

Evaluation Report Phase 1 Class of 2010

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I. Background and Purpose

A. Background

The **Climate Stewards Project (CSEP)** provides opportunities for local, state, and regional education partners to work with NOAA in responding to environmental challenges and inspire our youth to pursue careers in science, technology, engineering, and mathematics (STEM). CSEP brings NOAA science and education efforts together in a cohesive plan to provide education opportunities and rewards for environmental stewardship actions.

The purpose of the evaluation was to document the process of developing the Climate Steward project, and to assess the extent to which the outcomes were met with the 2010 group (the class of 2010).

B. Goals and Objectives

Goal 1. Provide educators with sustained professional development, STEM and geography-based teaching and collaborative tools, digital content resources and compelling NOAA contextual-based teaching applications that align with national standards for targeted content areas.



Goal 2. Provide ALL students of educators who are “climate steward certified” the opportunity to explore climate-related STEM and geography in a variety of engaging and interactive climate contexts to increase student interest, participation, knowledge about careers, and the ability to apply their knowledge of mathematics, science, technology and geography in real-world environmental situations and day-to-day decision making through a stewardship project.

C. Logic Model

Logic Models were developed with the Advisory Board in May 2010. The inputs, outputs and outcomes for the CSEP and for the stewardship project are shown below.

Hypothesis: Increased content knowledge and extended¹ collaborative work affects behaviors and attitudes about climate science.

¹ Extended is defined as a yearlong participation in the Climate Stewards project, including discussing content, communication and outreach strategies.

Climate Stewards Logic Model – Overall Project				
Inputs (Resources)		Outputs (Activities)		Outcomes (Goals)
Educators Informal Formal K-4 5-8 9-12 College Agencies (NOAA partners) Community Organizations (NGOs) NOAA Resources (funding, people) NOAA Projects (best practices) NSTA	Recruitment Elearning setup for CS Matrix of resources by climate literacy standards Posting of PD opportunities Stewardship examples, guidelines	Professional development opportunities Virtual Support for learning (social media, communities) Distance learning opportunities Develop data driven place-based stewardship projects	Participants conduct stewardship projects with partner involvement (local and NOAA+ ²) Present results of stewardship project (archive presentations) Participants contribute additional resources	Direct Outcomes 1) Increase adult educator STEM climate content knowledge 2) Increase the use of data resources by educators Indirect Outcomes through the teachers/participants 1) Increase student participation in environmental stewardship 2) Increase student knowledge about careers in STEM climate science 3) Increase student ability to apply STEM climate science concepts and skills in meaningful ways

The Climate Stewards Education Project outputs (activities) are to:

- Provide a series of **in-service opportunities** to formal and informal educators that include online and face-to-face seminars, symposia, short courses, and mini-conferences. The successful completion of a 15 training hours (aka professional development or PD), and the completion of a climate stewardship project will result in “climate steward” certification for the educator. Content will focus on Climate Literacy Guiding Principles D, E, F, G and Climate Literacy Essential Principles 2A, 2B, 3A, 4D, 5B, 5E, 6D and 7A-F.⁵ The entire 15 hours need not be completed before a Stewardship Project plan is developed and implemented. This is to accommodate different schedules and interests of the participating educators. The PD might also be used to support the Stewardship Project activities by increasing the knowledge of the participant about specific

² NOAA partners and other federal agencies

topics, strategies or resources specifically needed for the project. A core set of PD experiences tied to the pre/post test is required.

- Provide a **knowledge pretest for needs assessment** and feedback to the participants on what they need to know. Provide a posttest to be passed for certification as a Climate Steward.
- Utilize existing resources and partnerships with other agencies and institutions to provide a full suite of **professional development opportunities**. These include opportunities provided in the summer and during the school year in collaboration with professional education partners, state and national science and mathematics organizations, informal institutions and the Sea Grant education network.
- Provide for **annual re-certification** based on the completion of an additional 6-9 hours of professional development, regular contributions to the online community (at least one/month), and participation in stewardship activities that they then describe in the online community for others to learn from.
- Develop **informal online learning communities** through online wikispace Facilitation through forming special interest groups, organizing information, and locating additional resources.
- Expand the use of **virtual** professional development and online learning communities.
- Support the **formation of climate-ready communities** and collaborations with state mathematics and science education entities, informal education partners, citizen scientist networks, and higher education institutions.

Project Outcomes for Phase I

Direct Outcomes

- Increase the **content knowledge** of participants in climate-related STEM
- Increase the **use of NOAA data resources** by participants

Indirect Outcomes through the formal and informal educators and other participants

- Increase student/youth/audience **participation in active environmental stewardship**
- Increase student/youth/audience **knowledge about careers** in STEM climate science
- Increase student/youth/audience **ability to apply STEM climate science** concepts and skills in meaningful ways



Participant outputs and outcomes

Climate Stewards

- Complete at least 15 hours of professional development training in climate science and educational applications to become initially certified and an additional 6-9 hours per year as part of maintaining certification.
- Develop an Stewardship Project plan that will utilize climate knowledge in the community, school or organization (see stewardship guidelines)
- Participate in monthly telecons for project updates on climate stewardship.

- Provide feedback on the progress of the individual project.
- Take a climate science pre test. Pass a climate science post-test to become a Climate Steward.
- Develop an evaluation plan to gauge the effect of their climate steward activities on their participants as part of the Stewardship Plan. Post the results in the discussion forum.
- Be an active peer mentor, giving and seeking feedback from other participants in the Climate Steward Education Project.

The details of how the Stewardship Project works are given in a separate logic model to show the resources, activities and outcomes specific to this part of the Climate Stewards' activities. **Hypothesis:** Participation in a stewardship project will result in increasing positive attitudes and behaviors towards mitigating (lessening) the results (personal and social efficacy) of climate science

Stewardship Project Logic Model				
Inputs (Resources)		Outputs (Activities)		Outcomes (Goals)
Background knowledge Interests of participants NOAA Resources Examples of stewardship plans NOAA project ideas NOAA Funding Professional development	Stewardship guidelines Peer mentors Give Feedback to each other monthly (sharing progress, barriers and successes) (iterative) Develop local and NOAA partnerships	Participants produce Stewardship Plans including: 1) Authentic climate science issue 2) Hypothesis to test 3) Data ³ -driven: collection and analysis plan 4) Use of NOAA Resources 5) Evaluation plan ⁴ for effects on audience on knowledge, behavior and attitudes	Collect data and analyze it Draw evidence based conclusions Development of presentations Give presentations to stakeholders Archive presentations	Direct Outcomes 1) Participants apply their climate knowledge 2) Participants become climate stewards 3) Participants <u>intend</u> to continue with climate literacy activities and action projects Indirect Outcomes 1) Students/ audiences apply their climate knowledge 2) Students/ audiences become climate stewards 3) Students/participants (intend to continue climate stewardship)

³ Data could be from databases as well as collected in the field.

⁴ Support for evaluation design will be provided through webinars and written descriptions

II. Design and Methods

A. Research Questions

Based on these hypotheses,

- 1) Increased content knowledge and extended collaborative work affects behaviors and attitudes about climate literacy.
- 2) Participation in a Stewardship Project will result in attitude and behavior towards mitigating (lessening) the results (personal and social efficacy) of climate literacy

The research questions and outcomes for the evaluation are summarized below.
What role does increased content knowledge about climate literacy have on participants? To what extent do Climate Stewards increase their content knowledge?

Direct Outcomes

- Increase the **content knowledge** by participants in climate-related STEM
- Increase the **use of NOAA data resources** by participants

How does implementation of a Stewardship Project affect participants' attitude and behavior toward lessening the potential impacts of climate change?

Indirect Outcomes through the formal and informal educators and other participants

- Increase student/youth/audience **participation in active environmental stewardship**, knowledge about careers, and ability to apply STEM climate science concepts and skills in meaningful ways.

B. Methods and Measures

The evaluation needs to collect evidence on the extent to which the project has a design that is feasible to meet its goals (validity), the design is being implemented (fidelity), and the goals are achieved (summative). Just as the pilot is an opportunity to refine the design for the effective use of resources and the implementation of the activities, evaluation tools will be tested for power and feasibility.

Formative Evaluation (design validity and implementation fidelity)

Tool	Purpose	Timeline
PD Needs Assessment	Plan PD resources and support	Before PD
Climate Stewards Professional Development Review Survey	Feedback on PD Effect on participant Evidence of completion of PD	After each PD (already developed core reporting – needs additional questions) Sent to Bruce Survey
Stewardship Project Needs Assessment	Plan Stewardship resources and support	May 2010, with PD needs assessment in subsequent years Knoxville informal feedback
Climate Stewards Professional	Formative feedback Best resources	Midway - Stewardship Project posted on the wiki

Development Review Survey	How are you integrating CL into existing projects?	
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Summative Evaluation (outcomes)

Tool	Purpose	Timeline
Climate Literacy Knowledge Test ⁵	Needs assessment pretest for baseline measure of knowledge of core climate concepts. Posttest for effects of PD	Before beginning in project After PD and Stewardship project
Climate Literacy Participant Survey	Reflect back to before, then rate now after CS: Scope of CS use Frequency # hours/.year Interdisciplinary Integration Knowledge Confidence Interest Ways to teach specific concepts Plan for future (e.g., next steps, sustainability, expansion, new directions)	Self-report at end of project – retrospective survey with quantitative and qualitative data
Stewardship plans	Evidence of an accurate participant understanding of climate issues and how to involve students in taking action	Upon submission of the proposal
Participant designed plan for evaluating effects on audience involved in stewardship project	Evidence of positive effects on audience participant knowledge and attitudes toward lessening climate science. Products might include presentations, “This I Believe and Will Do essays,” flyers, papers, poems, podcasts, citizen science	Evaluation plan approved as part total Stewardship plan
Stewardship results (presentations)	Evidence of implementation, student involvement, effects	Upon submission of the results/presentation (feedback may result in editing before “publishing” to the archive)

⁵ <http://cimss.ssec.wisc.edu/climatechange/nav/resources.html>

Frank has also been in touch with Anthony Leiserowitz at Yale who is a Co-PI on the NSF Communicating Climate science grant with ASTC. He has been working on a Climate Literacy public survey that should be in the field by the end of April and early results by end of May

III. Findings

In this chapter we present the data for formative and summative results. First, we present the timeline of activities with the evaluation events.

A. Timeline of Activities with Evaluation

Date	Project Output (Activity)	Evaluation
Nov '09	Promotion of Climate Stewards and educator application opens	Description of recruitment process
March '10	Climate Steward candidates accepted	Needs assessment for PD
Ongoing	First cohort does professional development Summer - Extended professional development opportunities	PD review form Participant survey about PD overall when PD is completed Needs assessment for Stewardship Project
July 19-22, '10	Workshop at ESIP Federation conference in Knoxville, RN	Participant feedback
Nov 30, '10	First cohort of participants complete plans for Stewardship Projects and apply for mini-grants	Analysis of Stewardship Project plans, feedback from reviewers
May '11	First cohort complete Stewardship Projects	Participant reflections on Stewardship Project Results from participants evaluation data from their audiences
Dec '10	Second cohort selected and begins PD	Needs assessment PD
Ongoing	Second cohort do PD Summer - Extended professional development opportunities	PD review form Participant survey about PD overall when PD is completed Needs assessment for Stewardship Project
Feb'11	Second cohort completes plans for Stewardship Project	Analysis of Stewardship Project plans, feedback from reviewers
May '12	Second cohort complete Stewardship Projects	Participant reflections on Stewardship Project Results from participants evaluation data from their audiences

B. Online workspace

A private online workspace for the Climate Stewards was set up and was administered by the project leaders. Each Climate Steward has a “page” where they share their ideas and work. The space also provides for sharing of documents and ideas, project documents, evaluation information. Information can be posted on pages, in comments or uploaded as documents. As of August 2011, the sections are shown below:

- FAQs
- Important links
- Stewardship
- Evaluation
- Project documents and resources
- Discussion forums
- Participant pages

☆ Welcome to the Climate Stewards 2011 Workspace!

last edited by  bluegoose1903@yahoo.com 4 days, 21 hours ago

 Page history

FAQs

[Click here to view answers to frequently asked questions about the Climate Stewards Program and use of the Wiki](#)

Important Links

- [Climate.Gov](#)
- [NSTA ELearning Center](#)
- [AMS Earth's Climate System Education Course Web site](#) (ask Turtle Haste more about this)
- [Padilla Bay National Estuarine Research Reserve \(NERRS\) Climate Stewards Program](#)

Stewardship

- [EPA definition](#)
- [Climate Stewards – Stewardship Project Roadmap and Definitions](#)
- [Climate Stewards Action Plan Example – 1](#)
- [Climate Stewards Action Plan Example – 2](#)
- [Climate Stewards Action Plan Example – 3](#)
- [NERRS TOTE \(Teacher On The Estuary\) Stewardship Project Criteria](#)
- [NERRS TOTE Stewardship Project Examples](#)

Evaluation

- [Climate Stewards Pilot Program Evaluation Plan](#)
- [Climate Stewards Knowledge Survey – for the Climate Stewards Pilot Program Participants](#)
- [Climate Stewards Knowledge Survey – for the Climate Stewards Class of 2011](#)
- [Climate Stewards Audience Knowledge Survey – for all Climate Stewards Project Audiences](#)
- IPCC knowledge survey –  [sophisticated](#) and  [key](#)
- IPCC knowledge survey and key –  [general public](#)
- Yale Report –  [Knowledge of Climate Change Across Global Warming's Six Americas](#)
- Yale Climate Change Survey Report "[America's Knowledge of Climate Change](#)"
- Yale Climate Change Survey Report "[American Teen's Knowledge of Climate Change](#)"
- Yale Climate Change Survey Report "[Climate Change in the American mind: Americans' Global Warming Beliefs and Attitudes in May 2011](#)"
- HSBC [Climate Confidence Monitor](#)
- [American Climate Attitudes](#) : An Analysis of Public Opinion Trends and Recommendations for Advancing Public Engagement on Global Warming May 2011 (The Resource Innovation Group)

Program Documents & Resources

- [Climate Stewards – Program Description](#)
- [Climate Stewards Educator Acceptance Form](#)
- [Climate Stewards Education Program Logic Model](#)
- [Links to Meeting Notes](#)
- [Climate Resources](#)
 - [Climate Resources – Atmosphere](#)
 - [Climate Resources – Competitions](#)
 - [Climate Resources – Cryosphere](#)
 - [Climate Resources – Earth](#)
 - [Climate Resources – Energy and Sustainability](#)
 - [Climate Resources – Oceans and Estuaries](#)
 - [Climate Resources – Odds and Ends](#)
 - [Climate Resources – Policy and Legislation](#)
 - [Climate Resources–Spanish Language](#)
 - [Climate Resources –Communication](#)
- [Professional Development Experience Review Form](#)
- [Climate Stewards – Participants Incentives Poll](#)
- [Climate in the News](#)

Discussion Forums

- [Community Book Club](#)
- [Climate Change and Controversy](#)
- [Climate Change Misconceptions – What Are They, How Have You Addressed Them?](#)
- [Professional Development – Look What I Found! / Stay Away From This!](#)
- [Teaching Climate Change in the Classroom – What Works, What Doesn't.](#)
- [Communicating Climate Change to the Public \(Informal Education\) – What works, What Doesn't.](#)

Climate Stewards and Where they Live – Pilot Project Participants

[Lisa Bastiaans](#), NY: [Your Response to Climate Change Can Save You Money!](#)

[Darryl Baynes](#), WV: [Climate Change is Happening in Your Backyard, “See For Yourself”](#)

[Kathryn Cobb](#), MD: [Schoolyard Garden](#)

[Kathryn Hedges](#), IN: [Promoting Recycling in an urban community through Education of the Population](#)

[Richard Jones](#), HI: [Ocean Literacy at Hale Kula](#)

[Joseph Joyner](#), VA : [Surface Ultraviolet Radiation Measurements and Its Potential Meaning to Future Human Health](#)

[Bart Merrick](#), MD: [Climate Science to Climate Stewardship](#)

[Margaret Mooney](#), WI: [Engaging National Weather Service Storm Spotters in Stewardship and Mitigation](#)

[Vicky Peterson](#) MN: [Green Pride Plus Stewardship](#)

[Sylvia Quinton](#), MD : [Community Mobilizing Framework 4 Climate Steward Partnerships](#)

[Shannon Ricles](#), VA: [Engaging Youth in Climate Change Issues](#)

[Claire Silva](#), VA: [Transforming McLean's Climate or Examining Climate Change from the Inside Out](#)

[Joe Witte](#), VA: [Transforming McLean's Climate AND Communicating Climate via McLean HS's student TV broadcast](#)

C. Professional development identified and offered

Needs assessment

To gauge the needs of Climate Stewards, they were asked, “What do you hope to gain from this project?” Most Climate Stewards responded that they wanted to gain more knowledge of the content, ways to teach it and confidence in teaching students and the public. Their comments are given below:

- *Hope to gain more knowledge about ways to teach my students to reduce global warming.*
- *I hope to better understand the issues and be able to provide projects for various learning abilities. I want to help the local people along the coastal region where I live and work to understand what's going on and what they can do to help the situation.*
- *Obviously from my answers, a greater understanding of what science tells us is happening to our planet. We toss around the words greenhouse effect, global warming, climate science and I can't really define them, distinguish between them, or talk about the science behind them. I wish to learn more so that I can embed a sense of how critical our decisions are to my students, who will be dealing with the problems in the future.*
- *I want to learn and expand my knowledge through this project and I like to fill these questionnaires to see what I know about the environmental science area.*
- *Better understanding of the issues and the ability to share vetted information with other educators*
- *More content knowledge and ideas to help students apply content to real life solutions, workable within our own community and applicable broadly to neighbors.*
- *I still feel that I know very little and hope to be able to get a better understanding of the information available so that I can explain it to my students and help them to become interested in the topic.*
- *I hope to gain a greater knowledge about Global Climate science to be able to better educate my students to make a local impact to reduce anthropogenic effects on the climate.*
- *Increased climate literacy and confidence in discussing/teaching climate science. Ideas and information on educating about climate science. Access to experts and exceptional resources.*
- *An understanding of why some people believe humans are a major factor in REGIONAL warming.*
- *Answers to these questions? Is there a definite answer? Intrinsically being able to discuss all items in this questionnaire.*
- *I'd like to discuss the intentions of some questions. The adjectives used in some are difficult to quantify.*
- *Networking*
- *To become more knowledgeable about how global warming will impact the ocean and the biosphere; how different parts of the world will be impacted by global*

warming; climate modeling; and paleoclimatology so that I can speak with greater confidence and respond correctly to questions about climate science from my students and the public. To discover more resources to utilize in my classroom. To become a more active climate science educator in my community.

- A better understanding of climate and the ability to transfer that knowledge to others.
- A better understanding of climate science.
- Access to resources and the opportunity to network with others working on the climate issue.
- Learn a little more about global warming so I can teach my students

Professional development offered and identified through NOAA

Telecons were held on the following dates for the class of 2010 Climate Stewards:

January 15	July 12, 2010	Feb. 14, 2011
Feb. 16, 2010	September 13, 2010	Mar. 14, 2011*
Mar. 8, 2010	Oct. 18, 2010	Apr. 4, 2011
Apr. 12, 2010	Nov. 8, 2010	May 2, 2011
May 10, 2010	Dec. 13, 2010	Aug. 1, 2011
Jun. 14, 2010	January 10, 2011	

* Note, until March 2011 the pilot group and the class of 2011 held separate meetings. In April of 2011 they began having joint meetings as webinars with both groups together.

Resources provided or collected in the online workspace categorized in the online workspace as shown in the screen capture below:

- [Climate Resources](#)
 - [Climate Resources - Atmosphere](#)
 - [Climate Resources - Competitions](#)
 - [Climate Resources - Cryosphere](#)
 - [Climate Resources - Earth](#)
 - [Climate Resources - Energy and Sustainability](#)
 - [Climate Resources - Oceans and Estuaries](#)
 - [Climate Resources - Odds and Ends](#)
 - [Climate Resources - Policy and Legislation](#)
 - [Climate Resources - Spanish Language](#)
 - [Climate Resources - Communication](#)

Each of the bulleted phrases is a link to another page with a list of resources, such as this example from the first overall bullet.

Climate Literacy: Essential Principles of Climate Science

<http://www.globalchange.gov/resources/educators/climate-literacy>

A guide for students, teachers, and citizens to help them become climate literate and informed about "the climate's influence on you and society and your influence on climate."

NOAA Climate Portal

<http://www.climate.gov>

A one-stop Web portal for discovery and delivery of NOAA's climate information and resources for four different audiences including educators and students.

Climate Resources for Educators

<http://oceanservice.noaa.gov/education/pd/climate/>

National Estuarine Research Reserve System Teacher on the Estuary Program

<http://estuaries.gov/estuaries101/Teachers/Default.aspx?ID=170>

NESDIS National Climate Data Center

<http://www.ncdc.noaa.gov/oa/ncdc.html>

National Weather Service Cooperative Observer Program (COOP)

<http://www.stormready.noaa.gov/contact.htm>

The Nation's weather and climate observing network of, by and for the people. More than 11,000 volunteers take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops.

Climate Change: Wildlife and Wildlands Toolkit

<http://globalchange.gov/resources/educators/toolkit>

The next table shows the number of resources available on each page as of July 2011. The total is 203 resources.

Number	Page
140	Climate Resources
5	Atmosphere
6	Competitions
5	Cryosphere
2	Earth
6	Energy and Sustainability
17	Oceans and Estuaries
9	Odds and Ends
10	Policy and Legislation
1	Spanish Language
2	Communication

NOAA and other resources identified by participants in Stewardship plans

Climate Stewards 's plans have a section where they list NOAA and other resources to support the plan. Those resources were extracted from the plans and are listed below. Climate.gov was frequently listed, as was globalchange.gov. As the Climate Stewards located additional resources, or guest speakers on the telecons mentioned resources, they were added to the online workspace.

- Ocean Literacy AMS DataStreme Ocean Course Website:
<http://www.ametsoc.org/amsedu/DS-Ocean/home.html>
- NOAA World Ocean Atlas: http://www.nodc.noaa.gov/OC5/WOA09F/pr_woa09f.html
- NOAA Ocean Explorer: <http://oceanexplorer.noaa.gov/welcome.html>
- NOAA Coral Reef Conservation Project: <http://coralreef.noaa.gov/>
- NOAA Coral Ecosystem Education:
http://www.education.noaa.gov/Marine_Life/Coral_Ecosystems.html
- NOAA Marine Sanctuaries:
<http://sanctuaries.noaa.gov/about/ecosystems/coralwelcome.html>
- NOAA grades 6-8 coral curriculum:
http://oceanservice.noaa.gov/education/yos/curriculum/remote_sens_c.pdf
- <http://www.nws.noaa.gov/om/brochures/climate/Climatechange.pdf>
- <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climate-change-impacts/northeast>
- <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/climate-change-impacts-by-sector>
- <http://climate.nasa.gov/evidence/>
- Initially, information from NOAA Earth System Research Laboratory, Chemical Science Division: <http://www.esrl.noaa.gov/csd/assessments/ozone/2006/chapters/Q17.pdf>
- Published Global Climate science publications.
- <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts>

Professional Development Evaluation Results

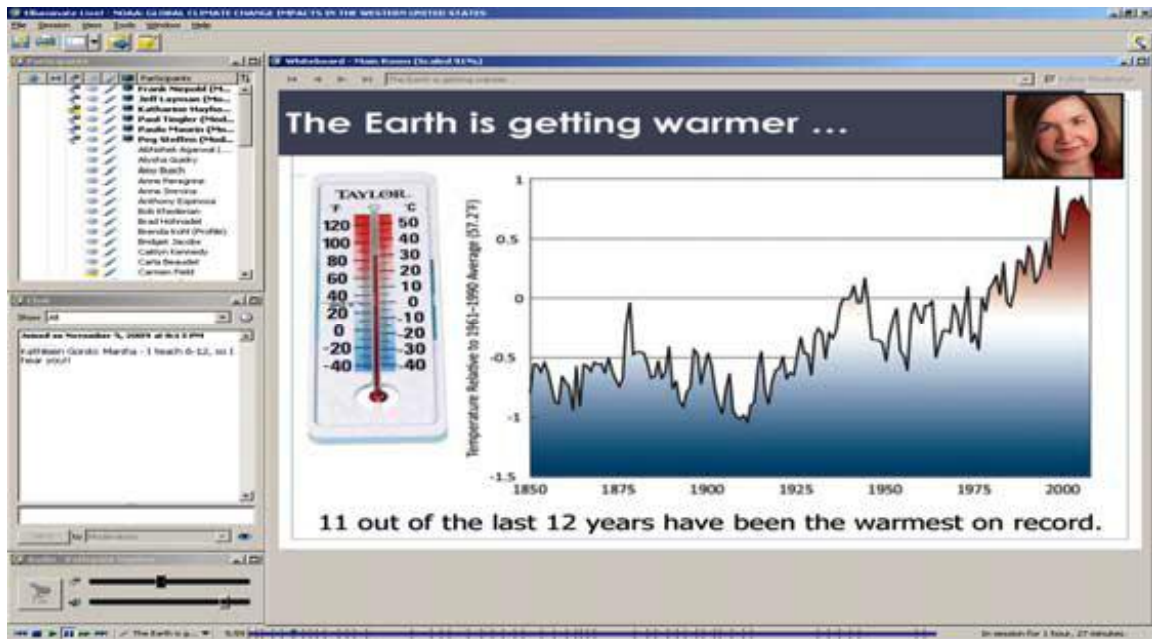
NSTA Workshop Evaluations, Philadelphia, March 2010 NOAA Climate Symposium
Overall 55% rated the session 4 (on a scale of 1-4), 43% rated 3. Pre/post test scores 50% pre, 71% post, 21% change. This event was open to any educator, but a number of climate stewards attended it.

	Average
This session met my expectations	3.55
The content of this session was relevant to my professional growth	3.67
The provided participant materials were useful	3.56
The visual aid(s) used were useful	3.73
I learned a lot from this symposium	3.72
I would recommend NSTA symposia to my colleagues	3.70
Compared to other conference-related professional development opportunities I have experienced, this was one of the best	3.40
I believe the follow-up web seminar opportunities could be a valuable extension to this in-person symposium experience	3.44

November 5, 2009

NOAA: Global Climate science Impacts in the Western United States

This Web Seminar took place on November 5, 2009, from 8:00 p.m. to 9:30 p.m. Eastern Time. Presenting was Katherine Hayhoe, Professor in the Department of Geosciences at Texas Tech University, Frank Niepold, UCAR Climate Education Coordinator at NOAA Climate Project Office, and Peg Steffen, Education Branch Chief at NOAA. In this Seminar, professor Hayhoe focused the presentation on specific climate sciences, current and expected in the Western United States. Sixty-eight (68) participants were in attendance at the Web Seminar and forty-seven (47) of them completed the online feedback survey at the end of the session. This Web Seminar's archive can be found at: http://learningcenter.nsta.org/products/symposia_seminars/fall09/NOAA/webseminar1.aspx



The first in a series of web seminars on climate science from NOAA as well as other governmental organizations started with some background on general climate science data and moved to specific regional climate issues of the Western United States. The presentation focused on information contained in the Global Climate science Impacts in the United States report that is largely based on results of the U.S. Global Change Research Project (USGCRP), and integrates those results with related research from around the world. Peg Steffen gave a web tour of a climate science tool-kit from NOAA and Frank Niepold assisted on the chat.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.72
The content of this Web Seminar was relevant to me	4.74
The interactive nature of the Web Seminar was valuable	4.64
The time the Web Seminar was held fit my schedule	4.17

Please describe how this content was valuable or relevant to you.

- *It has offered me additional information that I might be able to use in my classroom.”*
- *It reinforced a number of things that I have seen while trying to learn more about climate science.*
- *Provided graphics (my students are very visual learners) as well as the model predictions (personal knowledge). I love the fact that you a doing impacts on both the east and west coast. My students will be able to relate to their immediate environment and then compare to the other side of the country. This gives a good overview as a country.*
- *I found data and explanations that are relevant to our environmental studies.*
- *Very valuable and can be directly incorporated into units in biology and environmental science at HS level.*
- *Our sanctuary and NOAA Office of National Marine Sanctuaries are developing educational and outreach projects and materials. I am in need of more education myself in order to be a better contributor/collaborator/educator.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Katharine Hayhoe) using a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.98
Clarity of explanations	4.85
Responsiveness to questions	4.96
Pace of delivery	4.74

Additional comments from participants:

- *She had a great speaking for voice, clear, concise, and witty.*
- *The best presentation on climate science I have seen yet. Fantastic!!*
- *I love this resource! I haven't tried to access the project after the fact, but I am sure I will soon. I hope the archives are as clear as the original presentation.*
- *Very informative.*
- *Thank you for what you do!.*
- *Very pleased....I wish she was working with me at Montana State.*

Recommendation:

- *Just more from our speaker. She is infectious.*

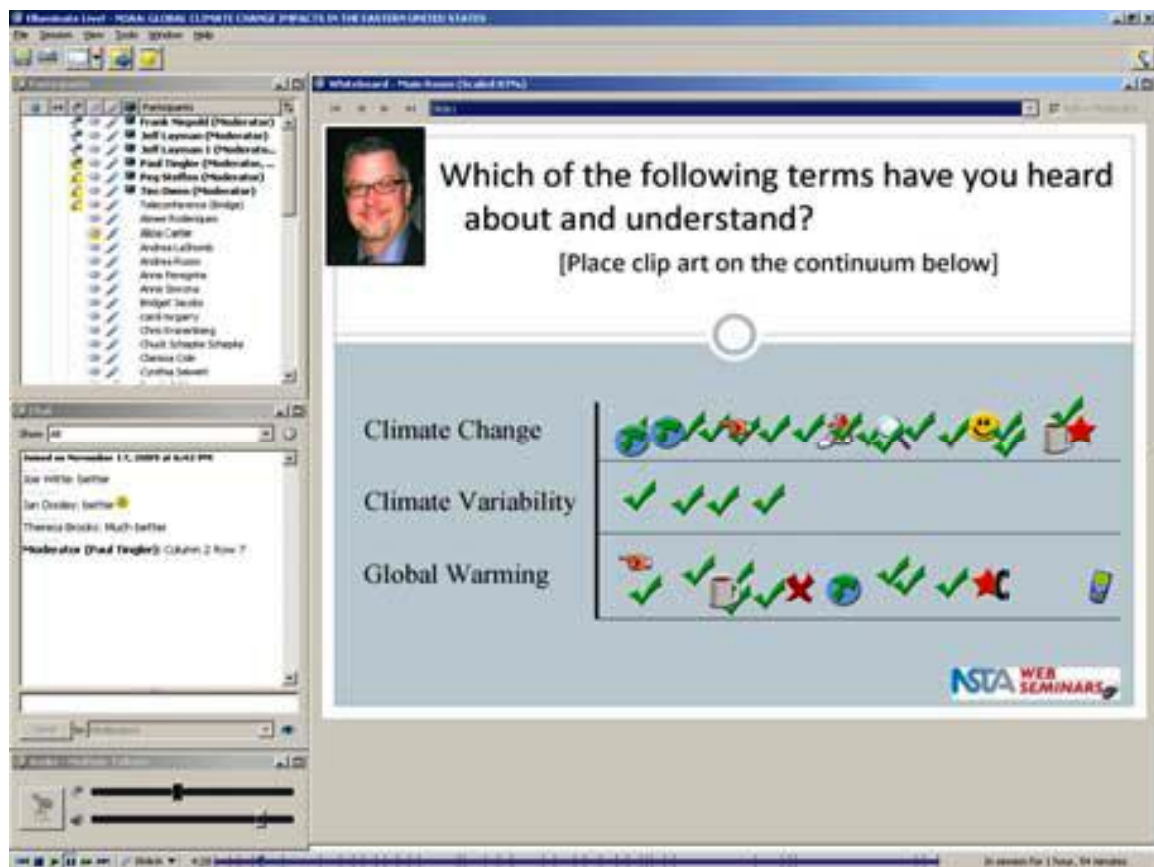
- *Examples of where being taught now. Highlight leading schools projects. Kids really care about this. Enthusiasm involvement.*

Web Seminar November 17, 2009

NOAA: Global Climate science Impacts in the Eastern United States

This Web Seminar took place on November 17, 2009, from 8:00 p.m. to 9:30 p.m. Eastern Time. Presenting was [Tim Owen](#), from NOAA's National Climatic Data Center, [Frank Niepold](#), UCAR Climate Education Coordinator at NOAA Climate Project Office; and [Peg Steffen](#), Education Branch Chief at NOAA. In this Seminar, Mr. Owen focused the presentation on specific climate sciences, current and expected in the Eastern United States. Sixty-one (61) participants were in attendance at the Web Seminar and forty-eight (48) of them completed the online feedback survey at the end of the session. This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/recording/playback/link/meeting.jnlp?suid=M.EBF2610A25C864834E355589C8B172>



Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of

these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.58
The content of this Web Seminar was relevant to me	4.52
The interactive nature of the Web Seminar was valuable	4.40
The time the Web Seminar was held fit my schedule	4.44

Please describe how this content was valuable or relevant to you.

- *Weather and climate is one of my passions*
- *Valuable resource for lesson plans*
- *Variety and good amount of clear data and relevant information*
- *It dealt with several topics that are covered in my curriculum including climate science and the impact it has into various aspects of the environment.*
- *The resources will be useful. The data didn't tell me anything I didn't already know.*
- *I am interested in and teach environmental / earth science in my writing and exploratory*
- *times. Students get very involved especially with the hands-on activities.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Tim Owen) using a scale: 5 - Excellent, 1 - Poor

Knowledge of subject	4.85
Clarity of explanations	4.58
Responsiveness to questions	4.60
Pace of delivery	4.54

Additional comments from participants:

- *Very good introduction to the subject matter.*
- *I found all of the speakers to have good pacing and to be interesting to follow.*
- *Great webinar. Bring this info down to an even more local level!!!*
- *Another great job! Thank you for sharing this opportunity!*
- *Thank you so much. This collaboration with NOAA is really wonderful!*
- *Thanks everyone!!*

Recommendation:

- *Maybe more specific areas. I did the one on western US last time and enjoyed both. Maybe have some on specific regions along with the educator's tool kit info and how to use that with each region mentioned.*
- *While I enjoyed the seminar- I don't think enough time was spent on the graphs explaining their particular relevance to the east coast.*

December 15, 2010

NOAA: Higher than a Sea-Bird's Eye View: Coral Reef Remote Sensing Using Satellites

This Web Seminar took place on December 15, 2009, from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Mark Eakin](#) Coordinator of the NOAA Coral Reef Watch (CRW) project, and he was assisted on the chat by NOAA colleagues Britt Parker and Tyler Christensen. In this Seminar, Dr. Eakin focused the presentation on the effect of climate sciences on coral reef ecosystems and the tools that NOAA and others can use to track those changes. Forty-four (44) participants were in attendance at the Web Seminar and thirty-nine (39) of them completed the online feedback survey at the end of the session. This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/recording/playback/link/meeting.jnlp?suid=M.543918AFFB41D1A4D65289969C1351>

The screenshot shows a web seminar interface. On the left, there is a 'Participants' list with names like Britt Parker, Jeff Layman, Mark Eakin, Paul Traylor, Tyler Christensen, Brenda Cook, Carol Bennett, Carolyn Dool, Cathy McBride, Colena Miller, Charles Salvo, Glenn Bennett, Chris Hansberg, Chuck Schaefer Schaefer, Cristina Wager, David Bridger, Ellen Collins, Heather Hammond, and James Stokes. Below the list is a chat window with a message from Moderator (Paul Traylor) stating: 'We also have Tyler and Brett from NOAA on the chat, so feel free to ask questions throughout as well as talk about what is happening in your classroom.' The main content area displays a slide titled 'Climate Change' with two bullet points: '2009 report from the US Global Change Research Program' and 'Climate Change impacts, focused on the United States'. To the right of the text is a graphic titled 'Global Climate Change Impacts in the United States' showing a map of the United States with a color gradient from green to red, indicating temperature changes. At the bottom of the slide is the URL 'http://globalchange.gov/publications/reports/scientific-assessments/us-impacts' and the NSTA WEB SEMINARS logo. The interface also includes a 'What's New' sidebar, a 'Share' button, and a 'Web Seminar Controls' panel at the bottom.

The third in a series of web seminars on climate science from NOAA, as well as other governmental organizations, began with some background information about coral and centered the discussion on the impact of climate science on coral reef ecosystems. Participants were shown how to use Google Earth to track the conditions of the ocean and how to view areas of concern for coral reefs throughout the world.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.68
The content of this Web Seminar was relevant to me	4.71
The interactive nature of the Web Seminar was valuable	4.68
The time the Web Seminar was held fit my schedule	4.42

Please describe how this content was valuable or relevant to you.

- *The main focus of my teaching is coral reefs of the Gulf of Mexico. This all has direct application.*
- *It gave me alternate avenues to explore climate and ecosystems*
- *As a marine science teacher, I like to stay up-to-date with current research and technology to share with my students.*
- *Environmental changes and effects*
- *Excellent information.*
- *I am studying this information now and it added a lot to my knowledge.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Mark Eakin) using the following scale: 5-Excellent, 1-Poor

Knowledge of subject	4.89
Clarity of explanations	4.82
Responsiveness to questions	4.82
Pace of delivery	4.66

Additional comments from participants:

- *Thank for the detailed information presented with clarity!*
- *Some of this information was beyond my understanding--general subjects not a science minor or major. I enjoyed the information presented.*
- *Thank you very much, I am very touched.*
- *Perfect....loved it!*
- *Thanks for helping me become a better teacher.*
- *All helpers/moderators were very helpful as well allowing him to continue on and only answer questions during q and a sessions*

Recommendation:

- *Maybe show some of those "expensive" photographs from space of coral reefs and bleachings*

- Go more in depth to explain what happens during the bleaching process and how some coral recover.

January 14, 2010

NOAA: Monitoring Climate science from Space

This Web Seminar took place on January 14, 2010, from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Professor Steve Ackerman](#) from the Atmospheric and Oceanic Sciences department at the UW-Madison and director of the Cooperative Institute for Meteorological Satellite Studies (CIMSS), and [Margaret Mooney](#), Earth Science Outreach Specialist. In this Seminar, Professor Ackerman focused the presentation on the uses of satellites for determining climate science data and Ms. Mooney gave an overview of online, satellite resources for teachers to use in their classrooms. Thirty (30) participants were in attendance at the Web Seminar and twenty-eight (28) of them completed the online feedback survey at the end of the session.

This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/installinfo/playback?psid=2010-01-14.1227.M.37CE0EF8F34AD3A6FC812BF51A5C0F.vcr>

The screenshot shows a web seminar interface. The main slide is titled "Basics of Observing from Satellites" and contains a question: "Question: What orbit would you select to monitor ice bergs and why?". Below the question is a table comparing Geostationary and Polar orbits. The table has three columns: Orbit Type, Characteristics, and Considerations. The Geostationary row lists characteristics such as orbiting the equator at the same speed as Earth's rotation, an altitude of approximately 36,000 km, and the ability to produce weather pattern animations. The Polar row lists characteristics such as lower altitude, a 100-minute travel time from pole to pole, high resolution, and frequent "snaps" of the Earth. Considerations for Geostationary orbits include being good for tracking weather storms but having poor resolution and limited visibility of the poles. Considerations for Polar orbits include good resolution and frequent views of the poles, but they do not see tropical and middle latitude regions as often.

Orbit Type	Characteristics	Considerations
Geostationary	<ul style="list-style-type: none"> Orbits the earth above the equator at the same speed the earth rotates Orbit is high - ~ 36,000 km Can produce animations of the earth's weather patterns 	<ul style="list-style-type: none"> Good for tracking weather storms Can observe changes in time Can not see the poles very well Can view only one hemisphere Image resolution is not very good because of distance from earth
Polar	<ul style="list-style-type: none"> Orbits are lower altitude Takes about 100 minutes to travel from pole to pole Produces high resolution "snaps" of the earth 	<ul style="list-style-type: none"> Image resolution is good because it's closer to earth Sees the poles a lot (~14 times a day) Sees give tropical and middle latitude regions of the globe twice a day

The fourth in a series of web seminars on climate science sponsored by NOAA, as well as other governmental organizations, began with historical information about the uses of

satellites to monitor climate sciences and then went on to discuss basics of satellite observation and the range of observations made today by satellites including surface changes, atmospheric changes, and even solar changes.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium ninety-six percent (96%) of participants would like to see similar synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.46
The content of this Web Seminar was relevant to me	4.43
The interactive nature of the Web Seminar was valuable	4.54
The time the Web Seminar was held fit my schedule	4.43

Please describe how this content was valuable or relevant to you.

- *I teach Chemistry...while I found this seminar interesting on a personal level, little if any applies to my current teaching assignment.*
- *Addresses content that is newly being covered at my college*
- *Excellent information!*
- *I wanted to use it to bolster my personal knowledge of how the data from satellites was converted into images. And to support my student's use of GIS/GPS maps and data analysis. It helped quite nicely with that.*
- *Will allow me to increase the use of satellite data/ real time data in my classes.*
- *I was interesting in using satellite imagery in the classroom, but needed more application. Resource part of presentation was cut short.*
- *As a marine science teacher I incorporate current research into all of my courses and enjoy being able to provide my students with up-to-date information and an understanding of the tools used to gather it.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	96%
No	4%

Please evaluate the presenter (Steve Ackerman) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.93
Clarity of explanations	4.64
Responsiveness to questions	4.64
Pace of delivery	4.14

Please evaluate the presenter (Margaret Mooney) using the following scale: 5-Excellent, 1-Poor

Knowledge of subject	4.71
Clarity of explanations	4.50
Responsiveness to questions	4.46
Pace of delivery	4.18

Additional comments from participants:

- *Very informative and excellent resources*
- *Thanks!*
- *Great webinar! Love that I have ideas that are immediately implement-able.*
- *I don't think Margaret had enough time to share her resources - luckily, the URL is available for us to explore!*
- *I felt bad that Margaret got "squeezed" for time and was not able to share as much of her information as she would have likes. Overall, a very valuable resource!*
- *Makes me want to get on the NOAA and NASA sites to explore*

Recommendation:

- *More info on the remote sensing data providing evidence of global warming*
- *Just better balance of time between presentation topics. But it was all very good*

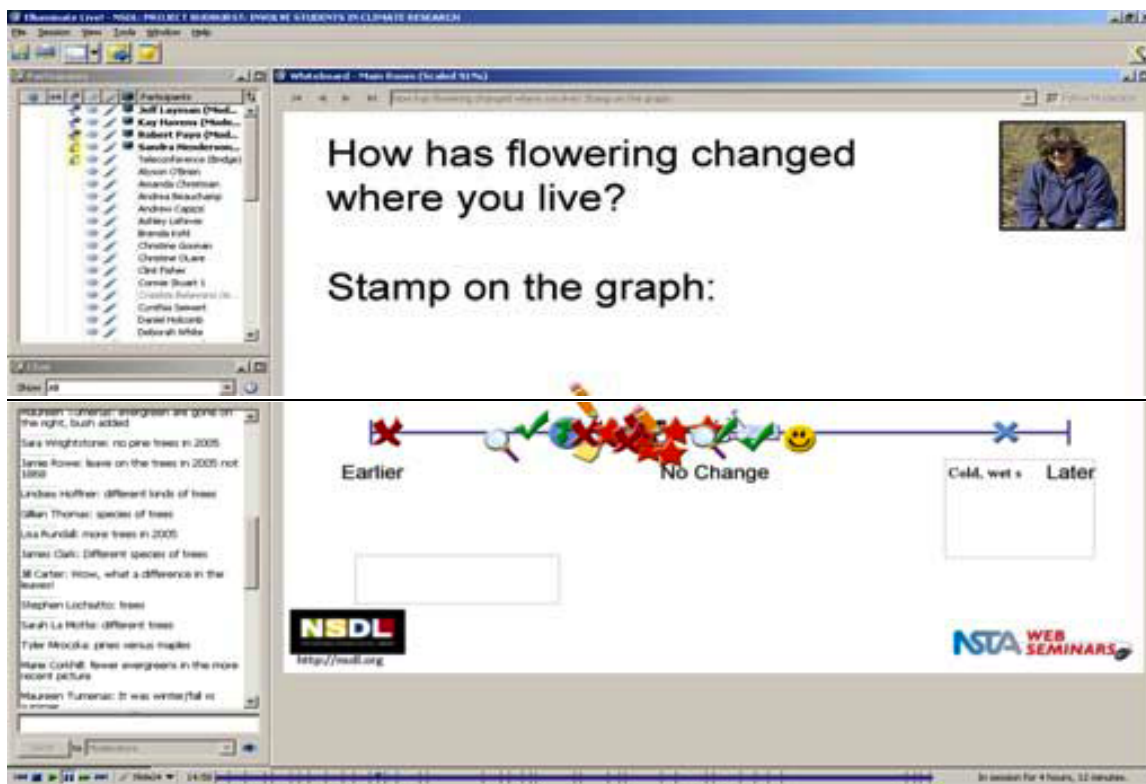
March 9, 2010

NSDL: Project BudBurst: Involve Students in Climate Research

This Web Seminar, developed in collaboration with the National Science Digital Library and the University Corporation for Atmospheric Research, took place on Tuesday, March 9, 2010 from 6:30 p.m. to 8:00 p.m. Eastern time. Presenting was Dr. Kayri Havens and Dr. Sandra Henderson. Fifty (50) participants were in attendance at the Web Seminar and forty-nine (49) of them completed the online feedback survey at the end of the session.

This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/jwsdetect/playback.jnlp?psid=2010-03-09.1246.M.DB52F583F32166E61D826D58F8EF7E.vcr>



Dr. Kayri Havens, Director of Plant Science at Chicago Botanic Garden and Co-Manager of Project BudBurst introduced the session by discussing phenology as the science that measures the timing of life cycle events in all organisms. Researchers and recreational observers have all contributed to this type of study that is becoming more significant as we track the changes in our climate with greater scrutiny. Phenology is the basis of the work of Project BudBurst and collecting local data on plant species by students for research. Dr. Havens also gave a brief overview of how this research helps to describe and understand the effects of climate science. Dr. Sandra Henderson, Project Budburst Director and Manager for Professional Development Projects is a science educator at the University Corporation for Atmospheric Research Office of Education and Outreach in Boulder, Colorado, followed up with more information about Project BudBurst and the online teaching materials and tools that teachers can use to get their students interested in their local environment by participating in this national project at all grade levels.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.53
The content of this Web Seminar was relevant to me	4.67

The interactive nature of the Web Seminar was valuable	4.61
The time the Web Seminar was held fit my schedule	4.37

Please describe how this content was valuable or relevant to you.

- *Thanks for all the great info!*
- *The study that Kay talked about (comparing Chicago bloom data) was especially interesting."*
- *I was able to get an idea of how can I engage my students to do a research if they could connect the climate conspiracy theory that they have been talking about with evidences that they could collect from a certain place.*
- *My students need to interact with nature as well as technology. An awareness of their surroundings is essential.*
- *I am an IB middle year school and this fits nicely*
- *Great knowledge and websites. Project Budburst!*
- *This is a great idea for incorporating technology into the classroom and will be fun and engaging for students.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Dr. Sandra Henderson) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.86
Clarity of explanations	4.78
Responsiveness to questions	4.78
Pace of delivery	4.63

Please evaluate the presenter (Dr. Kayri Havens) using the following scale: 5-Excellent, 1-Poor

Knowledge of subject	4.86
Clarity of explanations	4.80
Responsiveness to questions	4.73
Pace of delivery	4.69

Additional comments from participants:

- *Great resource for classrooms and home schools.*
- *Both presenters really knew their stuff!*
- *I'll participate in more of these in the future. Cool!*
- *Definitely will be looking for the presentations next week - and I'd love to go visit the Chicago gardens.*
- *Great job all around! Very informative and useful.*
- *Fabulous job, great ideas, easily incorporated into projects for my students.*

Recommendation:

- Present more data, to give the students more proof of the changes in the environment specifically its effect on the plants.
- Please give some in depth specifics on what to look for when participating.

March 25, 2010

NASA/UCAR: An introduction to Earth's Climate

This Web Seminar took place on March 25, 2010 from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Dr. Lisa Gardiner](#), Educational Designer with the Office of Education and Outreach at the University Corporation for Atmospheric Research in Boulder, Colorado. Dr. Gardiner presented an overview of the differences between climate and weather and explained the basics of what influences the Earth's climate and how it has changed, both historically and recently. Fifty-seven (57) participants were in attendance at the Web Seminar and forty-six (46) of them completed the online feedback survey at the end of the session.

This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/jwsdetect/playback.jnlp?psid=2010-03-25.1502.M.DD7104E69AF412D7B355D7C62BDE8E.vcr>

The screenshot shows a web seminar interface. The main window displays a poll question: "What's the *climate* where you live in March? Mark a location on the graph below to indicate general precipitation and temperature". The graph has a vertical axis for "Precipitation" ranging from "None" at the bottom to "Lots" at the top, and a horizontal axis for "Temperature" ranging from "Cold" on the left to "Warm" on the right. The graph area is filled with various icons, including smiley faces, exclamation marks, stars, and checkmarks, representing different user responses. To the left of the graph is a chat window with a list of participants and a message history. The chat history shows a conversation about temperature and precipitation, with participants like Angela Peters and Shelly Jenkins, and moderators like Paul Tregler. The interface also includes a navigation bar at the top and a status bar at the bottom.

This web seminar is part of a series of six projects designed to bring climate education resources to secondary educators from the Office of Education and Outreach at the University Corporation for Atmospheric Research. Dr. Gardiner presented information on

the aspects that influence the Earth’s climate from Albedo to Volcanoes. She also presented a number of classroom activities that are free and available online to teach students about climate and climate science.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.54
The content of this Web Seminar was relevant to me	4.48
The interactive nature of the Web Seminar was valuable	4.65
The time the Web Seminar was held fit my schedule	4.15

Please describe how this content was valuable or relevant to you.

- *It was a great introduction, and gave suggestions for lesson plans for children. I loved the website recommendation also. It is very practical.*
- *I now have a clear understanding on weather vs. climate and will be able to teach my future students.*
- *The resources provided and brought to my attention will be very helpful in the future.*
- *Great graphics and activities, esp. since they are centered around graphing which always needs to be reinforced.*
- *Provided numerous notes and websites to utilize in my classroom unit on weather and climate!*
- *The resources were great and Lisa was too*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Dr. Lisa Gardiner) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.76
Clarity of explanations	4.65
Responsiveness to questions	4.74
Pace of delivery	4.67

Additional comments from participants:

- *Lisa did a very good job of responding to questions and posting links in the chat, even responding to questions at times other than the "2 minutes for questions" section. Very helpful!*
- *Thanks you for the experience.*
- *Super!*

- *Dr.Lisa was great! Looking forward to additional seminars.*
- *Great job Lisa!*

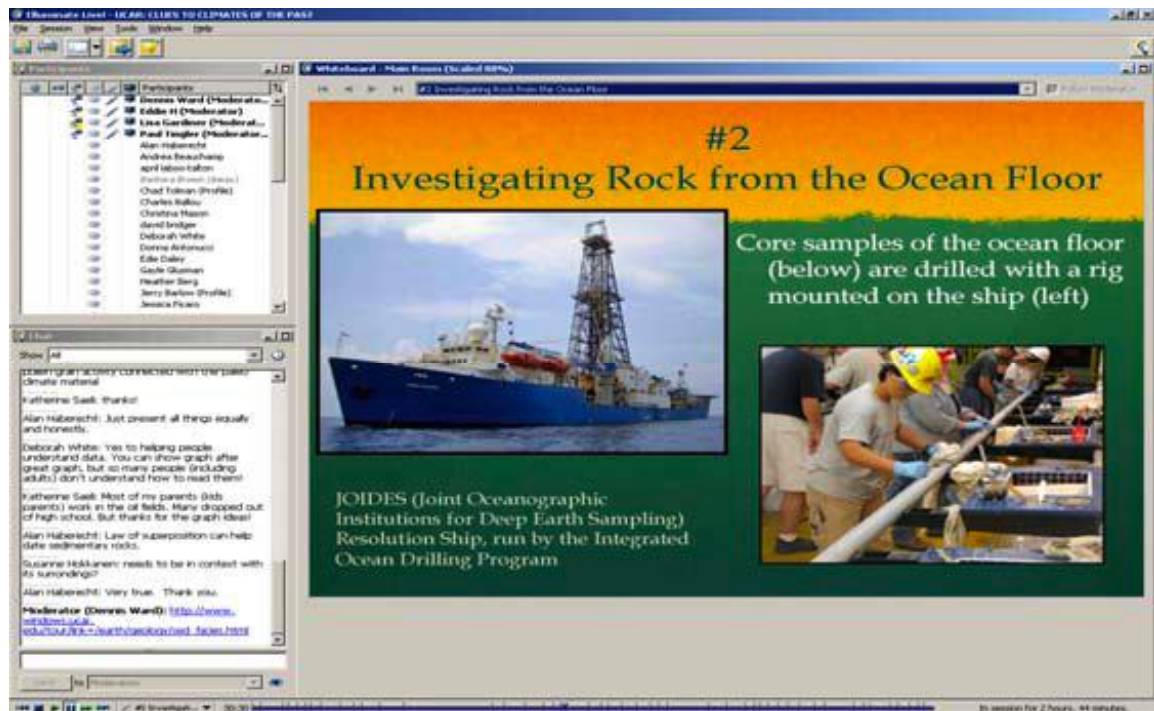
Recommendation:

- *Started off slow with the climate vs. weather then was very interesting with Daisyland. I wish there was more discussion of later info.*
- *More/deeper content knowledge on greenhouse gas because these detailed questions are always asked.*

March 31, 2010

NASA/UCAR: Clues to Climates of the Past

This Web Seminar took place on March 31, 2010 from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Dr. Lisa Gardiner](#), Educational Designer with the Office of Education and Outreach at the University Corporation for Atmospheric Research in Boulder, Colorado. In part two of the series, Dr. Gardiner presented information used in determining what the climate was like in the past. Forty-eight (48) participants were in attendance at the Web Seminar and forty-one (41) of them completed the online feedback survey at the end of the session. This Web Seminar’s archive can be found at: <https://sas.illuminate.com/site/external/jwsdetect/playback.jnlp?psid=2010-03-25.1502.M.DD7104E69AF412D7B355D7C62BDE8E.vcr>



This web seminar is part of a series of six projects designed to bring climate education resources to secondary educators from the Office of Education and Outreach at the University Corporation for Atmospheric Research. Dr. Gardiner presented information about the data sources for determining past climate. She explained how historical records,

proxy records, instrumental records and supercomputer modeling are all used to give a complete picture of the climates of the past.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. Ninety-eight percent (98%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.65
The content of this Web Seminar was relevant to me	4.58
The interactive nature of the Web Seminar was valuable	4.60
The time the Web Seminar was held fit my schedule	4.58

Please describe how this content was valuable or relevant to you.

- *Just starting an ecology unit, and ended relative/absolute dating of rocks, so this will build on these topics!*
- *Easy methods to explain to middle school students regarding past climate*
- *Ties in extremely well with Earth System and Global Change, the current course I am teaching. Excellent links provided for teaching resources in the classroom.*
- *The different tools presented were especially useful to me along with the resources given.*
- *It provided me with another perspective on climate that is new to me and allows me to incorporate this area into my current material on climate.*
- *I'm going to be starting a unit on climate science after Easter Break. I got some excellent ideas and resources tonight!*

Would you like to see more Web Seminars like this one offered in the future?

Yes	98%
No	2%

Please evaluate the presenter (Dr. Lisa Gardiner) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.83
Clarity of explanations	4.75
Responsiveness to questions	4.78
Pace of delivery	4.70

Additional comments from participants:

- *Very knowledgeable...would like to know more about her research!*
- *Very thorough and lovely slides*
- *Well informed but did not talk "over our heads" - and even when she wasn't feeling well :)*
- *Thank you!*
- *Very up front and honest.*

- Thanks for the information.
- Great seminar

Recommendation:

- Not sure if this has already been done, but it would be nice to have a list of all links posted in chat put into a separate page or document to be posted in the archives.
- Perhaps a few more minutes for questions.

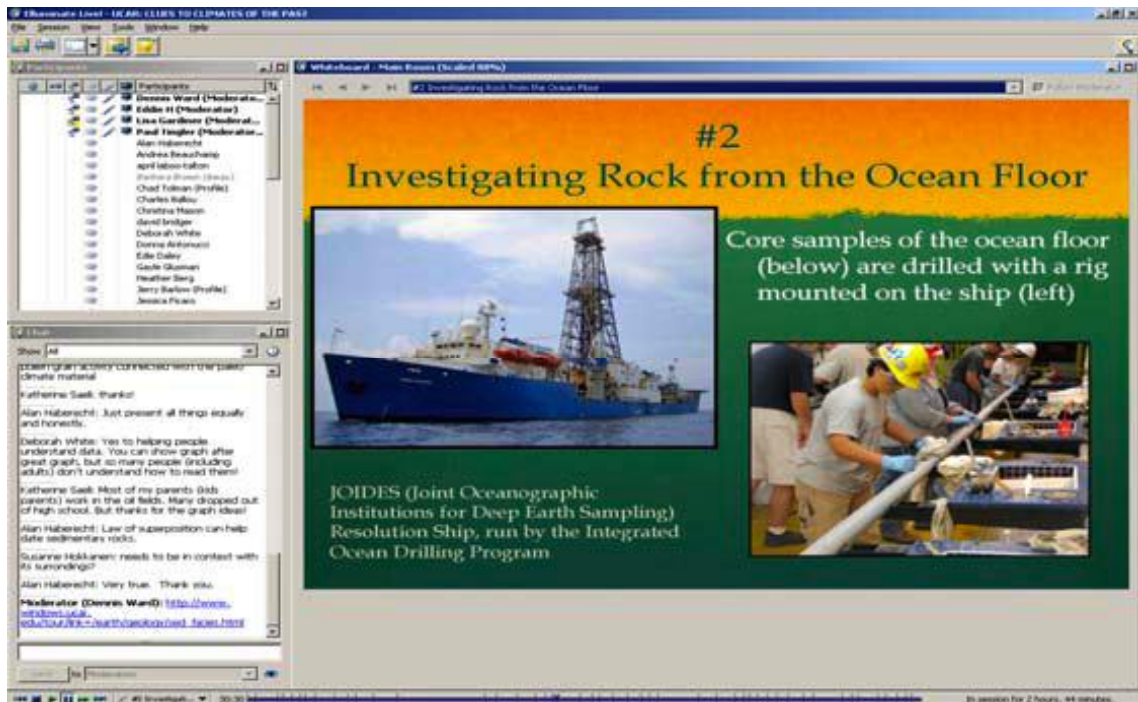
April 6, 2010

UCAR: Global Climate science and the Earth System

This Web Seminar took place April 6, 2010 from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Dr. Lisa Gardiner](#), Educational Designer with the Office of Education and Outreach at the University Corporation for Atmospheric Research in Boulder, Colorado. In part three of the series, Dr. Gardiner presented information about the Earth System. She explained what the system was and how the parts of the system are affected by climate science. Sixty-three (63) participants were in attendance at the Web Seminar and fifty-three (53) of them completed the online feedback survey at the end of the session.

This Web Seminar’s archive can be found at:

<https://sas.illuminate.com/site/external/jwsdetect/playback.inlp?psid=2010-04-06.1508.M.7AC2124FC081FA862393489727A600.vcr>



This web seminar is part of a series of six projects designed to bring climate education resources to secondary educators from the Office of Education and Outreach at the University Corporation for Atmospheric Research [UCAR]. Dr. Gardiner gave an

overview of the Earth System: atmosphere, hydrosphere, biosphere, geosphere, and cryosphere and talked about the parts of the system that were affected by climate science and what those effects were. As with previous projects in the series, several classroom activities and links to websites for classroom use were also demonstrated during the live project.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Web Seminar Topic and Participants Information

Please evaluate the presenter (Dr. Lisa Gardiner) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.85
Clarity of explanations	4.79
Responsiveness to questions	4.83
Pace of delivery	4.68

Additional comments from participants:

- *Very well done and covers a wide range of information.*
- *Informative presentation, thank you.*
- *Great job! Thank you!*
- *Thank you!*
- *I am glad she is feeling better! I can't wait for the next seminars.*
- *I enjoyed this!*
- *Great job!*

Recommendation:

- *It could potentially be split into individual webinars that focus on one cycle, or split into two webinars since it seemed lots of us had interesting questions.*
- *Maybe more data about why scientists are concerned?*

April 8, 2010

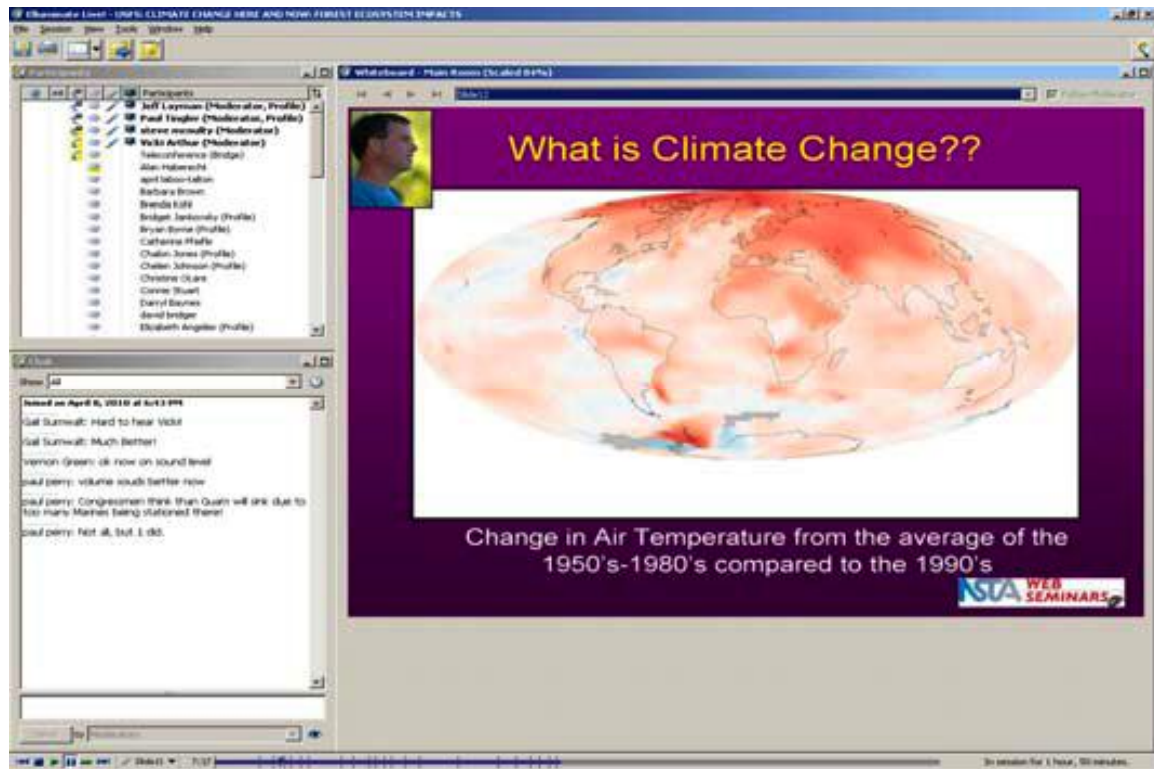
SRS/USFS: Climate science Here and Now: Forest Ecosystem Impacts - Exploring U.S. Regional Climate science Impacts: Why It Matters to You

This Web Seminar took place on April 8, 2010 from 6:30 p.m. to 8:00 p.m. Eastern Time. Presenting was [Dr. Steve McNulty](#), U.S. Forest Service Acting Director of Environmental Science Research, and US Congressional Fellow and [Vicki Arthur](#) of U.S. Forest Service, D.C. Headquarters, and Conservation Education Office. Dr. McNulty gave a cross-continental view of some of the impacts that climate science is having and will have on the ecosystems of the United States. Ms. Arthur followed Dr. McNulty's presentation by providing a large number of online resources for teachers to use in their classrooms. Sixty-four (64) participants were in attendance at the Web Seminar and fifty-three (53) of them

completed the online feedback survey at the end of the session.

This Web Seminar's archive can be found at:

<https://sas.illuminate.com/site/external/jwsdetect/playback.inlp?psid=2010-04-08.1500.M.8C7FA43CE076D27CE1CC76525CE276.vcr>



This is the first of two Web Seminars scheduled as a follow-up to *Climate science Here and Now: Forest Ecosystem Impacts Symposium* that took place at the NSTA National Conference on Science Education in Philadelphia, PA. In this project, Dr. McNulty began with an overview of climate science and the anthropogenic causes and contributors. Throughout the remainder of his presentation, he provided graphics and specific examples of what is happening, or going to happen, in each region of the United States. Vicki Arthur provided web sites that can be used in the classroom to help teach students about climate science in their own region or locale.

Overall, the participants rated the Web Seminar content as valuable, interactive, and relevant. Open response comments complimented the organization of the seminar and confirmed the ability of participants to engage with the facilitator and content experts via this medium. One hundred percent (100%) of the participants would like to see more of these types of synchronous online learning experiences offered.

Session Structure and Content: 5 - Excellent, 1 - Poor

Overall, the Web Seminar was valuable to me	4.49
The content of this Web Seminar was relevant to me	4.47
The interactive nature of the Web Seminar was valuable	4.57
The time the Web Seminar was held fit my schedule	4.28

Please describe how this content was valuable or relevant to you.

- *Just having background knowledge of this is helpful and the resources were excellent.*
- *The graphs are very useful as well as the websites with educational materials.*
- *It brought back some topics to mind.*
- *Great back ground info for the climate unit.*
- *Help me have a better understanding on the effects of climate science.*
- *Good presentation of data that can be used to present a position on various aspects of climate science.*

Would you like to see more Web Seminars like this one offered in the future?

Yes	100%
No	0%

Please evaluate the presenter (Steve McNulty) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.85
Clarity of explanations	4.68
Responsiveness to questions	4.68
Pace of delivery	4.49

Please evaluate the presenter (Vicki Arthur) on a scale: 5-Excellent, 1-Poor

Knowledge of subject	4.45
Clarity of explanations	4.04
Responsiveness to questions	3.98
Pace of delivery	3.70

Additional comments from participants:

- *Thank you for sharing your expertise*
- *Excellent content*
- *Overall quite good.*
- *Thanks!*
- *Everything was great.*
- *Unfortunate that the section on classroom resources had to be rushed, but the interactive section of posting questions and ideas was great!*
- *Need to do a Separate Web Seminar just on all of the resources-not a negative comment-would really love this! Would give us more time to explore! Thanks!*

Recommendation:

- *Informative about some specific effects on flora and fauna. However, was looking for more concerns and current impact studies for use in classes without the basic overview of the causes of greenhouse effect. More organized presentation of specific effects on the flora and fauna each of the climates of North American; Taiga, Tundra, etc.*
- *All have some bias, but if the presenters can do their thing without being so one sided, but present both sides more equally. As the DR. said "Fair and balanced"*

Summary of Findings for Professional Development

Attendance

Session	Date	# People	# Surveys
NOAA: Global Climate science Impacts in the Western United States	November 5, 2009	68	47
NOAA: Global Climate science Impacts in the Eastern United States	November 17, 2009	61	48
NOAA: Higher than a Sea-Bird's Eye View: Coral Reef Remote Sensing Using Satellites	December 15, 2010	44	39
NOAA: Monitoring Climate science from Space	January 14, 2010	30	28
NSDL: Project BudBurst: Involve Students in Climate Research	March 9, 2010	50	49
NASA/UCAR: An introduction to Earth's Climate	March 25, 2010	57	46
NASA/UCAR: Clues to Climates of the Past	March 31, 2010	48	41
UCAR: Global Climate science and the Earth System	April 6, 2010	63	53
SRS/USFS: Climate science Here and Now: Forest Ecosystem Impacts - Exploring U.S. Regional Climate science Impacts: Why It Matters to You	April 8, 2010	64	53

Structure and Content

Participants were asked to rate the session in four areas on a scale of 1-5 with 5 being the highest:

- Overall, the Web Seminar was valuable to me
- The content of this Web Seminar was relevant to me
- The interactive nature of the Web Seminar was valuable
- The time the Web Seminar was held fit my schedule

	Overall	Relevant content	Interaction valuable	Fit schedule
November 5, 2009	4.72	4.74	4.64	4.17

November 17, 2009	4.58	4.52	4.40	4.44
December 15, 2010	4.68	4.71	4.68	4.42
January 14, 2010	4.46	4.43	4.54	4.43
March 9, 2010	4.53	4.67	4.61	4.37
March 25, 2010	4.54	4.48	4.65	4.15
March 31, 2010	4.65	4.58	4.60	4.58
April 6, 2010	4.85	4.79	4.83	4.68
April 8, 2010	4.49	4.47	4.57	4.28

Would you like to see more Web Seminars like this one offered in the future?

Session	Yes	No
NOAA: Global Climate science Impacts in the Western United States	100%	0%
NOAA: Global Climate science Impacts in the Eastern United States	100%	0%
NOAA: Higher than a Sea-Bird's Eye View: Coral Reef Remote Sensing Using Satellites	100%	0%
NOAA: Monitoring Climate science from Space	96%	4%
NSDL: Project BudBurst: Involve Students in Climate Research	100%	0%
NASA/UCAR: An introduction to Earth's Climate	100%	0%
NASA/UCAR: Clues to Climates of the Past	98%	2%
UCAR: Global Climate science and the Earth System	na	na
SRS/USFS: Climate science Here and Now: Forest Ecosystem Impacts - Exploring U.S. Regional Climate science Impacts: Why It Matters to You	100%	0%

* na=no data available

Presenter Evaluations

Presenter	Knowledge of subject	Clarity of explanations	Responsiveness to questions	Pace of delivery
Katharine Hayhoe	4.98	4.85	4.96	4.74
Tim Owen	4.85	4.58	4.60	4.54
Mark Eakin	4.89	4.82	4.82	4.66
Steve Ackerman	4.93	4.64	4.64	4.14
Margaret Mooney	4.71	4.50	4.46	4.18
Dr. Sandra Henderson	4.86	4.78	4.78	4.63
Dr. Kayri Havens	4.86	4.80	4.73	4.69
Dr. Lisa Gardiner	4.76	4.65	4.74	4.67
Dr. Lisa Gardiner	4.83	4.75	4.78	4.70
Dr. Lisa Gardiner	4.85	4.79	4.83	4.68
Steve McNulty	4.85	4.04	3.98	3.70
Vicki Arthur	4.45	4.04	3.98	3.70

D. Climate stewardship plans and results

An outline for reporting on stewardship project and a roadmap were developed and discussed with the Climate Stewards (at ESIP and in telecons) and revised based on their feedback. Plans were developed, then reviewed and discussed by the advisory council. The Project Coordinator, Bruce Moravchik, provided individual feedback to the Climate Stewards based on these reviews. Most of the plans were accepted for funding; a few were asked to revise.

Outline for Stewardship Project Plan and Report

- **The Climate Science Issue** – Describe the issue, the need, and the context for stewardship. Place the issue in the larger context in climate science to establish it as an authentic issue that others are working on.
- **The Hypothesis to Test** – State the hypothesis and design for testing it. What will be the effect? On what or whom? For how long? Under what circumstances?
- **Participants and Partners** – Briefly describe who participated, in what activities over what period of time. Describe the partners, their interest and role, and continuing activity.
- **Data Collection, Analysis and Results**– Describe the data that will be collected or used to understand the problem, take action and effect change. Describe how the data will be collected and/or analyzed to inform the action and test the hypothesis.
- **Stewardship Process and Activities** – Describe the activities. Provide a timeline. Discuss how the process went according to plan, or did not, how things emerged or evolved, and any unintended events if they occurred.
- **Use of NOAA and Other Resources** – List the NOAA and other resources that will be used to inform the project. Describe how each one is used. Add to the list as you find new useful resources. We'll post these for everyone.
- **Assessment** – Describe how the effects of the project are evaluated. What are the effects on the audience or stakeholder knowledge, behavior and/or attitudes? The environment? Policy? How did you expect them to be affected? How can you show they were affected? (you may use the project evaluator as a resource for this)
- **Conclusions** - What evidence-based conclusions can you draw about the process and outcomes of the stewardship project? Was the hypothesis confirmed? What are the takeaways for others wishing to replicate your efforts? What lessons did you learn? What were the barriers, unintended consequences and/or benefits? Which of the direct and indirect outcomes in the logic model can you show evidence for in your project?
- **Presentations** – Who needs to know about this project before, during and after its implementation? What do they need to know? What format is best for communication?

The roadmap was used to review the plans and was posted on the online workspace for all the Climate Stewards.

Stewardship Plans

The following projects were approved and funded as stewardship projects. They are taken directly from the Climate Stewards' individual pages on the wiki. Some are in future tense since the plan was written, but the project not completed, while others are in past tense because they were completed.

Your Response to Climate science Can Save You Money! Lisa Bastianns, NY

In a community college class, 10-20 students from Nassau Community College tracked their energy use, determined their carbon footprint, kept a journal and portfolio to track saving energy practices over several months, and toured the college to learn about energy-saving practices the college is enacting. Students were expected to have a better understanding of: 1) how earth's climate system works, 2) how climate models work and how to interpret the uncertainty in climate science projections, 3) how they impact the climate system in their daily lives, 4) how they can reduce their carbon footprint and save money, 5) how they can become active in their communities to reduce carbon emissions.

Climate science is Happening in Your Backyard, "See For Yourself" Darryl Baynes, WV This project seeks to help people understand changes over time by scanning historic images of Wheeling and its surrounding areas that have dates on them, then taking the same images on the same date now and comparing the images with respect to type of precipitation if any, clothes worn by individuals in the picture to suggest temperature, and images of local flora to determine changes in budding patterns as a result of climate science. High school students from three counties participated and presented their findings in presentations to local audiences to encourage lifestyle changes.

Schoolyard Garden. Kathryn Cobb, MD Working with the PTA, 150 second grade students and five teachers from this LEED certified school created a Lorax (Dr. Seuss) vegetable garden and butterfly garden. Students are expected to have a better understanding of the air and environment around them, and how they can help make changes to their home.

Promoting Recycling in an urban community through Education of the Population. Kathryn Hedges, IN. Advertising the need for recycling in the school, local storefronts, and in the local boys and girls club was designed to increase community awareness and will increase the amount of materials that collected, which will be measured in monthly totals.

Ocean Literacy at Hale Kula. Richard Jones, HI Six elementary teachers at this army base elementary school did the free NSTA Sci Objects: Coral Reef Ecosystems: Interdependence, Ocean's Effect on Weather and Climate: Global Climate Patterns, Ocean's Effect on Weather and Climate: Changing Climate, Ocean's Effect on Weather and Climate: Global Precipitation and Energy, Ocean's Effect on Weather and Climate: Global Circulation Patterns. Using this foundation, teachers integrated the content

into the curriculum to achieve the ocean literacy standards with their students. Students also conducted a sea urchin study as a stewardship project.

Climate Science to Climate Stewardship. Bart Merrick, MD. Non-formal environmental educators receive professional development related to climate science (in terms of knowledge, resources to illustrate the issues and the development of hands-on field based activities) that they will incorporate this experience into their work with students, teachers and the general public and encourage a greater level of stewardship amongst project participants.

Engaging National Weather Service Storm Spotters in Stewardship and Mitigation. Margaret Mooney, WI. In the spring of 2011, Wisconsin Climate Steward Margaret Mooney collaborated with NOAA's National Weather Service (NWS), to invite storm spotters from the Milwaukee-Sullivan county warning area (KMKX) to attend a webinar featuring three main topics: 1) Relevant regional Climate science Impacts outlined in the USGCRP Midwest report & the WICCI report, 2) Smart Phone Applications to access real-time weather data and GPS coordinated alerts for air quality, flooding, heat waves and other events increasing in frequency due to climate science, 3) Actions they can take to alleviate environmental stresses and mitigate climate science. Nineteen storm spotters participated in the web seminar, which was less than expected. Eleven spotters provided feedback via the follow-up survey. A third of the respondents took action to minimize their carbon footprint, a large majority (90%) indicated their likelihood to take action in the near future and more than two-thirds said they would like to learn more about climate mitigation and sustainability in the Great Lakes Region.

Green Pride Plus Stewardship. Vicky Peterson, MN. This proposal aims to help the high school student body and the community by hosting a weeklong celebration of topics, through seminars and homeroom visits. The culmination of these events will be forty-five minute long seminars on the night of April 26, 2011 hosted by students and attended by community.

Community Mobilizing Framework 4 Climate Steward Partnerships. Sylvia Quinton, MD. We will mobilize the three schools in the Suitland community to participate in a community stewardship campaign to increase the use of reusable items by partnering with the Science Departments to develop a community-school-based education campaign on climate science as well as the stewardship activity. The NOAA Climate Steward(s) will conduct a briefing on climate science with the Science Department's and solicit their input into the design of a "social marketing" campaign in the community and the schools. The Science Departments will identify a school activity in which the S2BI can be launched as a value-added community-based activity. At this activity re-usable water bottles and/or bags with a reduce carbon footprint message will be distributed. A community focus group will be conducted to help to create a message cultural appropriate for the Suitland community and age appropriate for the schools. At each activity a pre-test will be administered. The

post-test will be conducted using survey monkey at least 30 days after the value-added school-based activity.

Engaging Youth in Climate science Issues. Shannon Ricles, VA. The Monitor National Marine Sanctuary's Youth Working Group (YWG) is a group of nine members and two volunteers between the ages of 14-17 that represent four local high schools. Three surveys (elementary, middle school, and high school) will be created to determine a student's knowledge, attitude, and behavior concerning climate science. In 2009-2010, this project occurred on a very limited piloted project without the survey portion. The YWG hosted a movie night at Cape Henry Collegiate High School at 7:00 pm on a Thursday evening three days before the end of the school year. The YWG had secured permission to show the video, A Sea Change. The video discussed ocean acidification. Even though school was almost finished for the year, over 70 students and teachers came to view the movie. From that one night, we collected numerous antidotal responses and even had four students request involvement in our group so that they too could help to make a difference. Two of those four are now serving on our YWG. We have also conducted ocean acidification activities with a variety of students and adults in various venues, such as Girl Scout Jamboree, GEAR-UP, teacher workshops, EarthFest, and other outreach events. The response from the public is always the same, stunned and in awe of how CO₂ emissions can change our climate and our ocean.

Transforming McLean's Climate or Examining Climate science from the Inside Out. Claire Silva and Joe Witte, VA. This stewardship project is a collaborative effort between Claire Silva and Joe Witte. Our audience will be McLean Community members including but not limited to McLean High School students and families. We plan to use the McLean High School Observatory, McLean High School Morning Show facilities, and other McLean High School resources. To publish the results of this stewardship project, Joe Witte and I plan to partner with the McLean High School Morning Show to produce a five segment series of video vignettes that will air over the course of a school week to promote greater student awareness of changing ones behavior to "transform McLean's climate". Some initial thoughts are to include interviews some participants about how this lesson has convinced them to change behaviors that impact climate science and show in graphical form the results of the survey.

Climate Steward Reflections on the Effect of the Stewardship Project on Participants

In September 2011, we asked Climate Stewards to reflect on the project, its effects on them, and on the participants in their stewardship project. The majority of the question responses appear in section III. F. The questions specifically about the stewardship project are reported here.

16. What about the effect on the participants in your stewardship project group? How much did it affect them in each of the areas listed below? 1-10 1=not at all satisfied, 10=very satisfied

Climate Stewards reported that the people who participated in their stewardship project felt they could make a difference with their own behaviors (9.1/10), increased their knowledge of climate science (9.0), increased their knowledge of NOAA resources for climate science (9.0), were ready and able to apply their knowledge of climate science to their lives (8.8), were able to meet other people interested in climate science (7.7), and increased their awareness of climate science careers (6.6).

People felt they could make a difference with their own behaviors	9.1
Participants increased their knowledge of climate science	9.0
Participants increased their knowledge of NOAA resources in climate science	9.0
Participants were ready and able to apply their knowledge of climate science in their lives	8.8
People interested in climate science met each other	7.7
Participants increased their awareness of climate science careers	6.6

17. Do you have evidence of the effect of your climate stewardship project? Yes=55% No=36% Please describe

- In an effort to leverage National Weather Service (NWS) storm spotters' history of community service to address regional impacts of climate science, the Cooperative Institute for Meteorological Satellite Studies (CIMSS) hosted a web seminar on climate science, climate mitigation and emerging applications to access weather and climate data with mobile devices. Nineteen storm spotters participated and eleven provided feedback via a follow-up survey. A third of the respondents took action to minimize their carbon footprint, a large majority (90%) indicated their likelihood to take action in the near future and more than two-thirds said they would like to learn more about climate mitigation and sustainability in the Great Lakes Region.*

The webinar is available for viewing at <http://vimeo.com/23571211>
- The NOAA Administrator will be participating in the induction of 30 students into the climate science academy.*
- We have surveys and carbon footprints of participants that we are currently evaluating.*
- Workshop participants filled out evaluations. I can make these available if you want. Story wise, some of the participants have reported using materials from*

this workshop in their staff trainings (Living Classrooms, and Alice Ferguson Fdn.) and with their project participants. I have also been asked to participate in other workshops as a result of this effort.

- *We took before and after survey, based somewhat on GMU survey tools. Claire has the results from her classes.*
- *Our garden was hugely successful, with parents emailing, coworkers sharing, local newspaper articles (including the Washington Post) and tons of pictures*

E. Climate Steward knowledge survey

The questions were chosen from the Yale study to test Climate Stewards' knowledge of each of the seven principles. Some questions apply to more than one principle. The results are presented with the Yale data and the 2010 Climate Stewards data for comparison purposes. Seventeen Climate Stewards took the test online in the spring of 2011 after participating. The Yale results were used as a comparison group to show how the Climate Stewards compared with the general population, as well as within group gains from pre to post.

Key to Yale questions by principle

<i>Climate Literacy principle⁷</i>	<i>Yale questions</i>
The sun is the primary source of energy for earth's climate system	8, 9, 10, 11
Climate is regulated by complex interactions among components of the earth system.	12, see also 7
Life on earth depends on, is shaped by, and affects climate.	13
Climate varies over space and time through both natural and man-made processes.	15
Our understanding of the climate system is improved through observations, theoretical studies, and modeling	31
Human activities are impacting the climate system	1-7
Climate science will have consequences for the earth system and human lives.	34-35, 39, 41, 42

Results

Principle 1: The sun is the primary source of energy for earth's climate system

For eight of the nine items on Principle 1, the Climate Stewards were more knowledgeable than the national Yale study sample. Specifically:

- 16 of the 17 (94%) Climate Stewards said they heard of the greenhouse effect compared with 87% in the Yale study.
- 100% of Climate Stewards correctly identified that the greenhouse effect refers to "gases in the atmosphere that trap heat" compared with 66% of respondents in the Yale study

⁷ http://oceanservice.noaa.gov/education/literacy/climate_literacy.pdf

- 100% of Climate Stewards correctly identified that greenhouse gases in the atmosphere affect the average temperature of the Earth compared with 68% in the Yale study
- 65% of Climate Stewards correctly identified changes in the Earth's orbit around the sun as affecting the average temperature of the Earth compared with 61% in the Yale study
- 89% of Climate Stewards correctly identified volcanic eruptions as affecting the average temperature of the Earth compared with 60% in the Yale study
- 89% of Climate Stewards correctly identified the amount of dust in the atmosphere as affecting the average temperature of the Earth compared with 58% in the Yale study
- 89% of Climate Stewards correctly identified sunspots as affecting the average temperature of the Earth compared with 47% in the Yale study
- 76% of Climate Stewards correctly identified clouds as affecting the average temperature of the Earth compared with 48% in the Yale study
- 76% of Climate Stewards correctly identified where the Earth's surface is light or dark colored as affecting the average temperature of the Earth compared with 37% in the Yale study
- 94% of Climate Stewards correctly identified carbon dioxide as a gas in the atmosphere that is good at trapping heat from the Earth's surface, compared with 45% in the Yale study
- 82% of Climate Stewards correctly identified methane as a gas good at trapping heat compared with 45% in the Yale study
- 59% of Climate Stewards correctly identified water vapor as a gas good at trapping heat compared with 12% in the Yale study

CS	Yale	Diff	
94%	87%	7%	Heard of greenhouse effect
100%	66%	34%	Definition of greenhouse effect
100%	68%	32%	Effect of greenhouse gases
65%	61%	4%	Effect of changes in Earth orbit
89%	60%	29%	Effect of volcanic eruptions
89%	58%	31%	Effect of amount of dust in atmosphere
36%	47%	-11%	Effect of sunspots
76%	48%	28%	Effect of clouds
76%	37%	39%	Effect of color of Earth's surface (albedo)

1. Have you heard of the greenhouse effect?

2010	Yale	N=17
94%	87%	Yes
6%	13%	No (N=1)

2. The greenhouse effect refers to:

2010	Yale	
100%	66%	Gases in the atmosphere that trap heat*
0%	21%	The Earth's protective ozone layer
0%	1%	Pollution that causes acid rain

0%	3%	How plants grow
0%	10%	Don't know

3. How much can each of the following affect the average temperature of the Earth? 4=A lot, 3=some, 2=a little, 1=not at all, don't know

2010		Yale		
4	3	4	3	
76%	24%	38%	30%	Greenhouse gases in the atmosphere*
41%	24%	32%	29%	Changes in the Earth's orbit around the sun*
18%	71%	28%	32%	Volcanic eruptions*
18%	71%	21%	37%	The amount of dust in the atmosphere*
12%	24%	17%	30%	Sunspots*
41%	35%	16%	32%	Clouds*
6%	6%	15%	18%	Earthquakes (no effect)
35%	41%	13%	24%	Where the Earth's surface is light or dark colored (albedo)*
0%	6%	8%	18%	The phases of the moon (no effect)

*Correct answers

4. Which of the following gases in the atmosphere are good at trapping heat from the Earth's surface? (Check all that apply)

2010	Yale	
94%	45%	Carbon dioxide*
82%	25%	Methane*
59%	12%	Water vapor*
6%	7%	Hydrogen
6%	7%	Oxygen
6%	42%	Don't know

Principle 2: Climate is regulated by complex interactions among components of the earth system.

On all seven items for this principle, a greater percentage of Climate Stewards correctly identified the statement as true or false (range from 25%-70% difference) than in the Yale study.

- 88% of Climate Stewards correctly identified as false that weather means the average climate conditions in a region compared with 18% in the Yale study
- 94% of Climate Stewards correctly identified as false that climate and weather are pretty much the same thing, compared with 28% in the Yale study
- 76% of Climate Stewards correctly identified as true that ocean currents carry heat from the equator toward the north and south poles, compared with 20% in the Yale study
- 71% of Climate Stewards correctly identified as false that the atmosphere carries heat from the north and south poles toward the equator, compared with 16% in the Yale study
- 65% of Climate Stewards correctly identified as false that climate often changes from year to year, compared with 12% in the Yale study

- 71% of Climate Stewards correctly identified as true that Climate means the average weather conditions in a region, compared with 34% in the Yale study
 - 71% of Climate Stewards correctly identified as true that weather often changes from year to year, compared with 46% in the Yale study
5. Are each of the following statements: 4=definitely true, 3=probably true, 2=probably false, or 1=definitely false or you do not know

2010	Yale	Diff	
88%	18%	70%	Weather means the average climate conditions in a region (F)
94%	28%	66%	Climate and weather mean pretty much the same thing (F)
76%	20%	56%	Ocean currents carry heat from the equator toward the north and south poles (T)
71%	16%	55%	The atmosphere carries heat from the north and south poles toward the equator (F)
65%	12%	53%	Climate often changes from year to year (F)
71%	34%	37%	Climate means the average weather conditions in a region (T)
71%	46%	25%	Weather often changes from year to year (T)

Principle 3: Life on earth depends on, is shaped by, and affects climate.

For all eight items on this principle, compared to the Yale Study, a greater percentage of Climate Stewards correctly identified the statements as definitely true or definitely false.

- 71% Climate Stewards vs. 20% of Yale study correctly identified as true that climate science has played an important role in the success of past civilizations
- 65% Climate Stewards vs. 14% Yale study correctly identified as true that in the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase
- Most (82%) Climate Stewards identified as false that Earth’s climate is colder now that it has ever been before, vs. 39% in the Yale study
- 82% Climate Stewards vs. 38% Yale study correctly identified as false that Earth’s climate has pretty much been the same for millions of years
- 35% Climate Stewards vs. 4% Yale study correctly identified as false that In the past, Earth’s climate always shifted gradually between warm and cold periods
- 41% Climate Stewards vs. 14% Yale study correctly identified as false that Earth’s climate is warmer now that it has ever been before
- More Climate Stewards (29%) than Yale study participants (9%) correctly identified as true that in the past, rising global temperatures have caused carbon dioxide levels in the atmosphere to increase
- More Climate Stewards (24%) than Yale study participants (8%) correctly identified as true that compared to the climate of the past million years, the last 10,000 have been unusually warm and stable




6. Are each of the following statements: 4=definitely true, 3=probably true, 2=probably false, or 1=definitely false or you do not know



2010	Yale	Diff	
71%	20%	51%	Climate sciences have played an important role in the advance or collapse of some past human civilizations (T)
65%	14%	51%	In the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase (T)
82%	39%	43%	The Earth's climate is colder now that it has ever been before (F)
71%	38%	33%	The Earth's climate has been pretty much the same for millions of years (F)
35%	4%	31%	In the past, the Earth's climate always shifted gradually between warm and cold periods (F)
41%	14%	27%	The Earth's climate is warmer now that it has ever been before (F)
29%	9%	20%	In the past, rising global temperatures have caused carbon dioxide levels in the atmosphere to increase (T)
24%	8%	16%	Compared to the climate of the past million years, the last 10,000 have been unusually warm and stable (T)

Principle 4: Climate varies over space and time through both natural and man-made processes.

For Principle 4, 13% more Climate Stewards than the Yale study participants chose the Threshold model as the best explanation for how the climate system works (47% vs. 34%).

7. People disagree about how the climate system works. The five pictures below illustrate five different perspectives. Each picture depicts Earth's climate system as a ball balanced on a line, yet each one has a different ability to withstand human-caused global warming. Which one of the five pictures best represents your understanding of how the climate system works?

<p>Gradual: Earth's climate is slow to change. Global warming will gradually lead to dangerous effects.</p> 	<p>Fragile: Earth's climate is delicately balanced. Small amounts of global warming will have abrupt and catastrophic effects.</p> 	<p>Stable: Earth's climate is very stable. Global warming will have little to no effects.</p> 
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<p>Threshold: Earth's climate is stable within certain limits. If global warming is small, climate will return to a stable balance. If it is large, there will be dangerous effects.</p> 	<p>Random: Earth's climate is random and unpredictable. We do not know what will happen.</p> 	
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2010	Yale	
47%	34%	Threshold* (best answer)
24%	24%	Gradual
12%	21%	Random
18%	11%	Fragile
0%	10%	Stable

Principle 5: Our understanding of the climate system is improved through observations, theoretical studies, and modeling.

For Principle 5, a greater percentage of Climate Stewards than Yale study participants correctly identified the statements as definitely true or definitely false (range of 14% to 70% difference) on all 12 items.

- 82% of Climate Stewards vs. 12% of Yale study participants correctly identified as false that global warming will cause equal increases in temperature in all countries.
- 94% of Climate Stewards vs. 26% of Yale study participants correctly identified as false that record snowstorms in the eastern US prove global warming is not happening.
- 76% of Climate Stewards vs. 11% of Yale study participants correctly identified as false that scientists' computer models are too unreliable to predict the climate of the future.
- 82% of Climate Stewards vs. 18% of Yale study participants correctly identified as true that global warming will cause some places to get wetter, while others will get drier.
- 71% of Climate Stewards vs. 13% of Yale study participants correctly identified as false that scientists can't predict the weather more than a few days in advance – they can't possibly predict the climate of the future.
- 76% of Climate Stewards vs. 20% of Yale study participants correctly identified as false that the decade from 2000-2009 was warmer than any other decade since 1850.
- 64% of Climate Stewards vs. 11% of Yale study participants correctly identified as true that global warming will increase crop yields in some places and decrease it in others
- 71% of Climate Stewards vs. 21% of Yale study participants correctly identified as false that the earth is actually cooling, not warming.

- 65% of Climate Stewards vs. 31% of Yale study participants correctly identified as false that global warming is happening, but will be more beneficial than harmful.
- 53% of Climate Stewards vs. 19% of Yale study participants correctly identified as false that any recent global warming is caused by the sun.
- 18% of Climate Stewards vs. 4% of Yale study participants correctly identified as false that in the 1970's, most scientists were predicting an ice age.

8. Are each of the following statements: 4=definitely true, 3=probably true, 2=probably false, or 1=definitely false or you do not know

2010	Yale	Diff	
82%	12%	70%	Global warming will cause temperatures to increase by roughly the same amount in all countries (F)
94%	26%	68%	The record snowstorms this winter in the eastern United States prove that global warming is not happening (F)
76%	11%	65%	Scientists' computer models are too unreliable to predict the climate of the future (F)
82%	18%	64%	Global warming will cause some places to get wetter, while others will get drier (T)
71%	13%	58%	Scientists can't predict the weather more than a few days in advance – they can't possibly predict the climate of the future (F)
76%	20%	56%	Earth's climate has changed naturally in the past, therefore humans are not the cause of global warming (F)
65%	12%	53%	The decade from 2000-2009 was warmer than any other decade since 1850 (T)
64%	11%	53%	Global warming will increase crop yields in some places and decrease it in others (T)
71%	21%	50%	Earth is actually cooling, not warming (F)
65%	31%	34%	Global warming is happening, but will be more beneficial than harmful (percentages represent those choosing definitely false)
53%	19%	34%	Any recent global warming is caused by the sun (F)
18%	4%	14%	In the 1970's, most scientists were predicting an ice age (F)

Principle 6: Human activities are impacting the climate system.

For Principle 6, Climate Stewards were more knowledgeable than the Yale study participants in all eight areas.

- 100% of Climate Stewards vs. 63% of Yale study participants think global warming is happening. Of those who think it is happening, 82% of Climate Stewards vs. 21% of Yale study participants are extremely sure that global warming is happening; 7% vs. 18% of those who do not think it is happening are extremely sure.
- Assuming global warming is happening, 53% of Climate Stewards vs. 50% of the Yale study participants think it is caused mostly by human activities; 41% vs. 6% think it is caused by both human activities and natural changes.
- 75% of Climate Stewards vs. 39% of Yale study participants share the view that most scientists think global warming is happening; 24% vs. 38% share the view

that there is a lot of disagreement among scientists about whether or not global warming is happening.

- 71% of Climate Stewards vs. 16% of Yale study participants are very worried about global warming.
- 89% of Climate Stewards vs. 62% of Yale study participants feel very or fairly well informed about how the Earth's climate system works.
- 95% of Climate Stewards vs. 65% of Yale study participants feel very or fairly well informed about the different causes of global warming.
- 94% of Climate Stewards vs. 66% of Yale study participants feel very or fairly well informed about the different consequences of global warming.
- 95% of Climate Stewards vs. 64% of Yale study participants feel very or fairly well informed about ways in which we can reduce global warming.

9. Do you think global warming is happening?

2010	Yale	Diff	
100%	63%	37%	Yes
0%	19%	-19%	No
0%	19%	-19%	Don't know

10. If yes, how sure are you that global warming is happening?

2010	Yale	Diff	
82%	21%	61%	Extremely sure
18%	35%	-17%	Very sure
0%	39%	-39%	Somewhat sure
0%	4%	-4%	Not at all sure

11. If no, how sure are you that global warming is not happening?

2010	Yale	Diff	
7%	18%	-11%	Extremely sure
0%	35%	-35%	Very sure
0%	41%	-41%	Somewhat sure
93%	6%	87%	Not at all sure

12. Assuming global warming is happening, do you think it is...

2010	Yale	Diff	
53%	50%	3%	Caused mostly by human activities
41%	6%	35%	Caused by both human activities and natural changes
6%	35%	-29%	Caused mostly by natural changes in the environment
0%	7%	-7%	None of the above because global warming isn't happening
0%	2%	-2%	Other
0%	1%	-1%	Don't know

13. Which comes closest to your own view?

2010	Yale	Diff	
76%	39%	36%	Most scientists think global warming is happening
0%	6%	-6%	Most scientists think global warming is not happening

24%	38%	-14%	There is a lot of disagreement among scientists about whether or not global warming is happening
0%	17%	-17%	Don't know enough to say

14. How worried are you about global warming?

2010	Yale	Diff	
71%	16%	55%	Very worried
24%	39%	-15%	Somewhat worried
6%	26%	-20%	Not very worried
0%	19%	-19%	Not at all worried

15. Personally, how well informed do you feel you are about... (very well informed, fairly well informed, not very well informed, not at all informed) Presented are % that report feeling "Very well informed"

2010	Yale	Diff	
89%	62%	27%	How the Earth's "climate system" works
95%	65%	30%	The different causes of global warming
94%	66%	28%	The different consequences of global warming
95%	64%	31%	Ways in which we can reduce global warming

Principle 7: Climate science will have consequences for the earth system and human lives.

For Principle 7, Climate Stewards were more knowledgeable than the Yale study participants in all 22 areas.

- 100% of Climate Stewards vs. 37% of Yale study participants correctly identified as true that melting of land ice in Antarctica can cause global sea levels to rise.
- 82% of Climate Stewards vs. 24% of Yale study participants correctly identified as true that warmer ocean temperatures can cause global sea levels to rise.
- 82% of Climate Stewards vs. 32% of Yale study participants correctly identified as true that melting of mountain glaciers can cause global sea levels to rise.
- 41% of Climate Stewards vs. 19% of Yale study participants correctly identified as false that increased evaporation can cause global sea levels to rise.
- 53% of Climate Stewards vs. 36% of Yale study participants correctly identified as true that melting of sea ice on the Arctic Ocean can cause global sea levels to rise.
- 35% of Climate Stewards vs. 22% of Yale study participants correctly identified that warmer ocean temperatures have contributed the most to sea level rise so far.
- 65% of Climate Stewards vs. 54% of Yale study participants correctly identified that warmer ocean temperatures cause coral bleaching.

- 71% of Climate Stewards vs. 32% of Yale study participants correctly identified that absorption of carbon dioxide by the ocean cause ocean acidification.
- 76% of Climate Stewards vs. 32% of Yale study participants correctly identified as false that if we stop punching holes in the ozone layer with rockets it would reduce global warming a lot.
- 53% of Climate Stewards vs. 16% of Yale study participants correctly identified as false that reducing toxic waste (nuclear, chemical) would reduce global warming a lot.
- 71% of Climate Stewards vs. 37% of Yale study participants correctly identified as true that reducing tropical deforestation would reduce global warming a lot.
- 41% of Climate Stewards vs. 16% of Yale study participants correctly identified as true that switching from fossil fuels to nuclear power would reduce global warming a lot.
- 41% of Climate Stewards vs. 16% of Yale study participants correctly identified as true that switching from regular (incandescent) to compact florescent light bulbs would reduce global warming a lot.
- 35% of Climate Stewards vs. 15% of Yale study participants correctly identified as false that banning aerosol spray cans would reduce global warming a lot.
- 35% of Climate Stewards vs. 15% of Yale study participants correctly identified as true that insulating buildings would reduce global warming a lot.
- 29% of Climate Stewards vs. 10% of Yale study participants correctly identified as true that placing a large tax on all fossil fuels would reduce global warming a lot.
- 41% of Climate Stewards vs. 27% of Yale study participants correctly identified as true that driving less would reduce global warming a lot.
- 18% of Climate Stewards vs. 10% of Yale study participants correctly identified as true that having at most two children per family would reduce global warming a lot.
- 47% of Climate Stewards vs. 40% of Yale study participants correctly identified as true that planting trees would reduce global warming a lot.
- 24% of Climate Stewards vs. 18% of Yale study participants correctly identified as true that increasing public transportation would reduce global warming a lot.
- 6% of Climate Stewards vs. 4% of Yale study participants correctly identified as true that stopping eating beef would reduce global warming a lot.
- 29% of Climate Stewards vs. 28% of Yale study participants correctly identified as true that switching from gasoline to electric cars would reduce global warming a lot.

16. Which of the following can cause global sea levels to rise? Definitely true, Probably true. Probably false, Definitely false, Do not know

2010	Yale	Diff	
100%	37%	63%	Melting of land ice in Antarctica (T)
82%	24%	58%	Warmer ocean temperatures (T)
82%	32%	50%	Melting of mountain glaciers (T)
41%	19%	22%	Increased evaporation (F)
53%	36%	17%	Melting of sea ice on the Arctic Ocean (T)

17. Of the causes you selected, which one has contributed the most to sea level rise so far?

2010	Yale	
12%	19%	Melting of land ice in Antarctica
24%	34%	Melting of sea ice on the Arctic Ocean
18%	24%	Melting of mountain glaciers
35%	22%	Warmer ocean temperatures *
12%	2%	Increased evaporation

18. Which of the following causes coral bleaching?

2010	Yale	
65%	54%	Warmer ocean temperatures*
6%	11%	Chemical spills in the ocean
18%	8%	Acid rain
0%	3%	Overfishing
2%	24%	Don't know

19. Which of the following causes ocean acidification?

2010	Yale	
71%	32%	Absorption of carbon dioxide by the ocean*
0%	16%	Chemical spills in the ocean
0%	19%	Acid rain
12%	13%	Warmer ocean temperatures
18%	21%	Don't know

20. How much do you think each of the following actions would reduce global warming if they were done worldwide? A lot, Some, A little, Not at all, Don't know. Percentage represents percentage who got it right

2010	Yale	Diff	
76%	32%	44%	Stop punching holes in the ozone layer with rockets (F)
53%	16%	37%	Reducing toxic waste (nuclear, chemical) (F)
71%	37%	34%	Reducing tropical deforestation (T)
71%	43%	28%	Switching from fossil fuels to renewable energy (wind, solar, geothermal) (T)
41%	16%	25%	Switching from fossil fuels to nuclear power (T)
41%	16%	25%	Switching from regular (incandescent) to compact florescent light bulbs (T)
35%	15%	20%	Banning aerosol spray cans (F)

35%	16%	19%	Insulating buildings (T)
29%	10%	19%	Placing a large tax on all fossil fuels (T)
41%	27%	14%	Driving less (T)
18%	10%	8%	Having at most two children per family (T)
47%	40%	7%	Planting trees (T)
24%	18%	6%	Increasing public transportation (T)
6%	4%	2%	Stop eating beef (T)
29%	28%	1%	Switching from gasoline to electric cars (T)
0%	2%	-2%	Using airplanes to scatter dust high in the atmosphere (% refers to "a lot")
0%	7%	-7%	Fertilizing the ocean to make algae grow faster (% refers to "a lot")

F. Climate Steward reflections on the project (Aug 2011 survey)

In August of 2011, Climate Stewards in the class of 2010 were asked to complete a survey about their experience in the project and its effect on them and their participants. In this section we report the results of the 20-question survey.

1. How satisfied are you with the Climate Stewards project?
2. What comments or recommendations do you have for the project for the project in the future?
3. Are there other technologies you would suggest we use in addition to webinars, the online workspace (wiki), and emails.
4. In your own words, how would you say being a Climate Steward has affected you and your work?
5. How are you integrating Climate Science into your existing projects or activities?
6. Has involvement with the climate stewards project influenced your personal behavior e.g. reducing your carbon footprint, etc., outside the classroom? And if so, how?
7. Would you recommend the Climate Stewards project to a colleague? YES NO What would you say?
8. Who do you think could benefit from becoming a Climate Steward?
9. How many hours did you spend in each of the following activities as part of the Climate Steward project?
10. Reflect back to before you joined the Climate Stewards project, then rate yourself in each of the following areas, now, after being a Climate Steward
11. Please explain your ratings from Question 10 and give examples in each area.
12. What are your plans for using your climate science knowledge in the future? Please explain each one you are pursuing.
13. Do you have any suggestions for the project going forward? (activities, expectations, application process, communication, resources...)
14. What are the benefits for you of doing a stewardship project as part of the NOAA Climate Stewards project?
15. Please explain and give examples or type NA for not applicable

18. During your time as a Climate Steward, you may also have shared your knowledge and resources with people who were not in your stewardship project. What was the effect on your other audiences?

19. In the future, would you be interested in any of the following?

20. Other comments or suggestions?

Note: The responses to these questions were reported in section III.D.

16. What about the effect on the participants in your stewardship project group? How much did it affect them in each of the areas listed below?

17. Do you have evidence of the effect of your climate stewardship project? Yes

1. How satisfied are you with the Climate Stewards project? 1-10=highest

Overall	8.9
Content of communications from NOAA	9.5
Communication methods (email, online workspace, telephone)	9.1
Professional development opportunities	9.3
Clarity of expectations	8.9
Value of the climate steward expectations for certification	8.5

2. What comments or recommendations do you have for the project in the future?

- *Continue the projects*
- *It would be nice if CS could meet each other but it's almost impossible to do that without expending a lot of money &/or carbon emissions so I wonder if a regional rotation might work for future classes with cohorts focusing on regional impacts & solutions.*
- *None*
- *I am happy with the evolution of the Climate Stewards project. Better teleconferencing software is needed. Something that can facilitate both audio and presentations, rather than having to use both a phone and laptop.*
- *This project offers a great many opportunities for professional development. Continued access to NSTA professional development sites.*
- *I understand that the online/phone format for this project is important, however, the ability to meet in person, at least a couple of times would be ideal. Perhaps, regional meetings could work best. I do think that the online meetings are a good answer to decreasing the carbon footprint.*
- *A greater inter-disciplinary approach may give the project even wider influence.*
- *The mini-grant process is cumbersome and time consuming. If these grants were 5000 rather than 500 I could see the need for the vetting and hoops. Some expectations were vague.*
- *Some of NSTA material was repetitive Minor*
- *I have noticed a lot of project changes that have already occurred with the new group of stewards. I like that we went to an online conference call that provides information from professionals that know what is currently happening in the*

I like that we went to an online conference call that provides information from professionals that know what is currently happening in the fields of climate science.

fields of climate science. The content knowledge they are providing is very helpful. I also like the wiki that was created as a 'one stop shop' for all of the information we are given. It makes it easy and convenient to find everything.

- *This is the only project of its kind that discusses the most important scientific question of our generation. It is critical to NOAA's mission and to the education of the next generation. We need more.*

3. Are there other technologies you would suggest we use in addition to webinars, the online workspace (wiki), and emails?

- *No (6) I think as the project has grown the technologies used as grown nicely. As the group/project changes additional changes may be needed, but right now everything works well. Not really, I think these are the appropriate tools. Perhaps some video conferencing option.*
- *Try to share or develop hands-on activities to share with other teachers or students*
- *Mobile message texting, twitter*
- *I love Elluminate Conferencing software. It is used by NSTA and many online academic institutions.*
- *I think that urban schools in particular could make use of DVDs that have the short videos that NOAA produces - especially if they were grouped by topic.*
- *Webinar worked well*
Wiki took a while to figure out
- *Take a look at Moodle.*

4. In your own words, how would you say being a Climate Steward has affected you and your work?

Participants report that participating in the project has positively affected their work in many ways, such as, giving them more resources, helping them apply for other grants, teaching them about climate science, giving them access to climate science experts, giving them themes for student projects, making them think about other educational approaches, and getting support from NOAA and their local organizations.

- *It has improved the work that I do by giving me more material to share with students and teachers*
- *I appreciated learning about the network and the funding for our pilot project.*
- *Wow! How about a \$1,056,000 grant from the National Science Foundation? The project has been priceless. The 2010 ESIP Summer meeting provided the capacity to submit for the NASA Innovations on Global Climate science Education grant. The resources and learnings - simply awesome!*
- *The PD is invaluable. I took advantage of the year's subscription to the NSTA Learning Center and many of the webinars. Learning from the leading scientists on Climate science and having contact with other Climate science educators and professionals has been invaluable.*
- *I have learned a lot more about climate since joining. I also tend to use climate as one of the*

Wow! How about a \$1,056,000 grant from the National Science Foundation? The project has been priceless.

- over riding themes when students do projects in my classes.*
- *Being a CS was the impetus for my having focused on Climate as the initial topic for training at the NOAA ESTC. The resources available through this project, the training opportunities (via NSTA), and consultation with Bruce M. and Peg S. all helped lay the groundwork for the Climate Science Workshop Series.*
 - *As a math faculty person, the impact is muted since I do not teach science concepts on a frequent basis. I attempt to bring science concepts into classroom material when appropriate for the course and level of students.*
 - *Being a Climate Steward has affected the content of all of my courses and driven much of my PD. Membership has given me a new direction in the courses I design and has helped focus aspects of other grants and projects. My Stewardship project has helped expand a Title II grant to include other schools in the same target complex and I have been able to leverage end of grant funds to expand my Stewardship project by purchasing library resources and eight aquaria for the schools.*
 - *Made me think about the 'educational' approaches at different grade levels*
 - *Being a Climate Steward has provided me a new perspective on climate education that has given me a chance to teach my students about an old topic in a more informative and new way. As an elementary school teacher climate science is something that is directly part of our normal instruction, but I have learned how to both prepare my students for a deeper knowledge in the future while giving them a solid foundation now.*
 - *Having the training and the backing of NOAA empowers me to discuss climate in depth in my classroom with the full backing of the entire administration of my district.*

5. How are you integrating Climate Science into your existing projects or activities?

Some have developed modules (<http://cimss.ssec.wisc.edu/climatechange/>), redirected projects toward “climate, ocean and weather,” offered workshops, integrated real time data into their classes, participated in a global carbon footprint study, added climate topics to Earth Science and Science Methods classes, and planted gardens.

- *I have teaching modules now that I created as a result of being a climate steward. <http://cimss.ssec.wisc.edu/climatechange/>*
- *We have redirected the mission of our organization to be Climate, Ocean and Weather. We are working on a dual enrollment project for our high school students at the local community college in climate, ocean and weather. Thus, by the time the students that participated in our climate steward project reach the 10th grade, they will be dually enrolled in high school in our Climate Science Academy as well as taking college courses in climate, ocean, and weather.*
- *I have integrated many of the real time data websites presented in the CS webinars into lessons on climate science in both my face to face and virtual classroom curricula in HS Oceanography. I have also given two public workshops and one teacher workshop.*
- *I wrote a multidisciplinary project for students at the school where I taught last year based on climate study. It included English, math, science and art. Students did short term experiments to illustrate concepts, wrote papers, and prepared power point presentations for the group. The teachers and students learned more about climate science.*
- *We participated in a global carbon footprint study.*
- *Yes, in pretty much all that I do and I am encouraging others to do likewise.*
- *I attempt to bring science concepts into classroom material when appropriate for the course and level of students*
- *Now teaching a Climate course at the University and have added Climate topics to my Earth Science and Science Methods courses.*
- *Using some of the literacy aspects*
- *In science we are always making connections and now I make sure to show students the connection to climate science; it provides me with a chance to extend everything another step further. The biggest change/extension is what I was able to do with the grant I was provided. Last year I was able to create a garden involving all of our second grade classes (125 students); the garden let us incorporate are best practice in all of the subjects with valuable, real-world connections. As our students and parents became excited about the garden and the many plants we grew we were able to talk more about carbon footprints which lead our families to be more aware.*

I have integrated many of the real time data websites presented in the CS webinars into lessons on climate science in both my face to face and virtual classroom

In science we are always making connections and now I make sure to show students the connection to climate science

- *I plan to have my students take my on-line climate education class in the fall.*

6. Has involvement with the climate stewards project influenced your personal behavior e.g. reducing your carbon footprint, etc., outside the classroom? And if so, how?

Being involved with the Climate Stewards project has also influenced participants' personal behaviors. They report "greening" their lives, being more aware of what they do, and focusing on "living lightly" by using a thermos and coffee cup instead of buying coffee, printing documents less often, growing a garden and using reusable containers instead of disposable ones.

- *No, not dramatically because I was already trying to lower my Carbon footprint.*
- *Being a CS reinforced the path I was already on.*
- *Yes, I recycle, reduce, and reuse more than I ever had. I have 'greened' my life.*
- *Yes. I am more conscious about my plastic consumption and use recyclable bags everywhere.*
- *I am more aware of what I do. I have always done things like recycling and planning trips to avoid using too much gas but I find that over time you get a bit complacent. Studying climate brings things back into perspective and renews your energy.*
- *Not really, I was on board with this prior to my involvement with CS.*
- *No. I was trying to be as environmentally conscience as possible before the climate stewards project.*
- *I am more focused on living lightly and improving the ocean environment since my participation.*
- *Still working on reducing footprint*
- *Yes, of course. If I ask my students to do something, I have to make sure I am taking the lead. There have been lots of little changes; growing my own garden at home, making sure that I use reusable containers for lunch vs. plastic bags, making sure I buy products that use less packaging, I have switched to a reusable water thermos instead of water bottles, and I no longer buy coffee daily but instead make it at home and use reusable coffee mugs. I have also worked hard to switch to a more 'digital life', using technology to help eliminate paper products, little things like switching to a digital calendar and digital to do list. Those are just a few little things that I have been able to do to, but according to the Carbon Footprint calculator all of those little things have added up in a way that I was surprised to see.*
- *Prior to this project I was not aware of the amount of impact gases other than carbon have on climate. I have made efforts to reduce my footprint of those in addition to reducing my carbon footprint.*

I am more aware of what I do.

I have 'greened' my life.

7. Would you recommend the Climate Stewards project to a colleague? YES NO What would you say? 100% of CS said they would recommend the project to others.

- *Yes, if they have an interest in climate science.*
- *NO to colleagues but YES to interested teachers or informal educators.
... I would tell them about the project.*
- *Yes, I did. I recommended it to the chair of the science department at our middle school.*
- *Yes. I would encourage all AP Environmental Science and Geosystems teachers to become climate stewards. Teachers can reach such a broad audience, especially as young adults that will grow to help positively impact Earth's health in the future.*
- *Yes, I became aware of many web sites that are very useful for teaching.*
- *Yes. I would say that there are a number of folks from around the country with stellar ideas for bringing climate education and understanding to others. Nobody is in this alone and CS represents a great way to gain further understanding of climate topics and innovative ideas in support of building climate understanding and managing challenges related to this.*
- *Yes. A science department colleague is likely to be more receptive than a math (or other discipline) department colleague.*
- *Yes, this is a great way to move society forward in climate science and stewardship. A great way to get your students involved in research and science that is 'place based'.*
- *Yes. Well worth the time investment*
- *Yes, I HAVE already. The project has provided me with a great deal of information in a field that I honestly didn't know a lot about. I feel stronger in my content knowledge. However, any teacher will have to know how to take the knowledge and apply it to their curriculum. The project is definitely for the teacher that is already strong in their field and wants to become even stronger.*
- *Yes. I think all educators in the US should have training like this. How else will the next generation learn to steward our climate and our planet?*

I think all educators in the US should have training like this. How else will the next generation learn to steward our climate and our planet?

8. Who do you think could benefit from becoming a Climate Steward? N=11

Classroom Teachers	10	91%
Informal educators (Park service educators, Educators at Nature Centers, Zoos and Aquariums, Meteorologists)	10	91%
College/higher education faculty	8	73%
Anyone interested in educating others about climate science	8	73%
Citizen scientist	6	55%

9. How many hours did you spend in each of the following activities as part of the Climate Steward project? We know many of you are involved in Climate Science activities as part of your work, or other projects so here we are asking you to think about what part of that time you would directly attribute to your participation in the Climate Stewards project.
- Choices - 1-5 6-10 11-20 21-40 41-80 81-160 161-200 201-300 >300

Participants reported spending the most time on professional development (41-80 hours), followed by self-study (21-40 hours) and telecons (20-30 hours). Other big time commitments were to developing and implementing the stewardship project (40-55 hours) and providing training to others (20-21 hours).

# Hours	Activity
41-80	Professional development (learning in courses, webinars, conferences, etc)
21-40	Self-study (looking things up, reading, talking with others)
20-30	Telecons
20-30	Stewardship project (developing)
20-25	Stewardship project (implementing)
20-21	Provide training or resources to others
10-15	On the wiki
10-15	Webinars
5-7	Stewardship project (evaluating)

10. Reflect back to before you joined the Climate Stewards project, then rate yourself in each of the following areas, now, after being a Climate Steward: on a scale of 1-10=highest

On a scale of 1-10, participants' ratings of the effect of the project on them ranged from 3.1 for interest in climate science (6.3-9.4) to 4.1 points for places and ways to locate resources on climate science (4.8-8.9). All areas increased as a result of the project: 4.0 for integration of climate science into your work (4.2-8.2), 3.9 for confidence in teaching/sharing climate science concepts (4.7-8.6), 3.8 for use of NOAA resources (4.8-8.9), 3.7 for content knowledge of climate science (4.8-8.5), 3.5 for ways to teach specific climate science concepts (5.0-8.3), 3.4 for impact of climate science (5.5-8.9), and 3.3 for ways to engage about climate science (6.3-9.4).

Before	After	Change	
4.2	8.2	4.0	Integration of climate science into your work
4.8	8.5	3.7	Content knowledge of climate science
4.7	8.6	3.9	Confidence in teaching/sharing climate science concepts
6.3	9.4	3.1	Interest in climate science
5.5	8.9	3.4	Impact of climate science
4.7	8.2	3.5	Ways to teach specific climate science concepts
5.0	8.3	3.3	Ways to engage about climate science
5.1	8.9	3.8	Use of NOAA resources
4.8	8.9	4.1	Places and ways to locate resources on climate science

11. Please explain your ratings from Question 10 and give examples in each area.

Integration of climate science into your work

- *I am an informal educator and teach a variety of science topics around the country. I now have more content to teach.*
- *We have a NSF grant in which climate science careers is the focus.*

I am doing more than ever before

- *I have integrated lessons using real time data*
- *Climate study as a part of a interdisciplinary biology study.*
- *Integrating Climate Sci. was just an idea seldom implemented prior to participation in CS. Following, I actively seek opportunities to integrate climate sci.*
- *As appropriate in math classes*
- *Include climate modeling and sea surface content in my courses*
- *Sharing websites*
- *Making connections to why plants are important*
- *I am doing more than ever before*

Content knowledge of climate science

- *The project has increased my content knowledge of climate issues.*
- *Because of the professional development training and the 2010 ESIP summer meeting*
- *I can elaborate with confidence about Climate science Science*
- *Several of the webinars provided information that I included into class study about evolutionary changes - honey bee movie*
- *The biggest jump for me on this score was developing the capacity to comfortably manage misconceptions related to climate science.*
- *I've been exposed to more information and resources about the climate.*
- *I have taken several additional courses in Climate including Corals and Climate, Communicating Ocean Science, and AMS Climate in the Earth System*
- *Knowledge about the wealth of website information*
- *Being more aware of the thing that occur that effect climate*
- *The training has helped increase my knowledge.*

The biggest jump for me on this score was developing the capacity to comfortably manage misconceptions related to climate science.

Confidence in teaching/sharing climate science concepts

- *The project has increased my confidence to teach climate issues.*
- *The CIRES course I took on Communicating Climate science improved my confidence level.*
- *I got powerpoint presentations specifically to allow me to teach to our community stakeholders*
- *Very high*
- *While I am still not as confident as I am with biology and chemistry concepts I feel that I can explain the data.*
- *The increase in knowledge led to more confidence in teaching about this topic. I would call out experience with and knowledge of NOAA resources related to climate in particular*

The completion of the project helps others look to me as a resource.

- *Science education is not my teaching background.*
- *Working with teachers and other in Climate PD activities*
- *Hearing the others talk about teaching challenges*
- *My teammates jumped on board for our climate project, and as we are continuing the project two more grade levels have already approached me about doing more with the project.*
- *The completion of the project helps others look to me as a resource.*

Interest in climate science

- *The project has increased my interest in climate issues.*
- *This is the first time in my professional career and personal life that I am passionate about a content area. As a policy attorney, I was trained to be neutral. I have become an alarmist about climate science.*
- *Heightened because I participated in this project*
- *Climate affects environmental changes that students are beginning to see. I find that the added awareness has come with increased knowledge.*
- *Prior involvement in this climate sci. was nice but I was shooting for more of an advocacy type of activity. However the science that supports our understanding of climate is very engaging and I think is key to supporting a climate literate and scientifically literate society.*
- *I was interested before and am still interested.*
- *Taking more personal PD*
- *Knowledge that there was a wide spectrum of involved individuals from a wide variety of fields*
- *Going beyond weather education to climate education and understanding the differences and how weather can change over a longer period of time*
- *Climate science is the most important scientific question of our age.*

This is the first time in my professional career and personal life that I am passionate about a content area

Impact of climate science

- *I have a better understanding of climate science impacts.*
- *I view climate and weather very different. I look beyond the obvious for local weather disasters. I have a better respect and love for my home rivers and the Chesapeake Bay. My family has lived on the Nanticoke river since the early 1800s now I understand my family love of the Choptank and the Nanticoke and I am very proud to live near the Bay.*
- *Improved greatly*
- *We see the impact of climate science if we garden or take part in other outdoor activities. In fact I was discussing butterfly counts done on July 4 with some people and we noticed that the numbers were shifting slightly in several areas of the state.*
- *The NSTA seminars I participated in were insightful along these lines.*
- *I know more and, thus, am more aware of the dangers*

- *Walking more, replacing Incandescent with CLF and LED, Solar water heater purchase, use of PV on own home*
- *Wide range of impacts for society*
- *Knowing what a carbon footprint is and how it can be reduced*
- *I learned a great deal about specifics in this area.*

The key here was learning about the NOAA resources

Ways to teach specific climate science concepts

- *The powerpoints that I downloaded from the webinars have been very useful.*
- *I participates in the Oregon State University Summer Teacher Workshop for their Science Math and Investigative Experience Club (SMILE Club)*
- *The webinars had very helpful tools and virtual resources*
- *I used a NOAA video about honeybees as part of a study on adaptation and evolution in my biology class. I also used a carbon footprint project with my students so that we could discuss the affect of humans on our environment.*
- *The key here was learning about the NOAA resources available to support this.*
- *Science education is not my teaching background but I am more knowledgeable as a result of climate stewards project.*
- *Specific training Climate modeling and ocean acidification*
- *Hearing different perspectives was helpful*
- *Having the confidence in the content knowledge to provide my students with accurate information*
- *There were many interesting discussion on this that helped a great deal.*

Hearing different perspectives was helpful

Use of NOAA resources

- *I used no NOAA resources in the past before I was a climate steward.*
- *I use the CDs and climate portal*
- *Beyond the NSTA webinar and learning center resources, I am not aware if there are more developed lesson plans or materials that exist.*
- *I had posters in my classroom and several other teachers also had posters. It is amazing how students are attracted to interesting posters. Also I used several short videos that NOAA produced.*
- *It was through this project that my eyes were opened to the wealth of resources both within and outside of NOAA that support climate education.*
- *I have been exposed to more NOAA resources than if I had not been involved in the project.*
- *Access to NOAA education web resources.*
- *Huge resource*

It was through this project that my eyes were opened to the wealth of resources both within and outside of NOAA that support climate education.

- *The new education site is great*
- *I learned lots of new resources.*

Places and ways to locate resources on climate science

- *I used no NOAA resources in the past before I was a climate steward.*
- *It was helpful to learn about resources from Bruce.*
- *As a result of the 2012 ESIP meeting I learned about climate science art and lots of climate resources at the education committee meeting.*
- *Got from PD*
- *I made lists of URLs talked about during the webinars and went back to them when I was planning a specific lesson.*
- *The links in the wiki have been very helpful.*
- *Increased exposure to NOAA resources has widened my horizon for finding even more resources.*
- *NSTA, NOAA, AMS*
- *Very helpful*
- *Just knowing what NOAA has along with their partners*
- *I learned lots of places to look for more data.*

12. What are your plans for using your climate science knowledge in the future? Please explain each one you are pursuing, or respond NA for not applicable.

Participants' future plans include continuing work on stewardship projects, using what they learned in their classes or activities, continuing their learning about climate science, using NOAA resources, and looking for additional resources.

Continue to work with people on the stewardship project.

- *My project is ongoing*
- *I have partnered with climate stewards to submit the NASA IGGCE grant. And, will work with the other climate steward in my community.*
- *Joe and I will be running our workshop for a FCPS Teacher Inservice in August, we will see where this leads.*
- *N/A (2)*
- *I will continue to offer workshops targeted at building climate understanding within the informal environmental education community.*
- *With tools from a recent NASA climate modeling workshop, re-explore original stewardship project.*
- *Building a greater network of teachers and climate specialists on O'ahu to move the Urchin project forward*
- *Continue work with engaging TV meteorologistss with on-air stories about climate*

With tools from a recent NASA climate modeling workshop, re-explore original stewardship project

- *The garden will grow... I am hoping to expand on our current number of garden beds in the vegetable garden and certainly the flower/butterfly garden*
- *I will implement my on-line class with future students*

Start a new stewardship project

- *Perhaps. I have not decided (4)*
- *I am open to presenting our workshop and differentiating it for audiences at local, state and national conferences for NOAA.*
- *Re-explore original stewardship project*
- *Our TV project will include some online lessons*
- *As an extension I would like to do 'trash free lunches' this year. I have two teachers (that were not in the project) that are willing to take on our composting bin.*
- *I have no plans*

As an extension I would like to do 'trash free lunches' this year.

Use what I learned as part of what I teach

- *I have no plans*
- *Using it in the NSF grants*
- *The lessons I have integrated will be utilized in the Oceanography curriculum. I am open to sharing them with Geosystems and AP Environmental Science courses.*
- *I plan to incorporate more of the information that I have gained into an outreach project that I am working on in local urban schools.*
- *I am constantly revising content based on what I learn about the various climate topics.*
- *Introduce more climate issues into the math classroom*
- *Add more content from climate PD and course to my own teaching*
- *Very helpful in developing multimedia type learning visualizations*
- *Constantly and regularly*

The lessons I have integrated will be utilized in the Oceanography curriculum. I am open to sharing them with Geosystems and AP Environmental Science courses

Build on some of the partnerships established for Climate Stewards

- *I have no plans*
- *Partnering on the NASA IGCCE grant*
- *I would like to also work more closely with NSTA on developing lessons with real time data to promote Climate Stewards*
- *Not sure, just yet, but I am trying to figure this out. (2)*
- *I hope to begin to establish partnerships in the future.*
- *Yes, folks from Coconut Island are joining another grant proposal*
- *Build on NOAA climate education partnership*
- *Absolutely. I have already emailed my current partners to thank them for a great start, but make it known that we will be meeting soon to reflect, grow, and stay excited*

- *Could we have other schools look at the on-line class I created?*

Continue learning about climate science

- *I would be willing to do more educational webinars time permitting*
- *Developing a dual climate, ocean, and weather project between our middle school, high school and community college*
- *I would like to have further access to the NSTA learning center and webinars for NOAA Climate Stewards*
- *Yes I plan to continue to participate in climate stewards webinars and other activities.*
- *I will remain plugged in to the CS wiki and other climate resources to continue learning*
- *Yes, especially with new tools from a recent NASA climate modeling workshop*
- *I hope to find even more PD to participate in*
- *Always more to learn about local/regional effects*
- *I would like to continue participating in the webinars*
- *Always*

Continue to use NOAA resources for climate science

- *I plan to continue to use NOAA resources*
- *Started a climate science academy focusing on NOAA careers*
- *Continue to utilize and integrate real time data into lessons to promote problem solving*
- *Yes, they are extremely useful.*
- *Always, I look forward to the next generation of climate.gov and the new tool kits*
- *Yes*
- *I will continue to search out NOAA resources and add them to my resources for teaching*
- *Absolutely*
- *Exploring and incorporating more all the time*
- *Always*

I would like to be a part of an RSS feed for NOAA Climate Science Resources

Look for additional resources on climate science

- *It all depends on what schools request.*
- *Material will be used in our climate, ocean, and weather institute which supports the climate science academy and the adaptation of the Oregon State University SMILE Club.*
- *I would like to be a part of an RSS feed for NOAA Climate Science Resources*
- *Many teachers would like to have more information about climate in my area.*
- *Always on the hunt for this as well. That is*

You might want to consider a regional rotation for future classes with cohorts focusing on regional impacts & solutions

what the network is all about, vetting resources that come up.

- *Yes*
- *A never-ending process. Many great international resources to find*
- *Looking for good scientific visualization*
- *Exploring and adding more*
- *Always*

13. Do you have any suggestions for the project going forward? (activities, expectations, application process, communication, resources...)

- *Nothing specific*
- *You might want to consider a regional rotation for future classes with cohorts focusing on regional impacts & solutions.*
- *I think that now that the project guidelines, expectations and other wiki resources are developed, the fruits of the workshops will be more rapidly realized.*
- *Continued learning opportunities and outreach support.*
- *My only suggestion is to facilitate face to face meetings at some point in the future.*
- *A greater inter-disciplinary approach may give the project even wider influence.*
- *Keep at it. This is a learning process for all of us*
- *Not sure how to do it... But try to get folks planning their projects early in the course so that they start zeroing in on details and specifics.*
- *A shorter survey :)*
- *No. The project was excellent (2)*

14. What are the benefits for you of doing a stewardship project as part of the NOAA Climate Stewards project? Rate each on a scale of 1-10=highest

Participants feel they benefitted from: applying what they learned in a practical project (8.9), meeting other people interested in climate science (8.6/10), making a difference in the local area (8.5), learning more about the local needs (8.4), working with local and regional partners (8.4), creating active environmental stewards (8.2), seeing how much people learned (8.0), developing a group of people who can continue to make a difference (7.9), feeling empowered to take action (7.9) and learning about climate science careers (7.5).

Learning more about the needs in my local area	8.4
Working with local and regional partners	8.4
Applying what I learned in a practical project	8.9
Making a difference in the local area	8.5
Developing a group of people who can continue to make a difference	7.9
Seeing how much people learned	8.0

Realizing how much people care	7.1
Creating active environmental stewards	8.2
Having participants learn about climate science careers	7.5
Feeling empowered to take action	7.9
Meeting other people interested in climate science	8.6

15. Please explain and give examples or type NA for not applicable

Learning more about the needs in my local area

- *Getting more information on the Chesapeake Bay foundation*
- *Need more local participants to evaluate needs.*
- *I did learn a little about the local environment as a result of writing the plan*
- *Learning more about the EE communities needs related to Climate Sci. is an invaluable outcome of the workshops offered.*
- *Having local area expertise is always helpful.*
- *Being part of this project has helped me learn more about my area in a shorter time than I would have otherwise been able to*
- *This is hugely important...why does it matter to me*
- *Exploring plants that were indigenous to our area*
- *Between this project and the TOTE, I have lots of resources on my local area.*

Working with local and regional partners

- *Partnering with the community college*
- *I have enjoyed working with Joe Witte and learning from his expertise in meteorology with NASA. I want to meet and work with more Climate Scientists*
- *I didn't do the project as part of this project*
- *Again, through CS and the workshops offered at the ESTC, I have been able to develop and participate in a number of local and regional climate education efforts.*
- *Working with local area partners is always helpful.*
- *Making great contacts with folks from a variety of agencies and organizations*
- *Working with local teacher and learning age appropriate material was helpful*
- *Involving our PTA in a huge way that let us bring in even more community partners*
- *I plan to work with local estuary people.*

Applying what I learned in a practical project

- *This is what is most important to me as I work with students, helping them to understand their impact on the world.*
- *Starting the climate, ocean and weather institute*
- *Very fulfilling*
- *Always a good thing.*
- *Having local area impact is always helpful.*
- *Transformed my teaching*

- *A lot will apply to our GMU project basics garden before, trash free lunches now*
- *I plan to implement projects in the fall.*

Making a difference in the local area

- *Through students*
- *Supporting the SMILE Club and the climate science academy as well as an urban farm*
- *Immediate impact is not evident. Hope to convince audience to make behavior changes.*
- *My students did learn quite a lot about climate and I know they talked to their parents about their work.*
- *I think I am 1 step removed from this action.*
- *Having local area impact is always helpful.*
- *Can see that we are going to make a positive impact locally*
- *Partnering with local teacher was helpful*
- *Donating extra vegetables to our local food bank*
- *Again, I plan to implement projects in the fall.*

Developing a group of people who can continue to make a difference

- *Through students*
- *This is a goal for the future. I can't take this on now.*
- *Establishing an advisory committee for the climate and an AmeriCorps Vista site for the urban farm*
- *I hope this is the case. The project I offered was meant to encourage the incorporation of climate science into field education projects.*
- *Working with local area groups is always helpful.*
- *Networking of like minded individuals has been great*
- *This Is a rewarding part of project*
- *forming a solid committee that continually steps up to help and work*
- *I plan to work with other teachers in my school using what I learned*

Seeing how much people learned

- *Students and the community*
- *Evaluating our efforts*
- *Eager to know - I am still evaluating via surveys*
- *It is great to get this feedback.*
- *Advancing knowledge is always helpful.*
- *A rewarding part of teaching*
- *What is what it is all about*
- *The wiki has been great*

Realizing how much people care

- *Recruiting people to volunteer to support our efforts*
- *Need more discussion within workshops*
- *Yep*
- *Increasing caring is always helpful.*
- *This has been a real positive to see how many people (not just kids) are concerned and want to do something positive for the Earth*
- *Again, a rewarding part of teaching*
- *Seeing the passion in my young students and watching it grow*
- *The wiki has been great*

Creating active environmental stewards

- *Students and the community*
- *Establishing the climate scholars project at the local college*
- *Hopeful with my teens*
- *I think most folks that I work with are already active environmental stewards.*
- *Increasing engagement is always helpful.*
- *Slow process but a good foundation is forming*
- *The shared experience is rewarding*
- *Finally being 'pushed' to do something I have always wanted to do at work*
- *I plan to create a group in the fall*

Having participants learn about climate science careers

- *Implementing a NSF Innovative technology for teachers and students (ITEST) grant for NOAA careers*
- *I need to flesh this out more in my presentation.*
- *I think having the opportunity to meet folks in careers related to climate science is significant, and not an opportunity that EE providers frequently get.*
- *Advancing knowledge is always helpful.*
- *Good*
- *Watching how much they become activists and peer pressure each other to be better*
- *This area was very interesting to me.*

Feeling empowered to take action

- *Students and the community*
- *Establishing a climate revolution/movement in our community*
- *I have made personal changes to lower my carbon footprint*
- *Increasing empowerment is always helpful.*
- *Kids are taking charge for their family and community*
- *Good*
- *Knowing that I have the power to make a difference*

- *I plan to create a group in the fall*

Meeting other people interested in climate science

- *Started a twitter posting the articles on the environment and climate published in the Washington Post*
- *I have also met many skeptics.*
- *This was very valuable, and hearing where others were coming from in relation to this topic was ideal.*
- *Meeting similarly engaged people is always helpful.*
- *Always great to meet new like minded folks, a real plus to the project*
- *Always good*
- *Collaboration is key and feedback only makes me think more and differently to make everything even better*
- *The wiki has been great*

18. During your time as a Climate Steward, you may also have shared your knowledge and resources with people who were not in your stewardship project. What was the effect on your other audiences? 1-10 1=not at all satisfied, 10=very satisfied

Participants also report sharing what they learned with people other than those in their stewardship project. These participants increased their knowledge (8.3), began to feel they could make a difference with their own behaviors (7.6), are able to apply what they learned in their own lives (6.6), met others interested in climate science (6.3), and increased their awareness of climate science careers (5.7).

Participants increased their knowledge of NOAA resources in climate science	8.3
People felt they could make a difference with their own behaviors	7.6
Participants were ready and able to apply their knowledge of climate science in their lives	6.6
People interested in climate science met each other	6.3
Participants increased their awareness of climate science careers	5.7

19. In the future, would you be interested in any of the following? Rate each on a scale of 1-10=highest.

Most are interested in being listed as a NOAA Climate Steward for those looking for resource people (9.1/10), staying a member of the online workspace (8.2), being funded to present at conferences (7.9), acting as a mentor for future Climate Stewards (7.5), and being a regional coordinator for Climate Stewards (7.1). Some are interested in moving on from Climate Stewards to focus on other things.

Being re-certified annually as a Climate Steward based on my continuing work with the climate stewards project climate science	6.6
Moving on from Climate Stewards to focus on other things	6.5
Staying a member of the wiki workspace so I can keep up on resources and the	8.2

activities of the project	
Being listed as a NOAA Climate Steward for those looking for resource people	9.1
Acting as a mentor for future Climate Stewards	7.5
Being a regional coordinator for Climate Stewards	7.1
Be funded by NOAA to present at regional or national conferences	7.9

20. Other comments or suggestions?

- *You might want to consider a regional rotation for future classes with cohorts focusing on regional impacts & solutions. Thanks!*
- *Project must continue. Thanks for this evaluation!!!*
- *I would like to grow and differentiate my workshop to present in more local, state and national conferences. I am also interested in working with NOAA/NSTA/Climate Stewards to develop lessons that utilize real time data to teach about Climate science.*
- *CS team, thanks for all of your work organizing and facilitating this effort.*
- *A greater inter-disciplinary approach may give the project even wider influence.*
- *Keep up the great work and continue to move the project forward. This is a way to improve the future of our children by having them become the force of change.*
- *It was, and still is this year, a very good project. Thanks for letting me be a part of it. Funding is always a challenge, but face to face meetings, gatherings at science conferences are always beneficial.*
- *THANKS again. Joe Witte*
- *I have learned a great deal, and would love to help anyone going through this process. I know as an elementary school teacher it can be very difficult to figure out how climate education is appropriate for our little ones, but I think it is so important. If there is anything I can do for the wonderful and amazing NOAA I would be very happy to help! My students, community and I send you a million thank yous!!!*

If there is anything I can do for the wonderful and amazing NOAA I would be very happy to help!

IV. Conclusions

In this chapter we summarize the data, draw conclusions and make recommendations for the evaluation questions and outcomes.

What role does increased content knowledge and climate literacy have on participants? To what extent do Climate Stewards increase their content knowledge?

Direct Outcomes

- Increase the **use of NOAA data resources** by participants
- Increase the **content knowledge** by participants in climate-related STEM

How does implementation of a Stewardship Project affect participants' attitude and behavior toward lessening the results of climate change?

Indirect Outcomes through the formal and informal educators and other participants

- Increase student/youth/audience **participation in active environmental stewardship**, knowledge about careers, and ability to apply STEM climate science concepts and skills in meaningful ways.

Effect on Knowledge

Three sources of evidence were used to address this question: 1) NOAA resources provided, 2) NOAA resources used by participants in stewardship projects, 3) Climate Stewards' knowledge compared with national sample (Yale study).

NOAA provided resources through telecons and Webinars, the online workspace, and individual communications with Climate Stewards (emails and phone calls). 18 telecons and Webinars were held, with 16 speakers. All resources were archived in the online workspace, where 203 resources are available as of July 2011. Sample resources listed in the online workspace include NOAA websites (climate.gov, dataintheclassroom.org, oceanservice.noaa.gov, ncdc.noaa.gov, stormready.noaa.gov), other agency sites (globalchange.gov, climate.nasa.gov, national academies), organization websites (acespace.org, national geographic, astc.org, climateprogress.org).

Climate Stewards identified NOAA and other resources in their Stewardship plans. 100% listed NOAA resources they used. Many of these were resources recommended by the project, while others were located by the Climate Steward. Resources used by Climate Stewards in their plans include solar data (Solar Data Analysis Centre, SEC Current solar forecast, Sunspot index data centre), ocean resources (NOAA World Ocean Atlas, NOAA Ocean Explorer, NOAA Coral Reef Conservation Project, NOAA Marine Sanctuaries), and satellite data (NASA Earth Observing system data).

On a test of knowledge and attitudes based on items from the Yale study, Climate Stewards were more knowledgeable than the Yale study participants. Items were chosen to test each of the seven climate principles.

For Principle 1 (sun as primary source of energy for Earth's climate), Climate Stewards were higher than Yale study respondents on eight of the nine items (ranging from -11%-39% higher). The least difference (-11%) was about the effect of the sunspots on the average temperature of the Earth (36% correct for Climate Stewards vs. 47% for Yale). The greatest difference was for the effect of where the Earth's surface is light or dark colored on the average temperature of the Earth (76% vs. 37%)

For Principle 2 (climate regulated by complex interactions among components of Earth system), a greater percentage of Climate Stewards correctly identified the statement as true or false (range from 25%-70% difference). The least difference was for the idea that weather often changes from year to year (25% more Climate Stewards identified this as true). The greatest difference was for the false statement that weather means the average climate conditions in a region (70% more Climate Stewards identified this as false).

For Principle 3 (life on earth depends on, is shaped by, and affects climate), a greater percentage of Climate Stewards correctly identified the statements as definitely true or definitely false for all eight items (range of 16% to 51% difference). The least difference was for the idea that in the past, rising global temperatures have caused carbon dioxide levels in the atmosphere to increase (29% Climate Stewards vs. 9% Yale participants identified this as true, and that compared to the climate of the past million years, the last 10,000 have been unusually warm and stable (24% vs. 8%). The items with the greatest difference were that climate science has played an important role in the success of past civilizations (71% Climate Stewards vs. 20% of Yale study) and that in the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase (65% Climate Stewards vs. 14% Yale study)

For Principle 4 (climate varies over space and time through both natural and man-made processes), 13% more Climate Stewards chose the Threshold model as the best explanation for how the climate system works (47% Climate Stewards vs. 34% Yale).

For Principle 5 (our understanding of the climate system is improved through observations, theoretical studies, and modeling), a greater percentage of Climate Stewards than Yale study participants correctly identified the statements as definitely true or definitely false (range of 14% to 70% difference) on all 12 items. The least difference was for the statement that In the 1970's, most scientists were predicting an ice age; 18% of Climate Stewards identified this as false, compared with 4% in the Yale study. The greatest difference was that 82% of Climate

Stewards vs. 12% of Yale study participants correctly identified as false that global warming will cause equal increases in temperature in all countries.

For Principle 6 (Human activities are impacting the climate system), Climate Stewards were more knowledgeable than the Yale study participants in all eight areas. 100% of Climate Stewards vs. 63% of Yale study participants think global warming is happening. Of those who think it is happening, 82% of Climate Stewards vs. 21% of Yale study participants are extremely sure; 41% vs. 6% think it is caused by both human activities and natural changes. Most Climate Stewards (75% vs. 39% of Yale study participants share the view that most scientists think global warming is happening, and 71% of Climate Stewards vs. 16% of Yale study participants are very worried about global warming. Most Climate Stewards feel very or fairly well informed about how the Earth's "climate system" works (89% Climate Stewards vs. 62% Yale study), the different causes of global warming (95% vs. 65%), the different consequences of global warming (94% vs. 66%), and ways in which we can reduce global warming (95% vs. 64%).

For Principle 7 (Climate science will have consequences for the earth system and human lives), Climate Stewards were more knowledgeable than the Yale study participants in all 22 areas. Climate Stewards correctly identified as true that melting of land ice in Antarctica can cause global sea levels to rise (100% vs. 37% in Yale study), that warmer ocean temperatures can cause global sea levels to rise (82% vs. 24%), that melting of mountain glaciers can cause global sea levels to rise (82% vs. 32%), that melting of sea ice on the Arctic Ocean can cause global sea levels to rise (53% vs. 36%), identified that warmer ocean temperatures have contributed the most to sea level rise so far (35% vs. 22%) and cause coral bleaching (65% vs. 54%), that absorption of carbon dioxide by the ocean cause ocean acidification (71% vs. 32%), that global warming could be reduced a lot through reducing tropical deforestation (71% vs. 37%), switching from fossil fuels to nuclear power (41% vs. 16%), switching from regular (incandescent) to compact florescent light bulbs (41% vs. 16%), insulating buildings (35% vs. 15%), placing a large tax on all fossil fuels (29% vs. 10%), driving less (41% vs. 27%), having at most two children per family (18% vs. 10%), planting trees (47% vs. 40%), increasing public transportation (24% vs. 18%), stopping eating beef (6% vs. 4%), and switching from gasoline to electric cars (29% vs. 28%). A greater percentage of Climate Stewards than Yale study participants correctly identified as false that increased evaporation can cause global sea levels to rise (41% vs. 19%), that it would reduce global warming a lot if we if we stop punching holes in the ozone layer with rockets (76% vs. 32%), reduced toxic waste (nuclear, chemical) (53% vs. 16%), or banned aerosol spray cans (35% vs. 15%).

Effects on Participants

On a scale of 1-10, participants' ratings of the effect of the project on them ranged from 3.1 for interest in climate science (6.3-9.4) to 4.1 points for places and ways to locate

resources on climate science (4.8-8.9). All areas increased as a result of the project: 4.0 for integration of climate science into your work (4.2-8.2), 3.9 for confidence in teaching/sharing climate science concepts (4.7-8.6), 3.8 for use of NOAA resources (4.8-8.9), 3.7 for content knowledge of climate science (4.8-8.5), 3.5 for ways to teach specific climate science concepts (5.0-8.3), 3.4 for impact of climate science (5.5-8.9), and 3.3 for ways to engage about climate science (6.3-9.4).

Participants report that participating in the project has positively affected their work in many ways, such as, giving them more resources, helping them apply for other grants, teaching them about climate science, giving them access to climate science experts, giving them themes for student projects, making them think about other educational approaches, and getting support from NOAA and their local organizations. Some have developed modules (<http://cimss.ssec.wisc.edu/climatechange/>), redirected projects toward “climate, ocean and weather,” offered workshops, integrated real time data into their classes, participated in a global carbon footprint study, added climate topics to Earth Science and Science Methods classes, and planted gardens.

Being involved with the Climate Stewards project has also influenced participants’ personal behaviors. They report “greening” their lives, being more aware of what they do, and focusing on “living lightly” by using a thermos and coffee cup instead of buying coffee, printing documents less often, growing a garden and using reusable containers instead of disposable ones.

Participants feel they benefitted from: applying what they learned in a practical project (8.9), meeting other people interested in climate science (8.6/10), making a difference in the local area (8.5), learning more about the local needs (8.4), working with local and regional partners (8.4), creating active environmental stewards (8.2), seeing how much people learned (8.0), developing a group of people who can continue to make a difference (7.9), feeling empowered to take action (7.9) and learning about climate science careers (7.5).

Participants also report sharing what they learned with people other than those in their stewardship project. These participants increased their knowledge (8.3), began to feel they could make a difference with their own behaviors (7.6), are able to apply what they learned in their own lives (6.6), met others interested in climate science (6.3), and increased their awareness of climate science careers (5.7).

Participants’ future plans include continuing work on stewardship projects, using what they learned in their classes or activities, continuing their learning about climate science, using NOAA resources, and looking for additional resources. Most are interested in being listed as a NOAA Climate Steward for those looking for resource people (9.1/10), staying a member of the online workspace (8.2), being funded to present at conferences (7.9), acting as a mentor for future Climate Stewards (7.5), and being a regional coordinator for Climate Stewards (7.1). Some are interested in moving on from Climate Stewards to focus on other things.

All (100%) of the Class of 2010 Climate Stewards would recommend the project to a colleague or already have. Their comments include:

- *I would encourage all AP Environmental Science and Geosystems teachers to become climate stewards. Teachers can reach such a broad audience, especially as young adults that will grow to help positively impact Earth's health in the future.*
- *CS represents a great way to gain further understanding of climate topics and innovative ideas in support of building climate understanding and managing challenges related to this.*
- *I became aware of many web sites that are very useful for teaching.*
- *The project is definitely for the teacher that is already strong in their field and wants to become even stronger.*
- *I think all educators in the US should have training like this. How else will the next generation learn to steward our climate and our planet?*

Most Climate Stewards (91%) think classroom teachers and informal educators would benefit from the project, as well as college/higher education faculty and anyone interested in learning about climate science (73%).

For the Climate Stewards project the Class of 2010 suggests having a regional focus, continuing to build resources, trying to arrange some face-to-face meetings, and encourage people to plan their projects early on.

Effects of Stewardship Projects

Climate Stewards reported that the people who participated in their stewardship project felt they could make a difference with their own behaviors (9.1/10), increased their knowledge of climate science (9.0), increased their knowledge of NOAA resources for climate science (9.0), were ready and able to apply their knowledge of climate science to their lives (8.8), were able to meet other people interested in climate science (7.7), and increased their awareness of climate science careers (6.6).

Appendices

**A. 2010 Educator Acceptance Form
Climate Stewards Education Pilot Project
Educator Acceptance Form**

Email completed form to Bruce.Moravchik@noaa.gov by COB Friday, February 26, 2010

Name: _____ Date: _____
School/Organization Name: _____
Position/Title: _____
NOAA Affiliation (if any): _____

____ **YES**, I accept that being a member of the pilot Climate Stewards project means that I will actively participate in the following:

- Complete at least 15 hours of professional development training in climate science and educational applications.
- Record my training progress in the NSTA eLearning Center.
- Develop an Stewardship Project plan that will utilize climate knowledge in my community, school or organization (stewardship guidelines)
- Enter the Stewardship Project plan and progress updates in the NSTA eLearning Center.
- Participate in monthly telecons for project updates.
- Participate in online communities as appropriate (e-learning center)
- Provide feedback on the progress of my project.

Email: _____
Mailing address: _____
City: _____ State: _____ Zip: _____
Preferred Contact Phone Number: _____

B. 2010 Professional Development Review Form

Please use the following form to document your experience using a Climate science professional development (PD) resource or participating in a professional development project.

At this time acceptable PD online resources and projects meeting Climate Steward Education Project requirements must be created and presented by NOAA, offered by an organization sponsored by NOAA, offered by an organization currently in a formal partnership with NOAA, or offered by another United States Federal Agency.

1. Educator Name:

2. Type of PD Resource:
 - Web Seminar (single instance)
 - Science Object (NSTA)
 - SciPak (NSTA)
 - Course (online or face to face)
 - Conference Symposium or Workshop (please note conference in description below)
 - Conference Presentation (please note conference in description below)
 - Other; Please describe below

3. Complete Name of PD Project or Resource (if online please include URL):

4. Organization Offering PD Project or Resource:

5. Date when PD Project or Resource was Taken/Used:

6. Number of Hours Engaged with Professional Development Resource:

7. Please rate each of the following on a scale of 1-10 in regards to this professional development opportunity
 - This PD was a good use of my time
 - This PD was well-organized conceptually
 - This PD was what I expected from the description (as advertised)
 - I would recommend this PD to _____
 - I learned about the science concepts behind climate science
 - I learned how to communicate about climate science
 - I learned about some good resources
 - I plan to use what I learned

8. In approximately 250 words please describe your experience with the professional development resource, information learned, delivery methods learned, and how you envision integrating this information in your role as a climate science educator.

C. ESIP Teacher Workshop
I



Teacher Workshop

**July 20th through 22nd
University of Tennessee - Knoxville**

The Federation of Earth Science Information Partners (ESIP) is a unique consortium of scientific organizations that collect, interpret and develop applications for remotely sensed data. This summer the ESIP education committee would like to invite Climate Stewards to *join us* at our annual meeting on the UCSB campus to learn about efforts to study and steward our planet.

Participating Climate Stewards will attend the an exclusive full day session on Tuesday July 20th before attending the ESIP introductory plenary on the morning of Wednesday July 21st followed by an afternoon and second full day of workshop sessions demonstrating ways that Earth science tools and data can be used in science classrooms. Sessions will be led by ESIP members from NOAA, NASA, EPA, DOE, CIMSS, TERC and other ESIP organizations.

ESIP is looking for science teachers to join our educational community. G6-12 educators are eligible to receive a \$200.00 time & travel stipend. Conference registration fees and lunches are complimentary. Lodging (single occupancy hotel rooms) will be covered for up to ten out of state participants.

Preliminary workshop topics and tools include

- Weather and Climate Investigations,
- Ocean temperature, salinity and density activities,
- Polar Sea Ice explorations,
- Climate Literacy, Climate science and Energy Awareness,
- Google Earth applications *and more.*

Participating teachers are encouraged to attend the July 20th reception and poster session where they can interact directly with ESIP scientists and enjoy an evening of social networking with local colleagues and ESIP members from around the country.

To apply and reserve your stipend, please send a short e-mail indicating the grade(s) and topic(s) you teach, school name, your interest in Earth Science education and ways you intend to share what you learn with your students and colleagues to Margaret Mooney at margaret.mooney@ssec.wisc.edu

For more information and agenda updates please visit
<http://cimss.ssec.wisc.edu/teacherworkshop/esip/>



ESIP Teacher Workshop

Tuesday July 20th – 22nd 2010

University of Tennessee School of Information Science

Tuesday July 20th

8:30 - NOAA Climate Stewards meeting

10:00 – Break

10:30 - NOAA Climate Stewards meeting

Noon – Lunch

1:30 - ESIP Overview - Brian Rogan (30 minutes)

2:00 - NOAA Weather and Climate Resources - Ron Gird (1 hour)

3:00 – Break

3:30 - Climate Literacy Ambassadors - Steve Ackerman & Margaret Mooney

5:00 – adjourn

Wednesday July 21st

8:30 – ESIP Conference Opening Welcome

8:45 - Plenary Speaker 1

9:30 - Falkenberg Award Presentation

9:45 - Break

10:15 - Plenary Speaker 2

11:00 - Plenary Speaker 3

11:45 - Lunch

1:15 – NOAA Climate Portal & Climate Watch Magazine - LuAnn Dalhman
NASA Earth Observatory - Kevin Ward

2:45 Break

3:15 ORNL/DOE Educators Recourses - Linda Holmes

EPA Report on the Environment - Ethan McMahon & Lee Pera

Poster session

Thursday July 22nd

MORNING Concurrent hands-on activity sessions - teachers will choose three of the following 1 hour interactive, hands-on data sessions: (sign up on Wednesday)

1) **Sampling the Sea** - Bruce Caron

Sampling the Sea will build a foundation for solutions using online collaborative

technologies to create awareness among students about the need to preserve ocean resources. A multi-disciplinary team from UC Santa Barbara, in partnership with Google Earth, NASA Globe, and ePals, will reach 200 classrooms, involving 3,500 students from multiple countries. By integrating social networks of students/teachers collecting data, images, and stories about seafood in their local communities with interactive, animated displays of scientific content about trends in fisheries and ocean species in Google Earth, students will learn about sustainable seafood choices and effects of human actions on the ocean. By "Sampling the Sea," students will actively participate in research, contribute knowledge, and foster a global discussion of how the oceans are changing, how our choices drive those changes, and possible solutions.

2) Discovering Earth Science Data and Services Using NASA's Global Change Master Directory (GCMD): The Value for Earth Science Teachers

Tyler Stevens (Data Services Coordinator, NASA's Global Change Master Directory)

Session Description: NASA's Global Change Master Directory (GCMD) enables users to discover and access Earth science data sets and data services relevant to global change and Earth science research. Data Services allow users of data to find tools to manipulate and manage Earth science data. Teachers can use the directory to find and access Earth science services that contain curriculum support materials and interactive projects to educate students about Earth science. Visit the GCMD at <http://gcmd.nasa.gov/>.

3) Digital Earth Watch & Picture Post - Using Digital Cameras for Environmental Monitoring - John Pickle and Annette Schloss

Session Description: Environmental monitoring begins with a click of your digital camera and your commitment to place-based-learning. The Digital Earth Watch (DEW) Picture Post system is an easy-to-use and free set of tools for students, citizens and researchers to monitor change-over-time in a local environment. This place-based learning strategy uses repeated digital photographs to build a standardized set of images on our website (<http://picturepost.unh.edu>). You record the 360o landscape and the sky. Pictures contain a wealth of information that can be examined by learners of all ages - from simply recording events, such as the date of budburst, to analyzing features using digital image processing techniques and our free software. This session will demonstrate - if you have a digital camera, bring it along!

4) NEO - NASA Earth Observations - Kevin Ward

Session Description: NASA Earth Observations helps educator's picture climate science and environmental changes happening on our home planet. NEO lets you search for and retrieve satellite images of Earth. Download them; export them to GoogleEarth and perform basic analysis. Tracking regional and global changes around the world just got easier!

5) EPA Environmental Indicators - Ethan McMahon & Lee Pera (session description pending)

6) Youth Leaders in Sustainability Initiatives - Doug Cohen (session description pending)

NOON – Lunch

1:30 Lesson Plan Breakout sessions – two concurrent 90 minute separate sessions (in two different rooms) to work on lessons plans divided by regional teachers and NOAA Climate Stewards

3:00 Break

3:30 - wrap up, report out evaluations, paper work, adjourn

D. Audience Survey

Climate Stewards Education Project Audience Knowledge Survey

Name of this event/class/course _____

Name of the Climate Steward _____

Your age (so we can compare your responses to a national survey) _____

Zip code (so we can map our participants) _____

1. The Climate Stewards Education Project offers professional development training, tools, and support for formal and informal educators to learn more about climate science and what they can do to help mitigate climate science. Even if you’re not a teacher or in the project, you can still be a climate steward. Can you name three actions you can take to be a climate steward?

2. and 3. On a scale of 1-4 rate how well informed you were about each of the following before, and after participating in this class/lesson/workshop/presentation.

1= Not at all informed 2=Not very informed 3=Fairly well informed 4=Very well informed

2. Before		3. After
	How the Earth’s “climate system” works	
	The different causes of global warming	
	The different consequences of global warming	
	Ways in which we can reduce global warming	

4. How much can each of the following affect the average global temperature of the Earth?

1=Not at all 2=A little 3=Some 4=A lot DK=Don’t know

- _ Greenhouse gases in the atmosphere
- _ Changes in the Earth’s orbit around the sun
- _ Volcanic eruptions
- _ The amount of dust in the atmosphere

- Sunspots
 - Clouds
 - Earthquakes
 - Whether the Earth's surface is light or dark colored
 - The phases of the moon
5. Are each of the following statements definitely false probably false, probably true, definitely true, or you do not know?
Use the ratings 1=definitely false, 2= probably false, 3=probably true, 4=definitely true, DK=you do not know.
- Weather often changes from year to year.
 - Climate means the average weather conditions in a region.
 - Climate often changes from year to year.
 - Ocean currents carry heat from the equator toward the north and south poles.
 - Weather means the average climate conditions in a region.
 - Climate and weather mean pretty much the same thing.
 - The atmosphere carries heat from the north and south poles toward the equator.
6. How much does each of the following contribute to global warming?
1=Not at all 2=A little 3=Some 4=A lot DK=Don't know
- | | |
|--|---|
| <input type="checkbox"/> Cars and trucks | <input type="checkbox"/> Nuclear power plants |
| <input type="checkbox"/> Burning fossil fuels for heat and electricity | <input type="checkbox"/> Volcanic eruptions |
| <input type="checkbox"/> Deforestation | <input type="checkbox"/> The sun |
| <input type="checkbox"/> The hole in the ozone layer | <input type="checkbox"/> Acid rain |
| <input type="checkbox"/> Toxic wastes | <input type="checkbox"/> The space project |
| <input type="checkbox"/> Aerosol spray cans | <input type="checkbox"/> Cows |
7. Are each of the following statements definitely false probably false, probably true, definitely true, or you do not know?
Use the ratings 1=definitely false, 2= probably false, 3=probably true, 4=definitely true, DK=you do not know.
- Global warming will cause some places to get wetter, while others will get drier.
 - The decade from 2000 to 2009 was warmer than any other decade since 1850.
 - Scientists can't predict the weather more than a few days in advance- they can't possibly predict the climate of the future.
 - Global warming will increase crop yields in some places, and decrease it in others.
 - Scientists' computer models are too unreliable to predict the climate of the future.
 - In the 1970s, most scientists were predicting an ice age.
 - The Earth's climate has changed naturally in the past, therefore humans are not the cause of global warming.

- Global warming will cause temperatures to increase by roughly the same amount in all countries.
 - Any recent global warming is caused by the sun.
 - The Earth is actually cooling, not warming.
 - Global warming is happening, but will be more beneficial than harmful.
8. How much do you think each of the following actions would reduce global warming if they were done worldwide? 1=Not at all 2=A little 3=Some 4=A lot DK=Don't know
- Switching from fossil fuels to renewable energy (wind, solar, geothermal)
 - Planting trees
 - Reducing tropical deforestation
 - Reducing toxic waste (nuclear, chemical)
 - Driving less
 - Banning aerosol spray cans
 - Increasing public transportation
 - Insulating buildings
 - Stop punching holes in the ozone layer with rockets
 - Placing a large tax on all fossil fuels
 - Fertilizing the ocean to make algae grow faster
 - Using airplanes to scatter dust high in the atmosphere

Optional Questions

1. Which of the following gases in the atmosphere are good at trapping heat from the Earth's surface? Check one or more.

<input type="checkbox"/> Carbon dioxide	<input type="checkbox"/> Water vapor
<input type="checkbox"/> Don't know	<input type="checkbox"/> Hydrogen
<input type="checkbox"/> Methane	<input type="checkbox"/> Oxygen

2. If we were to stop burning fossil fuels today, the amount of carbon dioxide in the atmosphere would decrease almost immediately. Check one.
 - Definitely true
 - Probably true
 - Probably false
 - Definitely false
 - Don't know

3. If we were to stop burning fossil fuels today, global warming would stop almost immediately. Check one.
 - Definitely true

- Probably true
- Probably false
- Definitely false
- Don't know

4. Which of the following can cause global sea levels to rise? Check one or more.

- Melting of land ice in Antarctica
- Melting of sea ice on the Arctic Ocean
- Melting of mountain glaciers
- Warmer ocean temperatures
- Increased evaporation

5. Which of the following causes coral bleaching? Check one or more.

- Warmer ocean temperatures
- Chemical spills in the ocean
- Acid rain
- Overfishing
- Don't know

6. Which of the following causes ocean acidification? Check one or more.

- Absorption of carbon dioxide by the ocean
- Chemical spills in the ocean
- Acid rain
- Warmer ocean temperatures
- Don't know

Climate Stewards Education Project Elementary Audience Knowledge Survey

What is the name of this event or activity or class _____

What is the name of your teacher or the leader of this event or activity

What is your age _____

What is your Zip code (ask your teacher or the event or activity leader if you don't know)

3. What is something you learned today about how to take care of the Earth?

2 and 3. How much did you know before today about the Earth compared with how much you know now?

1=Nothing 2=A little 3=Some 4=A lot DK= I don't know

2. Before		3. After
	Weather is what is happening today where I live	
	Climate is the weather over a long time	
	The climate of the Earth is getting warmer	
	A warmer climate will change our weather	
	We can slow down the warming by changing some things we do	

4. True or False

- Weather often changes from year to year.
- Climate means the average weather conditions in a region.
- Climate often changes from year to year.
- The Ocean carry heat from the equator to the north and south poles.
- Weather means the average climate conditions in a region.
- Climate and weather mean pretty much the same thing.
- The atmosphere carries heat from the north and south poles toward the equator.

5. How much does each of the following contribute to global warming?

1=Not at all 2=A little 3=Some 4=A lot DK=Don't know

- Cars and trucks
- Burning fossil fuels for heat and electricity
- Deforestation
- The hole in the ozone layer
- Toxic wastes
- Aerosol spray cans
- Nuclear power plants
- Volcanic eruptions
- The sun
- Acid rain
- The space project
- Cows

Optional Questions

1. Which of the following are "fossil fuels"? - check all the items below that you think are fossil fuels

- a. Coal
- b. Oil
- c. Natural Gas

- d. Wood
 - e. Hydrogen
 - f. Solar Energy
2. What gas is produced by the burning of fossil fuels?
- 1. Oxygen
 - 2. Hydrogen
 - 3. Helium
 - 4. Carbon Dioxide
 - 5. Don't Know
3. Which of the following statements is true?
- a. All of the glaciers on Earth are melting away.
 - b. Most of the glaciers on Earth are melting away.
 - c. Some of the glaciers on Earth are melting away.
 - d. None of the glaciers on Earth are melting away.
 - e. Don't Know
4. Which of the following gases in the atmosphere are good at trapping heat from the Earth? Check one or more.
- | | |
|---|--------------------------------------|
| <input type="checkbox"/> Carbon dioxide | <input type="checkbox"/> Water vapor |
| <input type="checkbox"/> Don't know | <input type="checkbox"/> Hydrogen |
| <input type="checkbox"/> Methane | <input type="checkbox"/> Oxygen |
5. If we were to stop burning fossil fuels today, the amount of carbon dioxide in the atmosphere would decrease almost immediately. Check one.
- Definitely true
 - Probably true
 - Probably false
 - Definitely false
 - Don't know
6. If we were to stop burning fossil fuels today, global warming would stop almost immediately. Check one.
- Definitely true
 - Probably true
 - Probably false
 - Definitely false
 - Don't know
7. Which of the following can cause global sea levels to rise? Check one or more.
- Melting of land ice in Antarctica
 - Melting of sea ice on the Arctic Ocean

- Melting of mountain glaciers
- Warmer ocean temperatures
- Increased evaporation

8. Which of the following causes coral bleaching? Check one or more.

- Warmer ocean temperatures
- Chemical spills in the ocean
- Acid rain
- Overfishing
- Don't know

9. Which of the following causes ocean acidification? Check one or more.

- Absorption of carbon dioxide by the ocean
- Chemical spills in the ocean
- Acid rain
- Warmer ocean temperatures
- Don't know

E. Climate Stewards Knowledge Survey (Spring 2011)

Climate Literacy Principles Yale-Based Pre/Post Knowledge Survey

The following questions were chosen from the Yale study to test Climate Stewards' knowledge of each of the seven principles. Some questions apply to more than one principle.

Principle 1: The sun is the primary source of energy for earth's climate system

1. Have you heard of the greenhouse effect? Yes No
2. The greenhouse effect refers to:
 - a. Gases in the atmosphere that trap heat
 - b. The Earth's protective ozone layer
 - c. Pollution that causes acid rain
 - d. How plants grow
 - e. Don't know
3. How much can each of the following affect the average temperature of the Earth? A lot, some, a little, not at all, don't know
 - a. Greenhouse gases in the atmosphere
 - b. Changes in the Earth's orbit around the sun
 - c. Volcanic eruptions
 - d. The amount of dust in the atmosphere
 - e. Sunspots
 - f. Clouds
 - g. Earthquakes
 - h. Where the Earth's surface is light or dark colored
 - i. The phases of the moon
4. Which of the following gases in the atmosphere are good at trapping heat from the Earth's surface? (Check all that apply)
 - a. Carbon dioxide
 - b. Methane
 - c. Water vapor
 - d. Hydrogen
 - e. Oxygen
 - f. Don't know

Principle 2: Climate is regulated by complex interactions among components of the earth system.

5. Are each of the following statements definitely true, probably true, probably false, or definitely false or you do not know
 - a. Weather often changes from year to year




- b. Climate means the average weather conditions in a region
- c. Climate often changes from year to year
- d. Ocean currents carry heat from the equator toward the north and south poles
- e. Weather means the average climate conditions in a region
- f. Climate and weather mean pretty much the same thing
- g. The atmosphere carries heat from the north and south poles toward the equator



Principle 3: Life on earth depends on, is shaped by, and affects climate.

6. Are each of the following statements definitely true, probably true, probably false, or definitely false or you do not know
- a. In the past, the Earth’s climate always shifted gradually between warm and cold periods
 - b. Climate sciences have played an important role in the advance or collapse of some past human civilizations
 - c. The Earth’s climate is warmer now that it has ever been before
 - d. In the past, rising levels of carbon dioxide in the atmosphere have caused global temperatures to increase
 - e. In the past, rising global temperatures have caused carbon dioxide levels in the atmosphere to increase
 - f. Compared to the climate of the past million years, the last 10,000 have been unusually warm and stable
 - g. The Earth’s climate has been pretty much the same for millions of years
 - h. The Earth’s climate is colder now that it has ever been before

Principle 4: Climate varies over space and time through both natural and man-made processes.

7. People disagree about how the climate system works. The five pictures below illustrate five different perspectives. Each picture depicts the Earth’s climate system as a ball balanced on a line, yet each one has a different ability to withstand human-caused global warming. Which one of the five pictures best represents your understanding of how the climate system works?

<p>Gradual: Earth’s climate is slow to change. Global warming will gradually lead to dangerous effects.</p> 	<p>Fragile: Earth’s climate is delicately balanced. Small amounts of global warming will have abrupt and catastrophic effects.</p> 	<p>Stable: Earth’s climate is very stable. Global warming will have little to no effects.</p> 
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<p>Threshold: Earth's climate is stable within certain limits. If global warming is small, climate will return to a stable balance. If it is large, there will be dangerous effects.</p> 	<p>Random: Earth's climate is random and unpredictable. We do not know what will happen.</p> 	
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Principle 5: Our understanding of the climate system is improved through observations, theoretical studies, and modeling.

8. Are each of the following statements definitely true, probably true, probably false, definitely false, or you do not know?
- Global warming will cause some places to get wetter, while others will get drier
 - The decade from 2000-2009 was warmer than any other decade since 1850
 - Scientists can't predict the weather more than a few days in advance – they can't possibly predict the climate of the future
 - Global warming will increase crop yields in some places and decrease it in others
 - Scientists' computer models are too unreliable to predict the climate of the future
 - In the 1970's, most scientists were predicting an ice age
 - The Earth's climate has changed naturally in the past, therefore humans are not the cause of global warming
 - Global warming will cause temperatures to increase by roughly the same amount in all countries
 - Any recent global warming is caused by the sun.
 - The record snowstorms this winter in the eastern United States prove that global warming is not happening
 - The Earth is actually cooling, not warming
 - Global warming is happening, but will be more beneficial than harmful

Principle 6: Human activities are impacting the climate system.

9. Do you think global warming is happening? Yes No Don't know
10. If yes, how sure are you that global warming is happening?
- Extremely sure
 - Very sure
 - Somewhat sure
 - Not at all sure
11. If no, how sure are you that global warming is not happening?
- Extremely sure
 - Very sure

- c. Somewhat sure
 - d. Not at all sure
12. Assuming global warming is happening, do you think it is...
- a. Caused mostly by human activities
 - b. Caused by both human activities and natural changes
 - c. Caused mostly by natural changes in the environment
 - d. None of the above because global warming isn't happening
 - e. Other
 - f. Don't know
13. Which comes closest to your own view?
- a. Most scientists think global warming is happening
 - b. Most scientists think global warming is not happening
 - c. There is a lot of disagreement among scientists about whether or not global warming is happening
 - d. Don't know enough to say
14. How worried are you about global warming?
- a. Very worried
 - b. Somewhat worried
 - c. Not very worried
 - d. Not at all worried
15. Personally, how well informed do you feel you are about... (very well informed, fairly well informed, not very well informed, not at all informed)
- a. How the Earth's "climate system" works
 - b. The different causes of global warming
 - c. The different consequences of global warming
 - d. Ways in which we can reduce global warming

Principle 7: Climate science will have consequences for the earth system and human lives.
--

16. Which of the following can cause global sea levels to rise? Definitely true, Probably true. Probably false, Definitely false, Do not know
- a. Melting of land ice in Antarctica
 - b. Melting of sea ice on the Arctic Ocean
 - c. Melting of mountain glaciers
 - d. Warmer ocean temperatures
 - e. Increased evaporation
17. Of the causes you selected, which one has contributed the most to sea level rise so far?
- a. Melting of land ice in Antarctica
 - b. Melting of sea ice on the Arctic Ocean
 - c. Melting of mountain glaciers
 - d. Warmer ocean temperatures
 - e. Increased evaporation
18. Which of the following causes coral bleaching?

- a. Warmer ocean temperatures
 - b. Chemical spills in the ocean
 - c. Acid rain
 - d. Overfishing
 - e. Don't know
19. Which of the following causes ocean acidification?
- a. Absorption of carbon dioxide by the ocean
 - b. Chemical spills in the ocean
 - c. Acid rain
 - d. Warmer ocean temperatures
 - e. Don't know
20. How much do you think each of the following actions would reduce global warming if they were done worldwide? A lot, Some, A little, Not at all, Don't know
- a. Switching from fossil fuels to renewable energy (wind, solar, geothermal)
 - b. Planting trees
 - c. Reducing tropical deforestation
 - d. Reducing toxic waste (nuclear, chemical)
 - e. Switching from gasoline to electric cars
 - f. Driving less
 - g. Increasing public transportation
 - h. Switching from regular (incandescent) to compact florescent light bulbs
 - i. Insulating buildings
 - j. Switching from fossil fuels to nuclear power
 - k. Banning aerosol spray cans
 - l. Stop punching holes in the ozone layer with rockets
 - m. Placing a large tax on all fossil fuels
 - n. Having at most two children per family
 - o. Fertilizing the ocean to make algae grow faster
 - p. Stop eating beef
 - q. Using airplanes to scatter dust high in the atmosphere

F. Climate Stewards Reflection Survey (Aug 2011)

Climate Stewards Survey Final 7/25/2011

Dear Climate Stewards, Class of 2010,

We'd like to hear you reflect on your experience as a Climate Steward. Please take some time to answer these questions. Your responses are completely confidential. We're only asking for your name to ensure 100% participation. Only the evaluator will see your name, and replace it with a code after checking off your name as complete.

Thank you,

Bruce, Peg and Hilarie

Name _____ Institution _____ Current position/title _____ Zip code _____
Highest education degree _____
Number of students per year _____ Public _____

7. How satisfied are you with the Climate Stewards project? 1-10=very satisfied

Overall

Content of communications from NOAA

Communication methods (email, online workspace, telephone)

Professional development opportunities

Clarity of expectations

Value of the climate steward expectations for certification

2. What comments or recommendations do you have for the project for the project in the future?

3. Are there other technologies you would suggest we use in addition to webinars, the online workspace (wiki), and emails.

4. In your own words, how would you say being a Climate Steward has affected you and your work?

5. How are you integrating Climate Science into your existing projects or activities?

6. Has involvement with the climate stewards project influenced your personal behavior e.g. reducing your carbon footprint, etc., outside the classroom? And if so, how?

7. Would you recommend the Climate Stewards project to a colleague? YES NO What would you say?

12. Who do you think could benefit from becoming a Climate Steward?

Classroom Teachers

Informal educators (Park service educators, Educators at Nature Centers, Zoos and Aquariums, Meteorologists)

College/higher education faculty

Anyone interested in educating others about climate science

Citizen scientist

13. How many hours did you spend in each of the following activities as part of the Climate Steward project? We know many of you are involved in Climate Science activities as part of your work, or other projects so here we are asking you to think

about what part of that time you would directly attribute to your participation in the Climate Stewards project. (0

- 1-5
- 6-10
- 11-20
- 21-40
- 41-80
- 81-160
- 161-200
- 201-300
- >300)

# Hours	Activity
	Professional development (learning in courses, webinars, conferences, etc)
	Telecons
	On the wiki
	Self-study (looking things up, reading, talking with others)
	Stewardship project (developing)
	Stewardship project (implementing)
	Stewardship project (evaluating)
	Webinars
	Provide training or resources to others

10. Reflect back to before you joined the Climate Stewards project, then rate yourself in each of the following areas, now, after being a Climate Steward: on a scale of 1-10=highest

Before		After
	Integration of climate science into your work	
	Content knowledge of climate science	
	Confidence in teaching/sharing climate science concepts	
	Interest in climate science	
	Impact of climate science	
	Ways to teach specific climate science concepts	
	Ways to teach about climate science	
	Ways to engage about climate science	
	Use of NOAA resources	
	Places and ways to locate resources on climate science	

11. Please explain your ratings from Question 10 and give examples in each area.

- Integration of climate science into your work
- Content knowledge of climate science
- Confidence in teaching/sharing climate science concepts
- Interest in climate science
- Impact of climate science
- Ways to teach specific climate science concepts
- Ways to teach about climate science
- Ways to engage about climate science
- Use of NOAA resources
- Places and ways to locate resources on climate science

12. What are your plans for using your climate science knowledge in the future? Please explain each one you are pursuing, or respond NA for not applicable.

- Continue to work with people on the stewardship project.
- Start a new stewardship project
- Use what I learned as part of what I teach
- Build on some of the partnerships established for Climate Stewards
- Continue learning about climate science
- Continue to use NOAA resources for climate science
- Look for additional resources on climate science

13. Do you have any suggestions for the project going forward? (activities, expectations, application process, communication, resources...)

14. What are the benefits for you of doing a stewardship project as part of the NOAA Climate Stewards project? Rate each on a scale of 1-10=highest

- Learning more about the needs in my local area
- Working with local and regional partners
- Applying what I learned in a practical project
- Making a difference in the local area
- Developing a group of people who can continue to make a difference
- Seeing how much people learned
- Realizing how much people care
- Creating active environmental stewards
- Having participants learn about climate science careers
- Feeling empowered to take action

15. Please explain and give examples or type NA for not applicable

- Learning more about the needs in my local area
- Working with local and regional partners
- Applying what I learned in a practical project
- Making a difference in the local area
- Developing a group of people who can continue to make a difference
- Seeing how much people learned
- Realizing how much people care
- Creating active environmental stewards
- Having participants learn about climate science careers
- Feeling empowered to take action

16. In question #14 we asked about the effect of the stewardship project on you. What about the effect on the participants in your stewardship project group? How much did it affect them in each of the areas listed below? 1-10 1=not at all satisfied, 10=very satisfied

- People interested in climate science met each other
- People interested in climate science met each other
- Participants increased their knowledge of climate science
- Participants increased their awareness of climate science careers
- Participants were ready and able to apply their knowledge of climate science in their lives
- Participants increased their knowledge of NOAA resources in climate science

People felt they could make a difference with their own behaviors

17. Do you have evidence of the effect of your climate stewardship project? Yes No Please describe

18. During your time as a Climate Steward, you may also have shared your knowledge and resources with people who were not in your stewardship project. What was the effect on your other audiences? 1-10 1=not at all satisfied, 10=very satisfied

People interested in climate science met each other

Participants increased their knowledge of climate science

Participants increased their awareness of climate science careers

Participants were ready and able to apply their knowledge of climate science in their lives

Participants increased their knowledge of NOAA resources in climate science

People felt they could make a difference with their own behaviors

19. In the future, would you be interested in any of the following? Rate each on a scale of 1-10=highest.

Being re-certified annually as a Climate Steward based on my continuing work with the climate stewards project climate science

Moving on from Climate Stewards to focus on other things

Staying a member of the wiki workspace so I can keep up on resources and the activities of the project

Being listed as a NOAA Climate Steward for those looking for resource people

Acting as a mentor for future Climate Stewards

Being a regional coordinator for Climate Stewards

Be funded by NOAA to present at regional or national conferences

20. Other comments or suggestions?