

# Carl J. Legleiter

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## Education

Ph.D., Geography, University of California, Santa Barbara, 2008.

M.A. Geography, University of California, Santa Barbara, 2004.

B.S. Earth Sciences — Geohydrology, Montana State University, 2002.

B.S. Mathematical Sciences — Statistics, Montana State University, 2002.

## Fields of Interest

Fluvial geomorphology, remote sensing, spatial analysis

## Experience

Research Hydrologist, Geomorphology and Sediment Transport Laboratory, United States Geological Survey National Research Program, 2016–present.

Adjunct Associate Professor, Department of Geography, University of Wyoming, 2016–present.

Associate Professor, Department of Geography, University of Wyoming, 2015.

Assistant Professor, Department of Geography, University of Wyoming, 2009–2015.

Faculty Affiliate, Geomorphology and Sediment Transport Laboratory, United States Geological Survey, 2009–present.

Hydrologist, Geomorphology and Sediment Transport Laboratory, United States Geological Survey, 2009.

Ph.D. Candidate, Geography, University of California, Santa Barbara, 2005–2008.

Teaching Assistant for Earth Systems Science, Bren School of Environmental Science & Management, University of California, Santa Barbara, 2007.

Term project supervisor for GIS Design and Applications, Geography, University of California, Santa Barbara, 2007.

Graduate Student Assistant, San Joaquin District River Management Section, California Department of Water Resources, 2004–2006.

Teaching Assistant for Geostatistical Modeling, Geography, University of California, Santa Barbara, 2004.

Research Assistant, Earth Sciences, Montana State University, 1999–2002.

## Publications

### *In Review*

Legleiter, C.J., Mobley, C.D., and Overstreet, B.T. A framework for modeling connections between hydraulics, water surface roughness, and surface reflectance in open channel flows. *Journal of Geophysical Research - Earth Surface*.

Leonard, C.M., Legleiter, C.J., and Overstreet, B.T. Comparing natural and leveed reaches of a high energy gravel-bed river: Snake River, Wyoming, USA. *Earth Surface Processes and Landforms*.

### *In Revision*

Chu, V.W., Smith, L.C., Yang, K., Legleiter, C.J., Gleason, C.J., and Rennermalm, A.K. Adaptation of Manning's equation for remote estimation of supraglacial river discharge using GIS modeling and WorldView-2 satellite imagery. *GIScience & Remote Sensing*.

### *Refereed Journal Articles*

Overstreet, B.T., and Legleiter, C.J., In press. Removing sun glint from optical remote sensing images of shallow rivers. *Earth Surface Processes and Landforms*, doi: 10.1002/esp.4063.

Gleason, C.J., Smith, L.C., Chu, V.W., Legleiter, C.J., Pitcher, L.H., Overstreet, B.T., Rennermalm, A.K., Forster, R.R., and Yang, K. 2016. Characterizing supraglacial meltwater channel hydraulics on the Greenland Ice Sheet from in situ observations. *Earth Surface Processes and Landforms*, 41(14): 2111–2122.

Legleiter, C.J. 2016. Calibrating river bathymetry via Image-to-Depth Quantile Transformation (IDQT). *Water Resources Research*, 52: 3722–3741, doi: 10.1002/2016wr018730.

- Pan, Z., Glennie, C., Fernandez-Diaz, J.C., Legleiter, C.J., and Overstreet, B.T. 2016. Fusion of LiDAR orthowaveforms and hyperspectral imagery for shallow river bathymetry and turbidity estimation. *IEEE Transactions on Geoscience and Remote Sensing*, 54(7): 4165-4177.
- Legleiter, C.J., Stegman, T.K., and Overstreet, B.T. 2016. Spectrally-based mapping of riverbed composition. *Geomorphology*, 264: 61-79.
- Legleiter, C.J., Overstreet, B.T., Glennie, C., Zhigang, P., Fernandez-Diaz, J., Singhanina, A. 2016. Evaluating the capabilities of the CASI hyperspectral imaging system and Aquarius bathymetric LiDAR for measuring channel morphology in two distinct river environments. *Earth Surface Processes and Landforms*, 41(3): 344-363.
- Lea, D.M., and Legleiter, C.J. 2016. Refining measurements of lateral channel movement from image time series by quantifying spatial variations in registration error. *Geomorphology*, 258: 11-20.
- Lea, D.M., and Legleiter, C.J. 2016. Mapping spatial patterns of stream power and channel change along a gravel-bed river in northern Yellowstone. *Geomorphology*, 252: 66-79.
- Pan, Z., Glennie, C. L., Legleiter, C. J., and Overstreet, B. T. 2015. Estimation of water depths and turbidity from hyperspectral imagery using support vector regression. *IEEE Geoscience and Remote Sensing Letters*, 12(10): 2165-2169.
- Legleiter, C.J. 2015. Downstream effects of recent reservoir development on the morphodynamics of a meandering channel: Savery Creek, Wyoming, USA. *River Research and Applications*, 31(10): 1328-1343.
- Legleiter, C.J. 2015. Calibrating remotely sensed river bathymetry in the absence of field measurements: Flow Resistance Equation-Based Imaging of River Depths (FREEBIRD). *Water Resources Research*, 51(4): 2865-2884, doi: 10.1002/2014WR016624.
- Pan, Z., Glennie, C. L., Hartzell, P. J., Fernandez-Diaz, J. C., Legleiter, C. J., and Overstreet, B. T. 2015. Performance Assessment of High Resolution Airborne Full Waveform LiDAR for Shallow River Bathymetry. *Remote Sensing*, 7(5): 5133-5159.
- Legleiter, C.J., and Lea, D. 2015. The Rolling Stones of Soda Butte Creek. *Yellowstone Science*, 23(1): 59-66.
- Smith, L.C., Chu, V.W., Yang, K., Gleason, C.J., Pitcher, L.H., Rennermalm, A.K., Legleiter, C.J., Behar, A.E., Overstreet, B.T., Moustafa, S.E., Tedesco, M., Forster, R.R., LeWinter, A.L., Finnegan, D.C., Sheng, W., and Balog, J. 2015. Efficient meltwater drainage through supraglacial streams and rivers on the southwest Greenland Ice Sheet. *Proceedings of the National Academy of Sciences*, 112(4): 1001-1006.

Constantine, J.A., Dunne, T., Ahmed, J., Legleiter, C.J., and Lazarus, E.D. 2014. Sediment supply as a driver of river meandering and floodplain evolution in the Amazon Basin. *Nature Geoscience*, 7(12): 899-903.

Legleiter, C.J., and Overstreet, B.T. 2014. Retrieving river attributes from remotely sensed data: An experimental evaluation based on field spectroscopy at the Outdoor Stream Lab. *River Research and Applications*, 30(6): 671-684.

Legleiter, C.J., Tedesco, M., Smith, L.C., Behar, A., and Overstreet, B.T. 2014. Mapping the bathymetry of supraglacial lakes and streams on the Greenland Ice Sheet using field measurements and high resolution satellite images. *The Cryosphere*, 8: 215-228.

Fernandez-Diaz, J.C., Glennie, C.L., Carter, W.E., Shrestha, R.L, Sartori, M.P., Singhan, A., Legleiter, C.J., and Overstreet, B.T. 2014. Early Results from a Simultaneous Airborne Terrain and Shallow Water Bathymetry Mapping LiDAR Sensor. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS)*, 7(2): 623-635.

Legleiter, C.J. 2014. A geostatistical framework for quantifying the reach-scale spatial structure of river morphology: 1. Variogram models, related metrics, and their relation to channel form. *Geomorphology*, 205: 65-84.

Legleiter, C.J. 2014. A geostatistical framework for quantifying the reach-scale spatial structure of river morphology: 2. Application to restored and natural channels. *Geomorphology*, 205: 85-101.

Legleiter, C.J., and Marston, R.A. 2013. Introduction to the special issue: The field tradition in geomorphology. *Geomorphology*, 200: 1-8.

Legleiter, C.J. 2013. Mapping river depth from publicly available aerial images. *River Research and Applications*, 29(6): 760-780.

Kinzel, P.J., Legleiter, C.J., and Nelson, J.M. 2013. Mapping river bathymetry with a small footprint green LiDAR: Applications and challenges. *Journal of the American Water Resources Association*, 49(1): 183-204.

David, G.C.L., Legleiter, C.J., Wohl, E. and Yochum, S.E. 2013. Characterizing spatial variability in velocity and turbulence intensity using 3D acoustic Doppler velocimeter data in a plane-bed reach of East St. Louis Creek, Colorado, USA. *Geomorphology*, 183: 28-44.

Legleiter, C.J., and Overstreet, B.T. 2012. Mapping gravel-bed river bathymetry from space. *Journal of Geophysical Research - Earth Surface*, 117(F04024): doi: 10.1029/2012jf002539.

Legleiter, C.J. 2012. Remote measurement of river morphology via fusion of LiDAR topography and spectrally-based bathymetry. *Earth Surface Processes and Landforms*, 37(5): 499-518.

Legleiter, C.J., Kinzel, P.J., and Overstreet, B.T. 2011. Evaluating the potential for remote bathymetric mapping of a turbid, sand-bed river: 1. Field spectroscopy and radiative transfer modeling. *Water Resources Research*, 47(W09531): doi: 10.1029/2011WR010591.

Legleiter, C.J., Kinzel, P.J., and Overstreet, B.T. 2011. Evaluating the potential for remote bathymetric mapping of a turbid, sand-bed river: 2. Application to hyper-spectral image data from the Platte River. *Water Resources Research*, 47(W09532): doi: 10.1029/2011WR010592.

Harrison, L.R., Legleiter, C.J., Wydzga, A., and Dunne, T. 2011. Channel dynamics and habitat development in a meandering, gravel-bed river. *Water Resources Research*, 47(W04513): doi: 10.1029/2009WR008926.

Legleiter, C.J., Kyriakidis, P.C., McDonald, R.R., and Nelson, J.M. 2011. Effects of uncertain topographic input data on two-dimensional flow modeling in a gravel-bed river. *Water Resources Research*, 47(W03518): doi: 10.1029/2010WR009618.

Legleiter, C.J., Harrison, L.R., and Dunne, T. 2011. Effect of point bar development on the local force balance governing flow in a simple, meandering gravel-bed river. *Journal of Geophysical Research - Earth Surface*, 116(F01005): doi: 10.1029/2010JF001838.

Legleiter, C.J., and Roberts, D.A. 2009. A forward image model for passive optical remote sensing of river bathymetry. *Remote Sensing of Environment*, 113(5): 1025-1045.

Legleiter, C.J., Roberts, D.A., and Lawrence, R.L. 2009. Spectrally based remote sensing of river bathymetry. *Earth Surface Processes & Landforms*, 34(8): 1039-1059.

Legleiter, C.J., and Kyriakidis, P.C. 2008. Spatial prediction of river channel topography by kriging. *Earth Surface Processes & Landforms*, 33(6): 841-867.

Legleiter, C.J., Phelps, T.L., and Wohl, E.E. 2007. Geostatistical analysis of the effects of stage and roughness on reach-scale spatial patterns of velocity and turbulence intensity. *Geomorphology*, 83(3-4): 322-345.

Legleiter, C.J., and Kyriakidis, P.C. 2006. Forward and inverse transformations between Cartesian and channel-fitted coordinate systems for meandering rivers. *Mathematical Geology*, 38(8): 927-958.

Legleiter, C.J., and Roberts, D.A. 2005. Effects of channel morphology and sensor spatial resolution on image-derived depth estimates. *Remote Sensing of Environment*, 95(2): 231-247.

Legleiter, C.J., and Goodchild, M.F. 2005. Alternative representations of in-stream habitat: classification using remotely sensed data, hydraulic modeling, and fuzzy logic. *International Journal of Geographical Information Science*, 19(1): 29-50.

Legleiter, C.J., Roberts, D.A., Marcus, W.A. and Fonstad, M.A. 2004. Passive optical remote sensing of river channel morphology and in-stream habitat: physical basis and feasibility. *Remote Sensing of Environment*, 93(4): 493-510.

Legleiter, C.J. 2003. Spectrally driven classification of high spatial resolution, hyperspectral imagery: a tool for mapping in-stream habitat. *Environmental Management*, 32(3): 399-411.

Marcus, W.A., Legleiter, C.J., Aspinall, R.J., Boardman, J.W. and Crabtree, R.L. 2003. High spatial resolution hyperspectral mapping of in-stream habitats, depths, and woody debris in mountain streams. *Geomorphology*, 55(1-4): 363-380.

Legleiter, C.J., Lawrence, R.L., Marcus, W.A., Fonstad, M.A., and Aspinall, R. 2003. Fluvial response a decade after wildfire in the northern Yellowstone ecosystem: a spatially explicit analysis. *Geomorphology*, 54(3-4): 119-136.

Wohl, E.E., and Legleiter, C.J. 2003. Controls on pool characteristics along a resistant boundary channel. *Journal of Geology*, 111(1): 103-114.

Legleiter, C.J., Marcus, W.A., and Lawrence, R.L. 2002. Effects of sensor resolution on mapping in-stream habitats. *Photogrammetric Engineering & Remote Sensing*, 68(8): 801-807.

### *Book chapters*

Legleiter, C. J. and Fonstad, M. A. 2012. An introduction to the physical basis for deriving river information by optical remote sensing, in *Fluvial Remote Sensing for Science and Management* (eds P. E. Carbonneau and H. Piégay), John Wiley & Sons, Ltd, Chichester, UK. pp. 43-69.

Marcus, W. A., Fonstad, M. A. and Legleiter, C. J. 2012. Management applications of optical remote sensing in the active river channel, in *Fluvial Remote Sensing for Science and Management* (eds P. E. Carbonneau and H. Piégay), John Wiley & Sons, Ltd, Chichester, UK. pp. 19-41.

## Conference Presentations and Invited Lectures

Legleiter, C.J. Fluvial remote sensing: Progress, problems, and possibilities. 2016. *USGS National Research Program-Eastern Branch Weekly Science Series Seminar*, Reston, VA. Invited.

Legleiter, C.J. Bathymetry Mapping by Optimal Band Ratio Analysis. 2016. *USGS Office of Surface Water Webinar Series*, online. Invited.

Legleiter, C.J. Fluvial remote sensing: Progress, problems, and possibilities. 2016. *University of Colorado Hydrologic Sciences and Water Resources Engineering Seminar Series*, Boulder. Invited.

Legleiter, C.J. Calibrating river bathymetry by image-to-depth quantile transformation. 2015. *Fall meeting of the American Geophysical Union*, San Francisco.

Leonard, C.L., and Legleiter, C.J. 2015. Linking River Management-Induced Perturbations of Hydrologic and Sediment Regimes to Geomorphic Processes Along a Highly-Dynamic Gravel-Bed River: Snake River, WY. *Fall meeting of the American Geophysical Union*, San Francisco.

Lea, D.M., and Legleiter, C.J. 2015. Refining measurements of lateral channel movement from image time series by quantifying spatial variations in registration error. *Fall meeting of the American Geophysical Union*, San Francisco.

Richardson, R., and Legleiter, C.J. 2015. Saving Salmon Through Advances in Fluvial Remote Sensing: Applying the Optimal Band Ratio Analysis (OBRA) for Bathymetric Mapping of Over 250 km of River Channel and Habitat Classification. *Fall meeting of the American Geophysical Union*, San Francisco.

Overstreet, B.T., Legleiter, C.J., Harrison, L., Pitcher, L., Ryan, J., Rennermalm, A., and Smith, L. 2015. Multiscale controls on water surface roughness and implications for remote sensing of rivers. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J., Overstreet, B.T., Glennie, C., Zhigang, P., Fernandez-Diaz, J., Singhanian, A. 2014. Comparative evaluation of hyperspectral imaging and bathymetric LiDAR for measuring channel morphology across a range of river environments. *Fall meeting of the American Geophysical Union*, San Francisco.

Overstreet, B.T., and Legleiter, C.J. 2014. Mapping water surface roughness in a shallow, gravel-bed river using hyperspectral imagery. *Fall meeting of the American Geophysical Union*, San Francisco.

Lea, D.M., and Legleiter, C.J. 2014. Mapping Spatial Distributions of Stream Power and Channel Change along a Gravel-Bed River in Northern Yellowstone. *Fall meeting of the American Geophysical Union*, San Francisco.

Leonard, C., and Legleiter, C.J. 2014. Evaluating the Effects of Constriction by Levees on a Dynamic Gravel-Bed River through Morphological Sediment Budgeting and Bed Mobility Studies, Snake River, WY. *Fall meeting of the American Geophysical Union*, San Francisco.

Chu, V., Smith, L.C., Yang, K., Gleason, C., Rennermalm, A.K., Pitcher, L., Legleiter, C.J., and Forster, R. 2014. Remote Estimation of Greenland Ice Sheet Supraglacial River Discharge using GIS Modeling and WorldView-2 Satellite Imagery. *Fall meeting of the American Geophysical Union*, San Francisco.

Chu, V., Smith, L.C., Yang, K., Legleiter, C.J., Rennermalm, A.K., Forster, R.R., Gleason, C.J., Pitcher, L.H., and Moustafa, S. 2013. Greenland Ice Sheet supraglacial stream morphology and dynamics. *Fall meeting of the American Geophysical Union*, San Francisco.

Laurence, L.C., Chu, V., Yang, K., Rennermalm, A.K., Legleiter, C.J., Gleason, C.J., Pitcher, L.H., Moustafa, S., Overstreet, B.T., Behar, A., Tedesco, M., Forster, R.R. 2013. Supraglacial meltwater runoff from the Greenland ice sheet. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2013. Mapping supraglacial streams and lakes on the Greenland Ice Sheet via field measurements and satellite images. *University of Wyoming Department of Geography "All Things Geography" Seminar Series*, Laramie, WY.

Legleiter, C.J., and Overstreet, B.T. 2012. Mapping gravel-bed river bathymetry from space. *Fall meeting of the American Geophysical Union*, San Francisco.

Overstreet, B.T., and Legleiter, C.J. 2012. Characterizing channel change along a multithread gravel-bed river using random forest image classification. *Fall meeting of the American Geophysical Union*, San Francisco.

Kinzel, P.J., Legleiter, C.J., Nelson, J.M., and Skinner, K. 2012. A decade remote sensing river bathymetry with the Experimental Advanced Airborne Research LiDAR. *Fall meeting of the American Geophysical Union*, San Francisco.

Smith, L.C., Rennermalm, A.K., Legleiter, C.J., Behar, A.E., Chu, V.W., Forster, R.R., Gleason, C.J., Moustafa, S., Overstreet, B.T., Pitcher, L.H., Tedesco, M., and Yang, K. 2012. Greenland supraglacial rivers and the extreme 2012 melt season. *Fall meeting of the American Geophysical Union*, San Francisco.

Chu, V.W., Smith, L.C., Rennermalm, A.K., Forster, R.R., Gleason, C.J., Pitcher, L.H., Moustafa, S., Overstreet, B.T., Legleiter, C.J., Behar, A.E., Tedesco, M., and Yang, K. 2012. Hydraulic geometry of Greenland Ice Sheet supraglacial streams. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2012. Remote sensing of rivers: Large, small, and slushy. *UW Research Across Disciplines (RAD) Seminar Series*, Laramie.

Legleiter, C.J. 2012. Spectrally-based remote sensing of river systems and potential applications to Greenland ice sheet hydrology. *Sixth Magrann Conference: Breaking the Ice - Theorizing the Arctic Thaw*, Rutgers, NJ. Invited.



Legleiter, C.J. Remote mapping of river bathymetry from publicly available multi-spectral image data. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2011. Measurement and mapping of riverine environments via optical remote sensing. *Colorado State University Department of Geosciences Seminar Series*, Fort Collins.

Legleiter, C.J. 2011. A hybrid approach to remote measurement of river morphology: Fusing LiDAR topography with spectrally-based bathymetry. *Annual meeting of the Association of American Geographers*, Seattle.

Legleiter, C.J., Kinzel, P.J., and Nelson, J.M. 2010. Mapping the bathymetry of a turbid, sand-bed river using ground-based reflectance measurements and hyperspectral image data. *Fall meeting of the American Geophysical Union*, San Francisco.

Kinzel, P.J., Legleiter, C.J., and Nelson, J.M. 2010. Processing and evaluation of riverine waveforms acquired by an experimental bathymetric LiDAR. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2010. Geostatistical geomorphology: spatial analysis of river channel form and behavior. *Wyoming Geographic Information Science Center Fall Speaker Series*, Laramie.

Legleiter, C.J. 2010. Co-registration of LiDAR and passive optical image data for remote measurement of river morphology. *New Tools in Process-Based Analysis of Lidar Topographic Data Workshop*, Boulder.

Legleiter, C.J. 2010. Measurement and mapping of riverine environments via optical remote sensing. *Department of Geography and Wyoming Geographic Information Science Center "All Things Geography" Brown Bag Speaker Series*, Laramie.

Legleiter, C.J., Harrison, L.R., and Dunne, T. 2010. Effect of point bar development on the local force balance governing flow in a simple, meandering gravel-bed river. *Annual meeting of the Association of American Geographers*, Washington, D.C.

Legleiter, C.J., Kyriakidis, P.C., McDonald, R.R., and Nelson, J.M. 2009. Effects of uncertain topographic input data on two-dimensional modeling of flow hydraulics, habitat suitability, and bed mobility. *Fall meeting of the American Geophysical Union*, San Francisco.

Harrison, L.R., Legleiter, C.J., Wydzyga, M.A., and Dunne, T. 2009. Channel dynamics and habitat complexity in a meandering, gravel-bed river. *Fall meeting of the American Geophysical Union*, San Francisco.

Kinzel, P.J., Legleiter, C.J., and Nelson, J.M. 2009. Computational modeling of river flow using bathymetry collected with an experimental, water-penetrating, green LiDAR. *Fall meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2008. Remote measurement of river channel morphology from LiDAR and passive optical image data. *NSF Workshop on Studying Earth Surface Processes with High-Resolution Topographic Data*, Boulder, Invited.

Legleiter, C.J. 2008. A forward image model for evaluating the utility of passive optical remotely sensed data in river research. *European Geosciences Union General Assembly*, Vienna.

Legleiter, C.J., and Roberts, D.A. 2007. Remote sensing of river channel morphology with passive optical image data. *Fall Meeting of the American Geophysical Union*, San Francisco.

Legleiter, C.J. 2007. Passive optical remote sensing of river channel bathymetry. *JASON Summer Study on Ocean and Riverine Depth*, La Jolla, Invited.

Legleiter, C.J. 2007. Quantifying the spatial variability of river morphology and hydraulics in natural and restored gravel-bed rivers. *Annual Meeting of the Association of American Geographers*, San Francisco.

Legleiter, C.J., Wyzga, M.A., Faulkenberry, K., Encinas, D., Kyriakidis, P.C., and Dunne, T. 2006. Morphologic response of a restored, gravel-bed reach of the Merced River to sustained high flows. *CALFED Science Conference*, Sacramento.

Legleiter, C.J. 2006. A geospatial framework for characterizing the spatial variability of river morphology and in-stream habitat. *University of Idaho Center for Ecohydraulics Research Seminar Series*, Boise, Invited.

Legleiter, C.J. 2006. Geospatial geomorphology: remote sensing and geostatistical methods for characterizing river channel morphology and in-stream habitat. *Salmonid Restoration Federation Annual Conference*, Santa Barbara.

Legleiter, C.J. 2005. Development and application of a geostatistical framework for quantifying the spatial variability of river channel morphology and in-stream habitat. *Joint Assembly of the American Geophysical Union and the North American Benthological Society*, New Orleans.

Legleiter, C.J. 2004. Remote mapping and geostatistical modeling of river channel change in northern Yellowstone. *Centennial Meeting of the Association of American Geographers*, Philadelphia.

Marcus, W.A., Legleiter, C.J., Aspinall, R., and Boardman, J. 2001. High spatial resolution, hyperspectral mapping of in-stream habitat, depth and woody debris in third to fifth order mountain streams. *Binghamton Symposium: Mountain Geomorphology - Integrating Earth Systems*, Chapel Hill.

Legleiter, C.J. 2001. Hyperspectral stream classification. *Annual Meeting of the Association of American Geographers*, New York.

Marcus, W.A., Legleiter, C.J., Rasmussen, J., Ahl, R., and Halligan, K. 2001. Evaluation of high spatial resolution hyperspectral imagery for stream mapping. *Annual Meeting of the Association of American Geographers*, New York.

Marcus, W.A., Legleiter, C.J., Rasmussen, J., and Halligan, K. 2000. The potential for fine spatial resolution hyperspectral imagery for mapping stream morphology and depth. *Annual Meeting of the Great Plains - Rocky Mountain Division of the Association of American Geographers*, Provo.

## Grants

Mapping channel change and habitat dynamics along the Snake River from a time series of remotely sensed data, 2015, University of Wyoming-National Park Service Research Station, \$5,000.

Ground support of the AirSWOT mission by the University of Wyoming's Fluvial Remote Sensing Research Group, 2015, NASA Jet Propulsion Laboratory SWOT Algorithms Definition Team Hydrology Activities, \$18,990.

Remote sensing of bathymetry and bottom type in alpine lakes of the Snowy Range: A space-age tool for interpreting Quaternary environmental change, 2015, Roy J. Shlemon Center for Quaternary Studies Grant-in-Aid of Research, \$4,000.

Tracking water balance, snowmelt, and surface-groundwater interactions in sub-alpine lakes, Co-PI with Bryan Shuman, Bryan McElroy, Andrew Parkesian, and David Williams, Wyoming Center for Excellence in Hydro-Geophysics (WyCEHG), \$113,000.

Establishing a facility for characterizing sediment transport & channel change, 2014, University of Wyoming WRESE Research and Instruction Improvement Grant, \$5,000.

Characterizing sandbars and habitats in rivers of the Great Plains via unmanned aerial vehicle (UAV)-based topographic surveys, 2014, Co-PI with Brandon McElroy, University of Wyoming New Grant Initiative, \$4,000.

Effects of Levee Constriction on a High-Energy Gravel-Bed River: Snake River, Wyoming, 2014-2015, University of Wyoming-National Park Service Research Station, \$5,000.

The role of bank erosion in the sediment budget of the Snake River in Grand Teton National Park, 2013-2015, University of Wyoming-National Park Service Research Station, \$4,995.50.

The field tradition in Geomorphology: 43<sup>rd</sup> Binghamton Geomorphology Symposium, Co-PI with Richard Marston, 2012, National Science Foundation Geography and Spatial Sciences and Geomorphology programs, \$33,953.

Water in a Changing West: The Wyoming Center for Environmental Hydrology and Geophysics, PI's W. Steven Holbrook and Scott Miller, 2012–2017, National Science Foundation EPSCoR program, \$20,000,000.

Towards hydrologic understanding of the Greenland Ice Sheet, Co-PI's with Larry Smith and Alberto Behar, 2012–2013, NASA Cryosphere Program, \$87,375.

Remote sensing and *in situ* instrumentation for research on the optical characteristics, morphology, and dynamics of riverine environments, 2012–2014, Office of Naval Research Defense University Research Instrumentation Program, \$628,135.

Remote sensing of rivers: Project-focused learning activities for a unique new course, 2012–2015, Wyoming NASA Space Grant Faculty Education Enhancement Grant, \$5,000.

Retrieving river attributes from remotely sensed data: an experimental evaluation based on field spectroscopy at the Outdoor Stream Lab, Co-PI with Nina Kilham, 2011, National Center for Earth Surface Dynamics Visitor Program, \$5,000.

Connections among fluvial dynamics, riparian habitat, and beaver activity along the Snake River in Grand Teton National Park, Co-PI with William Gribb, 2011–2012, University of Wyoming - National Park Service Research Center, \$5,000.

Measurement and mapping of riverine environments by optical remote sensing, 2010–2015, Office of Naval Research, \$539,822.

Savery Creek Geomorphology Study, 2010–2013, Wyoming Water Development Commission, \$22,660.

Influence of historical channel dynamics on modern river morphology: a field- and remote sensing-based investigation of the Laramie River, Wyoming, 2010, University of Wyoming College of Arts & Sciences, \$2,000.

Characterizing the spatial structure of river morphology and hydraulics: remote mapping and geostatistical modeling of a dynamic fluvial system, 2006–2008, Canon National Parks Science Scholars Program, \$80,000.

Quantifying connections between channel change, sediment transfer, and reach-scale spatial structure in gravel-bed rivers of northern Yellowstone, 2007–2008, National Center for Airborne Laser Mapping, Collection of remotely sensed data worth \$40,000.

Characterizing spatial patterns of river morphology and hydraulics: remote mapping and geostatistical modeling of a dynamic fluvial system, 2006–2007, National Science Foundation Geography and Regional Science Program Doctoral Dissertation Research Improvement Grant, \$11,924.

Characterizing the spatial structure of river morphology and hydraulics: remote mapping and geostatistical modeling of a dynamic fluvial system, 2006, Hydrology Section of the American Geophysical Union, \$10,000.

Channel change and sediment transfer in northern Yellowstone, 2006, University of California Santa Barbara Graduate Division, \$2,000.

Development and application of a physics-based framework for remote sensing of river channel morphology and in-stream habitat, 2006, California Space Institute, \$600.

Stage-dependent spatial structure of gravel-bed river hydraulics, 2006, NortekUSA, loan of flow measurement equipment.

Geostatistical geomorphology of the Yellowstone River Basin: Characterizing the spatial variability of a pristine fluvial system, 2005, Geological Society of America, \$1200.

## Honors and Awards

Certificate of Excellence in Reviewing, 2013, *Geomorphology*.

Keith Runcorn Travel Award for Non-Europeans, 2008, European Geosciences Union.

Excellence in Research Award, 2006, University of California Santa Barbara Department of Geography.

Graduate Research Fellowship, 2005, National Science Foundation.

Fischer Scholarship, 2004, American Society of Photogrammetry & Remote Sensing.

Student Illustrated Paper Competition (Second Prize), 2004, Association of American Geographers Cartography/GIS/Remote Sensing Specialty Groups.

National Defense Science and Engineering Graduate Fellowship, 2002, American Society for Engineering Education.

Regents Special Fellowship, 2002, University of California Santa Barbara.

Outstanding Senior in Statistics, 2002, Montana State University Department of Mathematical Sciences.

Top Senior in Geology, 2001, Montana State University Earth Sciences Department.

## Teaching

### *Courses Taught*

Remote Sensing of Rivers

Fluvial Geomorphology

River Systems: Human Impacts, Ecological Interactions, and Management Challenges

Geomorphology of Earth's Dynamic Landscapes

Watershed Dynamics Over Time

Introduction to Physical Geography

## Professional affiliations and activities

Committee memberships:

Binghamton Geomorphology Symposium steering committee

Memberships in professional societies:

American Geophysical Union: Hydrology section and Earth and Planetary Surface Processes focus group.

Manuscript Refereeing:

Member of editorial board for *Geomorphology*

*Remote Sensing of Environment, Earth Surface Processes & Landforms, Annals of the Association of American Geographers, Geomorphology, Eos, Remote Sensing, Geographical Analysis, International Journal of Geographical Information Science, Journal of Hydrology, Freshwater Biology, River Research and Applications, Journal of Geophysical Research – Earth Surface, Environmental Management, Water Resources Research, Transactions of the American Fisheries Society, Hydrological Processes, Environmental Modeling and Assessment, Boreal Environment Research, IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (JSTARS), Marine Geodesy, Limnology and Oceanography - Methods, Hydrology and Earth Systems Science, Computers & Geosciences, Ecological Complexity*

Proposal Reviewing:

*NASA, Wyoming NASA Space Grant Consortium, NSF Geomorphology and Land Use Dynamics Program, NSF Division of Polar Programs Major Research Instrumentation, NSF Hydrologic Sciences Program*

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