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Global Observatory for Ecosystem Services  
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### ***EDUCATION***

Indiana University, Biological Science, A.B., 1977  
Indiana University, Environmental Science, M.S., 1980  
University of New Hampshire, Natural Resources, Ph.D., 1992

### ***APPOINTMENTS***

Director, Global Observatory for Ecosystem Services, Michigan State University, 2005-present  
Professor, Department of Forestry, Michigan State University, 2005-present  
Professor, Department of Geography, Michigan State University, 1997-2005  
Director, Center for Global Change and Earth Observations, 2002-2005  
Director, Basic Science and Remote Sensing Initiative, Michigan State University, 1997-2003  
Research Professor, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, 1992-1997

### ***BIOGRAPHICAL SKETCH***

David L. Skole is Professor of Forestry. His research focuses on the role of forestry and agriculture in global climate change and the use of geographical information for sustainable development and natural resource management. His research involves new methods and applications of Earth Observations for global environmental change analytics. The current focus of his work is climate change mitigation and adaptation in international development, with a focus on carbon measurement and accounting for REDD+. He has more than 25 years of experience with research on forest ecosystems and carbon. His research program is situated in the Global Observatory for Ecosystem Services, which he directs. He was formally recognized for his climate change research as an official member of the United Nation's Intergovernmental Panel on Climate Change that shared the 2007 Nobel Peace Prize.

He was instrumental in constructing the first numerical carbon accounting model and has been spearheading the integration of satellite remote sensing measurements into carbon accounting models. He has more than 150 peer-reviewed publications on land use change and forestry issues related to forest and land cover carbon emissions and sequestration. He has been a leading expert on global environmental monitoring, having been instrumental in developing several international programs related to land use, carbon and climate change. In recent years he has been a leading authority on measurement, reporting and verification for forest carbon projects and has developed and published several protocols for A/R and REDD projects.

His work is now supporting international development programs of the US Government. He is group supports three major foreign assistance programs on REDD+ through USAID in India (Forest PLUS), Malawi (PERFORM) and Indonesia (LESTARI), and was senior investigator for the Carbon Benefits Program of UNEP and GEF. He is an advisor to the Forest Investment Program (World Bank Group) and led the development of its monitoring and reporting toolkit. He was a US delegate to the 14th Conference of the Parties for the Convention on Biodiversity in 2018. He was the charter Chair and current Chair of the United Nations Program on Global Observations of Forest Cover (GOFC), which is coordinating a monitoring program for forests worldwide. Dr. Skole is twice-Chair of the National Science Foundation Advisory Committee on Environmental Research and Education, a FACA Committee that led the creation of the Coupled Human Natural Systems program at NSF. He is also founding Chair of

the International Geosphere Biosphere Programme's Core Project on Land Use and Cover Change (LUCC). He has been a member of several committees of the National Academies including the Committee on Geographical Foundations of Agenda 21, and co-author of the report, *Down to Earth, the Geographic Information for Sustainable Development in Africa*, which was a key element of the U.S. position at the World Summit on Sustainable Development. He served on the Committee to Review the Climate Change Science Program Strategic Plan, the Committee on Geographic Sciences, and the Committee on Social and Behavioral Research Priorities for Environmental Decision making. Recently he served as a member of the Standing Committee on Earth Science Applications from Space.

He is now active in the emerging carbon financial markets and applications of his research to carbon sequestration and international climate change mitigation projects and programs. He has been active in developing methods for carbon offsets under cap-and-trade carbon regulations. He is currently supporting the California emissions mitigation programs through international forestry under the Governor's Climate and Forest Fund. He was a member of the Chicago Climate Exchange (CCX) and served as a member of its Offsets and Forestry Committee. Dr. Skole was part of the US Government Advisory Group on Carbon Accounting and a current Member of the USDA/USFS Advisory Committee on *Technical Guidelines for Quantifying Greenhouse Gas Sources and Sinks in the Forestry and Agriculture Sectors*, which developed US national forest and agriculture carbon measurement protocols and updates for 2022. He now advises the Michigan Department of Natural Resources on its forest carbon project in the Pigeon River Country, the first domestic public lands forest carbon project.

# CURRICULUM VITAE

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## ACADEMIC APPOINTMENTS

Professor, Department of Forestry, Michigan State University, 2005 - present

Professor, Department of Geography, Michigan State University, 1997 - 2005

Director, Center for Global Change and Earth Observations, Michigan State University, 2002 - 2005

Director, Basic Science and Remote Sensing Initiative, Michigan State University, 1997 - 2002

Research Professor, Institute for The Study of Earth Oceans and Space, University of New Hampshire.  
1992-1997

## EDUCATION

Ph.D., Natural Resources, University of New Hampshire, 1992

M.S., Environmental Science, Indiana University, 1980

A.B., Biological Science, Indiana University, 1977

## MEMBERSHIP OF LEARNED SOCIETIES

American Association for the Advancement of Science

American Association of Geographers

American Society for Photogrammetry and Remote Sensing.

## AWARDS AND RECOGNITION

Distinguished Service Recognition, National Science Foundation, 2016

Appointed, Committee on Earth Science and Applications from Space, National Academies, 2012

Classics in Physical Geography, paper award, 2008

Nobel Peace Prize (officially recognized recipient of the award to the IPCC lead authors), 2007

Certificate of appreciation for leadership, National Science Foundation, 2005

Recognition of achievement at the Centennial Meeting, American Association of Geographers, 2004

Appointed, Geographical Sciences Committee, The National Academies, 2004

Research achievement noted by the US Climate Change Science Program, 2004

Letter of commendation for outstanding work, The National Academies, 2002

Second most influential paper in the first decade of global change research, ISI

Research achievement recognized by John H. Gibbons, Director, OSTP, January 6, 1995

Research achievement from President William Clinton, *Science in the National Interest*, 1994

Research results placed on exhibit at the National Air and Space Museum, 1994

## PUBLICATIONS

Reiner, F., Brandt, M., Tong, X., **Skole, D.**, Kariryaa, A., Ciais, P., Davies, A., Hiernaux, P., Chave, J., Mugabowindekwe, M., Igel, C., Oehmcke, S., Gieseke, F., Li, S., SLiu, S., Saatchi, S., Boucher, P., Singh, J., Taugourdeau, S., Dendoncker, M., Song, X., Mertz, O., Tucker, C., Fensholt, R. in review. More than one quarter of Africa's tree cover found outside areas 2 previously classified as forest, *Nature Communications*.

Salmona, Y.B., Matricardi, E.A.T, **Skole, D.L.**, Silva J., Coelho, O., Pedlowski M.A., Sampaio J., Castrillón, L., Brandão, R.A., Silva A.L., Souza, S. In review. Effects of climate and deforestation on the Cerrado surface water. *Sustainability*.

Mugabowindekwe, M., Brandt, M., Chave, J., Reiner, F., **Skole, D.L.** Kariryaa, A., Igel, C., Hiernaux, P., Ciais, P., Mertz, O., Tong, X., Li, S., Rwanyiziri, G., Dushimiyimana, T., Alain, N., Uwizeyimana, V., Lillesø, J., Gieseke, F., Tucker, C., Saatchi S., Fensholt, R. 2022. Nation-wide mapping of tree level carbon stocks in Rwanda. *Nature Climate Change* (2022). doi.org/10.1038/s41558-022-01544-w.

Ojima, D.S., DeFries, R.S., Goward, S.N., Hansen, A., Hansen, M. Loveland, T., **Skole, D.L.**, Vogler, J. 2022. Landsat @ 50. *Frontiers in Ecology and the Environment*. 20(6): 340-342

Samek, J., Anhar, A., Maimunah, S., **Skole, D.** 2022. Measuring forest ecosystem services in Aceh Province for inclusion to local forest resource management plans. *APN Science Bulletin*. 2022. 91-102. 10.30852/sb.2022.1910.

**Skole, D.L.**, Mbow, C., Mugabowindekwe, M., Brandt, M.S., Samek, J.H. 2021. The importance of trees outside of forests as natural climate solutions. *Nature Climate Change*, 11(12): 1013–1016.

**Skole, D.L.**, Samek, J.H., Dieng, M., Mbow, C. 2021. The Contribution of trees outside of forests to landscape carbon and climate change mitigation in West Africa, *Forests*, 12(12): 1652; doi.org/10.3390/f12121652

**Skole, D.L.**, Samek, J.H., Mbow, C., Chirwa, M., Ndalowa, D., Tumeo, T., Kachamba, D., Kamoto, J., Chioza, A. and Kamangadazi, F., 2021. Direct Measurement of Forest Degradation Rates in Malawi: Toward a National Forest Monitoring System to Support REDD+. *Forests*, 12(4): 426.

Matricardi, E., **D. L. Skole\***, O. B. Costa M.A. Pedlowski, J. H. Samek, E.P. Miguel. 2020. Long term forest degradation surpasses deforestation in the Brazilian Amazon. *Science* 369(6509): 1378-1382.

Mbow, C., E. Toensmeier, M. Brandt, **D. Skole**, M. Dieng, D. Garrity, and B. Poulter. 2020 Agroforestry as a solution for multiple climate change challenges in Africa. In, Deryng, D. (ed.), *Climate Change and Agriculture*, Burleigh Dodds Science Publishing, Cambridge, UK, 404 pp.

Samek, J., **D. L. Skole**, R. Teguh, H. Segah, S. Maimunajh, 2020. Geography, E-Learning and a Course in Peatland Ecosystems and Climate Change Science. *Proceedings of the International Conference on Creative Economics, Tourism and Information Management (ICCETIM 2019) - Creativity and Innovation Developments for Global Competitiveness and Sustainability*, 91-97, ISBN: 978-989-758-451. Science and Technology Publications, Setúbal, Portugal. DOI: 10.5220/0009865300910097

David, E., Chhin, S., & **Skole, D. L.** 2018. Influence of Climate Variation on Growth of Tropical Tree Species in Western Kenya. *International Journal of Environment and Climate Change*, 8:295-307.

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Jayne, T.S. & Sitko, Nicholas J. & Mason, Nicole M., **Skole, D.**, 2016. "Can Input Subsidy Programs Promote Climate Smart Agriculture in Africa?" Food Security Collaborative Policy Briefs 245906, Michigan State University, Department of Agricultural, Food, and Resource Economics.

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David, E., S. Chhin, **D. Skole**. 2014. Dendrochronological potential and productivity of tropical tree species in wester Kenya. *Tree-Ring Research* 70(2):119-135

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Mbow, C., S. Chhin, B. Sambou, and **D.L. Skole**, 2013. Potential of dendrochronology to assess annual rates of biomass productivity in savanna trees of West Africa, *Dendrochronologia* 31(1): 41- 51.

**Skole, D.L.**, J.H. Samek, M. J. Smalligan and W.H. Chomentowski. 2013. Forests, carbon and the global environment: new directions in research. In, *Land use and the Carbon Cycle: Science and Applications in Human Environment Interactions*, Brown, D.G., D. T. Robinson, H.F. French, B.C. Reed, (eds.), Cambridge University Press, 586 pp.

Matricardi E.A.T., **D. L. Skole**, M. A. Pedlowski, and W. Chomentowski. 2013. Assessment of forest disturbances by selective logging and forest fires in the Brazilian Amazon using Landsat data, *International Journal of Remote Sensing*, 34(4):1057-1086.

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Mbow, C., **D. L. Skole**, M. Dieng, C. Justice, D. Kwesha, L. Mane, M. El Gamri, V. Von Vordzogbe, H. Virji, 2012. Challenges and Prospects for REDD+ in Africa: Review Of REDD+ Implementation in Africa. GLP Report No. 3. GLP-IPO, Copenhagen.

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Samek, J.H., **D.L. Skole** et al. 2011. Inpang Carbon Bank in Northeast Thailand: A Community Effort in Carbon Trading from Agroforestry Projects, In B.M. Kumar and P.K.R. Nair (eds.), *Carbon Sequestration Potential of Agroforestry Systems: Opportunities and Challenges*, Advances in Agroforestry 8, DOI 10.1007/978-94-007-1630-8\_15, Springer Science.

**Skole, D.L.**, J.H. Samek, and M.J. Smalligan. 2011. Implications of allometry, *Proceedings of the National Academy of Sciences*, 108(4):E12-E12.

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**Skole, D.L.** and B. M. Simpson. 2010. Climate change, land use, agriculture, and the emerging bioeconomy, In, *Linkages of Sustainability*, T. E. Graedel and Ester van der Voet (eds). 2010., MIT Press, Cambridge. ISBN: 0-262-01358-4

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Wiangwang, N., J.P. Messina, J. Qi, **D.L. Skole** Assessing water clarity and trophic condition of the Bight of Bangkok with satellite remote sensing. *International Journal of Geoinformatics* 2(3): 43- 50.

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Pedlowski, M.A., E. Matricardi, **D.L. Skole**, S. Cameron, W. Chomentowski, C. Fernandes, and A. Lisboa. 2005. Conservation Units: A New Deforestation Frontier in the Amazonian State of Rondônia, Brazil. *Environmental Conservation*. 32(2): 1- 7.

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**Skole, D.L.**, M.A. Cochrane, E. Matricardi, W.H. Chomentowski, M. Pedlowski, D. Kimble. 2004. Pattern to process in the Amazon region: measuring forest conversion, regeneration, and degradation, In, Gutman et al. (eds.), *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface, Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface, 77-95*, Kluwer Academic Publishers, 461pp

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**Skole D.L.** and M.A. Cochrane. 2004. Observations of LCLUCC in regional case studies. In, Gutman et al. (eds.), 2004. *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface, Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface, 53-55*, Kluwer Academic Publishers, 461pp.

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Gutman, G., Janetos, A.C., Justice, C.O., Moran, E.F., Mustard, J.F., Rindfuss, R.R., **Skole, D.L.**, Turner, B.L., Cochrane, M.A. 2004. *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface*, Springer, Dordrecht, 474pp. DOI 10.1007/978-1-4020-2562-4.

Samek, J., Lan, D.O., Silapathong, C., Navanagruha, C., Masturah, S., Gunawan, I., Crisostomo, B., Hilario, F., Hien, H.M., **Skole, D. L.**, Chomentowski, W., Salas. 2004. Land use and cover change in Southeast Asia, In, Gutman et al. (eds.), 2004. *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface, Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface*, 31-51, Kluwer Academic Publishers, 461pp

Nelson, S.A.C., P.A. Soranno, K.S. Cheruvilil, S.A. Batzli and **D.L. Skole**. 2003. Regional assessment of lake water clarity using satellite remote sensing. *Journal of Limnology* 62 (Suppl. 1):27-32

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Skole et al. 2002. *Forecast Michigan: Tracking Change for Land-Use Planning and Policymaking*, In Thornton and Weissert (eds). Urban Policy Choices for Michigan Leaders, Michigan State University Press, East Lansing

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**Skole, D.L.**, W.A. Salas and C. Silapathong. 1998. Interannual variation in the terrestrial carbon cycle: significance of Asian tropical forest conversion to imbalances in the global carbon budget. In J. Galloway and J. Melillo (eds.), *Asian Change in the Context of Global Change*, Cambridge University Press

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Townshend, J.R.G. and **Skole, D.L.** 1995 The global 1km AVHRR data set. In P. Mather (ed.), *Understanding the Terrestrial Environment, Remote Sensing Data Systems and Networks*, John Wiley and Sons, 75-82.

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**Skole, D.L.**, B. Moore III, and W.H. Chomentowski, 1993. Global geographic information systems and databases for vegetation change studies. In, Solomon, A.M. and H.H. Shugart (eds.), *Vegetation Dynamics and Global Change*, Chapman and Hall, New York.

Rock, B.N., **D.L. Skole**, and B.J. Choudhury, 1993. Monitoring vegetation change using satellite data. In, Solomon, A.M. and H.H. Shugart (eds.), *Vegetation Dynamics and Global Change*, Chapman and Hall, New York.

Houghton, R.A., **D.L. Skole**, D.S. Lefkowitz, 1991. Changes in the landscape of Latin America between 1850 and 1985: a net release of CO<sub>2</sub> to the atmosphere, *Forest Ecology and Management*, 38:31-57.

Houghton, R.A., D.S. Lefkowitz, and **D.L. Skole**, 1991. Changes in the landscape of Latin America between 1850 and 1985: Progressive loss of forests. *Forest Ecology and Management* 38:1-30.

Gever, J., Kaufmann, R., **Skole, D.**, Vorosmarty, C. 1991. *Beyond Oil: the Threat to Food and Fuel in the Coming Decades*, University of Colorado Press, 2<sup>nd</sup> edition, 301 pp.

Houghton, R.A. and D.L. Skole, 1990. Carbon, In, *The Earth Transformed by Human Action*, B.L. Turner (ed.), Cambridge University Press, Cambridge, 350 pp.

Mozeto, A.A., J.A. Stone, I.F. Brown, **D.L. Skole**, 1990. O uso de sistema geografico de informacao e de sensoriamento remoto na avaliacao do impacto ambiental na estacao ecologica de VHE Samuel, Rondonia, Brasil. *Interciencia* 15(5): 265-271.

Moore, B., M.P. Gildea, C.J. Vorosmarty, **D.L. Skole**, J. Melillo, J. Peterson, E. Rastetter, P. Steudler, 1989. A strategy for understanding changes in the metabolic system of the planet, In: Rambler, Margulis, and Sagan (eds.), *Global Ecology*, Academic Press, San Diego.

Melillo, J.M., J.R. Fruci, R.A. Houghton, B. Moore and **D.L. Skole**, 1988. Land-use change in the Soviet Union between 1850 and 1980: causes of a net release of CO<sub>2</sub> to the atmosphere. *Tellus* 40B:116-128.

Houghton, R.A., R.D. Boone, J.R. Fruci, J.E. Hobbie, J.M. Melillo, C.A. Palm, B.J. Peterson, G.R. Shaver, G.M. Woodwell, B. Moore, **D.L. Skole** and N. Myers, 1987. Geographic Distribution of the Net Biotic Flux in 1980. *Tellus* 39B, 122-139

Gever, J., **D.L. Skole** and C.J. Vorosmarty, 1986. Technology and the farm crisis. *USA Today Magazine*, 115(2494):26-28

Palm, C.A., R.A. Houghton, J.M. Melillo and **D.L. Skole**, 1985. Atmospheric carbon dioxide from deforestation in Southeast Asia. *Biotropica* 18(3):177-188

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Palm, C., R. Houghton, J. Melillo, **D. Skole** and G. Woodwell, 1985. The effect of tropical deforestation on atmospheric CO<sub>2</sub>, In: R. Lal, P.A. Sanchez and R.W. Cummings (eds.), *Land Clearing and Development in the Tropics*, A.A. Balkema Publishers, Rotterdam, 450 pp.

## **GRADUATE STUDENTS**

**Michael Chirwa**, PhD., current, (USAID funded Malawi Fellowship Program)

**Dan Ndalowa**, PhD., current, (USAID funded Malawi Fellowship Program)

**Tangu Tumeo**, MS, 2019, (USAID funded Malawi Fellowship Program), *Socio-Economic Context for Participatory Forest Landscape Restoration Monitoring in Malawi*

**Francis Kamangadazi**, MS, 2019, (USAID funded Malawi Fellowship Program), *Analysis of Tree Community Composition, Diversity and Natural Regeneration in Miombo Woodlands of Malawi*

**Daniel Zelenack**, MS. 2018. *Developing Activity Data from Remote Sensing for REDD+ Monitoring in Tropical Miombo Woodlands*

**Patrick Shults**, MS. 2017. *Exploring the Benefits of Cover Crops to Agroforestry Tree Plantations: An Analysis of Direct and Indirect Nitrogen Transfer in Alley Cropping Systems*

**Uy Pham**, PhD. 2016. *Monitoring and Mapping of the Extent of Industrial Forests in Malaysia*

**Yufuf Samsudin** MS. 2016 *Policies, Drivers and Land-Use Trends in Industrial Forest Plantation Development in Indonesia*

**Liborius Reinhardus**, MS. 2016. Allometric Relationships of Tropical Tree Species in Indonesia and Senegal

**Moussa Dieng**, PhD. 2015. *Landscape Carbon Measurement in Systems of Trees Outside of Forests: The Case of Agroforestry Systems in Rural Savannas of Senegal*

**Eric David**, MS. 2012. *Effects of Climate on Productivity in Tropical Tree Species in Western Kenya*

**Eraldo Matricardi**, PhD. 2007. *Spatiotemporal Dynamics of Forest Degradation by Selective Logging and Forest Fire in the Brazilian Amazon*

**Victorino Bata**, MS. 2006. *Establishing an Open, Distributed GIS Data Archive System*

**Cuizhen Wang**. PhD. 2004. *Estimation of Tropical Forest Biophysical Attributes With Synergistic Use of Optical and Microwave Remote Sensing Techniques*

**Yusuang Zhou**, PhD. 2002. *Development of Integrated Prognostic Models of Land Use /Land Cover Change: Case Studies in Brazil And China*

**Narumon Wiangwang**, PhD. 2002. *Water clarity/trophic condition monitoring using satellite remote sensing data.*

**William A. Salas**, PhD. 2001 *Optical and Radar Remote Sensing of Land Use and Land Cover Change in the Tropics: an Assessment of Deforestation and Secondary Vegetation*

## **TESTIMONY AND OFFICIAL BRIEFS**

### ***Executive Office of the President***

*Carbon Offsets*, invited briefing for the President's Council of Advisors on Science and Technology, 122

December 2009.

*Patterns to Processes: Scientific Challenges for Water Research*, invited briefing for the Director and Associate Director for Science, Office of Science and Technology Policy, 19 October 2004, Washington, D.C.

*Scientific Challenges for Water Research*, invited briefing for the National Science and Technology Council, Office of Science and Technology Policy, 16 December 2004, White Conference Center, Washington, D.C.

*Advances in Land Cover and Land Use Change Research*, invited briefing for the Assistant Director for Environment, Office of Science and Technology Policy, July 1999, White House Conference Center, Washington, D.C.

### **Congress**

*The Natural Environment and Indigenous People of Brazil*, prepared statement as testimony before the House Foreign Affairs Committee, Subcommittee on Western Hemisphere Affairs, May 10, 1994. United States Foreign Assistance and Tropical Deforestation, In, *Tropical Deforestation, Hearings before the Subcommittee on International Organizations of the Committee on Foreign Affairs*, House of Representatives, United States Congress.

### **Governor's Office**

*Michigan's Land Use Resource Project*, invited testimony before the Governor's Land Use Leadership Council, 24 March, 2003, Senate Hearing Room, Lansing MI.

### **BOOKS**

Gutman, G., A. Janetos, C. Justice, E. Moran, J. Mustard, R. Rindfuss, D. Skole, B. Turner (eds.) 2004. *Land Change Science: Observing, Monitoring, and Understanding Trajectories of Change on the Earth's Surface*. Kluwer Academic Publishers, Dordrecht, 459 pp.

Gever, J., R. Kaufmann, D.L. Skole and C.J. Vorosmarty, 1991. *Beyond Oil: The Threat to Food and Fuel in Coming Decades*, University Press of Colorado, 304 pp.

### **LEAD AUTHORSHIP ON SIGNIFICANT PEER REVIEWED REPORTS**

*Thriving on Our Changing Planet: A Decadal Strategy for Earth Observations from Space*, Earth Sciences Board, National Academies, January 2018.

*America's Future: Environmental Research and Education for a Thriving Century*, 10-year Outlook for the National Science Foundation, NSF, 2015

*GLP Report Challenges and Prospects for REDD+ in Africa*, START Washington DC, 2012

*GEO-4: Fourth Global Environment Outlook*, Chapter 3: Land (land degradation and forests), United Nations Environment Program, Nairobi, 2005.

*Exploring Our Planet for the Benefit of Society*, NASA Earth Science and Applications from Space Strategic Roadmap, National Aeronautics and Space Administration, Washington, DC., 2005

*Complex Environmental Systems: pathways to the future*, National Science Foundation, Washington, DC, 2005.

*Implementing Climate and Global Change Research: a review of the final US climate change science program strategic plan.* National Academies Press, Washington, DC, 2004

*Planning Climate and Global Change Research: a review of the US climate change science program strategic plan.* National Academies Press, Washington, DC, 2003

*Complex Environmental Systems: synthesis for Earth, life and society in the 21<sup>st</sup> century,* National Science Foundation, Washington DC., 2003

*Down to Earth: Geographic Information for Sustainable Development in Africa,* National Academies Press, Washington, DC., 2002

*Land Use, Land Use Change, and Forestry,* special report to the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, 2000.

*Land Use and Cover Change Implementation Strategy,* International Geosphere Biosphere Program report 48, Stockholm Sweden, 1999.

*Land Use and Land Cover Change Science/Research Plan,* International Geosphere Biosphere Program, report 35, Stockholm, Sweden, 1995.

*Relating land use and global land-cover change: A proposal for an IGBP-HDP core project.* Report from the IGBP-HDP Working Group on Land-Use/Land-Cover Change. Joint publication of the International Geosphere-Biosphere Programme (Report No. 24) and the Human Dimensions of Global Environmental Change Programme (Report No. 5). Stockholm: Royal Swedish Academy of Sciences 1993.

## **NATIONAL ACADEMIES OF SCIENCES AND ADVISORY COMMITTEES MAJOR REPORTS**

*Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry,* Update for the Executive Order on Tackling the Climate Crisis at Home and Abroad, White House. USDA, Office of the Chief Economist Climate Change Program Office, Energy and Environmental Policy, Washington DC. 2020.

<https://www.usda.gov/oce/energy-and-environment/climate/mitigation>  
<https://www.usda.gov/sites/default/files/documents/climate-smart-ag-forestry-strategy-90-day-progress-report.pdf>

*FIP Monitoring and Reporting Toolkit* (revised). Forest Investment Program, Climate Investment Funds, World Bank, Washington DC. 2020.

[https://www.climateinvestmentfunds.org/sites/cif\\_enc/files/fip\\_toolkit\\_en\\_revised.pdf](https://www.climateinvestmentfunds.org/sites/cif_enc/files/fip_toolkit_en_revised.pdf)

*Thriving on Our Changing Planet a Decadal Strategy for Earth Observation from Space,* Committee on the Decadal Survey for Earth Science and Applications from Space, National Academies, 2018.

<https://www.nap.edu/read/24938/chapter/1>

*FIP Measurement and Reporting Toolkit.* Forest Investment Program, Climate Investment Funds, World Bank, Washington DC. 2016.

[https://www.climateinvestmentfunds.org/sites/default/files/knowledge-documents/fip\\_monitoring\\_and\\_reporting\\_toolkit\\_final\\_march\\_2016.pdf](https://www.climateinvestmentfunds.org/sites/default/files/knowledge-documents/fip_monitoring_and_reporting_toolkit_final_march_2016.pdf)

New, forward-thinking report addresses environmental research, education. NSF 10-year Outlook Report, *Environmental Research and Education for a Thriving Century.* Sept. 2015

<https://www.sciencedaily.com/releases/2015/09/150921151428.htm>  
[https://www.nsf.gov/ere/ereweb/ac-ere/ac-ere\\_thriving\\_century.pdf](https://www.nsf.gov/ere/ereweb/ac-ere/ac-ere_thriving_century.pdf)

*Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory,* Technical Bulletin 1939, Office of the Chief Economist Climate Change Program Office. July 2014

<https://www.usda.gov/oce/energy-and-environment/climate/mitigation>

*Advancing Land Change Modeling Opportunities and Research Requirements*, Committee on Needs and Research Requirements for Land Change Modeling, National Academies, 2014.

<https://www.nap.edu/read/18385/chapter/1>

*Challenges and Prospects for REDD+ in Africa*. International START Secretariat, Global Land Project Report No. 3. GLP-IPO, Copenhagen, 2012

<https://start.org/publication/challenges-and-prospects-for-redd-in-africa/>

*Satellite Observations to Benefit Science and Society: Recommended Missions for the Next Decade*, Committee on Earth Sciences Applications from Space, National Academies, 2008.

<https://www.nap.edu/read/11952/chapter/1#iii>

*Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, Committee on Earth Science and Applications from Space: A Community Assessment and Strategy for the Future, National Academies, 2007

<https://www.nap.edu/download/11820>

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*Priorities for Geoint Research at the National Geospatial-Intelligence Agency*, Committee on Basic and Applied Research Priorities in Geospatial Science for the National Geospatial-Intelligence Agency, National Academies, 2006.

<https://www.nap.edu/read/11601/chapter/1>

*Complex Environmental Systems: Pathways for the Future*. National Science Foundation, Advisory Committee for Environmental Research and Education, March 2005.

[https://www.nsf.gov/ere/ereweb/ac-ere/acere\\_pathways.pdf](https://www.nsf.gov/ere/ereweb/ac-ere/acere_pathways.pdf)

*Decision Making for the Environment: Social and Behavioral Science Research Priorities*  
Panel on Social and Behavioral Science Research Priorities for Environmental Decision Making

<https://www.nap.edu/read/11186/chapter/1#ii>

*Implementing Climate and Global Change Research: A Review of the Final U.S. Climate Change Science Program Strategic Plan*, Committee to Review the U.S. Climate Change Science Program Strategic Plan, National Academies, 2004

<https://www.nap.edu/read/10635/chapter/1>

*Planning Climate and Global Change Research a Review of the U.S. Climate Change Science Program Strategic Plan*, Committee to Review the U.S. Climate Change Science Program Strategic Plan, National Academies, 2003.

<https://www.nap.edu/read/11565/chapter/1>

*Complex Environmental Systems: Synthesis for Earth, Life, and Society in the 21st Century*, Decadal Outlook, National Science Foundation Advisory Committee for Environmental Research and Education, January 2003.

[https://www.nsf.gov/ere/ereweb/ac-ere/acere\\_synthesis\\_rpt\\_full.pdf](https://www.nsf.gov/ere/ereweb/ac-ere/acere_synthesis_rpt_full.pdf)

*Down to Earth: Geographic Information for Sustainable Development in Africa*, Committee on the Geographic Foundation for Agenda 21, National Academies, 2002.

<https://www.nap.edu/read/10455/chapter/1#ii>

## **EDITORIAL BOARDS**

*Remote Sensing in Earth System Science*, Founding Editor, Section Editor for Ecology and Carbon Cycle, subject matter editor, Springer (present)

*Remote Sensing*, Editorial Board, MDPI (present)

*Land*, Special Editor, Special edition on REDD+, MDPI (completed)

*Regional Environmental Change*, Springer, Editorial Board member (completed)

## **COMMITTEES OF THE NATIONAL ACADEMIES**

*Committee to Review the 5<sup>th</sup> National Climate Assessment*, Board on Atmospheric Sciences and Climate, 2022-2023.

*Committee on the Decadal Survey of Earth Science and Applications from Space*, Space Studies Board, 2016-2018

*Standing Committee on Earth Science and Applications from Space*, Space Studies Board, 2012 - 2019

*Standing Committee on Geographical Sciences*, Board on Earth Sciences and Resources, 2004 – 2010

*Committee to Review the U.S. Climate Change Science Program*, Division on Earth and Life Studies  
Division on Engineering and Physical Sciences, and Division of Behavioral and Social Sciences and Education, 2002 – 2004

*Committee on Social and Behavioral Science Research Priorities for Environmental Decision Making*,  
Division of Behavioral and Social Sciences and Education, 2003 - 2005

*Committee on Ecological Impacts of Road Density*, Division on Earth and Life Studies Transportation  
Research Board, 2002 – 2003.

*Committee on Geographical Foundations of Agenda 21*, Division on Earth and Life Sciences, 2001- 2002.

## **FEDERAL ADVISORY COMMITTEES**

Member, USDA/USFS Forestry Committee, Technical Guidelines for Quantifying Greenhouse Gas Sources and Sinks for Climate Smart Agriculture and Forestry.

Member, SilvaCarbon, OSTP and US Government Advisory Group on Carbon Accounting

Member, USDA/USFS Forestry Working Group, Advisory Committee on Technical Guidelines for Quantifying Greenhouse Gas Sources and Sinks in the Forestry and Agriculture Sectors

Chair, Advisory Committee for Environmental Research and Education, National Science Foundation  
Strategic Roadmap Planning Committee, National Aeronautics and Space Administration

Land Use and Land Cover Change Steering Committee, U.S. Climate Change Science Program (interagency)

Advisory Committee, The Midwestern Regional Center of the National Institute for Global Environmental Change. US Department of Energy

Landsat 7 Science Team, National Aeronautics and Space Administration

Science Steering Committee, Large Scale Amazon Basin Experiment (LBA), 1997-2000, National Aeronautics and Space Administration

New Data and Information Systems Planning Committee, Earth Science and Applications, National Aeronautics and Space Administration.

## **INTERNATIONAL COMMITTEES AND PANELS**

Chair, Forest Cover Characteristics and Change Implementation Team, Global Observation of Forest Cover program, United Nations Global Terrestrial Observing System.

Chair, Fine Resolution Remote Sensing Design Team, Global Observations of Forest Cover Project, Committee on Earth Observation Satellites

Chair, Core Project on Land Use and Cover Change, International Geosphere Biosphere Program (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP), Barcelona, Spain.

Scientific Committee of the International Geosphere-Biosphere Programme, International Council of Scientific Unions, Stockholm, Sweden.

Steering Committee of the International Human Dimensions Programme on Global Environmental Change, International Council of Scientific Unions, Bonn, Germany.

Standing Committee for the International Geosphere-Biosphere Program's Data and Information System Office, Toulouse, France.

Science Advisory Panel for the Southeast Asian Regional Committee for START (governing body of the World Bank/GEF/UNDP sponsored activity of the IGBP, IHDP, and World Climate Research Program), Bangkok, Thailand.

Lead Author, *Intergovernmental Panel on Climate Change Special Report on Land Use, Land Use Change and Forestry*, Intergovernmental Panel on Climate Change, Framework Convention on Climate Change, United Nations.

## **CORPORATE ADVISORY BOARDS**

Academic Advisory Council, Spot Image, Inc., Reston Virginia, USA.

Forestry Committee, Chicago Climate Exchange

Offset Committee, Chicago Climate Exchange

## **RECENT PRIVATE SECTOR CONSULTING**

Forest Investment Program, the World Bank Chemonics International, for REDD+ in Panama

ICF International for support to USDA carbon accounting guidelines

The Boeing Company, Seattle, WA, for their Resource 21 Program.

Raytheon Company, Electronic Systems Division, Lexington, MA. for their Wide Area Monitoring and Surveillance Programs

Hughes Applied Information Systems, for development of Environmental Information Systems.

National Information Infrastructure Testbed Consortium, for development of the Earth Data System prototype.

## **SELECTED GRANTS AND CONTRACTS**

PI, *Monitoring and Measuring Carbon Stocks in Trees Outside of Forests in Africa for TerraFund*, World Resources Institute, 2022-2023. \$804,013

PI, *South Asian smallholder forests and other tree-based systems: synthesizing LCLUC data and approaches to foster a natural climate solution that improves livelihoods*, NASA, 2022-2025, \$2,100,003

Co-I, *NASA Land Cover Land Use Change (LCLUC) community support and GOFCC*, NASA, 2022-2027, \$2,954,306

PI, *Monitoring New Trends in Carbon Sequestration in Systems of Trees Outside of Forests*, NASA, 2021-2024, \$612,136

PI, *New Transitions in Small Holder Agricultural Systems than Promote Trees Outside of Forests*, NASA, 2020 – 2023, \$690,044

PI, *LESTARI project in Indonesia*, USAID, 2014-2018 \$640,000

PI, *Malawi Fellowship Program*, USAID, 2015-2018, \$265,000

PI, *Protecting Ecosystems and Restoring Forests in Malawi*, USAID, 2014-2018 \$629,000

PI, *Monitoring and Mapping the Area, Extent and Shifting Geographies of Industrial Forests in the Tropics*, NASA, 2014-2017, \$541,938

PI, *India Forest PLUS*, USAID, 2012-2017, \$1,675,000

PI, *Strengthening Indonesian Capacity for Developing National Forest Carbon Inventory, Mapping and MRV Technical Systems*, California Governor's Climate and Forest Fund, 2013-2014, \$138,000

PI, *Carbon, Climate and Livelihoods*, UNEP, 2009-2012, \$968,808

PI, *Developing Small-Holder Agro-forestry Carbon Offset Protocols for Carbon Financial Markets*, Asia Pacific Network Japan, 2009-2010, \$40,000

Co-I, *Financial Analysis Tools for Small Holder Agro-forestry Carbon Sequestration Projects*, World Agro Forestry Center, Nairobi, Kenya, 2009-2011, \$59,932

PI, *Enhancing Global Scale Observations And Information on Tropical Forest Change Using Landsat Global Data Remote Sensing*, NASA, 2008-2010, \$682,168.

PI, *Pilot Project for Reduced Emissions from Deforestation in the Peruvian Amazon*, WWF, 2009- 2010, \$64,303

PI, *What is The Global Rate And Extent of Tropical Deforestation; Forest Regeneration; Selective Logging; And Fragmentation?* NASA, 2004-2007, \$592,000

Co-I (with D. Clay), *Famine Early Warning System Network*, USAID/Chemonics, 2005 – 2010 , \$1,520,127



PI, *Global Tropical Rain Forest Information Center 2*, NASA, 2004 – 2008, \$4,167,000 PI, *Tropical Rain*

*Forest Information Center*, NASA, 1997 – 2003, \$4,832,000

PI, *Water: Challenges at the Intersection of Human and Natural Systems*, NSF, 2004-2005, \$72,000

Co-I (with J. Bartholic), *Development of the Great Lakes Natural Resource Gateway*, National Park Service, 2003-2005, \$178,000

PI, *Spatial Data and Information for Land Use and Forest Assessment and Management*, Asia Pacific Network for Global Change Research, 2001- 2005, \$192,000

PI, *Remote Sensing Component of the Michigan Department of Environmental Quality's Lake Water Quality Assessment Monitoring Program*, USGS, 2001 – 2002, \$40,000

PI, *Regional, multi-scaled, multi-temporal land use and land cover data to support global change research*. Asia Pacific Network for Global Change Research, 2003 - 2005, \$131,960

Co-I (with R. Walker), *Pattern to Process: Research and Applications for Understanding Multiple Interactions and Feedbacks on Land Cover Change*, NASA, 2000 – 2004, \$641,675

Co-I (with S. Batzli), *Land Use Study Component - US31 Location Project*, Michigan DOT, 2000- 2001, \$282,791

Co-I (with S. Gage), *Designing an Assessment Tool to Characterize the Impact of Changes in Land Use to Key Michigan Natural Resource Based Industries*, Public Sector Consultants, 2000- 2001, \$136,500

Co-I (with J. Qi), *GOCF Data and Information for Tropical Forest Assessment and Management*, NASA, 2000 – 2003, \$374,000

PI, *SIVAM*, Raytheon Company, 1999 – 2008, \$839,370

Co-I (with D. Brown), *Upper Great Lakes Regional Earth Science Applications Center*, NASA, 1999 – 2003, \$400,000

PI, *Human Dimensions of Deforestation And Regrowth In The Brazilian Amazonia*, NASA, 1998– 2000, \$195,000

PI, *Measurement and Modeling of the Inter-Annual Dynamics of Deforestation and Regrowth in the Brazilian Amazon*, NASA, 1998 – 2003, \$1,224,163

PI, *Acquisition and Analysis of Large Quantities of Landsat 7 Data for Measuring Tropical Land Change*, NASA, 1997– 2000, \$631,000

PI, *Landsat Pathfinder - Humid Tropical Forest Project*, NASA, 1997 – 1999, \$318,000

PI, *Michigan State University Center of Excellence in Applications of Remote Sensing to Regional and Global Integrated Environmental Change*, NASA, 1997 – 2000, \$392,000

PI, *Use of SAR for Monitoring Deforestation and Secondary Growth in the Tropics*, NASA, 1998, \$47,000

PI, *Case Studies and Diagnostic Models of the Inter-Annual Dynamics of Deforestation in Southeast Asia: is the Missing Sink for Carbon in Land Use Change?*, NASA, 1997 – 2001, \$460,000