Aim 5 – Education
PINEMAP Year 2 Final Progress Report
March 2013

This is the final Aim progress report for year 2 (March 2012-February 2013). Please update the outputs list and provide brief progress updates as applicable on milestones and work plan tasks. The information provided in these reports is used to track Aim-level outputs and outcomes over the course of the project and to fulfill NIFA reporting requirements via the annual continuation proposals and CRIS progress report.

Please return the updated report to Jessica Ireland no later than **March 22**.

Outputs

List ***Products*** developed/completed January 2012-current (including published, in press, or in review peer-reviewed publications; other written materials such as white papers, research summaries, fact sheets, or popular press articles; audio or video products; etc.).

A list of documented Aim 5 year 2 publications is provided below; please update as necessary and highlight in yellow any publications added to the list in the March 2013 Progress Report.

Peer-reviewed publications (January 2012-current)

Monroe, M.C., A. Oxarart, and R. Plate. In press. A Role for Environmental Education in Climate Change for Secondary Science Educators. *Applied Environmental Education and Communication*, Climate Change Special Edition.

Monroe, M.C. 2012. Enhancing both Cooperative Extension and national environmental education resources. *Journal of Extension, 50*(6) (Article No. 6IAW6) http://www.joe.org/joe/2012december/iw6.php.

Biedenweg, K., M. C. Monroe, and A. Oxarart. 2013. The Importance of Teaching Ethics for Sustainability. *International Journal for Sustainability in Higher Education*. 14(1): 6-14.

Oxarart, A. and M. C. Monroe. 2012. Using Interesting Text to Communicate Complex Natural Resources Issues. *Journal of Extension.* 50(1): Feature Article 8 http://www.joe.org/joe/2012february/a8.php

Other publications (January 2012-current)

Monroe, M.C., A. Oxarart, and R. Plate. 2012. *Understanding Southeastern Science Teachers' Interest in Climate Change Education*. PINEMAP Research Summary.

Kidd, J.B. and J.R. Seiler. 2013. *The PINEMAP Fellowship Program: Notes from Year One*. PINEMAP Press (2).

Monroe, M.C., A. Oxarart, and R. Plate.2012. *Understanding Southeastern Science Teachers' Interest in Climate Change Education.* PINEMAP Press (1).

Events/Activities (January 2012-current)

→ Provide a bulleted list of presentations (oral and poster) given at meetings or conferences. The format for citing presentations is as follows: Presenter(s)/Author(s). Date. Name/title of meeting/conference, location. *Indicate poster presentations by placing [poster] at end of citation.
Highlight in yellow presentations added to the list in the March 2013 Progress Report.

- Fowler, S., J. Munsell and J. Seiler. 2012. High school science teachers and forestry education: How are they connected? 9th Biennial Conference in University Education in Natural Resources, March 23-24, Fort Collins, CO. [Oral].
- Fowler, S., J. Munsell, and J. Seiler. 2011. High school science teachers and forestry education: How are they connected? SAF National Convention, Nov. 2-6, Honolulu, HI. [Oral].
- Hall, S. and M. C. Monroe. 2012. Climate change education for secondary students. PINEMAP Annual Conference, May 14-16, Atlanta, GA. [Poster].
- Hall, S. and M. C. Monroe. 2012. Climate Change Education for Secondary Students. North American Association of Environmental Education (NAAEE) Research Symposium, October 9, Oakland, CA. [Poster].
- Kidd, J.B., J.R. Seiler, M.C. Monroe, and S. Sriharan. 2012. The PINEMAP Intern Program: Integrating undergraduates into forest resource and climate change research and education. PINEMAP Annual Conference, May 14-16, Atlanta, GA. [Poster].
- Kidd, J.B., J.R. Seiler, M.C. Monroe, and S. Sriharan. 2012. The PINEMAP Intern Program: Integrating undergraduates into forest resource and climate change research and education. Biennial Conference on Undergraduate Education in Natural Resources, March 23-24, Fort Collins, CO. [Oral].
- Kidd, J.B., J.R. Seiler, M.C. Monroe, and S. Sriharan. 2012. The PINEMAP Intern Program: Integrating undergraduates into forest resource and climate change research and education. Ecological Society of America Annual Meeting, August 5-10, Portland, OR. [Poster].
- Monroe, M. C., A. Stenstrup, S. Hall, J. Li, and A. Oxarart. 2012. Climate Change and Southeastern Forests: A New PLT Secondary Module. North American Association of Environmental Education (NAAEE) Conference, October 11, Oakland, CA. [Oral].
- Oxarart, A., M. C. Monroe, S. Hall, J. Li, and A. Stenstrup. 2012. Project Learning Tree Secondary Module: Southern Forests and Climate Change. PINEMAP Annual Conference, May 14-16, Atlanta, GA. [Poster].

- Seiler, J.R., J.B. Kidd, M.C. Monroe, and S. Hall. 2012. Internship Successes and Education Research: PINEMAP's Integrating Education Projects. PINEMAP Internal Webinar Series, September 21. [Oral].

→ Provide a short narrative describing any workshops, courses, and/or trainings conducted.
Highlight in yellow items added to the list in the March 2013 Progress Report.

Undergraduate Communication Course

A distance delivered undergraduate course, *Effective Communication Skills,* was begun in the fall 2012 semester. The course was required of interns who participated in the past summer as PINEMAP Undergraduate Fellows and worked on a research project with graduate mentors. The course has the following objectives: learn principles of oral communication and inquiry-based education, create effective inquiry-based educational lessons regarding the role of southern pine management in climate change mitigation, present educational lessons to multiple local secondary school classrooms, learn to effectively use power point as a communication tool, and learn principles of scientific communication in the form of a poster presentation. The "heart" of the course is the delivery of ten presentations by each student to public schools and groups near their home institution.

Five of the six PINEMAP Undergraduate Fellows participated in the course. Students registered for 3 credits of independent study at their home institution. Through the semester students watched material on practical effective communication skills, listened to live lectures, and practiced their presentation to each other and the instructors. The class will be evaluated using a course evaluation tool, and students were surveyed before and after the class on speaking anxiety.

Presentations to nearby public secondary schools occurred in the month of November, 2012. All combined, the five students gave 54 presentations at 16 different schools, reaching a total of 29 teachers and 1,060 students.

Fellows were asked to complete a course evaluation survey at the end of the semester. Four of the five participants completed the survey. The survey contained 19 closed-ended, Likert-type items and 3 open-ended short answer questions.

Respondents indicated that the workload for the course was appropriate for the credit received. Content and assignments were identified as being organized and well-ordered, but due date timing could potentially be improved. Students agreed that course content increased their understanding of the subject matter and that their interests were stimulated. Students also identified that their ability to think creatively increased. Review of submitted assignments was met with a neutral response on average.

Responses to open-ended items indicate that students benefited greatly from practicing the public school presentations. The abstract, poster presentation, and oral presentation assignments were positively received and thought to be beneficial. However, due to the timing of these assignments and course schedule, feedback on these assignments suggests that they could be improved. Fellows suggested that the assignments should be spread out giving students more time to discuss them as a group and avoid having work for multiple classes pile up in a short time frame.

Distance Graduate Course

A distance graduate course, *Climate and Forests*, was launched in the spring of 2012. The course goals were to 1) prepare graduate students to address climate change mitigation and adaptation issues in southern pine forests; 2) facilitate greater levels of integration by encouraging students to engage in processes designed to enhance communication, cooperation, and collaboration among disciplines and across research, education, and Extension functions; and 3) build interdisciplinary research, education, and outreach capacity. Twenty-two students (16 Ph.D. and 6 M.S.) from 8 southeastern universities participated in the course, and an interdisciplinary team of 15 PINEMAP faculty members assisted with course instruction.

Students registered for 2 credits of independent study or special topics at their home institution. All course materials (readings, archived webinars, online discussion threads, and additional resources) were hosted on a course web site, the PINEMAP Education Portal. Throughout the semester, students participated in live webinars and reviewed narrated PowerPoint presentations covering topics including impact of climate change on forest ecosystems, climate model projections in the southern U.S., southern forest futures, carbon scoring and policy, Extension programming, challenges to communicating about climate, decision support system, and interdisciplinary research. In addition, students completed readings related to each topic and participated in online discussion.

Students completed two group assignments during the course. For the research assignment, students in each PINEMAP Aim group worked with a faculty member to understand their research foundations and questions. In working with fellow students and faculty in their disciplines, students learned about existing disciplinary knowledge, why research is proposed, and what questions the research is designed to answer. Student groups developed presentations to explain their Aim research to the other students. All students reviewed other groups' presentations and answered questions during a live webinar. For the interdisciplinary outreach assignment, students worked in groups to develop an extension product (fact sheet, web site, presentation, or action plan) for a target audience (limited resource landowner, private landowner, industrial/corporate landowner, or state forest agency) on the topic of southern pine forest vulnerability to climate change or management practices to enhance forest resilience. Groups created an evaluation form, sent their product to a team of reviewers, synthesized evaluation comments, and presented a brief report on their product and what they learned from this experience.

At the conclusion of the course, students completed an online survey evaluation and offered feedback on a webinar. Twenty students completed the survey which included 14 questions (3 closed-ended and 11 open-ended). Furthermore, a discussion activity regarding the course was conducted at the 2012 annual meeting to garner additional feedback from graduate students, faculty, postdocs, and staff.

Quantitative survey responses indicate that the course did a fairly good job at facilitating learning about climate change in the Southeast and climate change mitigation and adaptation in southern pine forests. Respondents also indicated that the course did a fairly good job at instilling a better understanding of integration among the PINEMAP Aims. Students indicated that the course aided them in better understanding PINEMAP objectives and strategies, and the majority of students felt that the course content was well organized. In addition, respondents indicated that the assignments were effective mechanisms for learning about Aim research goals and about Extension product development.

Qualitative responses gathered from the survey and the annual meeting activity indicate that students enjoyed interacting, collaborating, communicating with, and getting to know other graduate students and found that the course provided a great deal of useful information. Students thoroughly enjoyed the presentations, and felt that they were very informative and that the speakers were very knowledgeable. The course could do better at promoting discussion both online prior to the webinars and also during live webinars.

Students also indicated that the workload may have been too much for a 2-credit course and that some readings could be designated as supplemental. Students and faculty indicated that there needs to be more uniformity in grading—all students should receive a letter grade and there should be a standardized system for assigning grades. Students thought the assignments were useful, but also consistently noted that distance group work is difficult and tedious; students also indicated that more detail and direction for assignment 2 would be helpful and make the assignment more useful.

Students and faculty alike overwhelmingly agree that the course should be conducted in subsequent years of the project. We will utilize the evaluation results to guide revisions to the course structure and format for a two-credit graded course; revise assignments to provide better detail and instructions, as well as more opportunity for feedback; and review assigned readings. In addition, we will work closely with course instructors to clearly explain their role in and responsibilities with the course. We will ask instructors to be engaged in online discussion during their topic week and to develop specific points/questions to guide student discussion and input.

A draft syllabus for the second offering has been developed and faculty speakers have been secured for each week of the course. The course will be required of new PINEMAP graduate students and open to other interested students working with PINEMAP co-PIs.

PLT Activities with the Center for Precollegiate Education and Training, University of Florida

- We conducted a half-day program with 48 high school students in two Science Quest programs, a week-long residential science camp program at UF. Students explored the carbon cycle and measured carbon stored in trees at the Austin Cary Memorial Forest. This activity enabled us to pilot test two PLT activities. (July 11 and July 18, 2012)
- We worked with 90 high school students to provide basic information about climate change and to help them understand why people have different perceptions on the issue in two sessions, July 16 and 20. This enabled us to pilot test one PLT activity.

Contribution to Existing Undergraduate Course

We created a new case study on climate change communication challenges for the course Society and Natural Resources, taught at the University of Florida. The course is required of forestry and natural resource conservation majors and a large number of wildlife majors enroll as well. The case study used a National Research Council booklet as the information source and explored several possible explanations for distinctly different public perceptions about climate change, including partial information, selective perception, confirmation bias, homophily, and identity cognition. After an introduction to the Six Americas, students practiced developing statements to answer basic climate change questions for people holding different beliefs.

→ Provide a short narrative describing experiments or surveys conducted and/or analyzed. *Highlight in yellow items added to the list in the March 2013 Progress Report.*

Internship Survey

John Kidd and John Seiler leveraged the opportunity to survey undergraduate interns to examine intern attitudes toward research before and after a 12 week internship in PINEMAP-related research. Interns were asked to complete a pre-internship survey on their attitudes toward research. Pre-internship results will be compared with those from a post-internship survey as an attempt to detect changes in attitudes. This study will be conducted over the length of the Undergraduate Internship Program, and has a potential maximum sample size of 50 interns. To date, five of six interns voluntarily completed either pre- or post-internship surveys, and three students completed both surveys. Open-ended items from the post-test indicate that these particular students greatly value the research internship experience and gained a greater knowledge of the research process. Some respondents clarified their expected post-graduate career decisions.

Effective Communication Skills: Public Speaking Apprehension Survey

Undergraduate fellows participating in the PINEMAP internship program's distance education course, *Effective Communication Skills*, were asked to complete a pre- and post-

course quantitative survey using 5 point Likert-type items on their public speaking apprehension. Pre- and post-test responses will be collected each year the course is operated to identify changes in individuals' anxiety about public speaking. At the end of the course in fall 2012, all six students in the course voluntarily completed the pre-course survey and three students completed the post-course survey. Analyses on the survey will be conducted when all students have been through the program and the course has been given two more times to approximately 30 more students.

High School Educators: Forest Management Survey

A web-based survey of high school science teachers in the 5 state southern Piedmont region of the United States was conducted to study their knowledge, attitudes and teaching practices with regard to forest management. A total of 1024 surveys were successfully delivered with 324 returned for an adjusted response rate of 32%. Results indicate that most teachers (82%) agree forestry should be taught in high schools and most frequently present forestry concepts in the context of ecosystem services, followed by concepts related to physical and physiological characteristics of trees. Concepts related to products, uses, and management are taught least frequently. Variables that predict teaching frequencies for each of these three concept groups include classes taught in the last five years, environmental education program training, and childhood location in addition to attitudes toward and knowledge of forest management. The most widely reported constraints to teaching forestry concepts and taking field trips to forests are mandated standards or curriculum (60%), money (40%), time (32%), mandated testing (19%), and training, interest, and infrastructure (19%).

We also examined in detail the use of forest field trips among high school science teachers in the Southern Piedmont of the United States. We surveyed them about whether they have taken field trips to forests. We collected data on teacher characteristics, natural resources training and extra-curricular activities, and proximity of their school to a forest. Binary logistic regression was used to model the relationship between these data and whether a teacher has taken a class on a forest field trip. We also asked for comments about what they believe constrain these types of trips. Under half have taken a forest field trip. For respondents that teach in a high population density, 84 (46%) reported that they do not have a forest within walking distance of their school and 99 (54%) noted that they do. Forty-six percent, or 38 of the teachers in medium population densities marked that they do not have a forest within walking distance, while 45 (54%) do. For teacher respondents in a low population density, 8 (27%) reported that they do not have a forest and 22 (73%) do. Among the 56% of teachers who reported there is a forest within walking distance of their school, 105 (65%) have taken forest field trips for educational purposes and 57 (35%) have not. On the other hand, only 20 (15%) of the 44% that reported not having a forest nearby have taken field trips and 110 (85%) have not. Model results indicate that teaching at a school that is within walking distance to a forest, confidence in teaching forest topics, and participation in natural resources school programs predict teacher use of forest field trips ($\chi^2 = 127.81$).

Educator Needs Assessment

A needs assessment survey was distributed throughout the region in May 2012 to enable secondary science teachers to provide input to the PLT module. Because we asked people to forward the survey link to their lists, it is not possible to report on non-response bias. A total of 746 surveys were received; 675 of those were completed. Most respondents teach 11th and 12th grades (61% each); 57% teach 10th graders and 48% teach 9th graders. We heard from fewer middle school teachers; 16%, 21%, and 21% teach 6th, 7th, or 8th grades, respectively.

Most respondents (77%) already cover climate change in their secondary science courses. Teachers report being most likely to teach about climate change in environmental science, earth science, biology, environmental studies, or agriculture courses. In agriculture, chemistry, and physical science courses the largest percentage of respondents do so with informal discussions. Planned lessons lasting one week or less are used by the largest percentage of respondents teaching biology, AP biology, earth science, integrated science, and marine science. Teachers use planned lessons lasting more than a week in ecology, environmental issues, environmental science, and AP environmental science classes. A large majority (82%) of the respondents are interested in continuing to cover climate change in future courses.

Many teachers believe they have a moderate understanding of the issue (46%); 24% have a detailed understanding and 28% have a basic understanding. Because some students and parents may disagree with climate change science, only 37% of the respondents are very comfortable teaching about climate change; 35% are somewhat comfortable, and 15% are neutral.

Most respondents thought the variety of teaching strategies listed on the survey were appropriate to use for teaching about climate change. The widest diversity of respondents thought presenting all perspectives as valid, even though most scientist disagree to be the most inappropriate option (36% very inappropriate and inappropriate; 41% appropriate and very appropriate). Over 85% of the respondents believe it is appropriate or very appropriate to: explain scientific uncertainty, present the rationale for how people interpret climate change differently; discuss advantages and disadvantages of climate related policies, and discuss the history of climate change science. Just over 50% of the respondents are most interested in covering climate change impacts related to their local area (50.5%), their state (54%), and the nation (50%). Most, however, would like to cover climate change as it relates to the world (81%).

The majority of respondents (57%) prefer to incorporate a secondary module through lessons that can be inserted into several units throughout their course. Only 8% would use it as a unit lasting more than two weeks, but 30% would teach the module as a unit lasting one week or less, and 34% in a unit lasting from one to two weeks.

All of the supplemental resources will be very useful to the largest percentage of respondents with hands-on student activities (80%) and lab exercises (76%) collecting the

most votes. Background information, data sets to analyze, short videos of scientists, and photographs were also very useful.

It is very important to the largest percentage of respondents for the module to help them meet the following goals:

Connecting science to students' everyday lives	80%
Emphasizing critical thinking	79%
Developing data analysis skills	65%
Emphasizing choices that affect sustainability	55%
Emphasizing systems thinking	53%
Enabling students to use technology	46%

It is fairly important to the largest percentage of respondents for the module to help them meet the following goals:

Connecting science issues with policy	46%
Building skills for working in groups	43%
Exploring career options	43%
Implementing action projects	42%
Teaching about technology	42%

Climate Change Education Strategies

Climate change is a global issue that requires knowledgeable citizens who are able to make informed decisions about mitigation and adaptation activities. Currently, neither adults nor teens are well informed on this issue, suggesting the need for a stronger education effort. However, some teachers may avoid climate change because they are unsure of how to approach a controversial issue. Also, some students enter the classroom with misconceptions and attitudes about climate change that are influenced by sources outside the classroom. Using activities drafted for the Project Learning Tree secondary module, the following research questions were being investigated:

1. To what extent are student attitudes about climate change influenced by their perception of their parents' opinions of climate change?
2. How does integrating carbon lessons with climate change affect student interest and knowledge about carbon?
3. Is a role play or discussion more effective for encouraging students to respectfully discuss a variety of opinions about climate change?

Methods

Data were collected at two summer science programs organized by the Center for Precollegiate Education and Training, Science Quest (SQ) and Student Science Training Program (SSTP).

Science Quest

Participants were 47 rising high school sophomores in two offerings of a week-long program. Students in each program engaged in a half-day educational experience about forest carbon. The week one group (SQ 1) learned about carbon cycles in the context of climate change (Table

1). The week two group (SQ 2) participated in the same activities, but climate change was not mentioned until after the post test (Table 1). Group interviews were conducted after completing the activities to explore students' attitudes about the lesson.

Table 1. Students' attitudes about the lesson in the SQ1 group and SQ2 group.

SQ1 group- Carbon cycle activities in the context of climate change (n=23)	**SQ2 group- Carbon cycle activities <u>not</u> in the context of climate change (n=24)**
- Pre-test on carbon knowledge - Activities • Students move through the carbon cycle as a carbon atom and discuss human impacts on the carbon cycle • Students measure carbon in a tree, calculate their state's sequestration rate, and compare to emissions rate - Post-test - Interviews	- Pre-test on carbon knowledge - Activities • Students move through the carbon cycle as a carbon atom • Students measure carbon in a tree and calculate carbon in the forest - Post-test - Discussion of human impacts on carbon cycle, state's sequestration rate compared to emissions rate - Interviews

<u>SSTP</u>

Participants were 42 rising high school juniors and seniors in a seven-week research program. All students took a pretest that measured their climate change knowledge and attitudes as well as their perception of their parents' attitudes. Students attended a one-hour lecture introducing climate change science and why people hold different perspectives about this issue. Four days later, all students took a posttest on their climate change knowledge and attitudes. Students were split into small groups. Half of the groups participated in a role play with different climate change perspectives in which they were asked to generate three solutions to climate change that everyone could agree on. The other groups participated in a discussion in which they had to agree on three climate change solutions they felt would be practical given that people in their community hold many perspectives (the same perspectives as presented in the role play). Students also completed a questionnaire about the lesson.

Results

<u>Students' Climate Change Attitudes</u>

A forward stepwise regression was conducted to predict student attitudes about climate change. There was a strong R^2 value for SQ2 and SSTP; the most significant term was perception of parents' climate change attitudes. SQ1 had a weak R^2 value and the most significant term was students' political views. This implies that students come into the classroom already holding opinions about climate change that are partially influenced by outside factors, such as perception of parents' attitude and the political party they favor.

<u>Student Knowledge Gain and Interest</u>

In the SQ1 group, students scored significantly higher ($p<0.05$) on the posttest than the pretest. The pretest and posttest scores were not significantly different for SQ2. There was no significant difference between the week 1 and 2 pretests, and also no significant difference for

posttests. Embedding the carbon cycle lesson in the context of climate change appears to have significantly increased student knowledge about the carbon cycle, although this conclusion would be stronger if there were a significant difference between the posttest scores. In the interviews, students explained that linking carbon cycle activities with climate change makes the topic more interesting and relevant, even for students who are less concerned about climate change.

Role Play and Discussion

Students engaging in the role play activity made more frequent mentions of other perspectives but also had a greater frequency of disrespectful comments than students engaging in the discussion activity. Changing the role play to emphasize respect or adding a moderator could make the conversation more respectful. This modified role play offers a potential strategy for teachers to approach the controversy while not confusing students about the science of climate change.

Discussion

Climate is typically a unit for earth science classes, but it can also enhance the biology curriculum by providing an interesting purpose for learning about topics such as the carbon cycle. Students come into the classroom with knowledge and attitudes influenced by outside sources, however, which could affect learning. Activities should be designed to offer teachers guidance to approach the types of situations they are likely to face and to facilitate interesting and engaging activities with students.

Progress Updates: Milestones and Work Plan Tasks

Provide a short narrative describing progress and accomplishments on the year 2 milestones and work plan tasks listed below.

Progress updates are carried over from the November 2012 Interim Report. Please provide additional progress updates as applicable for each milestone and work plan task under the March 2013 Progress Report heading.

Year 2 Milestones

→ Report of audience assessment for PLT module (November 2012).

November 2012 Interim Report:

We completed a survey of secondary science teachers in the Southeast. The information gleaned is providing justifications for the Project Learning Tree/PINEMAP module and helping us prioritize activities and resources. These results have been shared with the Education Advisory Committee and PINEMAP collaborators through a research summary, PINEMAP newsletter article, and PINEMAP internal webinar. A peer-review

publication has been accepted in Applied Environmental Education and Communication's special edition on climate change.

March 2013 Progress Report:

Milestone complete, no additional activity to report.

→ Report of research on climate change education strategies (November 2012).

November 2012 Interim Report:

Data were collected in July on climate change education strategies to determine whether connecting carbon lessons to climate change affects student interest and knowledge gain, whether student's attitudes about climate change are influenced by their perception of their parents' opinions of climate change, and whether a discussion or a role play is more effective in getting students to discuss the variety of opinions about climate change. The results will be used in Stephanie Hall's thesis and developed into a journal article.

March 2013 Progress Report:

Stephanie Hall is finishing data analysis and drafting her thesis, and is scheduled to graduate in spring 2013.

→ Report of teachers' attitudes concerning forest management (November 2012).

November 2012 Interim Report:

A full report of this information is contained in the thesis:
Fowler, S.M. 2012. Forestry Education Attitudes and Teaching Practices Among High School Science Teachers in the Southern Piedmont. M.S.Thesis, Virginia Tech, Blacksburg, VA.

March 2013 Progress Report:

Further detailed analysis on factors predicting teachers' use of forestry field trips was conducted. A paper is currently in review for Natural Science Education.

→ Undergraduate research internships completed (August 2012).

November 2012 Interim Report:

Six interns worked at their mentors' host universities in mid- to late-May. Interns remained at their host university through the 12 week internships. After internships concluded in early August, students returned to their home universities for the fall semester and to participate in the undergraduate *Effective Communication Skills* course.

March 2013 Progress Report:

Undergraduate internships were completed in December with the end of the undergraduate distance course, *Effective Communications Skills*. Five of six interns participated in the course, and completely went through the full internship program.

The second year of the internship program began with the identification of 12 best undergraduate applicants and graduate mentors to the 2013 program. These applicants were notified in February. As of March, placements for the summer internship are in the process of being finalized.

→ Undergraduate teaching and communication distance course completed (December 2012).

November 2012 Interim Report:

The undergraduate distance-delivered course, *Effective Communication Skills*, is scheduled to be completed the second week in December. The course is on pace to meet this milestone with five of six students earning credit for completion.

March 2013 Progress Report:

The undergraduate distance-delivered course ended in December 2012. Five of six interns participated in and completed the course.

→ Web-based course in multidisciplinary research for graduate students completed (May 2012, May 2013).

November 2012 Interim Report:

The first offering of the PINEMAP graduate student course occurred spring term 2012 at 8 universities for 22 students.

March 2013 Progress Report:

The second offering of the course began January 2013 and ends April 2013. Nineteen students are participating in the course. Ten PINEMAP co-PIs and staff are leading weekly webinars and discussions; the course introduces graduate students to the diversity of disciplines that contribute to better understanding climate and forests in the South.

Year 2 Work Plan Tasks

Undergraduate Internship Program

→ Announce winners of intern micro-grant program (April 2012).

Graduate student winners of the 6 micro-grants to host interns for summer 2012 were notified in March 2012. Official letters were attached in an email to successful applicants, and they were asked for a confirmatory response within one week.

→ Facilitate undergraduate intern transitions to host universities (April-May 2012).

Mentors and the program coordinator assisted interns with identifying and procuring suitable housing at or near host universities for their summer internship. All interns needing housing finalized arrangements by their starting dates in May.

→ Maintain the intern program web site and update as needed with information for internships and the undergraduate distance course (September-October 2012).

This task is being performed as needed by the intern program coordinator. A Frequently Asked Questions (FAQ) page was uploaded to the intern program section on the PINEMAP internet site.

→ Continue development of undergraduate teaching and communication distance course (May-July2012).

The syllabus for the undergraduate teaching and communication course was completed in June. Other course materials such as assignment handouts and class notes were finalized in August.

→ Weekly monitoring of summer 2012 undergraduate intern program participants (June-August 2012).

This task is being performed on an informal basis by the intern program coordinator. Interns are contacted every other week when timesheets are due and other weeks to schedule online meetings.

→ Monthly online meetings with interns and graduate student mentors (June-August 2012).

We had 2 monthly meeting with program participants. Interns were able to meet each other and describe their current and projected work schedules. The program director provided additional detail about the fall distance course and how the internship fits into that half of the intern program.

→ Finalize undergraduate teaching and communication distance course syllabus (August 2012).

The final version of the undergraduate teaching and communication distance course syllabus was completed in June. The course is titled *Effective Communication Skills*. During the first half of the course, student interns learn public speaking skills in conjunction with some basic principles of science education. Concurrently, students identify learning content standards around which to develop their oral presentations to school students. The second half of the course requires interns to deliver their presentations, write scientific abstracts, and create professional quality scientific poster and oral presentations. These abstracts and presentations focus on work conducted and data collected during the summer internship.

→ Recruit secondary school teachers, 4H and Scout leaders, and introduce undergraduate intern teaching activities (June-October 2012).

More than 342 public secondary school science and agriculture teachers within three hours of interns' universities were contacted. From this group, 32 teachers inquired about how to schedule students for school visits. Teachers are currently scheduling visits with interns.

→ Conduct undergraduate communication and teaching distance course on education (August 2012).

November 2012 Interim Report:

The undergraduate course, *Effective Communication Skills*, operating as part of the internship program began on September 5. Five of six interns have completed the first part of the course that focused on public presentation skills. Students each developed a 50 minute presentation that conveys PINEMAP's goals and focuses on specific work, within the broader context of climate change, each intern conducted over the summer internship. Interns began presenting their lessons to public secondary school students during the second week of November.

March 2013 Progress Report:

The course was completed by December 14, 2012. Five of the six interns that participated in the course successfully completed it.

→ Promote 2013 summer undergraduate internship program (November 2012-February 2013).

November 2012 Interim Report:

Materials for the 2013 internship program are currently being updated in preparation for promotion in late November. Furthermore, we have decided to change the titles of participating undergraduates from "Undergraduate Interns" to "Undergraduate Fellows." This change better reflects the mission of the internship program to not only train students as undergraduate research assistants, but also to have them communicate the research to a variety of audiences.

March 2013 Progress Report:

The 2013 PINEMAP Undergraduate Fellowship Program was promoted from November 2012 through January 31, 2013. Announcements were distributed through relevant organizational and college listservs, and the position was posted on a variety of natural resources and ecology job boards.

→ Deliver inquiry-based educational presentations (October-December 2012).

November 2012 Interim Report:

Interns began site visits to nearby secondary schools and scouting groups during mid-November. Each intern is expected to deliver at least 10 presentations. Currently, 26 biology and agriculture classes and two Boy Scouts groups are scheduled for visits.

Students will continue to schedule visits and deliver presentations through the first week in December.

March 2013 Progress Report:

The five students in the course delivered 54 presentations at 16 public secondary schools in the classrooms of 29 teachers to a total of 1,060 students.

→ Evaluate goals, objectives, structure, and format of summer internship program and modify as necessary (January 2013).

March 2013 Progress Report:

Goals and objectives remain unchanged. Intern pay is split between the summer internship and fall course to incentivize continuing through the internship past the summer.

→ Conduct follow-up evaluation with teachers, mentors, and interns and modify as necessary (January-February 2013).

March 2013 Progress Report:

Done. Additional opportunities and requirements for interaction between participants will be implemented for the 2013 summer fellowships.

→ Conduct selection process for winners of intern micro-grant program (February-March 2013).

March 2013 Progress Report:

Completed March 2013. Placements are being finalized.

→ Conduct selection process for winners of undergraduate internship program (February-March 2013).

March 2013 Progress Report:

Completed March 2013. Placements are being finalized with official offers made and accepted by mid-March.

Distance Graduate Course

→ Obtain evaluation input from students and faculty on future graduate student interactions and next course offering (January 2013).

Evaluation data were collected in April and May 2012 and the course was discussed during the annual PINEMAP meeting in Atlanta. A compilation and summary report has been shared with all instructors and the course organizing team for 2013.

→ Compile and review evaluations and student/faculty input; plan for second version of course scheduled for spring 2013 as well as future graduate student activities and interaction within PINEMAP.

An evaluation report for the spring 2012 course was compiled.

We are also exploring opportunities and mechanisms to continue to engage graduate students in interdisciplinary research and outreach activities. Specifically, we are developing a plan and process for graduate students to team up to co-author Extension fact sheets for PINEMAP. The initial plan is for student teams to start planning and discussing before the 2013 annual meeting, and at the annual meeting, we will have an activity where they will share ideas, drafts, etc. and get feedback and assistance from Aim 6 members.

→ Revise course syllabus, structure, themes, and overall goals/objectives based on evaluations and student/faculty input.

The syllabus for the spring 2013 course was developed after consideration of the evaluation feedback from the spring 2012 course.

→ Identify instruction and assignment coordinators/teams; work with instruction and assignment teams to finalize course syllabus, structure, and themes.

Completed Nov 1, 2012.

PLT Secondary Module

→ Develop and revise activities, based on advisory committee feedback (January-December 2012).

November 2012 Interim Report:

We have held 5 conference calls with the Education Advisory Committee to review activity drafts and concepts. The final call is scheduled for December 2012. In addition to the feedback gathering during the call, several committee members have emailed suggestions and comments. Ten activities have been developed and are being revised, based on Advisory Committee feedback. The table on pages 14-15 summarizes activities that will be included in the module and their stages of development.

March 2013 Progress Report:

Complete. We held our final advisory committee conference call regarding activity developed. We have incorporated all the feedback provided by this group. The final module draft was completed and contains 13 activities, divided into 5 sections (see table on pages 20-21). The final draft was returned to the group, with a summary of the changes that were made to respond to their feedback. We invited all members to be on the advisory committee from another year January 2013-2014 to provide guidance on formative evaluation and training tasks. Four members agreed, and we recruited two new members. We will hold 3 conference calls during the year, with the first one scheduled in March 2013.

→ Identify experts to review activities (June-December 2012).

November 2012 Interim Report:

In progress.

March 2013 Progress Report:

Complete. Experts were identified through each aim, along with a few external experts from CORRIM, USFS, and the National Renewable Energy Laboratory. We have received 25 reviews from this group and are incorporating their comments into the new draft of the materials.

→ Develop supplemental resources (videos, web site, etc.) (July 2012-April 2013).

November 2012 Interim Report:

In progress.

March 2013 Progress Report:

In progress. We have drafted early ideas about the website and potential videos.

→ Research report on climate change education strategies (November 2012).

November 2012 Interim Report:

Stephanie Hall (UF) is analyzing data for her thesis and a journal article – in progress.

March 2013 Progress Report:

In progress. Stephanie Hall is finishing data analysis and drafting her thesis, and is scheduled to graduate in spring 2013.

→ Begin plans for formative evaluation (December 2012).

November 2012 Interim Report:

In progress. Christine (Jie) Li (UF) is developing a plan for the evaluation as part of a fall course and will finalize the plan with input from the Advisory Committee.

March 2013 Progress Report:

In progress. Plans are being finalized to recruit 40 high school teachers to use 2-4 activities with their students and report on their experience.

→ Expert review of module (January-April 2013)

March 2013 Progress Report:

Complete. A review process was developed and materials were sent to experts in February. We received excellent edits and comments from all reviewers (25 total), and we are currently working on revising the materials accordingly.

→ Develop formative evaluation tools (January-April 2013)

March 2013 Progress Report:

In progress. Christine (Jie) Li (UF) developed a draft teacher evaluation form that we will modify for each activity. Christine will also be developing tools to collect student data regarding knowledge, skills, attitudes, and behaviors for her dissertation research.

→ Develop training workshop for teachers (online and in person) (January-April 2013)

March 2013 Progress Report:

In progress. We have discussed early ideas for the online training materials and contacted several people who might be able to help complete this work. We are planning a May 24 in-service teaching training on UF Campus with several partners (CPET, Florida Climate Institute, LEEF).

Aim 5 Article for *PINEMAP Press*

The purpose of PINEMAP's quarterly newsletter, the *PINEMAP Press* is to inform and educate on research results, programs, and outcomes of the PINEMAP project. The newsletter is distributed to internal project collaborators as well as stakeholders, NIFA, and university administrators.

Issue #3 will be published in May/June 2013. Please identify a topic for a brief (600 words or less) article for the May 2013 issue. Provide a preliminary title, list of authors, and a 3 -5 sentence summary.

Title:

Author(s):

Summary:

Potential ideas:

- Stephanie Hall's results on climate change education strategies.
- Report on the May 24 workshop, an in-service training for teachers on climate change at UF (dependent on issue deadlines)
- Feature the fact sheets that grad students write for the pinemap course – in a blend of aims 5 and 6
- Feature on the UG communication course at Virginia Tech and the presentations fellows gave to young students.

Project Learning Tree Secondary Module: Activity Descriptions

Section 1. Climate Change and Forests: Theme: Projected climate change will likely affect forest ecosystem.	
Activity 1: The Changing Forests	In small groups, students learn about research that is exploring climate change impacts on southeastern forests. This information will help forest managers monitor and respond to changes using new tools and management techniques.
Activity 2: Clearing the Air	Students learn about the scientific evidence supporting climate change, use this information to evaluate and improve common conclusions that people draw about climate change, and participate in a role play to negotiate solutions. Through this activity, students explore the nature of science and better understand why there are various perspectives about climate change.
Activity 3: Atlas of Change	Students will use two online resources, the Climate Change Tree and Bird Atlases from the United States Forest Service, to explore the effects of climate change on the future distributions of suitable habitats for forest types, tree species, and bird species in southeastern United States.
Section 2. Forest Management and Adaptation Theme: Forests can be managed to thrive in a changing climate.	
Activity 4: Managing Forests for Change	This activity allows students to explore the connections between forests, climate change impacts, and management strategies for creating resilient forests. Students diagram these connections through concept mapping.
Activity 5: Mapping Seed Sources	Students use growth data from loblolly pine forests to identify genetically different populations and project where trees with certain characteristics are likely to thrive in changing climatic conditions.
Section 3. Carbon Sequestration Theme: Forests can be managed to reduce atmospheric greenhouse gases and to prevent greenhouse gases emissions.	
Activity 6: Carbon on the Move	By becoming a carbon atom, students learn how carbon cycles through biological and physical systems. Group work and class discussions allow students to better understand global carbon pools, quantities, fluxes, and residence time—with an emphasis on how human activities can affect the cycle.
Activity 7: Counting Carbon	Students measure trees near their school and calculate the amount of carbon stored in individual trees. Students then compare the carbon sequestration

	potential for land-use types in their state, and compare this to the amount of carbon released by human activities to discuss forests' ability to sequester atmospheric carbon.
Section 4. Life Cycle Assessment **Theme: Consumer choices can play a role in reducing and preventing carbon emissions.**	
Activity 8: The Real Cost	Through a simulated shopping activity students will learn about the impact of their consumer choices on the environment. They will explore questions such as: What factors do we use to make decisions about the products we buy? What are the hidden environmental costs of everyday items? Who should pay for these hidden costs?
Activity 9: Adventures on Life Cycle Assessment	Students investigate the life cycle data for three types of outdoor dining furniture (plastic resin, cast aluminum, and pine) and make conclusions regarding their relative impact on global climate change. The information necessary to perform the assessment is provided in two formats: 1) a three-act stage play and 2) student presentations.
Activity 10: Life Cycle Assessment Debate	After a debate where students compare products, students develop a set of life cycle questions that can be used to guide consumer choices.
Section 5: Solutions for Change **Theme: Working toward healthy, sustainable forests and communities**	
Activity 11: The Carbon Puzzle	Using a group activity, students assess a series of facts to understand how to manage forests to maximize the removal of atmospheric carbon.
Activity 12: Future of our Forests	Student teams review what they have learned in this module by compiling a report on the future of southeastern forests. Students can share their knowledge by writing a letter to state or county forester, city arborist, local newspaper, community leaders, or other audiences that are relevant in your area.
Activity 13: Starting an Environmental Action Project	Students use the knowledge gained throughout this module to plan and complete an environmental action project related to forests and climate change solutions in their community.