

Christopher B. Anderson, Ph.D.^{1,2}

¹Salo Sciences Inc., San Francisco CA 94107

cba@salo.ai

²Center for Conservation Biology, Stanford University, Stanford CA

cbanders@stanford.edu

Education

-
- | | |
|-----------|--------------------------------------------------------------------------------|
| 2016-2020 | Stanford University
Ph.D., Department of Biology |
| 2004-2008 | University of California, Santa Cruz
B.S., Ecology and Evolutionary Biology |
-

Employment

-
- | | |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2016- | Salo Sciences Inc.
Co-founder, vice president & CTO |
| 2009-2016 | Carnegie Institution for Science
Carnegie Airborne Observatory imaging spectrometer technical and science lead
Carnegie Spectranomics Project laboratory manager |
| 2007-2008 | University of California, Santa Cruz & Santa Cruz Municipal Water District
Restoration scientist |
-

Peer-reviewed publications

-
- Hendershot, J. N., Smith, J. R., **Anderson, C. B.**, Letten, A. D., Frishkoff, L. O., Zook, J. R., Fukami, T., & Daily, G. C. (2020). Intensive farming drives long-term shifts in avian community composition. *Nature*, 579(7799), 393-396. [[Link](#)]
- Bratman, G. N., **Anderson, C. B.**, Berman, M. G., Cochran, B., De Vries, S., Flanders, J., Folke, C., Frumkin, H., Gross, J. J., Hartig, T., Kahn Jr., P. H., Kuo M., Lawler, J. J., Levin, P. S., Lindahl, T., Meyer-Lindenberg, A., Mitchell, R., Ouyang, Z., Roe, J., Scarlett, L., Smith, J. R., van den Bosch, M., Wheeler, B. W., White, M. P., Zheng, H. & Daily, G.C. (2019). Nature and mental health: An ecosystem service perspective. *Science advances*, 5(7), eaax0903. [[Link](#)]
- Ramirez-Reyes C., Brauman, K. A., Chaplin-Kramer, R., Galford, G. L., Adamo, S. B., **Anderson, C. B.**, Anderson, C., Allington, G. R. H., Bagstad, K. J., Coe, M. T., Cord, A. F., Dee, L. E., Gould, R. K., Jain, M., Kowal, V. A., Muller-Karger, F., Norriss J., Potapov, P., Qiu J., Rieb J. T., Robinson, B. E., Samberg, L. H., Singh, N., Szeto, N. H., Voigt, B., Watson, K., Wright, T. M. (2019). Reimagining the potential of earth observations for ecosystem services assessments. *Science of the total environment*, in press. [[Link](#)]
- Anderson, C. B.** (2018). The CCB-ID approach to tree species mapping with airborne imaging spectroscopy. *PeerJ*, 6:e5666. [[Link](#)]
- Anderson, C. B.** (2018). Biodiversity monitoring, earth observations and the ecology of scale. *Ecology letters*, 21(10), 1572-1585. [[Link](#)]

- Smith, J. R., Letten, A. D., Ke, P. J., **Anderson, C. B.**, Hendershot, J. N., Dhami, M. K., Dlott, Glade A., Grainger, T. N., Howard, M. E., Morrison, B. M. L., Routh, D., San Juan, P. A., Mooney, H. A., Mordecai, E. A., Crowther, T. W., & Daily, G. C. (2018). A global test of ecoregions. *Nature ecology & evolution*, 2(12), 1889. [[Link](#)]
- Asner, G. P., Martin, R. E., Knapp, D. E., Tupayachi, R., **Anderson, C. B.**, Sinca, F., Vaughn, N. R., & Llactayo, W. (2017). Airborne laser-guided imaging spectroscopy to map forest trait diversity and guide conservation. *Science*, 355(6323), 385-389. [[Link](#)]
- Asner, G. P., Martin, R. E., **Anderson, C. B.**, Kryston, K., Vaughn, N., Knapp, D. E., Bentley, L. P., Shenkin, A., Salinas, N., Sinca, F., Tupayachi, R., Quispe Huaypar, K., Montoya Pillco, M., Cori Álvarez, F. D., Díaz, S., Enquist, B. and Malhi, Y. (2017), Scale dependence of canopy trait distributions along a tropical forest elevation gradient. *New phytologist*, 214(3), 973-988 [[Link](#)]
- Asner, G. P., Knapp, D. E., **Anderson, C. B.**, Martin, R. E., Vaughn, N. (2016). Large-scale climatic and geophysical controls on the leaf economics spectrum. *Proceedings of the national academy of sciences*, 113(28), E4043-E4051. [[Link](#)]
- Graves, S. J., Asner, G. P., Martin, R. E., **Anderson, C. B.**, Colgan, M. S., Kalantari, L., & Bohlman, S. A. (2016). Tree Species Abundance Predictions in a Tropical Agricultural Landscape with a Supervised Classification Model and Imbalanced Data. *Remote sensing*, 8(2), 161. [[Link](#)]
- Barbosa, J. M., Sebastián-González, E., Asner, G. P., Knapp, D. E., **Anderson, C.**, Martin, R. E., & Dirzo, R. (2016). Hemiparasite–host plant interactions in a fragmented landscape assessed via imaging spectroscopy and LiDAR. *Ecological applications*, 26(1), 55-66. [[Link](#)]
- Asner, G. P., Brodrick, P. G., **Anderson, C. B.**, Vaughn, N., Knapp, D. E., & Martin, R. E. (2016). Progressive forest canopy water loss during the 2012–2015 California drought. *Proceedings of the national academy of sciences*, 113(2), E249-E255. [[Link](#)]
- Baldeck, C. A., Asner, G. P., Martin, R. E., **Anderson, C. B.**, Knapp, D. E., Kellner, J. R., & Wright, S. J. (2015). Operational tree species mapping in a diverse tropical forest with airborne imaging spectroscopy. *PloS one*, 10(7), e0118403. [[Link](#)]
- Asner, G. P., **Anderson, C. B.**, Martin, R. E., Tupayachi, R., Knapp, D. E., & Sinca, F. (2015). Landscape biogeochemistry reflected in shifting distributions of chemical traits in the Amazon forest canopy. *Nature geoscience*, 8, 567-573. [[Link](#)]
- Somers, B., Asner, G. P., Martin, R. E., **Anderson, C. B.**, Knapp, D. E., Wright, S. J., & Van De Kerchove, R. (2015). Mesoscale assessment of changes in tropical tree species richness across a bioclimatic gradient in Panama using airborne imaging spectroscopy. *Remote sensing of environment*, 167, 111-120. [[Link](#)]
- Taylor, P., Asner, G., Dahlin, K., **Anderson, C. B.**, Knapp, D., Martin, R., Mascaro, J., Chazdon, R., Cole, R., Wanek, W., Hofhansl, F., Malavassi, E., Vilchez, B., & Townsend, A. (2015). Landscape-scale controls on aboveground forest carbon stocks on the Osa Peninsula, Costa Rica. *PloS one*, 10(6), e0126748. [[Link](#)]
- Higgins, M. A., Asner, G. P., **Anderson, C. B.**, Martin, R. E., Knapp, D. E., Tupayachi, R., Perez, E., Elespuru, N., & Alonso, A. (2015). Regional-scale drivers of forest structure and function in northwestern Amazonia. *PloS one*, 10(3), e0119887. [[Link](#)]

- Asner, G. P., Martin, R. E., **Anderson, C. B.**, & Knapp, D. E. (2015). Quantifying forest canopy traits: Imaging spectroscopy versus field survey. *Remote sensing of environment*, 158, 15-27. [[Link](#)]
- Asner, G. P., Knapp, D. E., Martin, R. E., Tupayachi, R., **Anderson, C. B.**, Mascaro, J., Sinca, F., Chadwick, K.D., Higgins, M.A., Farfan, W., Llactayo, W., & Silman, M. R. (2014). Targeted carbon conservation at national scales with high-resolution monitoring. *Proceedings of the national academy of sciences*, 111(47), E5016-E5022. [[Link](#)]
- Marvin, D. C., Asner, G. P., Knapp, D. E., **Anderson, C. B.**, Martin, R. E., Sinca, F., & Tupayachi, R. (2014). Amazonian landscapes and the bias in field studies of forest structure and biomass. *Proceedings of the national academy of sciences*, 111(48), E5224-E5232. [[Link](#)]
- Asner, G. P., Martin, R. E., Carranza-Jiménez, L., Sinca, F., Tupayachi, R., **Anderson, C. B.**, & Martinez, P. (2014). Functional and biological diversity of foliar spectra in tree canopies throughout the Andes to Amazon region. *New phytologist*, 204(1), 127-139. [[Link](#)]
- Higgins, M. A., Asner, G. P., Martin, R. E., Knapp, D. E., **Anderson, C. B.**, Kennedy-Bowdoin, T., Saenz, R., Aguilar, A. & Wright, S. J. (2014). Linking imaging spectroscopy and LiDAR with floristic composition and forest structure in Panama. *Remote sensing of environment*, 154, 358-367. [[Link](#)]
- Asner, G. P., Martin, R. E., Tupayachi, R., **Anderson, C. B.**, Sinca, F., Carranza-Jiménez, L., & Martinez, P. (2014). Amazonian functional diversity from forest canopy chemical assembly. *Proceedings of the national academy of sciences*, 111(15), 5604-5609. [[Link](#)]
- Asner, G. P., **Anderson, C. B.**, Martin, R. E., Knapp, D. E., Tupayachi, R., Sinca, F., & Malhi, Y. (2014). Landscape-scale changes in forest structure and functional traits along an Andes-to-Amazon elevation gradient. *Biogeosciences*, 11(3), 843-856. [[Link](#)]
- Mascaro, J., Asner, G. P., Knapp, D. E., Kennedy-Bowdoin, T., Martin, R. E., **Anderson, C. B.**, Higgins, M., & Chadwick, K. D. (2014). A tale of two “forests”: Random Forest machine learning aids tropical forest carbon mapping. *PLoS one*, 9(4), e85993. [[Link](#)]
- Asner, G. P., Kellner, J. R., Kennedy-Bowdoin, T., Knapp, D. E., **Anderson, C. B.**, & Martin, R. E. (2013). Forest canopy gap distributions in the southern Peruvian Amazon. *PloS one*, 8(4), e60875. [[Link](#)]
- Asner, G. P., Mascaro, J., **Anderson, C. B.**, Knapp, D. E., Martin, R. E., Kennedy-Bowdoin, T., van Breugel, M., Davies, S., Hall, J.S., Muller-Landau, H.C., Potvin, C., Souza, W., Wright, S.J. & Bermingham, E. (2013). High-fidelity national carbon mapping for resource management and REDD+. *Carbon balance and management*, 8(7). [[Link](#)]
- Asner, G. P., Knapp, D. E., Boardman, J., Green, R. O., Kennedy-Bowdoin, T., Eastwood, M., Martin, R.E., **Anderson, C. B.**, & Field, C. B. (2012). Carnegie Airborne Observatory-2: Increasing science data dimensionality via high-fidelity multi-sensor fusion. *Remote sensing of environment*, 124, 454-465. [[Link](#)]
- Asner, G. P., Martin, R. E., Knapp, D. E., Tupayachi, R., **Anderson, C. B.**, Carranza, L., Houcheime, M., Sinca, F., & Weiss, P. (2011). Spectroscopy of canopy chemicals in humid tropical forests. *Remote sensing of environment*, 115(12), 3587-3598. [[Link](#)]

Reports and books

Asner, G. P, Knapp, D. E., Martin, R. E., Tupayachi, R., **Anderson, C. B.**, Mascaro, J., Sinca, F., Chadwick, K.D., Sousan, S., Higgins, M., Farfan, W., Silman, M. R., Llactayo, W. A., & Neyra, A. F. (2014). The carbon geography of Perú. Minuteman Press, Berkeley, CA. 69 pp. ISBN: 978-0-9913870-7-6 (English edition) and ISBN: 978-0-9913870-6-9 (Spanish edition). [[Link](#)]

Pulgar-Vidal, M. G., Llactayo, W.L., Victoria, E.A., Salcedo, K.P., Marchand, G.L., Pérez, A.M., Garcia, W.C., Asner, G. P, Clark, J. K., Tupayachi, R., Knapp, D. E., Sousan, S., Pérez, P., **Anderson, C. B.**, Martin, R. E., & Kennedy-Bowdoin, T. (2011). Cuantificación de la cobertura de bosque y cambio de bosque a no bosque de la Amazonía Peruana: periodo 2009-2010-2011, Ministerio del Ambiente, Dirección General de Ordenamiento Territorial. Lima, Perú. [[Link](#)]

Technical reports

Anderson, C. B., Knapp, D. E., Boardman, J. W., Eastwood, M. E., & Asner, G. P. (2015). CAO Imaging Calibration and Validation Report 2015. Carnegie Institution for Science. [[Link](#)]

Editorial experience

Reviewer for: *American journal of botany*, *Biogeosciences*, *BMJ global health*, *Climate*, *EcoHealth*, *Forests*, *Journal of ecology*, *Frontiers in forests and global change*, *Nature communications*, *Proceedings of the national academy of sciences*, *Remote sensing of environment*, *Remote sensing*, *Sensors*, *Sustainability*

Select conference abstracts and presentations

Anderson, C. B., Precision biogeography: mapping tree species with airborne earth observations, NatCap Symposium, Stanford University, March 2019

Anderson, C. B., Smith, J.R, Daily, G. C., Pereira, H., Chaplin-Kramer, R., Linking earth observations and ecosystem services with the Essential Biodiversity Variables, AGU, Washington D.C., December 2018

Anderson, C. B., Howard, M. E., Daily, G. C., Mordecai, E. A., Multi-scale drivers of habitat suitability for *Aedes aegypti* and *Ae. albopictus*, ESA, New Orleans, August 2018

Anderson, C. B. & Daily, G. C., Earth observations for predicting multi-scale biodiversity patterns, Society for Conservation Biology, Santa Cruz, May 2017

Anderson, C. B. & Daily, G. C., Life on the edge: improved forest cover mapping in mixed-use tropical regions, Stanford GIS Day, Stanford University, December 2016

Anderson, C. B. & Daily, G. C., Field and airborne imaging spectroscopy for assessing ecosystem-scale biodiversity, ASD Lunch & Learn UC-Davis, Davis, October 2016

Anderson, C. B. & Daily, G. C., Remote sensing of ecosystem-scale biodiversity with LiDAR and

Other skills

600+ Hours of airborne data collection over five years globally

Flight planning and execution in five countries

Lead technical operator for three airborne instruments

CAO custom visible to shortwave infrared imaging spectrometer (AToMS)

ITRES CASI-1500 visible to near infrared imaging spectrometer

Optech Pegasus HA500 airborne LiDAR

Imaging spectroscopy analysis

Sensor calibration, validation, and noise analysis

Full-stream image processing (raw → radiance → surface reflectance)

Image orthorectification

Image classification (SAM, SVM, RandomForest)

Imaging spectroscopy to chemometric calibration development (PLS-R)

LiDAR image analysis

Full-stream data processing (raw → calibrated LAS points → raster and classified point mosaics)

Vegetation change analysis from multi-temporal data collections

Canopy vertical profile analysis from point cloud density

LiDAR and imaging spectrometer sensor fusion

Geospatial and scientific software experience

Custom algorithm development in Python, IDL, R, JavaScript, and KML

GDAL, Google Earth Engine, QGIS, Orfeo Toolbox, ENVI, ArcGIS, SAGA, LAStools, Optech

LMS Suite, Applanix PosPAC, SigmaPlot

3+ years of lab chemistry analysis in plant ecophysiology and biochemistry

Leaf elemental analysis (B, C, Ca, Fe, K, Mg, Mn, N, P, Zn)

Leaf structure analysis (LMA, SLA, % water, cellulose, lignin, hemicellulose, non-structural carbohydrates)

Leaf pigment analysis (chlorophyll-A, chlorophyll-B, total carotenoids)

Management and storage of over 12,000 dry and frozen leaf samples

Herbarium development and management

Memberships

American Geophysical Union

Ecological Society of America

California Native Plant Society

Bay Area Tropical Forest Network

Stanford Energy Club