Second State of the Carbon Cycle Report

A Sustained Assessment Report
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U.S. Global Change Research Program
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Front Cover

North American carbon cycling illustration, courtesy Ron Oden, University of Nevada, Reno.

This graphic represents the dynamic nature of carbon stocks and fluxes in the United States, Canada, and Mexico described in the Second State of the Carbon Cycle Report.

- The center sketch of researchers taking soil samples pays tribute to the hundreds of scientists who served as authors for this report and the thousands of researchers whose data were used throughout the document.
- Arrows depict carbon emissions to the atmosphere (red) and carbon uptake by different land types and aquatic environments (teal), processes described in Ch. 1: Overview of the Global Carbon Cycle and Ch. 2: The North American Carbon Budget.
- Plotted data—collected by the National Oceanic and Atmospheric Administration’s Earth System Research Laboratory—show monthly means of atmospheric carbon dioxide (CO2) concentrations (red curve in parts per million) taken at the Mauna Loa Observatory and monthly means of methane (CH4) concentrations (green curve in parts per billion) from globally averaged marine surface sites. Deseasonalized data are depicted by the black lines (Ch. 8: Observations of Atmospheric Carbon Dioxide and Methane).
- Coral reefs, fish, and beaches represent carbon processes in coastal waters (Ch. 15: Tidal Wetlands and Estuaries and Ch. 16: Coastal Ocean and Continental Shelves). These are key areas experiencing carbon cycle changes due to direct effects of increasing CO2 (Ch. 17: Biogeochemical Effects of Rising Atmospheric Carbon Dioxide).
- Forests (first inset, lower left) and their soils represent the largest terrestrial carbon sink in North America. Factors influencing the strength of this sink and trends in disturbances such as wildfire, insects, and land-use change are described in Ch. 9: Forests.
- Mountains with melting glacier (second inset, lower left) illustrate the effects of greenhouse gas–induced warming on carbon cycling, particularly in high-latitude and boreal areas (Ch. 11: Arctic and Boreal Carbon).
- Pastoral scene (center inset, bottom) captures the interdependent carbon cycling processes among different terrestrial and aquatic systems (Ch. 5: Agriculture, Ch. 7: Tribal Lands, Ch. 10: Grasslands, Ch. 12: Soils, Ch. 13: Terrestrial Wetlands, and Ch. 14: Inland Waters).
- Power plant (second inset, lower right) illustrates carbon fluxes from the energy sector and other human systems and their potential impact on future carbon cycling (Ch. 3: Energy Systems and Ch. 19: Future of the North American Carbon Cycle).
- Coastal city and port (first inset, lower right) represent the many ways carbon is embedded in social systems and the different levels of information and governance involved in carbon decision making (Ch. 4: Understanding Urban Carbon Fluxes, Ch. 6: Social Science Perspectives on Carbon, and Ch. 18: Carbon Cycle Science in Support of Decision Making).

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Carbon Cycle Interagency Working Group, SOCCR2 Federal Steering Committee, and SOCCR2 Federal Liaisons
(*Federal Steering Committee member, ** Federal Liaison)

Nancy Cavallaro,* USDA National Institute of Food and Agriculture; Co-chair, Carbon Cycle Interagency Working Group; SOCCR2 Administrative Agency Lead
Zhiliang Zhu,* U.S. Geological Survey; Co-Chair, Carbon Cycle Interagency Working Group
Daniel Stover,* DOE Office of Science
Marlen Eve,* USDA Agricultural Research Service
Noel P. Gurwick, U.S. Agency for International Development
Kathy Hibbard,* NASA Earth Science Division
Erica H. Ombres,* NOAA Ocean Acidification Program
Tom Wirth,* U.S. Environmental Protection Agency
James H. Butler,** NOAA Earth System Research Laboratory
Laura Lorenzoni,** NASA Earth Science Division
Anne Marsh,** USDA Forest Service
Kathy Tedesco,** NOAA Ocean Observing and Monitoring Division; UCAR Cooperative Programs for the Advancement of Earth System Science
Paula Bontempi, NASA Earth Science Division
Gyami Shrestha,* Ex officio as Lead SOCCR2 Development Advisor and Manager; U.S. Carbon Cycle Science Program Office Director; Carbon Cycle Interagency Working Group; UCAR Cooperative Programs for the Advancement of Earth System Science

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Melanie A. Mayes, Oak Ridge National Laboratory
Raymond G. Najjar, The Pennsylvania State University
Sasha C. Reed, U.S. Geological Survey
Paty Romero-Lankao, National Center for Atmospheric Research (currently at National Renewable Energy Laboratory)

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Chapter Leads

Vanessa L. Bailey, Pacific Northwest National Laboratory
Lori Bruhwiler, NOAA Earth System Research Laboratory
David Butman, University of Washington
Wei-Jun Cai, University of Delaware
Abhishek Chatterjee, Universities Space Research Association;
  NASA Global Modeling and Assimilation Office
Sarah R. Cooley, Ocean Conservancy
Grant Domke, USDA Forest Service
Katja Fennel, Dalhousie University
Kevin Robert Gurney, Northern Arizona University
Daniel J. Hayes, University of Maine
Alexander N. Hristov, The Pennsylvania State University
Deborah N. Huntzinger, Northern Arizona University
Andrew R. Jacobson, University of Colorado, Boulder;
  NOAA Earth System Research Laboratory
Jane M. F. Johnson, USDA Agricultural Research Service
Randall Kolka, USDA Forest Service
Kate Lajtha, Oregon State University
Elizabeth L. Malone, Independent Researcher
Peter J. Marcotullio, Hunter College, City University of New York
Maureen I. McCarthy, University of Nevada, Reno; Desert Research Institute
A. David McGuire, U.S. Geological Survey; University of Alaska, Fairbanks
Anna M. Michalak, Carnegie Institution for Science;
  Stanford University
John B. Miller, NOAA Earth System Research Laboratory
David J. P. Moore, University of Arizona
Elise Pendall, Western Sydney University
Stephanie Pincetl, University of California, Los Angeles
Vladimir Romanovsky, University of Alaska, Fairbanks
Paty Romero-Lankao, National Center for Atmospheric Research (currently at National Renewable Energy Laboratory)
Edward A. G. Schuur, Northern Arizona University
Carl Trettin, USDA Forest Service
Rodrigo Vargas, University of Delaware
Tristram O. West, DOE Office of Science
Christopher A. Williams, Clark University
Lisamarie Windham-Myers, U.S. Geological Survey

Contributing Authors

Rose Abramoff, Lawrence Berkeley National Laboratory
Javier Alcocer, Universidad Nacional Autónoma de México
Simone R. Alin, NOAA Pacific Marine Environmental Laboratory
Andreas Andersson, Scripps Institution of Oceanography
Denis Angers, Agriculture and Agri-Food Canada
Dominique Bachelet, Oregon State University
Ashley Ballantyne, University of Montana
Sheel Bansal, U.S. Geological Survey
Leticia Barbero, NOAA Atlantic Oceanographic and Meteorological Laboratory
Sourish Basu, University of Colorado, Boulder; NOAA Earth System Research Laboratory
Brian Benscoter, Florida Atlantic University
Michele Betsill, Colorado State University
Sharon A. Billings, University of Kansas
Richard Birdsey, Woods Hole Research Center
Timothée Bourgeois, Dalhousie University
Scott Bridgham, University of Oregon
Molly E. Brown, University of Maryland
Lori Bruhwiler, NOAA Earth System Research Laboratory
David Butman, University of Washington
Nancy Cavallaro, USDA National Institute of Food and Agriculture
Darrel Cerkowniak, Agriculture and Agri-Food Canada
Abhishek Chatterjee, Universities Space Research Association;
  NASA Global Modeling and Assimilation Office
Mikhail Chester, Arizona State University
Rodney Chimner, Michigan Technological University
David W. Clow, U.S. Geological Survey
Richard T. Conant, Colorado State University
Sarah R. Cooley, Ocean Conservancy
John Coulston, USDA Forest Service
Felix Creutzig, Mercator Research Institute on Global Commons and Climate Change
Joseph Crosswell, Commonwealth Scientific and Industrial Research Organisation
Kenneth Davis, The Pennsylvania State University
Steven Davis, University of California, Irvine
Ben de Jong, El Colegio de la Frontera Sur
Daniel deB. Richter, Duke University
Paul del Giorgio, Université du Québec à Montréal
Stephen J. Del Grosso, USDA Agricultural Research Service
Scott Denning, Colorado State University
Yannis G. Dialynas, University of Cyprus (formerly at Georgia Institute of Technology)
Judith Drexler, U.S. Geological Survey
Review Editors

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Christine Negra, Versant Vision
Emily J. Pindilli, U.S. Geological Survey
Adam J. Terando, U.S. Geological Survey
Nicholas Ward, Pacific Northwest National Laboratory

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(Based at Oak Ridge National Laboratory)

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Kris Christen
Marilyn Langston
Sheryl Martin
Stacey McCray
Marissa Mills
Judy Wyrick
Brett Hopwood
Betty Mansfield, Group Leader

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Former SOCCR2 Federal Steering Committee Members and Liaisons: Karina V. R. Schäfer (formerly National Science Foundation), Jared DeForest (formerly U.S. Department of Energy), Eric Kasischke (formerly NASA), Carolyn Olson (formerly USDA Office of the Chief Economist), Ben DeAngelo (formerly U.S. Global Change Research Program), and Glynis Lough (formerly National Climate Assessment, U.S. Global Change Research Program)

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Expert Reviewers: Sam Baldwin, DOE Office of Energy Efficiency and Renewable Energy; Sarah Burch, Waterloo University; John Robinson, University of Toronto; Benjamin Sovacool, University of Sussex and Aarhaus University; Camille Stagg, U.S. Geological Survey; Hal Willhite, University of Oslo; and Nicole Woolsey Biggart, University of California, Davis
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