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(RCN) Terrestrial Ecosystem Response to Atmospheric and Climatic Change

Lindsey E. Rustad

Principal Investigator; University of Maine, Orono

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Final Report for Period: 03/2007 - 09/2007**Submitted on:** 02/15/2008**Principal Investigator:** Rustad, Lindsey E.**Award ID:** 0090238**Organization:** University of Maine**Submitted By:****Title:**

(RCN) Terrestrial Ecosystem Response to Atmospheric and Climatic Change

Project Participants**Senior Personnel****Name:** Rustad, Lindsey**Worked for more than 160 Hours:** Yes**Contribution to Project:****Post-doc****Name:** Arnone, John**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the workshop.

Name: Dukes, Jeff**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Gunderson, Carla**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Wan, Shiqiang**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Verburg, Paul**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the workshop and ran the field trip.

Name: Ainsworth, Elizabeth**Worked for more than 160 Hours:** No**Contribution to Project:**

TERACC support Elizabeth to complete a meta-analysis and prepare a peer reviewed paper.

Name: Pavao-Zuckerman, Mitchell**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the workshop.

Name: Euskirchen, Eugenie**Worked for more than 160 Hours:** No

Contribution to Project:

Participated in the workshop.

Name: Classen, Aimee**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Dijkstra, Paul**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Heisler, Jana**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Sherry, Rebecca**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Weng, Ensheng**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Demody, Orla**Worked for more than 160 Hours:** No**Contribution to Project:**

Author of review paper for 2006 ESA Symposium

Graduate Student**Name:** Shaw, Rebecca**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the workshop.

Name: Cavaleri, Molly**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Cheng, Weixin**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Engel, E. Cayenne**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Hui, Dafeng**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the meeting.

Name: Kerr, Amber

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Naumburg, Elke

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Schaphoff, Sibyll

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Shapiro, Josslyn

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Trueman, Rebecca

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Barker, David

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Fang, Wei

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Luomala, Eeva-Maria

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop

Name: Sherry, Rebecca

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Su, Bo

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Tjoelker, Mark

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Volder, Astrid

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Bayless, Meagan

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Castro, Joseph

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Iversen, Colleen

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Kim, Hyun-Seok

Worked for more than 160 Hours: No
Contribution to Project:
 participated in the workshop
Name: Langley, Adam

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop and co-authored review paper.
Name: Lunch, Claire

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Shim, Jee

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Wittig, Victoria

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Xu, Tao

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Zhu, Xinguang

Worked for more than 160 Hours: No
Contribution to Project:
 Participated in the workshop.
Name: Albert, kristian

Worked for more than 160 Hours: No
Contribution to Project:

student, co-funded by EU

Name: Albert, Holly

Worked for more than 160 Hours: No

Contribution to Project:

Name: Anderson, Karen

Worked for more than 160 Hours: No

Contribution to Project:

co-funded by grant from the European Union

Name: Suseela, Vidya

Worked for more than 160 Hours: No

Contribution to Project:

Name: Bell, Jesse

Worked for more than 160 Hours: No

Contribution to Project:

Name: Dermody, Orla

Worked for more than 160 Hours: No

Contribution to Project:

Name: Futter, Martyn

Worked for more than 160 Hours: No

Contribution to Project:

Funded by grant from European Union

Name: Heinsch, Faith Ann Heins

Worked for more than 160 Hours: No

Contribution to Project:

Name: Ibro, Andrea

Worked for more than 160 Hours: No

Contribution to Project:

Funding provided by a grant from the European Union

Name: Inglima, Ilaria

Worked for more than 160 Hours: No

Contribution to Project:

Name: Vargas, Rodrigo

Worked for more than 160 Hours: No

Contribution to Project:

Rodrogo is a graduate student and was a co-author on the workshop review paper.

Undergraduate Student

Name: Moore, David

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Technician, Programmer**Name:** Walls, Tracey**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Ms. Walls helped manage data for a meta-analysis on forest ecosystem response to elevated N deposition. Altogether, data were available from 51 experiments in northeastern North America and northern Europe. Data from several of the longer-term studies will be presented at the spring TERACC workshop. Ms. Walls was also instrumental in helping with logistics for the spring TERACC meeting.

Name: Savage, kathleen**Worked for more than 160 Hours:** Yes**Contribution to Project:****Other Participant****Name:** Pataki, Diane**Worked for more than 160 Hours:** No**Contribution to Project:**

Diana Pataki is a member of the Scientific Steering committee, and provides a direct link the the Global Change in Terrestrial Ecosystem program to which TERACC is closely affiliate.

Name: Pitelka, louis**Worked for more than 160 Hours:** No**Contribution to Project:**

Dr. Pitelka is a member of the Scientific Steering committee that provides oversight for TERACC.

Name: Norby, Richard**Worked for more than 160 Hours:** No**Contribution to Project:**

Dr. Norby is a member of the Scientific Steering committee that provides oversight for TERACC.

Name: Shaver, Guis**Worked for more than 160 Hours:** No**Contribution to Project:**

Dr. Shaver is a member of the Scientific Steering Committee that provides oversight for TERACC.

Name: Koerner, Christian**Worked for more than 160 Hours:** No**Contribution to Project:**

Dr. Koerner is a member of the Scientific Steering committee that provides oversight for TERACC.

Name: Luo, Yiqi**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** Parton, Bill**Worked for more than 160 Hours:** No**Contribution to Project:**

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: ?gren, G?ran**Worked for more than 160 Hours:** No**Contribution to Project:**

Participated in the workshop.

Name: Beier, Claus

Worked for more than 160 Hours: Yes

Contribution to Project:

Funded by a grant from the European Union

Name: Bridgham, Scott

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Drake, Bert

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Finzi, Adrien

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Gower, Stith

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Hanson, Paul J

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Harte, John

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Highsmith, Maxine

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Kubiske, Mark

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Loik, Michael

Worked for more than 160 Hours: No

Contribution to Project:

Name: Lowell, Cadance

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Masters, Gregory

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: McGuire, David

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Melillo, Jerry

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Morgan, Jack

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Peterson, Andrew

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Pregitzer, Kurt

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Rastetter, Edward

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Wallace, Linda

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Weltzin, Jake

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Smith, Stan

Worked for more than 160 Hours: No

Contribution to Project:

Name: Ellsworth, David

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Hendrey, George

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Hungate, Bruce

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Johnson, Dale

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Kicklighter, Dave

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Law, Beverly

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Linder, Sune

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Long, Stephen

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Lucht, Wolfgang

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Megonigal, Patrick

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Nielson, Ron

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Pendall, Elise

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Griffin, Kevin

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the meeting.

Name: Giardina, Christian Giard

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Gifford, Roger

Worked for more than 160 Hours: Yes

Contribution to Project:

Participated in the workshop.

Name: Gower, Tom

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Harmens, Harry

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Janssens, Ivan

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Lewis, Jim

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: McDonald, Evan

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: McMurtrie, Ross

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Penuelas, Josep

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Shafer, Steven

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Smith, Ben

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant fro the European Union

Name: Tarnay, Leland

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Hoosbeek, Marcel

Worked for more than 160 Hours: No

Contribution to Project:

participated in the workshop.

Name: Allison, Steven

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Barrett, Damian

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Clark, James

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Classen, Aimee

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Kaplan, Jed an

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Moorcraft, Paul

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop

Name: Neilson, Ronald

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Ojima, Dennis

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Prentice, Colin

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Prince, Stephen

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: Williams, Mathew

Worked for more than 160 Hours: No

Contribution to Project:

Participated in the workshop.

Name: de Angelis, Paolo

Worked for more than 160 Hours: No

Contribution to Project:

Co-funded by grant from European Union

Name: Bachelet, Doinique

Worked for more than 160 Hours: No

Contribution to Project:

Name: Borken, Werner

Worked for more than 160 Hours: No

Contribution to Project:

funded by grant from European Union

Name: Briske, David

Worked for more than 160 Hours: No

Contribution to Project:

Name: Cardinot, Gina

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant fro the European Union

Name: Christensen, Jens

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Ciais, Philippe

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant for the European Union

Name: Davidson, Eric

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Dukes, Jeff

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Emmett, Bridgett

Worked for more than 160 Hours: No

Contribution to Project:

Funded by grant from European Union

Name: Fisk, Melaney

Worked for more than 160 Hours: No

Contribution to Project:

Name: Grace, John

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant fro the European Union

Name: Haaland, Stale

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Hanson, Paul

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Knapp, Alan

Worked for more than 160 Hours: No

Contribution to Project:

Name: Kovacs-Lang, Edit

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Kull, Olevi

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Lamersdorf, Norbert

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Leavitt, Steven

Worked for more than 160 Hours: No

Contribution to Project:

Name: Leuzinger, Sebastian

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Miglietti, Franco

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Moldan, Filip

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Moreno, Jose

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Nepstad, Dan

Worked for more than 160 Hours: No

Contribution to Project:

Name: neilson, Ron

Worked for more than 160 Hours: No

Contribution to Project:

Name: Ogle, Kiona

Worked for more than 160 Hours: No

Contribution to Project:

Name: Ollinger, Scott

Worked for more than 160 Hours: No

Contribution to Project:

Name: Pauling, Andreas

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grand from the European Union

Name: Piermatteo, Daniela

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Peterson, Jane

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: peterson, Merete

Worked for more than 160 Hours: No

Contribution to Project:

funded by a grant from the European Union

Name: Reichstein, Markus

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Risch, Anita

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Sala, Osvaldo

Worked for more than 160 Hours: No

Contribution to Project:

Name: Sarris, Dimitris

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Schidt, Inger

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Shaver, Gus

Worked for more than 160 Hours: No

Contribution to Project:

Name: Tietema, Albert

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Wan, Shiquiang

Worked for more than 160 Hours: No

Contribution to Project:

Name: Yarie, John

Worked for more than 160 Hours: No

Contribution to Project:

Name: Kramer, Wolfgang

Worked for more than 160 Hours: Yes

Contribution to Project:

Funded by a grant from the European Union

Name: Korner, Christian

Worked for more than 160 Hours: No

Contribution to Project:

Funded by a grant from the European Union

Name: Gerten, Dieter

Worked for more than 160 Hours: Yes

Contribution to Project:

Funded by a grant from the European Union

Name: Norby, Rich

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Del Grosso, Steve

Worked for more than 160 Hours: No

Contribution to Project:

Speaker at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Medlyn, Belinda

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Percy, Kevin

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Karnosky, David

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Reich, Peter

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Henry, H.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Shaw, Rebecca

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Chiarello, N

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Field, Chris

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Wullschleger, Stan

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Tschaplinski, T.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Gunderson, Carla

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Beckage, B.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: McLachlan, J.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Saunders, C.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Blum, M.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Herrick, J.

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at 2006 ESA Symposium on 'mucking through multi-factor experiments'.

Name: Schimel, Josh

Worked for more than 160 Hours: No

Contribution to Project:

Name: Johnson, Mark

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Joslin, Dev

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Burton, Andrew

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Treseder, Kathleen

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Wallenstein, Matt

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Schlesinger, Bill

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Change'

Name: Balser, Teri

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Hobbie, Eric

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Phillips, Rich

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Cardon, Zoe

Worked for more than 160 Hours: Yes

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Dijkstra, Paul

Worked for more than 160 Hours: No

Contribution to Project:

Paper presenter at the SSSA 2006 Symposium on 'Towards a Predictive understanding of belowground response to Global Change'

Name: Alberti, G.

Worked for more than 160 Hours: No

Contribution to Project:

Name: Bahn, M.

Worked for more than 160 Hours: No

Contribution to Project:

Name: Black, T.A.

Worked for more than 160 Hours: No

Contribution to Project:

Name: Butnor, john

Worked for more than 160 Hours: No

Contribution to Project:

Name: Carone, Mariah

Worked for more than 160 Hours: No

Contribution to Project:

Name: Contosta, Alexandra

Worked for more than 160 Hours: No

Contribution to Project:**Name:** Yuste, jorge**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Vedove, Gemini**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Gough, Christopher**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Gu, Lianhong**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Hollinger, dave**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Hubbard, Robert**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Irvine, James**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Longdoz, Bernard**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Martin, johnathon**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** McDermitt, Dayle**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Migliavacca, Mirco**Worked for more than 160 Hours:** Yes**Contribution to Project:****Name:** moorcroft, paul**Worked for more than 160 Hours:** No**Contribution to Project:**

Name: Palmroth, Sari

Worked for more than 160 Hours: No

Contribution to Project:

Name: Richardson, Andrew

Worked for more than 160 Hours: No

Contribution to Project:

Name: Ryan, Michael

Worked for more than 160 Hours: No

Contribution to Project:

Name: Schuur, Ted

Worked for more than 160 Hours: No

Contribution to Project:

Name: Tang, Jianwu

Worked for more than 160 Hours: No

Contribution to Project:

Name: Trumbore, Sue

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: varner, Ruth

Worked for more than 160 Hours: No

Contribution to Project:

Name: Vogel, Christopher

Worked for more than 160 Hours: No

Contribution to Project:

Name: White, Sandra

Worked for more than 160 Hours: No

Contribution to Project:

Name: Alberti, Giorgio

Worked for more than 160 Hours: No

Contribution to Project:

Name: Black, T.

Worked for more than 160 Hours: No

Contribution to Project:

Name: Carbone, Miriah

Worked for more than 160 Hours: No

Contribution to Project:

Name: Gough, Chris

Worked for more than 160 Hours: No

Contribution to Project:**Name:** Inghima, Ilaria**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Moorcroft, oaul**Worked for more than 160 Hours:** No**Contribution to Project:****Name:** Zhou, Xuhui**Worked for more than 160 Hours:** No**Contribution to Project:****Research Experience for Undergraduates****Organizational Partners****Global Land Project**

TERACC is an endorsed network of the Global Land Project.

USDA Forest Service - Northeastern Forest Experiment Station**European Union 6th Framework Programme**

The EU 6th Framework program co-sponsored the 2006 EPRECOT workshop.

Other Collaborators or Contacts

A joint European Union/TERACC funded conference on 'Effects of Precipitation Change on Terrestrial Ecosystems (EPRECOT) held May 22-25, 2006, Elsinore, Denmark. The EU committed 141,100 euros (~\$190,485) for participant and salary support.

Ecological Society of America - We sponsored a symposium in coordination with the August 2006 ESA meetings on 'Mucking Through Multi-factor Experiments.'

Soil Science Society of America - We sponsored a symposium in coordination with the November 2006 SSSA meetings on 'Towards a Predictive Understanding of belowground Ecosystem Response to Global Change.'

Activities and Findings**Research and Education Activities: (See PDF version submitted by PI at the end of the report)**

In September 2007, 36 researchers met in Durham, New Hampshire, USA for a workshop on Automated Soil Respiration Measurements. The overall goal of the workshop was to initiate communication among the automated soil respiration measurement community and provide a foundation for future research and syntheses studies. The meeting focused on how automated measurements are advancing our understanding of soil respiration, procedures for quality analysis and control of measurements and large datasets, and identifying current knowledge gaps and future research directions.

We also continued to upgrade our website (<http://www.umaine.edu/teracc>), specifically to add a section on global change experimental sites. We believe this is a unique resource to the global change community.

Findings: (See PDF version submitted by PI at the end of the report)

New insights from automated soil respiration (ASR) data include the importance of diel patterns and time lags, and the quantitative evaluation of seasonal dynamics. The workshop highlighted the need for clearly-defined and common QA/QC procedures for ASR measurements, and for rigorous techniques for data assimilation to synthesize information and construct robust mechanistic models of soil respiration. A major knowledge gap is understanding the role of substrate supply for both autotrophic and heterotrophic respiration sources. Future research should include a combination of approaches including the simultaneous deployment of CO₂ concentration profile sensors and chambers measurements, isotopic applications, manipulations, and high frequency measurements of root and mycorrhizal dynamics to test hypotheses about drivers of soil respiration variability. Emerging opportunities for cross-site and regional comparisons and synthesis analysis of ASR measurements were identified.

Training and Development:

TERACC provided support for air travel for 6 students to attend the LTER meeting on High Latitude Terrestrial and Freshwater Ecosystems: Interactions and Response to Environmental Change, September 11-14, Abisko, Sweden.

TERACC provided support for professorial and student attendance at Utah Stable Ecology Course summer 2007.

TERACC provided support for one month of salary a post-doc to construct a database to explore hypotheses relative to C and N interactions under global change, which will help provide a basis for a manuscript and for discussion at future meeting on the same topic.

TERACC supported 6 graduate students at the Workshop on Automated Soil Respiration Measurements.

TERACC supported participation of 3 post doctorate students (2 female; 1 male) and 4 graduate students (female) at the EPRECOT workshop.

TERACC supported salary for one post doc for three months to work on the EPRECOT data model experiment.

91 people from 25 different countries directly participated in TERACC sponsored activities during this project period (several hundred more attended our international symposia or were co-authors on papers and posters). Of these, 26% were women and 8% were students. TERACC has made a concerted effort to (1) promote international collegiality and communication, (2) identify and promote women in global change science and (3) help educate the next generation of global change scientists.

Outreach Activities:

1. EPRECOT Workshop - In coordination with our EU colleagues, TERACC helped prepared a color glossy brochure aimed at policy makers and science directors. The brochure describes the basic problem of precipitation change and summarises the key findings and recommendations from the workshop. During the course of the EPRECOT project, press releases were submitted to both national and international press, explaining the objective of the project. Several radio interviews were given as well as notices in the newspapers (all national Danish).

A website was launched at the start of the project to allow the public and any interested people to follow the progress and the results.

2. Lindsey Rustad presented an instructional seminar on global climate change to high school teachers in a 'Forest for Every Class' in August 2006.

Journal Publications

Lindsey Rustad, "From Transient to Steady-State Response of Ecosystems to Atmospheric CO₂-Enrichment and Global Climate Change: Conceptual Challenges and Need for an Integrated Approach.", *Plant Ecology*, p. 43, vol. 182, (2006). Published,

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Paul Dijkstra, "Long-term enhancement of N availability and plant growth under elevated CO₂ in a semiarid grassland.", Functional Ecology, p. , vol. , (2008). Submitted,

Books or Other One-time Publications

Yiqi Luo and Bill Parton, "New Developments in Ecosystem Modeling", (). Book, in preparation

Editor(s): Yiqi Luo and Bill Parton

Bibliography: to be determined

I. Norby, R.J., L.E. Rustad, J.S. Dukes, D.S. Ojima, W.P. Parton, S. J. Del Grosso, E.E. McMurtrie, and D.A. Pepper, "Ecosystem Responses to Warming and Interacting Global Change Factors. Terrestrial Ecosystems in A Changing World", (2007). Book, Published

Editor(s): J. Canadell, D. Pataki, L. Pitelka

Collection: Terrestrial Ecosystems in a Changing World

Bibliography: Springer-Verlag, Berlin Heidelberg, p. 336

Web/Internet Site

URL(s):

<http://www.umaine.edu/teracc/>

Description:

This is the home page for TERACC

Other Specific Products

Product Type:

list-server

Product Description:

We established a list-server to provide more rapid communication to over 200 member in 26 countries.

Sharing Information:

All project participants and other interested individuals are added to the list-server.

Product Type:

Newsletter

Product Description:

We compiled a newsletter, highlighting TERACC activities.

Sharing Information:

The newsletter is available on the website and was distributed at the annual workshop.

Product Type:

Brochure

Product Description:

We produced a color glossy brochure to highlight the goals and activities of TERACC.

Sharing Information:

The brochure has been distributed to interested individuals and organizations worldwide.

Product Type:

website

Product Description:

We created a website for the EPRECOT meeting: <http://www.climaite.dk/eprecot/eprecot.html>.

The goals were to share information about the conference, provide information on precipitation change experiments, and provide a platform for internal activities such as paper submissions.

Sharing Information:

The site is available on the world wide web.

Product Type:

Data or databases

Product Description:

We are working on creating a database of global change experiments. This database currently includes data from 135 experimental sites in 25 countries.

Sharing Information:

The database will be available on the TERACC site on the world wide web: <http://www.umaine.edu/teracc/>

Product Type:

brochure

Product Description:

We produced a color, glossy brochure explaining the problem of global change derived changes in precipitation and its impacts on terrestrial ecosystems, targeted at policy makers, research directors, and the lay public in the US and Europe.

Sharing Information:

The brochure has been distributed widely in Europe and is available on the TERACC and EPRECOT websites: <http://www.umaine.edu/teracc/> and <http://www.climaite.dk/eprecot/Results&Documents/Results&Documents.html>

Contributions

Contributions within Discipline:

We feel that we have already been successful in (1) increasing the communication and interaction between global change scientists, (2) promoting research on multiple, interacting vectors of global change, and (3) encouraging greater interaction between experimentalists and modelers.

Contributions to Other Disciplines:

We feel we have already been successful in increasing the communication and interactions between experimentalists studying single and/or multiple global change effects on terrestrial ecosystems, and ecosystem-, regional-, and global-scale modelers. This year we focused specifically on this communication, as well as examining new approaches to better integrating models with experiments (i.e. the 'model-experiment' for the EPRECOT project).

Contributions to Human Resource Development:

In 2007, TERACC provided resources for 6 students to attend the Workshop on Automated Soil Respiration Measurements in September 2007, for airfare for 6 students to attend the LTER meeting on High Latitude Terrestrial and Freshwater Ecosystems: Interactions and Response to Environmental Change, September 11-14, Abisko, Sweden, for 1 month for a post doctoral student to work on a database on C and N relationships in terrestrial ecosystems, and support for the Utah Stable Ecology Course summer 2007.

We provided resources for 7 students to attend the EPRECOT workshop in May 2006 and for one student to work on a global precipitation modelling project for 3 months. We specifically encouraged them to bring posters and to be fully participating members of the discussions

and meetings.

We supported REU-type experiences for undergraduate students but were not successful in securing projects for this activity in 2006. If TERACC were to be continued, we would suggest a full time steering committee member devoted to this activity.

We continue to promote women in global change science, with 24% of our 2006 participants being women. Additionally, women had leadership roles as co-organizers in all of our workshops and conferences.

We were not as successful in promoting additional diversity at our meetings. If TERACC were to be continued, we would suggest adding a steering committee member specifically devoted to this objective.

Contributions to Resources for Research and Education:

The TERACC website provides useful information on global change research projects and research sites. TERACC also provides a point of contact for researchers from around the world interested in establishing new global change experiments.

Lindsey Rustad presented a seminar on Global Climate Change to high school teachers in the 'Forest for Every Class' program in August 2006.

Contributions Beyond Science and Engineering:

The ultimate benefit of TERACC will be to improve our understanding and predictions of the effects of global change on terrestrial ecosystems, leading ultimately to better informed policy and land management decisions related to global change.

Conference Proceedings

Categories for which nothing is reported:

Any Conference

1. The main findings of the EPRECOT workshop are as follows:
 - Global warming will amplify the weather patterns and many regions are likely to experience shifts in extreme weather phenomena – flooding as well as drought, and the change is larger the warmer the scenario.
 - Annual precipitation, its seasonality and variability determine biome distributions and disturbance regimes. In the future the variability as well as drought, fire and other disturbances will change and will affect all stages of the life cycle of plants and ecosystems. Examples presented at EPRECOT showed evidence from Greece of reduced rainfall over the past 50-70 years and increased frequency of strong droughts and dying of natural habitats. If continued this could drive the dominant vegetation of these and similar habitats in the eastern Mediterranean close to extinction
 - Evidence exists that the rate of evolution (adaptation) lags behind rate of climate change.
 - Changes in timing of precipitation and increased drought pressure may increase decoupling of plant/microbe processes
 - Ecosystems are usually more responsive to precipitation decreases than to precipitation increases and the drier the weather the stronger the response even to small precipitation changes.
 - It is not the precipitation alone but the balance between water supply and atmospheric demand is decisive, i.e. temperature (and CO₂) effects will have additional hydrologic effects.
 - The effect of droughts is not only of interest in drier environments where strong water limitation is important, but may be just as harmful on very wet ecosystems where drying can release limitations from excess water and lead to strong increase in the rates of biological processes.
 - Changes in rainfall and rainfall patterns will affect different plant species and may therefore have long term effects on biodiversity and ecosystem structure.
 - Interactive effects among climate factors are substantial (the responses of the factors together are not similar to the effects of the individual factors added together).

 2. The EPRECOT Workshop, the ESA and SSSA symposia, and the BIOGEOMON talks all re-inforced the TERACC theme that multi-factor modeling must be used in conjunction with fully replicated, factorial global change experiments in order to generate hypotheses and expand empirical findings on the effects of single and multiple vectors of global change on terrestrial ecosystems. All activities also emphasized the need to conduct more global change investigations in under-represented ecosystems, especially in the tropics and at high latitudes.
-

During 3/2006 to 3/2007, TERACC supported one international conference and two international symposia on Global Change, and was the topic of the keynote speech at the 2006 BIOGEOMON Conference. These activities are described below:

1. A workshop on "Effects of PREcipitation Change On Terrestrial (EPRECOT)" was held May 22-25, 2006 in Elsinore, Denmark. This meeting was co-funded by TERACC and a grant from the European Union's 6th Framework Convention Programme. The conference was co-organized by Lindsey Rustad (US Forest Service, USA) and Claus Beier (Riso, Denmark), with additional help from Wolfgang Cramer (Germany), Christian Korner (Switzerland), Josep Penuelas (Spain), Dieter Gerten (Germany), Michael Loik (USA), Yiqi Luo (USA), William Parton (USA) and Richard Norby (USA). Participants included 50 men and 19 women (including 7 US graduate students and/or post-docs) from 17 countries. The overarching goal of the workshop was to bring together international research groups focusing on global change precipitation manipulation experiments, modeling, and related research, with an aim to facilitate future international research collaboration within the field between US and European researchers and researchers from developing countries.

The workshop evaluated current knowledge on (i) the direct and indirect responses of terrestrial ecosystems to changes in the quantity and timing of precipitation, and (ii) how changes in water mediate ecosystem response to warming and elevated CO₂. The workshop consisted of several activities, including:

1a - Model experiment: Although numerous elevated CO₂ and warming experiments have been conducted over the last several decades, there have been relatively few precipitation manipulation experiments. Therefore, in order to test current hypotheses and generate new hypotheses regarding the effects of precipitation change on terrestrial ecosystems, a modeling experiment was conducted *prior to the workshop*. Data from 5 experimental field sites at different climatic conditions were collected and 3 different models were used to run a series of future climate change scenarios and the effects on the ecosystems were compared. The results of the model experiment were distributed to all participants prior to the meeting and were used to guide discussions throughout the workshop.

1b – Workshop Main Session – The main sessions focused on three themes:

- “Setting the stage” where our basic knowledge about past and future climate conditions and the effects on biological processes were presented.
- “Effects of water alone” where results from experimental studies focusing on water alone were presented and the results from the model experiment with water alone scenarios were discussed.
- “Effects of interaction between water and other drivers” where results from a few multifactor experiments and inter-annual variations were presented and the results from the model experiment with interactions were discussed.

1c. Workshop Group Discussions - Group discussions were organized on 4 different subjects :

- Contrasting ecosystem responses to precipitation change at different climatic conditions (wet/dry & cold/warm).
- Major factors regulating/controlling the effects of precipitation change on ecosystems.
- Contrasting effects of changes in precipitation amounts vs distribution patterns.
- Uncertainties, thresholds, time lags, and climate and ecological "surprises".

1d. Workshop Poster Sessions - 2 poster sessions were conducted where 58 posters were presented with different precipitation aspects.

1e. Workshop Field Trip - A field trip was conducted to the Danish CLIMAITE site where a multifactor experiment is being conducted involving elevated CO₂, elevated temperature and altered precipitation.

The workshop website can be found at: <http://www.climaite.dk/eprecot/eprecot.html>.

2. A symposium on 'Mucking Through Multifactor Experiments', was held August 8, 2006 at the Annual Ecological Society of America Meetings in Memphis, TN. The conference was organized by Aimee Classen (ORNL). Participants included 7 men and 1 woman from 4 different countries. Average attendance was 150 people.

The symposium included talks meant to tease apart some of the complexities in multifactor experiments using current projects as examples, and included discussions of creative ways to analyze complex results using mechanistic models, and how to better integrate models into future experimental designs.

The speakers and talks were as follows:

- Introduction: Aimee Classen (ORNL USA)
- A multifactor world, a multifactor problem. Claus Beier (Risø National Laboratory, Denmark)
- Potential long term impacts of global change on C and N cycling in forest and grassland ecosystems. Steve Del Grosso (USDA Fort Collins, CO), Bill Parton and Dennis Ojima (Colorado State University).
- Modeling multi-factor interactions in CO₂-enrichment experiments. Ross McMurtrie and Belinda Medlyn (University of South Wales, Australia).
- Using multifactor global change experiments to answer big science questions: linking science to monitoring and policy. Kevin Percy

(Canadian Forest Service) and David Karnosky (Michigan Technological University).

- Lessons learned from almost 10 years of multifactor work at BioCON. P. Reich (University of Minnesota).
- Linking above- and belowground processes in a multifactor world: analyzing and interpreting multifactor experiments. Aimée Classen, Rich Norby (Oak Ridge National Lab, Tennessee) and Jake Weltzin (University of Tennessee).
- When do interactions matter? Continuing lessons from Jasper Ridge. Jeff Dukes (University of Massachusetts), H. Henry, Rebecca Shaw, N. Chiariello (Stanford University) and C. Field (Carnegie Institution).
- Using single factor experiments to answer multifactor questions. Paul Hansen, S. Wullschleger, T. Tschaplinski, Rich Norby, and Carla Gunderson (Oak Ridge National Lab, Tennessee).
- Multifactor experiments as a model selection problem: An application of Bayesian Reversible Jump MCMC. B. Beckage (University of Vermont) and James Clark (Duke University, North Carolina).
- Population and evolutionary response to 100 years of environmental change in a Maryland Salt Marsh. J. McLachlan (University of California, Davis), C. Saunders (Florida International University), M. Blum (Health and Ecosystem Effects, Environmental Protection Agency) and J. Herrick (Molecular Ecology Research Branch, Environmental Protection Agency).
- Future Design and Synthesis Discussion (Aimee Classen, Univ. of TN, USA)

3. A symposium on ‘Towards a Predictive Understanding of Belowground Ecosystem Response to Global Change’ was held at the Soil Science Society of America’s Annual Meeting November 14, 2006 in Indianapolis, IN. Co-organizers were Lindsey Rustad (US Forest Service), Elise Pandal (University of Wyoming) and Josh Schimel (University of California, Santa Barbara). The goals of the symposium were to examine the response of the belowground ecosystem to single and combined vectors of global change, including elevated atmospheric CO₂, changes in climate, and increased N deposition. The symposium included three oral sessions (14 talks) and one poster session (17 posters) with discussion. Average attendance was 150-200 people.

Invited talks and contributed poster presentations focused on belowground biotic (roots, microbial flora and fauna) and abiotic (solid and solution phase soil chemistry and hydrology) responses to global change. Recent perspectives on the influence of temperature on soil organic matter decomposition were presented and new techniques for evaluating

root exudation and turnover, respiration partitioning, and microbial activity were featured. The speakers and talks were as follows:

- Do We Know Enough about Fine Root Dynamics of Woody Plants to Predict their Response to Natural and Anthropogenic Stresses?. Mark Johnson, P. Rygielwicz, D. Tingey, C. Andersen, and D. Phillips (EPA)
- Effects of Altered Water Regimes on Forest Root Systems. Dev Joslin (Belowground forest Research)
- Root System Responses to Chronic N Additions. Andrew Burton (Michigan Tech. Univ.)
- Mycorrhizal Fungi and Their Influence on Soil Dynamics. Kathleen Treseder (UC Irvine) and K. Turner (Stanford)
- The Temperature Sensitivity of Decomposition of Soil Organic Matter: Moving Beyond Q10. Eric Davidson (WHRC)
- Microbial Stress-Response Physiology: Influences on Whole-Ecosystem C and N Flows. Josh Schimel (UC Santa Barbara)
- Soil Microbial Response to Elevated CO₂. Adrien Finzi (Boston Univ.)
- Effects of Increased Nitrogen Inputs on Soil Microbes: Implications for Decomposition and N Cycling. Matt Wallenstein (Colorado State University)
- Microbial Determinants of Soil Carbon Response to Climate Warming. Teri Balser (University of Wisconsin)
- What to Expect with Global Warming. William Schlesinger (Duke University)
- Assessing Root Turnover with Isotopic Measurements. Eric Hobbie (Univ. New Hampshire)
- New Approaches for Capturing Soluble Root Exudates: Effects of Elevated CO₂, N and Mycorrhizal Species on Rates and Composition. Rich Phillips (Duke University)
- Live Reports from the Soil Grain -- the Promise and Challenge of Microbiosensors. Zoe Cardon, P. Herron, C. Arango Pinedo, Z. Haider, D. Gage (Univ. of Connecticut)

- Soil Moisture Alters Rhizosphere Effects on Soil C Decomposition in Two Different Soil Types. Feike Dijkstra and Weixin Cheng, (UC Santa Cruz)

A collection of 7 papers from this symposium are currently in preparation and will be submitted to Functional Ecology in May 2007.

4. Lindsey Rustad presented the keynote talk at the 2006 BIOGEOMON Conference on June 26, 2006, Santa Cruz, CA. The talk was entitled: “The Response of Terrestrial Ecosystems to Global Climate Change: Towards an Integrated Approach” and highlighted lessons learned from TERACC over the last 5 years. The abstract is available on-line at:

<http://www3.villanova.edu/conferences/biogeomon2006/Plenary%20Address.pdf>