simulator
GB	Gigabyte
Gbps	Gigabit per second
GIS	Geographic Information Systems
HBCU	Historically Black Colleges and Universities
HIS	Hydrologic Information System
HP	Hewlett-Packard
HSI	Hispanic-Serving Institution
HUD	Housing and Urban Development
IBP	Institute for Broadening Participation
IDeA	Institutional Development Award
IDG	Integration Discussion Group
IDR	Interdisciplinary Research
IGERT	Integrative Graduate Education and Research Traineeship Program
IMRC	Innovative Media Research and Commercialization
INBRE	IDeA Networks of Biomedical Research Excellence

Acronym	Definition
IPCC	Intergovernmental Panel on Climate Change
IRB	Institutional Review Board
ISE	Informal Science Education
ISO	International Organization for Standardization
IT	Information Technology
ITEST	Innovative Technology Experience for Students and Teachers
K-12	Kindergarten through 12th grade
K-A	Knowledge-to-Action
LSAMP	Louis Stokes Alliance for Minority Participation
LTER	Long-Term Ecological Research
MaineREN	Maine Research And Education Network
MDIBL	Mount Desert Island Biological Laboratory
ME	Maine
MGCP	Maine Girls Collaborative Project
MIEAB	Maine Innovation Economy Advisory Board
MIT	Massachusetts Institute of Technology
MLTI	Maine Laptop Initiative
MMSA	Maine Mathematics and Science Alliance
MPBN	Maine Public Broadcasting Network
MSP	Math and Science Partnership
MSSM	Maine School of Science and Mathematics
MWC	Maine Water Conference
NAIP	National Aerial Imagery Program
NAS	Network-attached storage
NASA	National Aeronautics and Space Administration
NBII	National Biological Information Infrastructure
NCURA	National Council of University Research Administrators
NEAGEP	Northeastern Alliance for Graduate Education and the Professoriate
NECC	Northeast Cyberinfrastructure Consortium
NED	National Elevation Dataset
NEON	National Ecological Observatory Network
NEREN	Northeast Education and Research Network
NGCP	National Girls Collaborative Project
NGO	Non-Governmental Organization
NHD	National Hydrography Data
NIH	National Institutes of Health
NSEES	Nicholas School of the Environment and Earth Sciences
NSF	National Science Foundation
NWI	National Wetlands Inventory
OI	Organizational Innovation
P-16	Pre-school through undergraduate education
PA	Project Administrator
PD	Project Director
PI	Principal Investigator
PIRE	Partnerships for International Research and Education
POST-GIS	Open source software program that adds support for geographic objects to the PostgreSQL object-relational database
PSP	Physical Sciences Partnership
RAM	Random-access memory
REU	Research Experience for Undergraduates
RFDE	RESTful Framework for Dynamic Client Environments
RFP	Request for Proposals
RII	Research Infrastructure Improvement

Acronym	Definition
RiSE	Research in STEM Education
ROI	Return on Investment
RSV	Reverse Site Visit
RUI	Research in Undergraduate Institutions
S&T	Science and Technology
SBIR	Small Business Innovation Research
SES	Social-Ecological Systems
SESYNC	Socio-Environmental Synthesis Center
SRA International	Society of Research Administrators International
SRN	Sustainability Research Networks
SSI	Sustainability Solutions Initiative
SSP	Sustainability Solutions Initiative Partner institution
SSURGO	Soil Survey Geographic
STEM	Science, Technology, Engineering, and Mathematics
STTR	Small Business Technology Transfer
SURP	Sustainable Urban Regions Project
TB	Terabyte
TCU	Tribal Colleges and Universities
TUES	Transforming Undergraduate Education in Science
UM or UMaine	University of Maine
UMPI	University of Maine at Presque Isle
UNH	University of New Hampshire
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USM	University of Southern Maine
U.S. V.I.	United States Virgin Islands
WaterML	Water Markup Language
WISE	Women Interested in Science and Engineering
YR	Year