Curriculum Vita - **Curtis E. Woodcock**
Professor and Chair
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Education: B.A. (1977), M.A. (1982), Ph.D. (1985) in Geography, U.C. Santa Barbara

Areas of Specialization: *Remote sensing*, particularly of forests and natural vegetation, environmental monitoring and change detection*; Land Cover and Land Use Change; Terrestrial Carbon Dynamics; Spatial modeling and analysis; Digital image processing.*

Professional Activities/Service (Recent)
Science Team Leader, USGS/NASA Landsat Science Team (1/1/07-present)
2005 Senior Review of the Mission Operations and Data Analysis Program, NASA
Northern Eurasia Earth Science Partnership Initiative (NEESPI), Science Team Member
    (1/05-present)
NASA Land Cover and Land Use Change, Science Team Member (1/05 - present)
GOFC/GOLD Land Cover Implementation Team (team member 2/2002-present and Co-
    Chair 1/1/07- present)
ORNL NASA DAAC for Biogoechemistry, Member User Working Group 1996-1998,
    Chair, 1999-2002.
Landsat Global Data Working Group, Member (9/01-9/03). NASA Landsat Science
    Team (member, 10/96-12/01)

Employment and Appointments
Chair, Department of Earth and Environment, 7/12-present.
Professor, Department of Earth and Environment, 7/12-present.
Chair, Department of Geography, Boston University, 9/01-6/03.
Professor, Department of Geography and Environment, Boston University, 9/98-6/12.
Research Fellow, Department of Cognitive and Neural Systems, Boston University, 2/97-
    present
Chair, Department of Geography, Boston University, 7/91-9/98.
Associate Professor, Department of Geography, Boston University, 9/90-9/98.
Director of Geographic Applications, Center for Remote Sensing, Boston University,
    6/86-present.
Acting Director, Center for Remote Sensing, Boston University,9/85-6/86.
Assistant Professor, Department of Geography, Boston University,9/84-8/90.
Research Associate, Department of Geology and Geography, Hunter College, City
    University of New York,9/82-9/84.
Staff Research Associate, Geography Remote Sensing Unit, University of California,
    Santa Barbara, 3/79-9/82

Honors and Awards

NASA Graduate Researchers Program (Johnson Space Center) 1980-1983.

1995 ERDAS Award for Best Science Paper in Remote Sensing, (With Sucharita Gopal) from the American Society of Photogrammetry and Remote Sensing, for the paper: Gopal, S., and C.E. Woodcock, 1994. Theory and Methods for Accuracy Assessment of Thematic Maps Using Fuzzy Sets, *Photogrammetric Engineering and Remote Sensing*, 60(2):181-188.

1996 ERDAS Award for Best Science Paper in Remote Sensing (Third Prize), (With Soren Ryherd) from the American Society of Photogrammetry and Remote Sensing, for the paper: Ryherd, S., and C.E. Woodcock, 1996.Combining spectral and texture data in the segmentation of remotely sensed images, *Photogrammetric Engineering and Remote Sensing*, 62(2):181-194.

2000 Autometric Award for the Best Paper in Photogrammetric Interpretation, (With John Collins) from the American Society of Photogrammetry and Remote Sensing, for the paper: Collins, J.B., and C.E. Woodcock, 1999. Geostatistical estimation of resolution-dependent variance in remotely sensed images, *Photogrammetric Engineering and Remote Sensing*, 65(1):41-50.

2003 Leica Geosystems Award for the Best Scientific Paper in Remote Sensing (Second Prize) with A. Schneider, M. Friedl and D.K McIver, from the American Society of Photogrammetry and Remote Sensing, for the paper: Schneider, A., Friedl, M.A., McIver, D.K., and C.E. Woodcock, 2003.Mapping Urban Areas by Fusing Multiple Sources of Coarse Resolution Remotely Sensed Data, *Photogrammetric Engineering and Remote Sensing*, 69(12):1377-1386.

2008 John I. Davidson President's Award for Best Practical Paper, from the American Society of Photogrammetry and Remote Sensing, (with A. Baccini, M. Friedl and J. Zhu), for the paper: Baccini, A., Frield, M.A, Woodcock, C.E., and J. Zhu, 2007. Scaling Field Data to Calibrate and Validate Moderate Spatial Resolution Remote Sensing Models, *Photogrammetric Engineering and Remote Sensing*, 73(8):945-954.

2008 Leica Geosystems Award for Best Scientific Paper (Third Prize), from the American Society of Photogrammetry and Remote Sensing, (with A. Baccini, M. Friedl and J. Zhu), for the paper: Baccini, A., Frield, M.A, Woodcock, C.E., and J. Zhu, 2007. Scaling Field Data to Calibrate and Validate Moderate Spatial Resolution Remote Sensing Models, *Photogrammetric Engineering and Remote Sensing*, 73(8):945-954.

Erasmus Mundus Visiting Scholar, 9/2005-12/2005, University of Southampton.

*2010 Outstanding Contributions Award***,** Remote Sensing Specialty Group of the Association of American Geographers.

2012 Boeing Award for Best Paper in Image Analysis and Interpretation from the American Society of Photogrammetry and Remote Sensing (with Joe Fortier, John Rogan and Daniel Miller Runfola) for the paper: Fortier, J., Rogan, J., Woodcock, C.E., and D.M. Runfola, 2011. Utilizing Temporally Invariant Calibration Sites to Classify Multiple Dates and Types of Satellite Imagery, *PE&RS*, 77(2):181-189.

Media

Earth's Forests from Space, 2010, Interview on EarthSky: available at
http://earthsky.org/earth/curtis-woodcock-earths-forests-from-space

Ten Thousand Shovels: Rapid Urban Growth in China, 2006, Karen Seto, Producer,
Curtis E. Woodcock, Associate Producer.

Publications

Strahler, A.H., Logan, T.L., and C.E. Woodcock, 1979. Forest classification and
inventory system using Landsat, digital terrain, and ground sample data, *13th Int.
Symp. on Remote Sensing of Environment*, Ann Arbor, Mi, p. 1541-1557.

Woodcock, C.E., Strahler, A.H., and T.L. Logan, 1980. Stratification of forest vegetation
for timber inventory using Landsat and collateral data, *14th Int. Symp. on Remote
Sensing of Environment*, San Jose, Costa Rica, p. 1769-1787.

Strahler, A.H., Woodcock, C.E., and T.L. Logan, 1980. Forest stratification for timber
inventory using digital landsat and terrain model data in northern California, *Proc.
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Cosentino, M.J., Woodcock, C.E., and J. Franklin, 1981. Scene analysis for wildland fire
fuel characteristics in a mediterranean climate, *15th Int. Symp. On Remote Sensing
of Environment*, Ann Arbor, Mi, p. 635-636.

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management and planning, *Environmental Management*, 7(3):223-238.

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forest classification and inventory using remotely sensed data, Papers Selected for
Presentation at the *16th Int. Symp. on Remote Sensing of Environment*, Buenos
Aries, Argentina, p. 963-974.

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vector conversion, *Proceedings of the ISPRS IV, Environmental Assessment and
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raster databases and point sample data, *Technical Papers, 49th Annual Meeting*,
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sensed data, *17th Int. Symp. On Remote Sensing of Environment*, Ann Arbor, Mi,
p. 839-852.

Woodcock, C.E., and A.H. Strahler, 1983. Initial exploration of the relationship between
coniferous biomass and Landsat MSS data, *Proc. Second CERMA Conference on
Resource Management, Energy, and Environment*, San Francisco, p. 124-137.

Strahler, A.H., Woodcock, C.E., Li, X., and D.L.B. Jupp, 1984. Discrete object modeling
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Paris, France, p. 465-473.

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remotely sensed scenes, *Proc. Third Australian Remote Sensing Conference*,
Queensland, Australia, p. 512-518.

Woodcock, C.E., 1985. Variograms and spatial variation in remotely sensed images,
IGARSS '85 Digest, University of Massachusetts, Amherst, p. 1078-1083.

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Strahler, A.H., Woodcock, C.E., and J.A. Smith, 1986. On the nature of models in remote sensing, *Remote Sensing of Environment*, (20):121-139.

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Woodcock, C.E., Ryherd, S.L., Jakabhazy, V.D., El-Khattib, H.,Hawela, F., Abdel-Samad, F.A., and R. El-Toudy, 1991. Testing a satellite-based agricultural crop area estimation procedure in the Nile Delta of Egypt, *Proceedings of the Conference on The application of Remote Sensing to Sustainable Agricultural Development*, Cairo, Egypt, p. 223-230.

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Woodcock, C.E., and V.J. Harward, 1992. Nested-hierarchical scene models and image segmentation, *International Journal of Remote Sensing*, 13(16):3167-3187.

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Chen, R., Woodcock, C.E., Strahler, A.H., and D.L.B. Jupp, 1993. Nonlinear estimation of scene parameters from digital images using zero-hit run-length statistics, *IEEE Transactions on Geoscience and Remote Sensing*, 31(3):735-746.

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Jupp, D. L. B., E. R. MacDonald, B. A. Harrison, X. Li, A. H. Strahler, and C. E. Woodcock, 1994, Prospects for mapping canopy structure using geometric-optical models, *Proc. 7th Australasian Remote Sensing Conference*, Melbourne, Australia, March 1-4, 1994, 9 pp.

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Macomber, S., and C.E. Woodcock, 1994. Mapping and monitoring conifer mortality using remote sensing in the Lake Tahoe Basin, *Remote Sensing of Environment*, 50:255-266.

Collins, J.B., and C.E. Woodcock, 1994. Change detection using the Gramm-Schmidt transformation applied to mapping forest mortality, *Remote Sensing of Environment*, 50:267- 279.

Li, X., C.E. Woodcock, and R. Davis, 1994. A hybrid geometric optical and radiative transfer approach for modeling pyranometer measurements under a Jack Pine forest, *Geographic Information Science*, 1(1):27-33.

Woodcock, C.E., Collins, J., Jakabhazy, V.D., Li, X., and S. Macomber, 1995. Inversion of the Li- Strahler model for mapping forest vegetation: What works and what doesn't, *Proceedings ASPRS Conference*, 2:299-308.

Moody, A. and C.E. Woodcock, 1995. Calibration-based methods for correcting coarse resolution estimates of land-cover proportions, *Proceedings ASPRS Conference*, 3:684-693.

Pax-Lenny, M., C.E. Woodcock, and J.B. Collins, 1995. Identification of agricultural lands of reduced productivity in Egypt using satellite remote sensing, *Proceedings ASPRS Conference*, 2:309-317.

Collins, J.B., Woodcock, C.E., and D.L.B. Jupp, 1995. Spatial dependence and nested hierarchical scene models, *Proceedings ASPRS Conference*, 3:535-544.

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Moody, A. and C.E. Woodcock, 1995. The influence of scale and the spatial characteristics of landscapes on land-cover mapping using remote sensing, *Landscape Ecology*, 10(6):363-379.

Ryherd, S., and C.E. Woodcock, 1996. Combining spectral and texture data in the segmentation of remotely sensed images, *Photogrammetric Engineering and Remote Sensing*, 62(2):181-194.

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Gopal, S., and C.E. Woodcock, 1996. Remote sensing of forest change using artificial neural networks, *IEEE Transactions on Geoscience and Remote Sensing*, 34(2):398-404.

Woodcock,C.E., 1996. On roles and goals for map accuracy assessment: A remote sensing perspective, *Spatial Accuracy Assessment in Natural Resources and Environmental Sciences: Second International Symposium*, May, Fort Collins, Co, 535-540p.

Collins, J.B., and C.E. Woodcock, 1996. Explicit consideration of multiple landscape

scales while selecting spatial resolutions, *Spatial Accuracy Assessment in Natural Resources and Environmental Sciences: Second International Symposium*, May, Fort Collins, Co, 121-128p.

Milliken, J.A., and C.E. Woodcock, 1996.Integration of inventory and field data for automated fuzzy accuracy assessment of large scale remote sensing derived vegetation maps in Region 5 National Forests, *Spatial Accuracy Assessment in Natural Resources and Environmental Sciences: Second International Symposium*, May, Fort Collins, Co, 541-544p.

Pax Lenney, M., Woodcock, C.E., Collins, J.C., and H. Hamdi, 1996. The status of agriculutural lands in Egypt: The use of multitemporal NDVI features dervied from Landsat TM, *Remote Sensing of Environment*, 56(1):8-20.

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Gopal, S., Woodcock, C.E., and A.H. Strahler, 1996. Fuzzy ARTMAP classification of global land cover from AVHRR data*, IGARSS '96*, Lincoln, Nebraska, May, 1996, 1:538-540.

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Li, X., Ni, W., Woodcock, C.E., and A.H. Strahler, 1996. A simplified hybrid model for radiation under discontinuous canopies, *IGARSS '96,* Lincoln, Nebraska, May, 1996, 1:293-295.

Carpenter, G.A., Gjaja, M.N., Gopal, S., and C.E. Woodcock, 1996. ART neural networks for remote sensing: Vegetation classification from Landsat TM and terrain data, *IGARSS '96,* Lincoln, Nebraska, May, 1996, 1:529-531.

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multitemporal Landsat TM imagery: How many images are needed?, *Remote Sensing of Environment*, 59(3):522-529.

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"Quantifying the Effects of Land Use Change on the Carbon Budgets of the Black Sea Region," C.E. Woodcock, P.I., R.A. Houghton and M. Ozdogan, Co-Is, NASA LCLUC Program, 2/1/05-1/31/08, $642,320.

"The Use of Variograms to Characterize Errors in Gap Filling in the Landsat SLC-Off Era", C.E. Woodcock, PI, NASA Goddard Space Flight Center, 10/1/05-9/30/06, $18,000.

"NELDA: Monitoring and Validating the Distribution and Change in Land Cover across Northern Eurasia", O. Krankina, PI., includes many others, including M.A. Friedl and C.E. Woodcock from Boston University, NASA Land Cover and Land Use Change Program, 1/1/06-12/31/08, (BU portion $198K).

"Retrieval of Vegetation Structure and Carbon Balance Parameters Using Ground-Based Lidar and Scaling to Airborne and Spaceborne Lidar Sensors", NASA, A. H. Strahler, PI, C. E. Woodcock, C. Schaaf, and W. Ni, Co-Is, 1/1/06-12/30/08, $458,592.

"Toward Operational Global Monitoring of Landcover Change", C.E. Woodcock, PI, USGS/NASA Landsat Science Team (Leader), USGS, 10/1/06-9/30/11, $700,000.

"Accuracy Assessment of Global Land Cover Products and Production of a 'Best Available' Land Cover Map: a GOFC-GOLD Initiative, NASA Land Cover and Land Use Change Program, C.E. Woodcock, PI, Steve Stehman, Co-I, 6/1/08-

5/31/10, $390,000.

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"Research and Training in support of SilvaCarbon", USGS, C.E. Woodcock, PI, (IPA for Woodcock, summer 2011), $64,828, 6/1/11-8/31/11.

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Current Projects:

"Development of a Dual-Wavelength, Ground-Based, Echidna® Lidar (DWEL) for Structural Characterization and Virtual Reconstruction of Forest Canopies", NSF MRI Program, A.H. Strahler, PI, C.E. Woodcock, S. Chakrabarti, T. Cook, and C. Schaaf, Co-Is, $1,662,384.

"Enhancing Compatibility of Sentinel 2 and Landsat products for improved monitoring of the Earth System", NASA, Earth Science US Participating Investigator Program, PI, C.E. Woodcock, Co-I, Eric Vermote, 1/1/2011-12/31/2014, $725K (extended to 12/31/15).

"Towards a Land Cover Climate Data Record from VIIRS", NASA, M.A. Fried, PI, C.E. Woodcock, Co-I, 6/1/11-5/30/14, $628,995.

"Using MODIS to Monitor Dynamics in Land Cover and Phenology at Seasonal to Decadal Time Scales", NASA, M.A. Fried, PI, C.E. Woodcock, Co-I, 6/1/11-5/30/14, $588,725.00

"Snythesis of Studies on Institutional Change and LCLUC Effects on Carbon, Biodiversity, and Agriculture After the Collapse of the Soviet Union,", V. Radeloff, PI, C.E. Woodcock, PI of BU portion $77,520. 1/1/12-12/31/14.

"4-D Modeling of the Regional Carbon Cycle in and Around Urban Environments: An Interdisciplinary Study to Advance Observational and Modeling Foundations," M.A. Frield, PI, C.E. Woodcock, L. Hutyra, S. Wofsy, A. Dunn and K. Chance, Co-Is, NASA Interdisciplinary Science Program, 8/12-7/15, $1,282,141.

"Better Use of the Landsat Temporal Domain: Monitoring Land Cover Type, Condition and Change", C.E. Woodcock, PI, M.A. Friedl and P. Olofsson, Co-Is, USGS Landsat Science Team, $1,000,000, 10/12-9/17.

"Making better use of Landsat images: Time series algorithms to screen clouds, shadows and snow as well as find deforestation and land cover change." Woodcock, C.E. Principal Investigator, Google, $41,567, 12/12-6/13.

"Time Series Fusion of Optical and Radar Imagery for Improved Monitoring of Activity Data, and Uncertainty Analysis of Emission Factors for Estimation of Forest Carbon Flux", Josef Kellndorfer, PI, C.E. Woodcock, R. Houghton, P. Olofsson, Co-Is, NASA Carbon Monitoring System, 8/1/13-7/31/16, $894,735 (BU portion $317,054.