NAUFRP

National Association of University Forest Resources Programs

Creating Knowledge–Developing Leaders

March 21, 2016

mailto:carpenter.thomas@epa.gov
Mr. Thomas Carpenter
Designated Federal Officer
EPA Science Advisory Board
United States Environmental Protection Agency
1300 Pennsylvania Avenue, NW
Washington D.C. 20004

Dear Mr. Carpenter and Members of the Science Advisory Board:

On behalf of the National Association of University Forest Resources Programs (NAUFRP), we are pleased to write to provide comments with respect to the Draft SAB Review Report on the Framework for Assessing Biogenic CO2 Emissions From Stationary Sources which you will review at your March 31 meeting. NAUFRP represents 80 of the country's universities that have programs devoted to forest resources and who share a common purpose to advance the health, productivity and sustainability of our nation's forests.

We provide the attached summary of science fundamentals, signed by more than 100 university experts in the field, that many in the science community, and the forestry disciplines in particular, strongly believe should underlie the agency's policy considerations for biomass carbon accounting. These fundamentals, which are essential to understanding and benefiting from the low carbon attributes of managed forests and the biomass derived from them, are also addressed in an article appearing in the November 2014 issue of the Journal of Forestry. We previously transmitted these principles to EPA Administrator McCarthy.

EPA must satisfy programmatic requirements for addressing biomass while addressing the practical needs of both the regulating and regulated community. In short, we believe that your advice will be most helpful if it is firmly grounded in the following scientific fundamentals, which are more fully explained in the attached paper:

1. The carbon benefits of sustainable forest biomass energy are well established.

2. Measuring the carbon benefits of forest biomass energy must consider cumulative carbon emissions over the long term.

3. An accurate comparison of forest biomass energy carbon impacts with those of other energy sources requires the use of consistent timeframes in the comparison.

4. Economic factors influence the carbon impacts of forest biomass energy.

We offer our expertise to the Agency as it develops a sound, science-based accounting policy for biomass energy and remain ready to work with Agency staff to respond to your report.

Respectfully,

James A. Allen, President
Northern Arizona University

Keith L. Belli, President – Elect
University of Tennessee

Steve H. Bullard, Immediate Past President
Stephen F. Austin State University

Janaki Alavalapati, Policy Chair
Auburn University

Tim White, Past President
University of Florida

Science Fundamentals of Forest Biomass Carbon Accounting

Policy makers are increasingly considering the use of forest biomass energy to meet national, regional and state energy and carbon emissions objectives. As they do so, it is imperative that their policy decisions be informed by current peer-reviewed science on the carbon impacts of woody biomass as an energy source. Some studies on the subject offer views with stringent assumptions that may be confusing to decision-makers.

Peer-reviewed literature examining the net emissions from the wide spectrum of forest-based activities reveals a number of important fundamentals policy makers should consider when characterizing the carbon impacts of the increased use of forest biomass for energy.[1] While these fundamentals do not address all of the issues policy makers confront, they help clarify those most directly affecting the potential role forest biomass energy can play in energy and climate policy.

As experts in forest science, we recommend the following four science fundamentals to policy makers and others seeking to develop a science-based approach to biomass energy production.

Fundamental 1: The carbon benefits of sustainable forest biomass energy are well established.

The long-term benefits of forest biomass energy are well-established in science literature. As stated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, "In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre or energy from the forest, will generate the largest sustained mitigation benefit.[2]" Most debates regarding the carbon benefits of forest biomass energy are about the timing of the benefits rather than whether they exist.

Fundamental 2: Measuring the carbon benefits of forest biomass energy must consider cumulative carbon emissions over the long term.

The most effective carbon mitigation measures are those which reduce carbon accumulation in the atmosphere over time. Forest biomass energy yields significant net decreases in overall carbon accumulation in the atmosphere over time compared to fossil fuels. Comparisons between forest biomass emissions

---

1 Miner, R.A., R.C. Abt, J.L. Bowyer, M.A. Buford, R.W. Malmsheimer, J. O'Laughlin, E.E. Oneil, R.A. Sedjo, and K.E. Skog. 2014. Forest Carbon Accounting Considerations in U.S. Bioenergy Policy. *Journal of Forestry* Forthcoming http://www.ingentaconnect.com/content/saf/jof/pre-prints/content-jof14009

2 p. 543 Nabuurs, G.J., O. Masera, K. Andrasko, P. Benitez-Ponce, R. Boer, M. Dutschke, E. Elsiddig, et al. 2007. Forestry. Chapter 9 in *Climate change 2007: Mitigation*. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Metz, B., O.R. Davidson, P.R. Bosch, R. Dave, and L.A. Meyer (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. P. 541-584.

and fossil fuel emissions at the time of combustion and for short periods thereafter do not account for long term carbon accumulation in the atmosphere and can significantly distort or ignore comparative carbon impacts over time.

Fundamental 3: An accurate comparison of forest biomass energy carbon impacts with those of other energy sources requires the use of consistent timeframes in the comparison.

The most common timeframe for measuring the impacts of greenhouse gases is 100 years, as illustrated by the widespread use of 100-year global warming potentials.[3] This timeframe provides a more accurate accounting of cumulative emissions than shorter intervals. Measuring the net cumulative carbon emissions from forest biomass energy over a 100 year timeframe, as is done for fossil fuels, more accurately captures and more appropriately demonstrates the cumulative carbon benefits of biomass energy compared to fossil fuels.

Fundamental 4. Economic factors influence the carbon impacts of forest biomass energy.

Research demonstrates that demand for wood helps keep land in forest and incentivizes investments in new and more productive forests, all of which have significant carbon benefits. This is particularly true when landowner investments are made in anticipation of future market demand. Likewise wood markets significantly influence both the availability of wood and the kind of wood used for biomass energy. For example, large trees better suited for higher value markets are typically not used for energy. The consideration of landowner response to the marketplace is essential to fully accounting for the long-term carbon impacts of using forest biomass for energy.[4] Failing to consider the effects of markets and investment on carbon impacts can distort the characterization of carbon impacts from forest biomass energy.

Research on the use of forest biomass as an energy source to mitigate GHG emissions dates back to the late 1980's. Changes in technology, forest conditions, and markets and global economics will influence forest biomass utilization now and in the future. A commitment to continuing research on forest biomass utilization is necessary to quantify the risks and benefits associated with its use, encourage dialogue and debate, drive innovation and investment in new technologies and inform policy.

---

[3] Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, et al. 2007. Changes in atmospheric constituents and in radiative forcing. Chapter 2 in *Climate Change 2007: The physical science basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[4] Alavalapati, J.R.R., P. Lal, A. Susaeta, R. Abt, and D. Wear. 2013. Forest biomass-based energy pp213-260. A chapter In Southern Forest Future Project edited by D. Wear and J. Griess, U.S. Forest Service General Technical Report SRS-178, 1318 pages.

Kamran Abdollahi, Ph.D.
Program Leader and Graduate Director
Urban Forestry Program
Southern University and A&M

Damian C. Adams, Ph.D.
Assistant Professor, Natural Resource Economics & Policy
School of Forest Resources & Conservation
University of Florida
Gainesville, FL

Francisco X. Aguilar, Ph.D.
Associate Professor
Department of Forestry
University of Missouri

Janaki Alavalapati, Ph.D.
Professor and Head
Department of Forest Resources and Environmental Conservation
College of Natural Resources and Environment
Virginia Tech
Blacksburg, VA

James A. Allen, Ph.D.
Professor and Executive Director
School of Forestry
College of Engineering, Forestry and Natural Sciences
Northern Arizona University
Flagstaff, AZ

Mila Alvarez, Ph.D.
Principal
Solutions for Nature, LLC

Dorothy H. Anderson, Ph.D.
Professor Emeritus
Department of Forest Resources
University of Minnesota
St. Paul MN

Michael G. Andreu, Ph.D.
Associate Professor - Forest Systems
Extension Specialist & Undergraduate Coordination
School of Forest Resources and Conservation
University of Florida IFAS

B.Bruce Bare, Ph.D.
Dean Emeritus and Professor
School of Environmental and Forest Sciences
University of Washington
H. Michael Barnes, Ph.D.
W.S. Thompson Distinguished Professor of Wood Science & Technology
Editor, *Wood & Fiber Science*
Fellow-IAWS, SWST, IOM
Department of Sustainable Bioproducts
Mississippi State University

David M. Baumgartner
Professor Emeritus
School of the Environment
Washington State University
Pullman, WA

Richard Drew Bowden, Ph.D.
Professor of Environmental Science
Department of Environmental Science
Allegheny College

James Bowyer, Ph.D.
Professor Emeritus
Department of Bioproducts and Biosystems Engineering
University of Minnesota, St. Paul

Richard W. Brinker, Ph.D., CF
Dean Emeritus
School of Forestry and Wildlife Sciences
Auburn University

Steven H. Bullard, Ph.D.
Dean, Arthur Temple College of Forestry and Agriculture
Interim Dean, Nelson Rusche College of Business
Stephen F. Austin State University
Nacogdoches, Texas

Dean W. Coble, Ph.D.
Minton Distinguished Professor
Arthur Temple College of Forestry&Agriculture
Stephen F. Austin State University
Nacogdoches, Texas

Mark D. Coleman, Ph.D.
Professor, Rangeland and Fire Sciences
University of Idaho

William Wallace Covington, Ph.D.
Executive Director, The Ecological Restoration Institute
Regents' Professor of Forest Ecology
Northern Arizona University
Flagstaff, Arizona

Gregory Dahle, Ph.D., BCMA
Assistant Professor of Arboriculture & Urban Forestry
Division of Forestry & Natural Resources
West Virginia University
Morgantown, WV

Thomas H. DeLuca Ph.D.
Professor and Director
School of Environmental and Forest Sciences
University of Washington
Seattle, WA

Ivan Eastin Ph D.
Professor and Director
Center of International Trade in Forest Products
School of Environmental and Forest Sciences
College of the Environment
University of Washington
Seattle, WA

Alan R. Ek, Ph.D.
Professor & Head
Department of Forest Resources
University of Minnesota
St. Paul, MN

Ivan J. Fernandez, Ph.D.
School of Forest Resources and Climate Change Institute
University of Maine

Robert E. Froese, Ph.D., RPF, CF
Associate Professor of Forest Science
School of Forest Resources and Environmental Science
Michigan Technological University
Houghton, MI

Mark D. Gibson, Ph.D.
Professor & Director
School of Forestry
Louisiana Tech University
Ruston, LA

Barry Goodell, Ph.D
Professor
Department of Sustainable Biomaterials
Virginia Tech
Blacksburg, VA

Thomas M. Gorman, Ph.D., P.E.
Associate Dean and Professor of Renwable Materials
College of Natural Resources
University of Idaho
Moscow, ID

Dale Green, Ph.D.
Professor and Associate Dean for Academic Affairs
Warnell School of Forestry & Natural Resources
University of Georgia
Athens, GA

Edwin J. Green, Ph.D.
Professor
Department of Ecology, Evolution and Natural Resources
Rutgers University
New Brunswick, NJ

Richard Guyette, Ph. D.
Research Professor
Forestry Department
School of Natural Resources
University of Missouri
Missouri Tree Ring Laboratory
Columbia, MO

Han-Sup Han, Ph. D
Professor
Humboldt State University
Arcata, CA

Donald Hanley, Ph.D.
Extension Forestry Professor Emeritus
Washington State University

Robert B. Harrison, Ph.D.
Professor
University of Washington
Seattle, WA
Adjunct Professor, Universidade Estadual Paulista,
Botucatu SP Brazil
Fellow, Soil Science Society of America

Austin Heine
Operations Manager
Cooperative Tree Improvement Program
North Carolina State University

John A. Helms, Ph.D.
College of Natural Resources
University of California, Berkeley, (Ret.)

Howard M. Hoganson, Ph.D.
Professor
Department of Forest Resources
University of Minnesota
St. Paul, MN

George M. Hopper, Ph.D.
Dean, College of Forest Resources
Dean, College of Agriculture and Life Sciences
Director, MS Agricultural and Forestry Experiment Station
Director, Forest and Wildlife Research Center
Mississippi State University

Theodore E. Howard, Ph.D.
Professor of Forestry Economics & Associate Dean
College of Life Sciences and Agriculture
University of New Hampshire
Durham, NH

Fikret Isik, Ph.D.
Associate Professor
Department of Forestry and Environmental Resources
North Carolina State University

James E. Johnson, Ph. D.
Associate Dean and Professor of Forestry
Oregon State University
Corvallis, OR

Eric J. Jokela, Ph.D.
Professor
IFAS School of Forest Resources and Conservation
University of Florida

Shibu Jose, Ph.D.
H.E. Garrett Endowed Professor and Director
The Center for Agroforestry
Editor-in-Chief, *Agroforestry Systems*
University of Missouri
Columbia, MO

John F. Katers, Ph.D.
Professor and Chair, Natural and Applied Sciences (Engineering)
Director, Environmental Management and Business Institute (EMBI)
University of Wisconsin-Green Bay

Michael Kelleher
Executive Director Energy and Sustainability
SUNY
College of Environmental Science and Forestry
Syracuse, NY

Richard K. Kobe, Ph.D.
Chairperson and Professor
Department of Forestry
Michigan State University
East Lansing, MI

Peter F. Kolb, Ph.D.
Montana State University Extension Forestry Specialist
Associate Professor Forest Ecology & Management
Montana State University
Missoula, MT

Thomas E. Kolb, Ph.D.
Professor of Forest Ecophysiology
Graduate Coordinator
School of Forestry and Wildlife Sciences
Northern Arizona University
Flagstaff, AZ

Patricia A. Layton, Ph.D.
Director
Wood Utilization and Design Institute
Clemson University

Larry Leefers, Ph.D.
Department of Forestry
Michigan State University

Bruce Lippke
Professor Emeritus
College of Environment
University of Washington

Graeme Lockaby, Ph.D.
Professor
School of Forestry and Wildlife Sciences
Auburn University

Ajit K. Mahapatra, Ph.D.
Research Assistant Professor
Food & Bioprocess Engineering
College of Agriculture, Family Sciences & Technology
Fort Valley State University
Fort Valley, GA

Robert W. Malmsheimer, Ph.D., JD
Professor, Forest Policy and Law
SUNY-College of Environmental Science and Forestry

Timothy A. Martin, Ph.D.
Professor, Tree Physiology
School of Forest Resources and Conservation
University of Florida
Gainesville, FL

Marc McDill, Ph.D.
Associate Professor of Forest Management
Department of Ecosystem Science and Management
Penn State University
University Park, PA

Steven E. McKeand, Ph.D.
Professor of Forestry and Environmental Resources
Director, Cooperative Tree Improvement Program
North Carolina State University
Raleigh, NC

J.F. McNeel, Ph.D
Professor & Director
Division of Forestry & Natural Resources
Davis College of Agriculture, Natural Resources & Design
West Virginia University
Morgantown, WV

Richard Meilan, Ph.D.
Professor of Molecular Tree Physiology
Department of Forestry and Natural Resources
Purdue University
West Lafayette, IN

Michael G. Messina, Ph.D.
Head and Professor
Department of Ecosystem Science and Management
Penn State University
University Park, PA

P.K. Nair, Ph.D.
Distinguished Professor
School of Forest Resources and Conservation
University of Florida
Gainesville, FL

David Newman, Ph.D.
Professor and Chair
Department of Forest and Natural Resources Management
SUNY-ESF
Syracuse, NY

Kevin L. O'Hara, Ph.D.
Professor of Silviculture
University of California
Berkeley, CA

Jay O'Laughlin, Ph.D.
Professor of Forestry & Policy Sciences
Director of Policy Analysis Group
College of Natural Resources
University of Idaho
Moscow, ID

Chadwick Dearing Oliver, Ph.D.
Pinchot Professor of Forestry and Environmental Studies
Director, Global Institute of Sustainable Forestry
School of Forestry and Envrionmental Studies
Yale University

Elaine Oneil, Ph.D.
Executive Director, CORRIM
Research Scientist
University of Washington
Seattle, WA

Douglas D. Piirto, Ph.D., RPF
Professor
Natural Resources Management and Environmental Sciences Department
California Polytechnic State Universtiy
San Luis Obispo, CA

Kurt Pregitzer, Ph.D.
Dean
College of Natural Resources
University of Idaho
Moscow, ID

Timothy G. Rials, Ph.D.
Professor and Director
Center for Renewable Carbon
University of Tennessee

Daniel D. Richter, Ph.D.
Professor of Soils
Duke University

Daniel J. Robison, Ph.D.
Dean and Professor
Davis College of Agriculture, Natural Resources & Design
West Virginia University
Morgantown, WV

D. Allen Rutherford, Ph.D.
Director and Bryant A. Bateman Distringuished Professor of Renewable Natural Resources
School of Renewable Natural Resources
Louisiana State University Agricultural Center

Roger Sedjo, Ph.D.
Senior Fellow
Resources for the Future

Stephen Shaler, Ph.D.
Professor & Director
School of Forest Resources
Associate Director, Advanced Structures & Composites Center
University of Maine
Orono, ME

Terry L. Sharik, Ph.D.
Robbins Professor of Sustainable Resources and Dean
School of Forest Resources and Environmental Science
Michigan Technological University
Houghton, MI

James P. Shepard, Ph.D.
Professor
School of Forestry and Wildlife Sciences
Auburn University

Wayne H. Smith, Ph.D.
Professor Emeritus and Director (retired)
School of Forest Resources and Conservation
University of Florida

William B. Smith, Ph.D.
Professor, Wood Products Engineering
Director, Wood Utilization Service
Sustainable Construction Management and Engineering
SUNY ESF
Syracus, NY

Douglas G. Sprugel
Professor Emeritus of Forest Ecology
School of Environmental and Forest Sciences
University of Washington

Richard B. Standiford, Ph.D., RPF
Cooperative Extension Forest Management Specialist
University of California
Berkeley, CA

Kirsten Stephan, Ph.D.
Associate Professor of Biology
Department of Life and Physical Sciences
Urban Forester, Cooperative Research
Lincoln University
Jefferson City, MO

William Stewart, Ph.D.
Forestry Specialist, Environmental Science, Policy and Management
University of California
Berkeley, CA

Thomas J. Straka, Ph.D.
Faculty of Forestry
Clemson University

Philip A. Tappe, Ph.D.
Dean
School of Forest Resources
University of Arkansas at Monticello

Larry Teeter, Ph.D
Professor
School of Forestry and Wildlife Sciences
Auburn University

Richard P. Thompson, Ph.D., RPF
Interim Head
Natural Resources Management & Environmental Sciences Department
Director, Urban Forest Ecosystems Institute
Cal Poly
San Luis Obispo, CA

Brian K. Via, Ph.D.
Associate Professor and Director of Auburn Forest Products Development Center
School of Forestry and Wildlife Sciences
Auburn University

Jason G. Vogel, Ph.D.
Assistant Professor
Department of Ecosystem Science and Management
Texas A&M University

John C. Volin, Ph. D.
Professor and Head
Department of Natural Resources and the Environment
Director, Environmental Science
College of Agriculture and Natural Resources
University of Connecticut
Storrs, CT

Timothy A. Volk, Ph.D.
Senior Research Scientist
Department of Forest and Natural Resources
College of Environmental Science and Forestry
State University of New York College of Environmental Science & Forestry
Syracuse, NY

John E. Wagner, Ph.D.
Professor of Forest Resource Economics
Department of Forest and Natural Resources Management
SUNY-College of Environmental Sciences and Forestry
Syracuse, NY

Robert G. Wagner, Ph.D.
Henry W. Saunders Distinguished Professor in Forestry
Director, Center for Research on Sustainable Forests (CRSF) and Cooperative Forestry Research Unit (CFRU)
University of Maine
Orono, ME

Aaron Weiskittel, Ph.D.
Associate Professor of Forest Biometrics and Modeling
Irving Chair of Forest Ecosystem Management
School of Forest Resoures
University of Maine
Orono, ME

Tim White, Ph.D.
Professor and Director
School of Forest Resources and Conservation
IFAS, University of Florida
Gainesville, FL

Hans M. Williams, Ph.D.
Associate Dean
Nelson Distinguished Professor of Forestry
Arthur Temple College of Forestry and Agriculture
Stephen F. Austin State University
Nacogdoches, TX

Jerrold E. Winandy, Ph.D.
Adjunct Professor
Department of Bioproducts and Biosystems
Engineering
University of Minnesota
St. Paul, MN

Paul M. Winistorfer, Ph.D.
Dean
College of Natural Resources and Environment
Virginia Tech
Blacksburg, VA

Y. Jun Xu, Ph.D.
Professor
School of Renewable Natural Resources
Louisana State University
Baton Rouge, LA

Ruth D. Yani, Ph.D.
Professor
SUNY-ESF
Syracuse, NY

Timothy M. Young, Ph.D.
Professor and Graduate Director
Department of Forestry, Wildlife and Fisheries
Center for Renewable Carbon
University of Tennessee
Knoxville, TN

Dehai Zhao, Ph.D.
Research Scientist - Graduate Faculty
Warnell School of Forestry & Natural Resources
University of Georgia
Athens, GA