

GREGORY P. ASNER

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I lead the Center for Global Discovery and Conservation Science, an ASU research unit with faculty and labs in Hawai'i and Arizona, dedicated to the exploration and stewardship of terrestrial and marine ecosystems. We emphasize scientific impact in resource management, environmental decision-making, community engagement, and public outreach. My core research focuses on applications of spatial ecology and remote sensing in large-scale conservation of forests and reefs.

Professional Experience

2019 - Director, ASU Center for Global Discovery and Conservation Science
2022 - Professor, ASU School of Ocean Futures
2019 - Professor, ASU School of Geographical Sciences and Urban Planning
2019 - Professor (adjunct), ASU School of Earth and Space Exploration
2002 - Professor (adjunct), Stanford Univ, Program in Environment & Resources
2018 - 2019 Senior Staff Scientist, Dept of Global Ecology, Carnegie Institution for Science
2007 - 2019 Professor (crtsy), Stanford Univ, Earth System Science
2004 - 2007 Assoc Professor (crtsy), Stanford Univ, Geological & Envir. Sciences
2001 - 2017 Staff Scientist, Dept of Global Ecology, Carnegie Institution for Science
2001 - 2004 Asst Professor (crtsy), Stanford Univ, Geological & Envir. Sciences
1999 - 2001 Asst Professor, Univ of Colorado, Geological Sciences & Envir. Studies
1998 - 1999 Postdoctoral Fellow, Stanford Univ, Geological & Envir. Sciences
1996 - 1998 Visiting Scientist, National Center for Atmospheric Research, Boulder, CO

Professional Preparation

1997 Ph.D. Biology, University of Colorado, Boulder
1995 M.S. Geography (ecology), University of Colorado, Boulder
1991 B.S. Engineering (radiative physics), University of Colorado, Boulder

Honors and Awards

Major

- Recipient, Heinz Award for the Environment, 2017
- Elected Fellow, Ecological Society of America, 2016
- Elected Fellow, American Geophysical Union, 2015
- Elected, U.S. National Academy of Sciences, 2013
- Recipient, Presidential Early Career Award (PECASE), 2000

Other

- Batseva Fellow, Israeli Academy of Sciences and Humanities, 2017
- Pongo Environment Award, 2017
- IFOF Honoree Award in Aviation, 2015
- Association for American Geographers Outstanding Contributions Award, 2014
- Nominet Trust 100 Award for Social Innovation, 2014
- Popular Science Magazine Brilliant Ten Award, 2007

- NASA Early Career Award, 2000
- NASA Group Achievement Award, 1999
- NASA Earth System Science Fellowship, 1996-1998
- NSF Biosphere-Atmosphere Interactions Fellowship, 1996-1998
- W.M. Keck Foundation Fellowship Award, 1995-1996
- Mabel Duncan Conservation Biology Award, 1996

National and International Service

Current Service

2006-	<i>Director</i> , Global Airborne Observatory (formerly Carnegie Airborne Observatory)
2014-	<i>Editorial Board</i> , Proceedings of the National Academy of Sciences
2018-	<i>Co-director</i> , Hawai‘i Marine Education and Research Center
2019-	<i>Sustainability Speaker</i> , Washington Speakers Bureau, Washington DC
2020-	<i>Director</i> , Allen Coral Atlas, http://allencoralatlas.org
2021-	<i>Chief Science Officer</i> , Carbon Mapper Mission, http://carbonmapper.org
2021-	<i>Board Member</i> , Global Conservation
2022-	<i>Board Chair</i> , Miloli‘i Charter School, South Kona, Hawai‘i Island
2022-	<i>Board Member</i> , Bermuda Institute of Ocean Sciences

Examples of Past Service

(major activities in **bold**)

1996-1997	Science Team; NASA Lewis & Clark Missions
1998	Panelist; NASA Triana Mission
1998-2008	Panelist; NASA Large-scale Biosphere-Atmosphere Experiment in Amazônia Program
1998	Co-chair; International Forum on BRDF Remote Sensing
1998	Panelist; NOAA Climate and Global Change Program
1998-2015	Panelist; Natural Environment Research Council, United Kingdom
1999-2001	Member; NSF Long-term Ecological Research (LTER) Technology Committee
1999	Panelist; University of California, Digital Media Innovation Program
1999	Co-organizer; NASA Large-scale Biosphere-Atmosphere Experiment in Amazônia
1999	Advisor; Fundação Floresta Tropical (Tropical Forest Foundation), Brazil
1999-2009	Panelist; U.S. Strategic Environmental Research and Development Program
2000	Panelist; NASA New Millennium Program
2000-2001	Land-use Committee; Ecological Society of America
2001-2014	Panelist; NSF Environmental Biology Panels
2001	Panelist; NASA Visions Working Group for Decadal Strategic Plan
2002	Panelist; NASA Terrestrial Ecology Program
2002	Panelist; NASA New Investigator Program
2003	Co-convenor; AGU Chapman Conference “Ecosystem Interactions with Land-use Change”
2003	Steering Committee; International Symposium on Remote Sensing; Honolulu, HI
2003	Panel Chair; NASA Terrestrial Ecology Program
2003	Panel Co-chair; NASA Northern Eurasia Environmental Science Program Initiative (NEESPI), Yalta, Ukraine
2003-2007	Steering Committee; NASA-Brazil Large-scale Biosphere-Atmosphere Experiment in Amazonia Program
2003-2006	Steering Group; U.S. Carbon Cycle Program

2004 Panelist; NASA Carbon Cycle and Ecosystems Review

2004-2006 Ecological Society of America (ESA) Habitat Change Rapid Response Team

2005 Panelist; World Bank Rural Days Conference;

2005 NSF Committee for Environmental Research and Education

2005-2009 NASA Senior Review Committee (Chair, 2007-2009)

2005 Co-convener; Environmental Defense Fund (EDF) Global Deforestation and Forest Degradation Workshop

2005 Search Committee; USFS Institute for Pacific Islands Forestry

2005-2006 Panel Chair; NASA North American Carbon Program

2005 Panel Chair; Tropical Deforestation and Climate Change; UN Framework Convention on Climate Change COP-11, Montreal

2006-2007 Author; U.N. Livestock in a Changing Landscape Forum

2007 Lead Author; FLORA satellite mission concept. National Academy Decadal Survey

2007 Instructor; ASP Colloquium; National Center for Atmospheric Research

2007 Author; NASA Plant Physiology and Functional Types Working Group

2006-2007 Advisory Committee; Department of Land and Natural Resources; State of Hawaii

2008-2017 Science and Technology Advisor, Peruvian Ministry of Environment

2008 Panel Chair; NASA Carbon Cycle and Ecosystems Joint Science Workshop

2008-2019 Director; CLASlite Forest Monitoring and Training Program

2008-2010 Advisor; National Ecological Observatory Network (NEON)

2008-2011 Steering Committee; bioDISCOVERY Program, Diversitas International

2008-2021 Working Group; NASA HypIRI-SBG satellite development team

2009-2012 PI; Google Earth Engine, Google.org and Google Inc.

2009 Panelist; Tropical Extinction Symposium, Museum of Natural History; Smithsonian

2009 Panelist; US Congressional panel on satellite monitoring for carbon markets

2009 Lead Author; GOFCC-GOLD Source Book on deforestation and degradation

2009 Panelist; U.S. Congressional panel on satellite monitoring of deforestation

2009 Delegate; U.N. Framework Convention on Climate Change COP-15, Copenhagen

2010 Steering Committee; Center for Tropical Forest Science, Smithsonian Institute

2010-2020 Editorial Board; Remote Sensing of Environment

2010 Panelist; International Plant Biology Symposium, Harvard University

2010 Co-author; UN FAO Historical Forest Degradation report

2010 Delegate; Convention on Biological Diversity COP-10, Nagoya; United Nations

2010-2013 Working Group; Governors Climate and Forests (GCF) Task Force, State of California

2010 Delegate; Ambassadors for Forests, Nagoya, World Wildlife Fund

2010 PI; Global Terrestrial Ecosystem Observatory proposal, Jet Propulsion Laboratory, NASA Earth Ventures

2010 Delegate; Framework Convention on Climate Change COP-16, Cancun

2011-2013 Senior Fellow, Energy and Climate Partnership; US State Department

2011 Advisor; World Bank; Carbon monitoring for the UNFCCC climate treaty

2012 PI; Land Ecosystem Assessment & Forecast mission proposal, Jet Propulsion Laboratory, NASA Earth Ventures

2012 Panelist; Forest Carbon Partnership Facility; World Bank

2012 Panelist; Latin American Development Bank

2013-2018 Working Group 3 Member; GEO Biodiversity Observation Network

2013 Panelist; Prince's Rainforest Project; London

2013 PI; Linnaeus mission proposal; Jet Propulsion Laboratory, NASA Earth Ventures

2013- Advisory Board; Amazon Aid Foundation

2014-2017 Scientific Steering Committee, NGEE-Tropics, Department of Energy

2015-2017 Advisor; California Air Resources Board and CA Dept of Forestry and Fire Protection

2016- Working Group; Rapid Ohia Death Task Force; State of Hawaii

2015-2018 Author; National Academy of Sciences Decadal Survey for Earth Science and Applications from Space

2017-2018-2021 Editorial Board; *Remote Sensing for Ecology and Conservation* journal
Carnegie and ASU Partnership Lead, *Allen Coral Atlas*; allencoralatlas.org

2018-2022 Space Studies Board, National Academy of Sciences, Engineering and Medicine

2019 Committee Member; Competing Interests Committee, National Academy of Sciences

2020 Co-Author; Campaign for Nature, <https://www.campaignfornature.org/protecting-30-of-the-planet-for-nature-economic-analysis>

2020 Plenary; Future Use of NASA Airborne Platforms to Advance Earth Science Priorities; NASEM; 29-31Jul20

2020 Plenary, Global Biodiversity, Planet Explore 2020 15Oct20

2021 Keynote Speaker, Hawai‘i Sustainability Summit, 15Mar21

2021 Speaker, Transportation and Infrastructure Roundtable for Hawai‘i. U.S. House of Representatives Sub-committee on Transportation and Infrastructure, 1Apr21.

2021 Session Chair and Speaker, International Coral Reef Symposium, Bremen, Germany

2021 Member, State of Hawaii Coral Reef Restoration Science Team

2021 Invited Audience, Pope Francis at the Vatican, 25Aug21

2021 Invited Speaker, NOAA Office of Law Enforcement Annual Meeting, 26Oct21

2021 Invited Speaker, TEDx Hawai‘i, 13Nov21

2022 Invited Keynote, Laudato Si, Vatican, Rome, 23May22

Academic Advising

PhD/MA Advisees

Name (year, degree), current employer

David Lobell (2003, PhD), Stanford U.	Roberta Martin (2003, PhD), ASU
Thomas Harris (2003, MS), Planet Inc.	Charles Wheeler (2004, MS), U. Arizona
Timothy Varga (2007, MS), Climate Pol. Inst.	John Clark (2009, MS), Google Inc.
Matthew Colgan (2012, PhD), Blue River Tech	Kyla Dahlin (2012, PhD), Michigan State U.
Eben Broadbent (2013, PhD), U. Florida	Angelica Almeyda (2013, PhD), U. Florida
Kelly McManus (2016, PhD), Stanford U.	Dana Chadwick (2016, PhD), JPL
Christa Anderson (2018, PhD), WWF	Rebecca Niemiec (2018, PhD), Colorado State U.
Elsa Ordway (2018, PhD), UCLA	Emily Francis (2019, PhD), Univ of Texas
Nicholas Johnson (2019, MA), ASU	Randy Fulford (2019, MA), ASU
Rachel Engstrand (2021, PhD), Pachama	Rachel Carlson (PhD), Stanford U.
Megs Seeley (PhD), ASU	Victoria Vandekop (2020, BS), ASU
Bryant Grady (2022, MA), Nature Conservancy	Kimberly Fuller (MA), Hawaii Div. Aquatic Res.
Kailey Pascoe (PhD), ASU	Kelly van Woesik (MA), ASU

Post-doctoral/Research Advisees

Name (years in lab), current employer

Sharon Hall (1999-01), ASU	Jeffrey Hicke (2000-03), U. Idaho
Lydia Olander (2003-04), Duke U.	Andrew Elmore (2003-04), U. Maryland
Roberta Martin (2004-06), ASU	Natalie Boelman (2005-06), Columbia U.
Maoyi Huang (2005-08), Pacific NW Nat. Lab.	Choying Huang (2006-08), Taiwan Nat U.
Chris Doughty (2008-10), Northern Arizona U.	Shaun Levick (2008-10), CSIRO, Australia
Scott Loarie (2008-10), Cal Acad. of Sciences	Jim Kellner (2008-11), Brown U.
Joseph Mascaro (2010-13), Planet Labs	Jean-Baptiste Féret (2010-13), U. Montpellier
Nick Vaughn (2012-13), Carnegie Institution	Mark Higgins (2011-14), USAID
Claire Baldeck (2012-15), Yale U.	Paulo Brando (2013-15), Woods Hole R.C.

David Marvin (2014-2016), The Nature Conservancy	Jomar Barbosa (2014-2016), U. of Madrid
Tarin Paz-Kagan (2016-2017), U. Tel Aviv	Dana Chadwick (2016-2017), Stanford U.
Andrew Davies (2014-2019), Harvard U.	Chris Balzotti (2015-2018), ASU
James Askew (2018-2019), U. of S. California	Pramukta Kumar (2018-2019), DG Inc.
Philip Brodrick (2016-2019), JPL	Ovidiu Csillik (2018-2019), Wageningen U.
Luke Evans (2016-2020), U. of Florida	Yaping Xu (2019-2020); U. of Tennessee
Fredrick Draper (2016-2021), U. of Leeds	Jiwei Li (2018-2021), ASU
Shawna Foo (2018-2021), U. Sydney	Yujia Zhang (2020-2021), ASU
Adrian Pascual (2020-2021), U. Maryland	Jie Dai (2021-)
Ana Gabriela Bonelli (2021-)	Rachel Mason (2022-)
Kelly Hondula (2022-)	Marcel Konig (2022-)
Elahe Jamalnia (2022-)	

Other student committees

ASU: Alex Goldman, Danielle Smilovsky **Stanford Univ:** Toby Ahrens, Michael Beman, Kate Brauman, Claire Lunch, Stephen Porder **Univ Colorado:** Laura Belanger, Jon Carrasco, Kathleen Farley, Cory Cleveland, Nancy Golubiewski, Amanda Warner, Khatib Nader, David Kinner, David Mixon, Jennifer Mengan; **Univ Arizona:** Dawn Browning; **Colorado State Univ:** Lara Prihodko; **Univ Brasilia:** Ana Paula Ferreira de Carvalho, Zayra do Prado; **Univ Florida:** Ane Alencar; **Univ Paris:** Jean-Baptiste Féret, Lena Maatoug; **Univ Grenoble:** Guillaume Tochon; **Univ Pretoria:** Russell Main, Laven Naidoo; **Univ Witwatersrand:** Penelope Mograbi; **Univ San Marcos-Peru:** Raul Tupayachi, Felipe Sinca; **Yale Univ:** Kim Carlson; **Wake Forest Univ:** Stephanie Bilodeau, Cassie Freund

Peer-reviewed Publications

Web of Science Highly Cited Researcher: [2018, 2019, 2020, 2021](#)
 Google Scholar [H-index: 138 overall, 100 last five years](#)

1996-1999

1. Asner, G.P. and S.W. Beatty. 1996. Effects of an African grass invasion on Hawaiian shrubland nitrogen biogeochemistry. *Plant and Soil* 186:205-211.
2. Asner, G.P., T.R. Seastedt, and A.R. Townsend. 1997. The decoupling of terrestrial carbon and nitrogen cycles. *BioScience* 47:226-234.
3. Asner, G.P. and G. Goldstein. 1997. Correlating stem biomechanical properties of Hawaiian canopy trees with hurricane wind damage. *Biotropica* 29:145-150.
4. Asner, G.P. and C.A. Wessman. 1997. Scaling PAR absorption from the leaf to landscape level in spatially heterogeneous ecosystems. *Ecological Modelling* 103:81-97.
5. Asner, G.P., C.A. Wessman, and J.L. Privette. 1997. Unmixing the directional reflectances of AVHRR sub-pixel landcovers. *IEEE Transactions on Geoscience and Remote Sensing* 35:868-878.
6. Asner, G.P., B.H. Braswell, D.S. Schimel, and C.A. Wessman. 1998. Ecological research needs from multi-angle remote sensing data. *Remote Sensing of Environment* 63:155-165.
7. Asner, G.P. 1998. Biophysical and biochemical sources of variability in canopy reflectance. *Remote Sensing of Environment* 64:234-253.
8. Asner, G.P., C.A. Wessman, and S. Archer. 1998. Scale dependence of absorption of photosynthetically active radiation in terrestrial ecosystems. *Ecological Applications* 8:906-925.
9. Wessman, C.A. and G.P. Asner. 1998. Ecosystems and the problems of large-scale measurements. Successes, Limitations, and Frontiers in Ecosystem Ecology. P. Groffman and M. Pace (eds.) Springer-Verlag, Berlin.

10. Asner, G.P., C.A. Wessman, D.S. Schimel, and S. Archer. 1998. Variability in leaf and litter optical properties: implications for canopy BRDF model inversions using AVHRR, MODIS, and MISR. *Remote Sensing of Environment* 63:200-215.
11. Asner, G.P., C.A. Wessman, and D.S. Schimel. 1998. Heterogeneity of savanna canopy structure and function from imaging spectrometry and inverse modeling. *Ecological Applications* 8:926-941.
12. Asner, G.P., C.A. Bateson, J.L. Privette, N. Z. El Saleous, and C.A. Wessman. 1998. Vegetation structural effects on carbon uptake using satellite data fusion and inverse modeling. *Journal of Geophysical Research* 103:28839-28853.
13. Mesarch, M.A., E.A. Walter-Shea, G.P. Asner, E.M. Middleton, and S.S. Chan. 1999. A revised measurement methodology for conifer needle spectral optical properties. *Remote Sensing of Environment* 68:177-192.
14. Asner, G.P., A.R. Townsend, and M.C.M. Bustamante. 1999. Spectrometry of pasture condition and biogeochemistry in the Central Amazon. *Geophysical Research Letters* 26:2769-2772.
15. Diner, D.J., G.P. Asner, R. Davies, J.-P. Muller, B. Pinty, C.B. Schaaf, and J. Stroeve. 1999. New directions in Earth observing: scientific applications of multiple-view-angle remote sensing. *Bulletin of the American Meteorological Society* 80 (11):2209-2228.

2000-2002

16. Bateson, C.A., G.P. Asner, and C.A. Wessman. 2000. Endmember bundles: A new approach to incorporating endmember variability in spectral mixture analysis. *IEEE Transactions on Geoscience and Remote Sensing* 38:1083-1094.
17. White, M.A., G.P. Asner, R.R. Nemani, J.L. Privette, and S.W. Running. 2000. Monitoring fractional cover and leaf area index in arid ecosystems: digital camera, radiation transmittance, and laser altimetry results. *Remote Sensing of Environment* 74:45-57.
18. Privette, J.L., G.P. Asner, F. Huemmrich, et al. 2000. The Prototype Validation Exercise (PROVE) for EOS land and atmosphere products. *Remote Sensing of Environment* 74:1-12.
19. Asner, G.P., C.A. Wessman, C.A. Bateson, and J.L. Privette. 2000. Impact of tissue, canopy and landscape factors on reflectance variability of arid ecosystems. *Remote Sensing of Environment* 74:69-84.
20. Asner, G.P. and D.B. Lobell. 2000. A biogeophysical approach for automated SWIR unmixing of soils and vegetation. *Remote Sensing of Environment* 74:99-112.
21. Asner, G.P. 2000. Contributions of multi-view angle remote sensing to land surface and biogeochemical research. *Remote Sensing Reviews* 18:137-162.
22. Asner, G.P., A.R. Townsend, and B.H. Braswell. 2000. Satellite observation of El Niño effects on Amazon forest phenology and productivity. *Geophysical Research Letters* 27:981-984.
23. Asner, G.P., A.R. Townsend, W. Riley, P.A. Matson, J.C. Neff, and C.C. Cleveland. 2001. Physical and biogeochemical controls of terrestrial ecosystems responses to nitrogen deposition. *Biogeochemistry* 54:1-39.
24. Neff, J.C. and G.P. Asner. 2001. Dissolved organic carbon in terrestrial ecosystems: synthesis and model. *Ecosystems* 4:29-48.
25. Lobell, D.B., G.P. Asner, B. Law, R. Treuhaft. 2001. Sub-pixel canopy cover estimation of coniferous forest using SWIR imaging spectrometry. *Journal of Geophysical Research* 106:5151-5160.
26. Asner, G.P. 2001. Cloud cover in Landsat observations of the Brazilian Amazon. *International Journal of Remote Sensing* 22:3855-3862.
27. Asner, G.P. and R.O. Green. 2001. Imaging spectroscopy measures desertification in the Southwest U.S. and Argentina. *EOS Transactions* 82(49):601-606.
28. Asner, G.P., M. Keller, R. Pereira, and J. Zweede. 2002. Remote sensing of selective logging in Amazônia: Assessing limitations based on detailed field measurements, Landsat ETM+ and textural analysis. *Remote Sensing of Environment* 80(3):483-496.

29. Lobell, D.B., G.P. Asner, B. Law, R. Treuhaft. 2002. View angle effects on canopy reflectance and spectral mixture analysis of coniferous forests using AVIRIS. *International Journal of Remote Sensing* 23:2247-2262.
30. Lobell, D.B. and G.P. Asner. 2002. Moisture effects on soil reflectance. *Soil Science Society of America Journal* 66:722-727.
31. Asner, G.P. and K.B. Heidebrecht. 2002. Spectral unmixing of vegetation, soil and dry carbon in arid regions: Comparing multi-spectral and hyperspectral observations. *International Journal of Remote Sensing* 23:3,939-3,958.
32. Treuhaft, R.N., G.P. Asner, B.E. Law, and S. Van Tuyl. 2002. Forest leaf area density profiles from the quantitative fusion of radar and hyperspectral data. *Journal of Geophysical Research* 107:4568 doi:10.1029/2001JD000646
33. Lobell, D.B., G.P. Asner, I. Ortiz-Monasterio, and T. Benning. 2002. Remote sensing of regional crop production in the Yaqui Valley, Mexico: Estimates and uncertainties. *Agriculture, Ecosystems and Environment* 94(2):205-220.
34. Asner, G.P., M. Palace, M. Keller, R. Pereira Jr., J.N.M. Silva, and J.C. Zweede. 2002. Estimating canopy structure in an Amazon forest from laser rangefinder and IKONOS satellite observations. *Biotropica* 34:483-492.
35. Hicke, J.A., G.P. Asner, J. Randerson, S. Los, S. Birdsey, C.J. Tucker, and C.B. Field. 2002. Changes in North American net primary production, 1982-1998. *Geophysical Research Letters* 29:69-73.
36. Hicke, J.A., G.P. Asner, J.T. Randerson, S. Los, R. Birdsey, J.C. Jenkins, C.J. Tucker, and C.B. Field. 2002. Trends in North American net primary productivity derived from satellite observations, 1982-1998. *Global Biogeochemical Cycles* 16 doi:10.1029/2001GB001550.
37. Townsend, A.R., G.P. Asner, C.C. Cleveland, M. Lefer, and M.M.C. Bustamante. 2002. Unexpected changes in soil phosphorus dynamics following forest-to-pasture conversion in the humid tropics. *Journal of Geophysical Research* 107:8,067-8,076.
38. Pereira, R., J. Zweede, G.P. Asner, and M. Keller. 2002. Forest canopy damage from conventional and reduced impact selective logging in Eastern Amazon, Brazil. *Forest Ecology and Management* 168:77-89.
39. Townsend, A.R., G.P. Asner, P.P. Tans, and J.W.C. White. 2002. Land use effects on atmospheric ¹³C imply a sizable terrestrial CO₂ sink in tropical latitudes. *Geophysical Research Letters* 29 doi:10.1029/2001GL013454.
40. Lobell, D.B., J.I. Ortiz-Monasterio, C.L. Addams, and G.P. Asner. 2002. Soil, climate and management impacts on regional agricultural productivity. *Agricultural and Forest Meteorology* 114:31-43.
41. Lobell, D.B., J.A. Hicke, G.P. Asner, C.B. Field, C.J. Tucker, and S. O. Los. 2002. Satellite estimates of productivity and light use efficiency in United States agriculture, 1982-1998. *Global Change Biology* 8:722-735.

2003-2005

42. Asner, G.P., J.M.O. Scurlock, and J.A. Hicke. 2003. Global synthesis of leaf area index observations: Implications for ecological and remote sensing studies. *Global Ecology and Biogeography* 12:195-205.
43. Hicke, J.A., G.P. Asner, E.S. Kasishke, N.H.F. French, J.T. Randerson, G.J. Collatz, B.J. Stocks, C.J. Tucker, S.O. Los, C.B. Field. 2003. Postfire response of North American boreal forest net primary productivity. *Global Change Biology* 9:1145-1157.
44. Zavaleta, E.S., B.D. Thomas, N.R. Chariello, G.P. Asner, M.R. Shaw, and C.B. Field. 2003. Plants reverse warming effect on ecosystem water balance. *Proceedings of the National Academy of Sciences* 100:9892-9893.

45. Asner, G.P., S.A. Archer, R.F. Hughes, J.N. Ansley, and C.A. Wessman. 2003. Net changes in regional woody vegetation cover and carbon storage in North Texas rangelands, 1937-1999. *Global Change Biology* 9:316-335.
46. Lobell, D.B. and G.P. Asner. 2003. Climate and management contributions to recent trends in U.S. agricultural yields. *Science* 299:1032.
47. Lobell, D.B. and G.P. Asner. 2003. Comment on climate and management contributions to recent trends in U.S. agricultural yields. *Science* 300:1505.
48. Asner, G.P., C. Borghi, and R. Ojeda. 2003. Desertification in Central Argentina: Regional changes in ecosystem carbon-nitrogen. *Ecological Applications* 13:629-648.
49. Harris, A.T., G.P. Asner, and M.E. Miller. 2003. Changes in vegetation structure following long-term grazing in pinyon-juniper ecosystems. *Ecosystems* 6:368-383.
50. Martin, R.E., G.P. Asner, R.J. Ansley, and A.R. Mosier. 2003. Effects of woody vegetation encroachment on soil nitrogen oxide emissions in a temperate savanna. *Ecological Applications* 13:897-910.
51. Treuhaft, R.N., G.P. Asner, and B.E. Law. 2003. Structure-based forest biomass from fusion of radar and hyperspectral observations. *Geophysical Research Letters* 30:1472-1476.
52. Asner, G.P. and K.B. Heidebrecht. 2003. Imaging spectroscopy for desertification studies: Comparing AVIRIS and EO-1 Hyperion in Argentina drylands. *IEEE Transactions on Geoscience and Remote Sensing* 41:135-155.
53. Lobell, D.B. and G.P. Asner. 2003. Comparison of Earth Observing-1 ALI and Landsat ETM+ for crop identification and yield prediction in Mexico. *IEEE Transactions on Geoscience and Remote Sensing* 41:128-134.
54. Harris, A.T. and G.P. Asner. 2003. Grazing gradient detection with airborne imaging spectroscopy on a semi-arid rangeland. *Journal of Arid Environments* 55:391-404.
55. Asner, G.P., M.M.C. Bustamante, and A.R. Townsend. 2003. Scale dependence of biophysical structure in deforested lands bordering the Tapajós National Forest, Central Amazon. *Remote Sensing of Environment* 87:507-520.
56. Asner, G.P. and A.S. Warner. 2003. Canopy shadow in IKONOS satellite observations of tropical forests and savannas. *Remote Sensing of Environment* 87:521-533.
57. Hurtt, G., X. Xiao, M. Keller, M. Palace, G.P. Asner, et al. 2003. IKONOS imagery for the Large Scale Biosphere-Atmosphere Experiment in Amazônia (LBA). *Remote Sensing of Environment* 88:111-127.
58. Asner, G.P., J.A. Hicke, and D.B. Lobell. 2003. Per-pixel analysis of forest structure: Vegetation indices, spectral mixture analysis and canopy reflectance modeling. *Methods and Applications for Remote Sensing of Forests: Concepts and Case Studies*. M. Wulder and S.E. Franklin (eds.) Kluwer Academic Publishers, New York.
59. Asner, G.P. 2004. Biophysical remote sensing signatures of arid and semi-arid regions. *Remote Sensing for Natural Resources, Management and Environmental Monitoring*. S. Ustin (ed.) John Wiley & Sons, New York.
60. Ustin, S.L., S. Jacquemoud, P.J. Zarco-Tejada, and G.P. Asner. 2004. Remote sensing of environmental processes: State of the science and new directions. *Remote Sensing for Natural Resources, Management and Environmental Monitoring*. S. Ustin (ed.) John Wiley & Sons, New York.
61. Ustin, S.L., D.A. Roberts, J.A. Gamon, G.P. Asner, and R.O. Green. 2004. Using imaging spectroscopy to study ecosystem processes and properties. *BioScience* 54:523-534.
62. Treuhaft, R.N., B.E. Law, and G.P. Asner. 2004. Forest attributes from radar interferometric profiling and its fusion with optical data. *BioScience* 54:561-571.
63. Hall, S.J., G.P. Asner, and K. Kitayama. 2004. Land use, climate and substrate controls over soil nitrogen dynamics and N-oxide emissions in Borneo. *Biogeochemistry* 70:27-58.
64. Galloway, J., et al., G.P. Asner, et al. 2004. Regional and global N cycles: Past, present and future. *Biogeochemistry* 70:153-226.

65. Hicke, J.A., R.L. Sherriff, T.T. Veblen, and G.P. Asner. 2004. Carbon accumulation in Colorado ponderosa pine stands. *Canadian Journal of Forest Research* 34:1283-1295.
66. Asner, G.P., A.R. Townsend, M.M.C. Bustamante, G.B. Nardoto, and L.O. Olander. 2004. Pasture degradation in the Central Amazon: Linking carbon and nutrient dynamics with remote sensing. *Global Change Biology* 10:844-862.
67. Keller, M., M. Palace, G.P. Asner, R. Pereira Jr., and J.N.M. Silva. 2004. Coarse woody debris in undisturbed and logged forests in the Eastern Brazilian Amazon. *Global Change Biology* 10:784-795.
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Remote Sensing Analysis of Forest Disturbances; United States Patents 8189877, 20090214084, 20120288159-A1 and 20130216103; International Classification G06K9/62; Expiration: May 21, 2028. Patent applies to a general methodology for monitoring any forest disturbances with satellite imagery. The patents protect the Carnegie Landsat Analysis System (CLAS), Carnegie Landsat Analysis System-

Lite (CLASlite), Automated Monte Carlo Unmixing (AutoMCU), and Multispectral and Hyperspectral Libraries. The invention can be used to monitor any type of forest disturbance or degradation including selective logging, agricultural expansion, cattle ranching, and natural hazards such as fire and windstorms.

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