

# CRAIG A. COBURN

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## Education

- 1996-2002 **Doctor of Philosophy**  
*Thesis Title: "Local Spatial Variability as a Measure of Image Texture: A Multidimensional Approach to Image Texture Classification."*  
Simon Fraser University, Department of Geography  
Burnaby, BC
- 1994-1996 **Master of Science,**  
*Thesis Title: "The Use of Digital Elevation Models for Soil Type Interpretation."*  
University of Alberta, Department of Earth and Atmospheric Sciences  
Edmonton, Alberta
- 1989-1994 **Bachelor of Science (Hons.),**  
University of Saskatchewan, Department of Geography  
Saskatoon, Saskatchewan

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## Awards

- *J. Lewis Robinson Award for Meritorious Service to the Western Division of the Canadian Association of Geographers, (2007)*
- *Nominated for 2005/2006/2009/2010 University of Lethbridge Distinguished Teaching Award,*
- *2001 Graduate Fellowship (\$5000),*
- *1999 Ph.D Research Stipend (\$4500),*
- *1998 Graduate Fellowship (\$5000),*
- *1996 Henry Kroeger Memorial Graduate Scholarship (\$2500),*
- *1995 Province of Alberta Graduate Student Scholarship (\$9500),*
- *1995 Eugene Brody Graduate Scholarship (Geography) (\$4000),*
- *1995 J. Gordin Kaplan Graduate Student Award (\$250),*
- *1992-93 Academic Honour Roll, University of Saskatchewan.*

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## Research Activities

Date	Project Title	Brief Outline	Role	Project Leader
2011-2013	Food Security (\$800,000 Tecterra)	Development of a novel geomatics-based food security system	Co-Investigator	Dr. W. Xu

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2011	Development of a Unmanned Aerial Vehicle Remote Sensing System	Development of a novel set of UAV remote sensing system for rapid deployment with flexible payloads (\$14,000 – various sources)	Principal Researcher	Dr. C. Coburn
2011-2012	Field Research in Geography (\$13,500 - Tecterra)	Funding to pay for student field research experience. Two years of funding.	Professor	Dr. C. Coburn/Dr. T. Johnston
2011	Development of manual field goniometer system (\$24,000 – US Army Corps of Engineers)	Development of a manual field goniometer system for field collection of BRDF information.	Principal Researcher	Dr. C. Coburn
2010 – 2016	NSERC Create – AMETHYST (\$1.6 Million)	Educational program for graduate training in hyperspectral remote sensing	Co-Investigator and Education Coordinator	Dr. P. Teillet/Dr. K. Staenz
2006 – 2009	Remote sensing of environmental dynamics in riparian cottonwood forests of Southern Alberta (\$248,000 over 3 years from AICWR)	Riparian Forests, Forest Monitoring, Remote Sensing, Climate Change, Forest Damage, Geographical Information Science, Multitemporal image analysis, Image-Based Texture Analysis, Ecophysiology, Ecosystem Dynamics	Co-Investigator	
2006 - 2009	Topoclimatic and Remote Sensing Analysis of Rocky Mountain Watersheds (\$318,890 from AICWR)	Water, Alberta Rocky Mountains, Watersheds, Topoclimatic Indices, Remote Sensing, Precipitation, Wind, Temperature, Solar Radiation, Snow, Canopy Biophysical Structure, 3-D Reflectance Model Inversion, HQP Training	Co-Applicant	D.R. Peddle
2006 – Present	Remote Sensing of Cattle Wintering Sites (\$45,000 over 3 years from PFRA)	Detection of cattle in the riparian zone and evaluating cattle damage. Mitigation and best management practices.	Principal Researcher	
2006	National Land and Water Information System (\$13,500, From NR Can)	Alberta ground truth co-ordinator.	Principal Researcher	
2006 - Present	Robotic Goniometer Development (\$240,000)	Developing a robotic Goniometer system to investigate the Bidirectional effects of Earth surface targets	Principal Researcher	
2002- Present	Mountain Pine Beetle Detection and Monitoring: Remote Sensing Evaluations.	Assessment of the utility of various forms of remotely sensed data to characterize Mountain Pine Beetle detection. Forestry Innovation Investment: \$147,718	Co-Investigator	Dr. A. Roberts
2003-present	Remote Sensing of Forest Stand Structural Changes.	Implementing a Multidimensional Image-Based Measure of Texture using image variance and geostatistical procedures to improve the mapped accuracy of early stages of Mountain Pine Beetle attack. University of Lethbridge Research Fund: \$4500	Principal Researcher	
2003-	Low-Cost Field	Building and testing of a low-cost field	Primary	

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2005	Goniometer Development	goniometer to measure the bi-directional reflectance distribution of various targets.	Researcher	
2003- Present	Airborne digital Remote Sensing System	Development and testing of a six-band digital video remote sensing system with extended infrared capability	Primary Researcher	
2003 – Present	Sonification of Satellite Image Data.	This project is investigating ways of making music from satellite images. The basic premise is that images have structures that make areas visually different. By transforming the digital values from the image into controls for a variety of musical parameters (tone, tempo, pattern), image differences can be transformed into music.	Collaborative Researcher with Dr. A. William Smith	

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## Peer-Reviewed Publications

### Journals and Book Chapters

- Wang, Z., Coburn, C.A. Ren, X., and Teillet, P.M. 2012. Effect of Soil Surface Roughness and Scene Components on Soil Surface Bidirectional Reflectance Factor. *Canadian Journal of Soil Science*, 92 (2) 297-313.
- Forbes, K., Kienzle, S.W., Coburn, C.A., Byrne, J.M. and Rasmussen, J. 2011. Modeling the impacts of selected GCM derived climate scenarios on the future hydrology of a hybrid watershed in the Oldman River watershed, Alberta, Canada. *Climactic Change* 105:555-576.
- Letts, M.G., Johnson, D.R.E. and Coburn, C.A. 2010. Drought stress ecophysiology of grass and shrub functional groups on opposing slopes of a temperate grassland valley. *Botany* 88 (9): 850-866.
- Teillet, P. M. and Coburn, C.A., 2010. "Radiometric Correction." *Encyclopaedia of Geography*. Sage Publication. [http://www.sage-ereference.com/geography/Article\\_n952.html](http://www.sage-ereference.com/geography/Article_n952.html)
- Soenen, S.A., D.R. Peddle, R.J. Hall, C.A. Coburn, and F.G. Hall, 2010. Estimating Aboveground Forest Biomass from Canopy Reflectance Model Inversion in Mountainous Terrain. *Remote Sensing of Environment*. 114(7): 1325–1337. DOI: 10.1016/j.rse.2009.12.012
- Gamon, J.A., Coburn, C.A., Flanagan, L.B., Huemmrich, K.F., Kiddles, C., Sanchez-Azofeifa, G.A. Thayer, D.R., Vescovo, L., Gianelle, D., Sims, D.A., Rahman, A.F., Pastorello, G.Z. 2010. SpecNet Revisited: Bridging Flux and Remote Sensing Communities (Review Paper). *Canadian Journal of Remote Sensing* 36 (Suppl. 2): 376-390.
- Coburn, C.A., Van Gaalen, K.E., Peddle, D.R., and Flanagan, L.B., 2010. Anisotropic Reflectance Effects on Spectral Indices for Estimating Ecophysiological Parameters using a Portable Goniometer System. *Canadian Journal of Remote Sensing*, 36 (Suppl. 2): 355-364.

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- Eddy P.R., A.M. Smith, B.D. Hill, D.R. Peddle, C.A. Coburn and R.E. Blackshaw, 2009. Weed and Crop Discrimination using Hyperspectral Image Data and Reduced Bandsets. *Weed Technology*. (submitted August 28, 2009: in review)
- Soenen, S.A., D.R. Peddle, C.A. Coburn, R.J. Hall, and F.G. Hall, 2009. Canopy Reflectance Model Inversion in Multiple Forward Mode: Forest Structural Information Retrieval from Solution Set Distributions. *Photogrammetric Engineering & Remote Sensing*. 75(4): 361–374.
- Xu,S., Peddle, D.R., Coburn, C.A., and Kienzle, S., 2008. Sensitivity of a Carbon and Productivity Model to Climatic, Water, Terrain, and Bioophysical Parameter in a Rocky Mountain Watershed. *Canadian Journal of Remote Sensing*, Vol 34 (3) 1-14.
- Soenen, S.A., D.R. Peddle, C.A. Coburn, R.J. Hall, and F.G. Hall, 2008. Improved topographic correction of forest image data using a 3-D canopy reflectance model in multiple forward mode. *International Journal of Remote Sensing*. 29(4): 1007 - 1027.
- Coburn, C.A., and A.W. Smith. (Accepted – 2008). Sonification of Satellite Data and the Process of Creating Visuals and Sound for Regina. *The Art of Immersive Soundscapes: contemporary sound art practices*, Pauline Minevich and Ellen Waterman Eds. University of Regina Press.
- Smith A.W., and Coburn, C.A. (Accepted – 2008). Regina from Eta Carinae (DVD). *The Art of Immersive Soundscapes: contemporary sound art practices*, Pauline Minevich and Ellen Waterman Eds. University of Regina Press.
- Eddy P.R., A.M. Smith, B.D. Hill, D.R. Peddle, C.A. Coburn and R.E. Blackshaw. 2008 Hybrid Segmentation - Artificial Neural Network Classification in Agriculture. *Photogrammetric Engineering and Remote Sensing*, Vol. 74, No. 10, pp. 1249-1257
- Soenen, S.A. D.R. Peddle, C.A. Coburn, R.J. Hall, F.G. Hall, (Accepted - 2007). Canopy Reflectance Model Inversion in Multiple Forward Mode: Forest Structural Information Retrieval from Solution Set Distributions. *Photogrammetric Engineering and Remote Sensing*.
- Coburn, C.A. and Smith, A.W. 2007. *Sonification of Satellite Image Data: Canadian Cities from Space*. (Juried Paper Presentation). *The Art of Immersive Soundscapes 2*, University of Regina, June 20-22, 2007.
- Coburn, C. A. and Peddle, D.R. 2006 A Low-Cost Field and Laboratory Goniometer System for Estimating Hyperspectral Bi-directional Reflectance. *Canadian Journal of Remote Sensing*. Vol 32 (3), 244-253.
- Soenen, S.A., Peddle, D.R. and Coburn, C.A. 2005. SCS+C: A Modified Sun-Canopy-Sensor Topographic Correction in Forested Terrain. *IEEE Transactions on Geoscience and Remote Sensing*. Vol. 43 (9), 2148-2159.
- Coburn, C.A. and A.W. Smith. 2005. Musical Landscapes Using Satellite Data. (Juried Feature Paper) in SPARK Festival of Electronic Music and Art. 3<sup>rd</sup> Annual Conference. University of Minnesota, Minneapolis, MN. February 16-20, 2005.
- Coburn C. A. and A.C.B. Roberts. 2004. A Multiscale Texture Analysis Procedure for Improved Forest Stand Classification. *International Journal of Remote Sensing*. Vol. 25 (20), 4287-4308.

- Coburn, C.A., A.C.B. Roberts, and K.C. Bach. 2001. Spectral and Spatial Artifacts from the Use of Desktop Scanners for Remote Sensing. *International Journal of Remote Sensing*. Vol. 22 (18), 3863-3870.
- Roberts, A., K. Bach, C. Coburn, M. Häfele, 1997. *Airborne Remote Sensing of Fish Habitat, Channel Morphology and Riparian Conditions*, A. P. Cracknell, E.S. Rowan [Ed.](1998): Physical Processes in the Coastal Zone - Computer Modelling and Remote Sensing, Proceedings, Forty ninth Scottish Universities Summer School in Physics, Dundee, August 1997, Edinburgh:121-148.
- P.M. Teillet , X. Ren, C. Coburn, and A.M. Smith, 2010, An image-based method for the study of vegetation reflectance anisotropy. *Remote Sensing of Environment*. (Submitted July 5, 2010)

### Edited Volumes

- Coburn, C.A, and Peddle, D.R. 2010 (Ed). Proceedings, 30th Canadian Symposium on Remote Sensing. June 22-25, 2009: Lethbridge, Alberta, Canada. Canadian Remote Sensing Society. ISBN: 978-0-9781886-4-1. 1352 pages.
- Peddle, D.R. and C.A. Coburn, 2010 (Eds). *Canadian Journal of Remote Sensing* Special Symposium Issue: 30<sup>th</sup> Canadian Symposium on Remote Sensing - June 22-25, 2009: Lethbridge, Alberta, Canada; Canadian Remote Sensing Society. CJRS Volume 36, Number 2.

### Conference Proceedings (with oral presentation)

- Kloppenburg, C., Smith, A.M., Staenz, K., Bouchier, R., Coburn, C.A., Rochdi, N. 2012. Detecting leafy spurge in native grassland using hyperspectral image analysis. *Proceedings of the 33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Parshakov, I., Staenz, K., Coburn, C.A., Kienze, S.W. and Predoi-Cross, A. 2012. Automatic Class Labelling of Classified Imagery Using a Hyperspectral Library. *Proceedings of the 33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Pryor, L., Coburn, C.A., Staenz, K., Zhang, J., 2012. Simulating Sentinel-2 Data from Airborne Hyperspectral Sensor Data. *Proceedings of the 33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Mazumdar, D.D., Coburn, C.A., Teillet, P.M. and Smith A.M. 2010. Effects of Clumping on Agricultural Crop Canopy BRDF. *Proceedings of the 31<sup>th</sup> Canadian Remote Sensing Symposium*,. June 1-5, 2010, Regina, Canada.
- Wang Z., Coburn, C.A., Teillet, P.M. 2010. A new goniometer capability for image-based bidirectional reflectance distribution function data acquisition. *Proceedings of the 31<sup>th</sup> Canadian Remote Sensing Symposium*,. June 1-5, 2010, Regina, Canada. pp. 325-328.
- Wang, Z., Coburn, C.A., Ren, X., Mazumdar, D.D., Myshak, S., Mullin, A., and Teillet, P.M. 2010. Assessment of soil surface BRDF using an imaging spectrometer. 2010 SPIE Remote Sensing Conference on Sensors, Systems, and Next-Generation

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- Satellites (RS03), to be held in Toulouse, France, 20-23 September 2010. V7830, p.783010-1-783010-9.doi:10.1117/12.865099.
- Coburn, C. A. and Noble, S.D. 2009. High-Performance Field and Laboratory Goniometer for Measuring Hyperspectral Bi-directional Reflectance Characteristics of Various Agricultural Canopies. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*,. June 22-25, 2009, Lethbridge, Canada. pp. 748-757.
- Coburn, C.A., Van Gaalen, K.E., Peddle, D.R., and Flanagan, L.B., 2009. Anisotropic Reflectance Effects on Spectral Indices for Estimating Ecophysiological Parameters. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*, June 22-25, 2009, Lethbridge, Canada. pp. 978-989.
- Eddy, P.R., Smith, A.M., Hill, B.D., Peddle, D.R., Coburn, C.A. and Blackshaw, R.E., 2009. Neural Network Classification of Hyperspectral Image Data for Improved Site-Specific Herbicide Management. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*, June 22-25, 2009, Lethbridge, Canada. pp. 887-897.
- Teillet, P.M., Ren, X, Seyed-Mahmoud, R., Coburn, C.A., Smith, A.M., and Noble, S.D. 2009. Image-Based Measurements of Vegetation BRDF Characteristics. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*,. June 22-25, 2009, Lethbridge, Canada. pp.155-163.
- Myshak, S., Coburn, C.A., Teillet, P.M. and, Smith, A.M. 2009. Using Bi-Directional Reflectance to Identify and differentiate crop types using the University of Lethbridge Lightweight Field Goniometer 2 (ULGS2). *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*,. June 22-25, 2009, Lethbridge, Canada. pp. 921- 933.
- Rolfson, D., Staenz, K., Coburn, C.A., Teillet, P.M. and Smith, A.M. 2009. Spectral Separability of Selected Rangeland Plant Species Common to Southern Alberta. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*,. June 22-25, 2009, Lethbridge, Canada. pp. 666-674.
- Mullin, A. and Coburn, C.A. 2009. Hyperspectral Discrimination of Cottonwood Clones in Southern Alberta. *Proceedings of the 30<sup>th</sup> Canadian Remote Sensing Symposium*,. June 22-25, 2009, Lethbridge, Canada. pp. 904-908.
- Eddy, P.R., Smith, A.M., Hill, B.D., Peddle, D.R., Coburn, C.A. and Blackshaw, R.E., 2007. Improved Site-Specific Herbicide Management Using Artificial Neural Networks and Hyperspectral Image Data. *Proceedings of CSRS/ASPRS*, Oct 28-Nov 1, 2007, Ottawa, Ontario.
- Soenen, S., Peddle, D.R., Coburn, C. A., and Hall R.J., 2006. Assessment of Multiple Forward Mode Inversion Solutions from a Forest Canopy Reflectance Model. In *Proceedings of IGARSS 2006, Colorado, USA, July 31 – August 4, 2006*.
- Eddy, P.R., Smith, A.M., Hill, B.D., Peddle, D.R., Coburn, C.A. and Blackshaw, R.E., 2006. Comparison of neural network and maximum likelihood high resolution image classification for weed detection in crops: Applications in precision agriculture. In *Proceedings of IGARSS 2006, Colorado, USA, July 31 – August 4, 2006*.



- Smith, A.W. and Coburn, C.A. Musical Landscapes: Satellite Imagery Pixel Data to Sound. Proceedings of Connectivity: The tenth biennial Arts and Technology Symposium at Connecticut College. Pp 171-184. March 30 – April 1, 2006.
- Soenen, S., Peddle, D.R., Coburn, C. A., and Hall R.J., 2005. A canopy reflectance model based topographic normalisation approach for forested terrain. In Proceedings, 12th SPIE Europe International Symposium on Remote Sensing, Brugge, Belgium, September 19-22 2005.
- Coburn, C.A. and Roberts, A.C.B. 2005. A Multi-Resolution Texture Classification Procedure for Improving Forest Stand Classification from High Spatial Resolution Imagery. *Proceedings of the 26<sup>th</sup> Canadian Remote Sensing Symposium*,. June 11-13, 2005, Wolfville, Canada.
- Coburn, C.A. and Smith, A.W. 2005. Sonification of Satellite Data: The Alberta Experience. *Proceedings of the 26<sup>th</sup> Canadian Remote Sensing Symposium*,. June 11-13, 2005, Wolfville, Canada.
- Coburn, C. A. and Peddle, D.R. 2005. A Low-Cost Field and Laboratory Goniometer System for Estimating Hyperspectral Bi-directional Reflectance of Vegetation Canopies. *Proceedings of the 26<sup>th</sup> Canadian Remote Sensing Symposium*,. June 11-13, 2005, Wolfville, Canada.
- Soenen, S., Peddle, D.R. and Coburn, C. A., 2005. Topographic correction in forested terrain using sun-canopy-sensor geometry and canopy reflectance models. *Proceedings of the 26<sup>th</sup> Canadian Remote Sensing Symposium*,. June 11-13, 2005, Wolfville, Canada.
- Eddy, P.R., Smith, A.M., Coburn, C.A. Peddle, D.R. and Blackshaw, R.E., 2005. Weed detection through segmentation of ground-based hyperspectral remote sensing imagery. *Proceedings of the 26<sup>th</sup> Canadian Remote Sensing Symposium*,. June 11-13, 2005, Wolfville, Canada.
- Coburn, C.A. and A.W. Smith. 2005. Musical Landscapes Using Satellite Data. *SPARK Festival of Electronic Music and Art*. February 16-20, 2005.
- Soenen, S. Peddle, D.R. and Coburn, C. A., 2003. Topographic Correction of Remote Sensing Imagery Using a Canopy Reflectance Model. *Proceedings of the 25<sup>th</sup> Canadian Remote Sensing Symposium*. October 13-17, 2003, Montreal, Canada.
- Roberts, A.C.B. and Coburn, C.A., 2001. Multispectral Remote Sensing of Mountain Pine Beetle Green Attack in Lodgepole Pine Forests. *Proceedings of the Fifth International Airborne Remote Sensing Conference*, San Francisco, California, 17-20 September, 2001.
- Roberts, A.C.B., Bach, K., Coburn, C.A., Haeefe, M., and Walter, F., 2000. Multispectral remote sensing of shallow water bathymetry: ground truth accuracy and interference, *Proceedings of the 22<sup>nd</sup> Annual Canadian Remote Sensing Symposium*. August 21-25, 2000, Victoria, Canada, pp. 245-250.
- Roberts, A.C.B., Bach, K., Coburn, C.A., and Haeefe, M., 2000. Low Cost Integrated Airborne Multispectral Remote Sensing. *Proceedings of the 22<sup>nd</sup> Annual Canadian Remote Sensing Symposium*. August 21-25, 2000, Victoria, Canada, p. 185.
- Roberts, A.C.B., Bach, K., Coburn, C.A., Haeefe, M., and Walter, F., 2000. Multispectral remote sensing of shallow water bathymetry: ground truth accuracy and interference, *Accuracy 2000*, Heuvelink and Lemmens (eds), Delft University Press, Delft, The Netherlands, pp. 553-560.
- Roberts, A.C.B., Bach, K., Coburn, C.A., and Haeefe, M., 2000 Low Cost Integrated Airborne Multispectral Remote Sensing, *LAPRS, Vol XXXIII*, Amsterdam, , July 16-23, 2000.

- Häfele, M., Roberts, A.C.B., Bach, K., and Coburn, C.A., 1999. Sediment Monitoring in Small Streams. *Proceedings of the 13<sup>th</sup> International Conference on Applied Geologic Remote Sensing*, Vancouver, Canada, March 1-3, 1999, pp. 117-124.
- Coburn, C.A., Roberts, A.C.B., Bach, K., and Häfele, M., 1999. A Supervised Approach for Texture Segmentation. *Proceedings of the 13<sup>th</sup> International Conference on Applied Geologic Remote Sensing*, Vancouver, Canada, March 1-3, 1999, pp. 305-312.
- Roberts, A.C.B., Bach, K., Coburn, C.A., Häfele, M., and Walter, F., 1999. Inversion of Multispectral Shallow Water Bathymetry for the Determination of Suspended Sediments in Salmon Spawning Streams. *Proceedings of the Forth International Airborne Remote Sensing Conference and 21<sup>st</sup> Canadian Symposium on Remote Sensing*, 21-24 June, 1999, Ottawa, Canada, pp. 138-145.

### Government Reports

- Final Report, Evaluating the Impacts of Cattle Wintering Sites on Riparian Ecosystems using Remote Sensing. Prairie Farm Rehabilitation Administration – Agriculture Canada (C. Coburn – Principal Investigator)
- Final Report. Estimating Forest Stands and Structures from Airborne Digital Remote Sensing Imagery. Forest Renewal British Columbia. 2000. (A. Roberts, Principal Investigator)
- Final Report. Airborne Remote Sensing of Suspended Sediment in Streams. Forest Renewal British Columbia. 2000. (A. Roberts, Principal Investigator)

### Conference Presentations

- Coburn, C.A. and Soffer, R. 2012. Reference Panel Characterisation in Support of Canadian Field Spectroscopy. *33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Soffer, R. and Coburn, C.A. 2012. Field Spectroscopy: A Review of Data Acquisition and Processing Issues. *33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Xu, S., Peddle, D.R., Boon, S., Coburn, C.A. 2012. Mountain Pine Beetle Disturbance, Forest Productivity and Carbon Dynamics from Multi-Temporal Landsat Imagery and a Process-Based Carbon Model. Poster. *33<sup>rd</sup> Canadian Remote Sensing Symposium*,. June 11-14, 2012, Ottawa, Canada.
- Coburn, C.A., 2011. Opportunities in Agricultural Remote Sensing: Field Measurement of BRDF and Biophysical/ Biochemical Information Extraction. **Keynote Presentation**, The Sixth International Symposium on Intelligent Information Technology in Agriculture (ISIITA2011), Beijing, China, Oct. 28-30, 2011.
- Myshak, S.P., Coburn, C.A., Mullin, A.D., and Smith, A.M., 2011. Assessment of plant phenology on bidirectional reflectance measured in hard red spring wheat. *Proceedings of the 32<sup>th</sup> Canadian Remote Sensing Symposium*. June 13-16, 2011, Sherbrooke, QC, Canada.



- Telliet, P.M., Ren, X., Coburn, C.A. and Smith, A.M. 2010. An Image-Based Method for the Study of Vegetation Reflectance Anisotropy. Invited presentation at the Institute of Remote Sensing Applications, Chinese Academy of Sciences, Beijing, China, September 1, 2010.
- Coburn, C.A. 2010. Advances in the Measurement of Bidirectional Reflectance of Agricultural Crops. Invited presentation at National Engineering Research Center for Information Technology in Agriculture, Beijing, China, August 30, 2010.
- Coburn, C.A. and Smith, A.W. 2007. *Sonification of Satellite Image Data: Canadian Cities from Space*. (Juried Paper Presentation). The Art of Immersive Soundscapes 2, University of Regina, June 20-22, 2007.
- Coburn, C.A., 2007. *Airborne Remote Sensing of Riparian Habitat*. Western Division of the Canadian Association of Geographers, March 9-10, Abbotsford, BC.
- Iwanicka, D., Johnson, D and Coburn, C.A., 2007. Analysis of MODIS NDVI product at a provincial scale. Western Division of the Canadian Association of Geographers, March 9-10, Abbotsford, BC.
- Coburn, C. A, Peddle, D.R., Rood, S., Letts, M., Iwanicka, D, Eddy, P.R., 2006 Remote sensing of environmental dynamics in riparian cottonwood forests of Southern Alberta. AICWR Researcher's Conference – Edmonton, Alberta, November 3-4, 2006
- Soenen, S., Peddle, D.R., Coburn, C. A., and Hall R.J., 2006. Assessment of Multiple Forward Mode Inversion Solutions from a Forest Canopy Reflectance Model. In Proceedings of IGARSS 2006, Colorado, USA, July 31 – August 4, 2006.
- Eddy, P.R., Smith, A.M., Hill, B.D., Peddle, D.R., Coburn, C.A. and Blackshaw, R.E., 2006. Comparison of neural network and maximum likelihood high resolution image classification for weed detection in crops: Applications in precision agriculture. In Proceedings of IGARSS 2006, Colorado, USA, July 31 – August 4, 2006.
- Coburn, C.A., 2006. *A Low-Cost Approach to Measuring Hyperspectral Bidirectional Reflectance*. Western Division of the Canadian Association of Geographers, March 10-11, Kamloops, BC.
- Iwanicka, D., and Coburn, C.A., 2006. *Low-Cost Multispectral Airborne Remote Sensing Systems*. Western Division of the Canadian Association of Geographers, March 10-11, Kamloops, BC.
- Coburn, C.A. 2005. *The Trouble with High Spatial Resolution Imagery: The Introduction of Digital Moiré Patterns by Resampling*. Western Division of the Canadian Association of Geographers, March 11-13, Lethbridge, Alberta.
- Soenen, S.A. Peddle, D.R., Coburn, C.A. 2005. *SCS+C: A Modified Sun-Canopy-Sensor Topographic Correction for Forested Terrain*. Western Division of the Canadian Association of Geographers, March 11-13, Lethbridge, Alberta.
- Van Gaalen, K.E. Flanagan, L. Peddle, D.R. Coburn C.A. 2005. *Photosynthetic CO<sub>2</sub> exchange and spectral reflectance of boreal mosses: application of the water band (WBI), NDVI, and photochemical reflectance (PRI) indices*. Western Division of the Canadian Association of Geographers, March 11-13, Lethbridge, Alberta.
- Eddy, P.R., Smith, A.M., Peddle, D.R., Coburn C.A. 2005. *Weed Detection Through Ground-Based Hyperspectral Remote Sensing*. Western Division of the Canadian Association of Geographers, March 11-13, Lethbridge, Alberta.

- Coburn, C.A. and Smith, A.W. 2004. *Landscapes of Music: Turning Satellite Imagery into Musical Compositions*. Western Division of the Canadian Association of Geographers, March 18-20 Medicine Hat, Alberta.
- Coburn, C.A., and Roberts, A.C.B. 2003. High-Resolution Remote Sensing Monitoring of a Mountain Pine Beetle Attack. Mountain Pine Beetle Symposium: Challenges and Solutions. October 30-31, 2003, Kelowna, Canada, p. 282.
- Coburn, C.A., and Smith, A.W. 2003. *Singing Lethbridge From the Sky*. Audio/Visual presentation at *Music, Machines & New Media*. University of Lethbridge, November 7, 2003.
- Coburn, C.A. 2002. Image-Based Texture Analysis: The Multiscaled Variance Approach Western Division of the Canadian Association of Geographers, Burnaby, BC.
- Coburn, C.A., 1999. So You're a Geographer: Defining Spatial Logic. *Mapping the Millennium: Third Annual Western Geography Graduate Student Conference*. February 5-7, 1999, Seattle, Washington, USA.
- Coburn, C.A., 1995. The Use of Digital Elevation Models and Remotely sensed data for Soil Type Interpretation. *Annual Meeting of the Canadian Cartographic Association*, May, 1995, Calgary, Canada.

### **Public Presentations**

Eye in the Sky: Advanced Technology in Agriculture. Presented at the Southern Alberta Conservation Association Conference. December 2, 2009.

Anisotropic reflectance measurements of various crop canopies for improved biophysical and biochemical parameter retrieval. Agriculture and Agri-Food Canada Seminar Series Presentation. November 25, 2009.

Angular Remote Sensing: Definitive proof that the grass is always greener somewhere else. University of Lethbridge, Department of Physics and Astronomy Summer Seminar. August 14, 2009.

Bidirectional Reflectance Measurement at the UofL: Presentation at CEOS (Committee on Earth Observation Satellites) IVOS (Infrared and Visible Optical Sensors) working group on Calibration and Validation. August 11, 2009, Lethbridge, Canada.

Environmental Remote Sensing: Tools and Challenges: 2009 invited speaker at Edmonton's Telus World of Science (May 13, 2009).

Coburn, C.A. and Smith, A.W. 2005. Musical Landscape Series. University of Lethbridge New Media 2005 Alberta Centennial Festival. March 05, 2005.

Coburn, C.A. 2005. Research Adventures in Remote Sensing. Department of Geography Graduate research Seminar. January 21, 2005.

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Coburn, C.A. and Smith, A.W. 2004. *re-Sounding Calgary. Audio/Visual presentation at Music, Machines & New Media. University of Lethbridge, November 12, 2004.*

Coburn, C.A. and Smith, A.W. 2003. *Singing Lethbridge From the Sky. Audio/Visual presentation at Music, Machines & New Media. University of Lethbridge, November 7, 2003.*

### **Research In Progress**

Nakonechny KN, MG Letts, CA Coburn and DR Peddle. (In Prep.). Very high resolution spatiotemporal modelling of solar radiation and microclimate in temperate grassland hillslopes. For: Int J. Biomet. Expected submission: December 2013

### **Invited Lectures**

Fall, 1998, 2000, 2001 – Physical Properties of Colour. Invited lecture for Geog 351, Thematic Cartography, Department of Geography, Simon Fraser University.

Spring 1996 – Morphometrics and Terrain Classification. Invited lecture for Geog 327, Raster Cartography, Department of Earth and Atmospheric Sciences, University of Alberta.

Spring 1996 – Fundamentals of Global Positioning Systems. Invited lecture for Geog 250, Biogeography, Department of Earth and Atmospheric Sciences, University of Alberta.

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### **Teaching:**

#### **The University of Lethbridge, Department of Geography**

<b>Semester</b>	<b>Course Title</b>	<b>Course Number</b>	<b>Role</b>	<b>Enrolment</b>
2011 – Spring	Intro Geographical Information Science	Geog 2735	Instructor	55
2011 – Fall	Geographic Data and Analysis	Geog 2700	Instructor	25
2011 - Fall	Remote Sensing	Geog 3720	Instructor	35
2011 - Fall	Geography Field Experience	Geog 3850	Co-Instructor	19
2011 – Spring	Geographical Information Systems	Geog 3740	Instructor	48
2011 – Spring	Intro Geographical Information Science	Geog 2735	Instructor	53
2010 – Fall	Graduate Research Methods	Geog 5850	Co-Instructor	15

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2010 - Fall	Seminar in Spatial Modelling	Geog 4751	Instructor	12
2010 - Fall	Intro Geographical Information Science	Geog 2735	Instructor	57
2009 - Spring	Soils	Geog 3080	Instructor	17
2009 - Spring	Seminar in Spatial Modelling	Geog 4751	Instructor	20
2008 - Fall	Introduction to Geography	Geog 1010	Temporary-Instructor	195
2008 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	33
2008 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	44
2008 - Spring	Geographic Data and Analysis	Geog 2700	Instructor	54
2008 - Spring	Seminar in Spatial Modelling	Geog 4751	Instructor	8
2007 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	31
2007 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	48
2007 - Spring	Applied GIS	Geog 4740	Instructor	37
2007 - Spring	Seminar in Spatial Modelling	Geog 4751	Instructor	26
2006 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	39
2006 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	27
2006 - Fall	Introduction to Geography	Geog 1010	Instructor	195
2006 - Spring	Seminar in Remote Sensing	Geog 5753	Instructor	2
2006 - Spring	Seminar in Remote Sensing	Geog 4753	Instructor	26
2005 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	41
2005 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	48
2005 - Spring	Remote Sensing of Modelled Ecosystems	Geog 4990	Instructor	1
2005 - Spring	Seminar in Spatial Modelling	Geog 5751	Instructor	3
2005 - Spring	Seminar in Spatial Modelling	Geog 4751	Instructor	8
2005 - Spring	Soils	Geog 3080	Instructor	26
2004 - Fall	Seminar in Remote Sensing	Geog 5753	Instructor	4
2004 - Fall	Seminar in Remote Sensing	Geog 4753	Instructor	11
2004 - Fall	Advanced Geoprocessing	Geog 4990	Instructor	1

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In GIS				
2004 - Fall	Digital Remote Sensing System Design	Geog 4990	Instructor	1
2004 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	44
2004 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	45
2004 - Summer	Advanced Spatial Analysis	Geog 3990	Instructor	1
2004 - Spring	Seminar in Spatial Modelling	Geog 4751	Instructor	29
2004 - Spring	Soils	Geog 4050	Instructor	40
2004 - Spring	Geographic Data and Analysis	Geog 2700	Instructor	57
2003 - Fall	Fluvial Sedimentology	Geog 5990	Co-Instructor (with Dr. J. Byrne)	1
2003 - Fall	Topics in Field Remote Sensing	Geog 5990	Co-Instructor (With Dr. D. Peddle)	1
2003 - Fall	Introduction to Remote Sensing	Geog 3720	Instructor	46
2003 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	51
2003 - Spring	Advanced Remote Sensing	Geog 5725	Instructor	1
2003 - Spring	Advanced Remote Sensing	Geog 4725	Instructor	8
2003 - Spring	Soils	Geog 4050	Instructor	51
2003 - Spring	Geographic Data and Analysis	Geog 2700	Instructor	49
2002 - Fall	Geographic Data and Analysis	Geog 2700	Instructor	48
2002 - Fall	Seminar in Spatial Modelling	Geog 4751	Instructor	13

### Graduate Student Supervision

Student Name	Thesis Topic	Supervisor	Role
Shiyong Xu	Remote Sensing of Net Primary Productivity in the Rocky Mountains, Kananaskis Alberta.	Dr. D.R. Peddle	Committee Member
Scott Soenen	Topographic Effect Correction Using Canopy Reflectance Models.	Dr. D.R. Peddle	Committee Member
K. Eric Van Gaalen	Photosynthetic CO <sub>2</sub> exchange and spectral reflectance of boreal mosses: application of the water band (WBI), NDVI, and photochemical reflectance (PRI) indices.	Dr. D.R. Peddle and Dr. L. Flanagan	Committee Member

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Sarah Bigelow	Hydrogeomorphic Characteristics of the Little Bow River, Alberta.	Prof. S. Rood	Committee Member
Lisa Simpson	Nutrient Cycling and Nutrient Budgets for Farm Nutrient Management.	Dr. C. Coburn	Supervisor
Peter Eddy	Weed Detection Through Ground-Based Hyperspectral Remote Sensing.	Dr. D.R. Peddle	Committee Member
Casey Vandenberg	Multiple-Forward Mode Canopy Reflectance Modelling: Applications and Prospects for MODIS Image Analysis in Mountainous Terrain.	Dr. D.R. Peddle	Committee Member
Barry Gergel	Compression of Multiple Image Sets.	Dr. Howard Cheng	Committee Member
Katherine Forbes	Modelling Climate Change using ACRU.	Dr. Craig Coburn/Dr. Stefan Kienzle	Co-Supervisor
Karen Gill	Cottonwood Recruitment	Dr. S. Rood	Committee Member
Todd Masse	Meta-Analysis of NIMBY Phenomena	Dr. R. Kool (Royal Rhodes University)	Committee Member
David Rolfson	Hyperspectral Analysis of Grasslands	Dr. K. Staenz/Dr. C. Coburn	Co-Supervisor
Catherine Ovens	Richardson Ground Squirrels	Prof. G. Michener	Committee Member
Shilo Andrews	Ecophysiological Response of Mountain Forests to Changing Climate	Prof L.Flanagan	Committee Member
Vivek Trivedi	Remote Sensing Image Compression	Dr. H. Chang	Committee Member
Deepayan Mazumdar	Effects of aggregation or clumping and heterogeneity on vegetation BRDF	Dr. C. Coburn	Supervisor
Aaron Mullin	LAI effects on BRDF signatures	Dr. C. Coburn/Dr. K. Staenz	Co-Supervisor
Logan Pryor	Simulating SENTINEL satellite data for mapping wetlands.	Dr. C. Coburn/Dr. K. Staenz	Co-Supervisor
Ilia Parshakov	Automatic class label assignment for unsupervised image classification using hyperspectral libraries	Dr. C. Coburn/Dr. K. Staenz	Co-Supervisor
Stephen Myshak	The effect of seed pod development on bidirectional reflectance signatures	Dr. C. Coburn/Dr. K. Staenz	Co-Supervisor

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		Staenz	
Catherine Kloppenburg	Hyperspectral image analysis for the identification of invasive species.	Dr. A. Smith/Dr. K. Staenz	Committee Member
Owen Brown	Methods relating to terrestrial laser scanning	Dr. C. Hugenholtz	Committee Member
Allison Becker	Hydrological Controls on Bird Habitat	Dr. J. Rasmussen	Committee Member
Shiyong Xu	Modelling the effect of bark beetle on net primary productivity and canopy reflectance	Dr. D.R. Peddle	Committee Member

### Simon Fraser University, Department of Geography

Semester	Course Title	Course Number	Role	Enrollment
2002 – Spring	Aerial Photographic Interpretation	Geog 253.3	Instructor	42
2002 – Spring	Remote Sensing	Geog 353.4	Instructor	28
2001 – Fall	Aerial Photographic Interpretation	Geog 253.3	Instructor	36
2001 – Spring	Remote Sensing	Geog 353.4	Instructor	28
2000 – 1997	Aerial Photographic Interpretation	Geog 253.3	Teaching Assistant	35-45
2000 – 1998	Remote Sensing	Geog 353.4	Teaching Assistant	35
1998 – 1999	Digital Image Processing	Geog 453.4	Teaching Assistant	14

### University of Alberta, Department of Earth and Atmospheric Sciences

Semester	Course Title	Course Number	Role	Enrollment
Summer – 1996	Introduction to Physical Geography	Geog 130.3	Teaching Assistant	35
Summer – 1996	Introduction to Physical Geography	Geog 131.3	Teaching Assistant	35
Spring – 1996	Digital Remote Sensing	Geog 427.3	Teaching Assistant	40
Fall – 1995	Raster Cartography	Geog 327.3	Teaching Assistant	40
Spring – 1995	Geographic Information Systems	Geog 328.3	Teaching Assistant	15
Fall – 1994	Geographic Information Systems	Geog 328.3	Teaching Assistant	54

### University of Saskatchewan, Department of Geography

Semester	Course Title	Course Number	Role	Enrollment
Fall 1993 – Spring 1994	Introduction to Physical Geography	Geog 110.6	Teaching Assistant	54

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## Teaching Assistant Supervision

### The University of Lethbridge, Department of Geography

Semester	Course Title	Course Number	Teaching Assistant	Enrollment
2002 - 2003	Introduction to Remote Sensing	Geog 3720	Suzan Lapp	46
2002 – 2004l	Geographic Data and Analysis	Geog 2700	Jacqueline Montain	51
2003	Advanced Remote Sensing	Geog 4725	Nicole Rabe	8
2003 – 2004	Soils	Geog 4050	Suzan Lapp	51

### Simon Fraser University, Department of Geography

Semester	Course Title	Course Number	Teaching Assistant	Enrollment
2002 – Spring	Aerial Photographic Interpretation	Geog 253.3	Crystal Huscroft	42
2001 – Fall	Aerial Photographic Interpretation	Geog 253.3	Alberto Reyes	36

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## Work Experience

- *July 2009 – present*

**Associate Professor,**

*Department of Geography, The University of Lethbridge, Lethbridge, AB.*

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- *July 2002 – July 2009*

**Assistant Professor,**

*Department of Geography, The University of Lethbridge, Lethbridge, AB.*

- *September 2001-April 2002*

**Sessional Lecturer,**

*Department of Geography, Simon Fraser University, Burnaby, BC*

- *March – August 2000*

**SIS Laboratory Administrator,**

*Department of Geography, Simon Fraser University, Burnaby, BC*

- *1996 – 2000*

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## **Research Assistant,**

Supervisor: Dr. Arthur Roberts

*Simon Fraser University, Department of Geography, Burnaby, BC*

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## **Service**

### **Service to The University of Lethbridge:**

- 2011 – Present      Chair, Master of Science Program Committee, School of Graduate Studies.
- 2010                  Geography Representative, Lab Revision, AWESB.
- 2009                  Canadian Journal of Remote Sensing, Guest Associate Editor.
- 2009                  Canadian Symposium on Remote Sensing, Organising committee and webmaster.
- 2009                  Canadian Symposium on Remote Sensing, Co-Editor Conference Proceedings.
- 2008                  Review Committee, University Hall.
- 2008                  Building Committee for the Alberta Water and Environmental Science Building.
- 2005                  **Organizing Committee Member**, WDCAG 2005. Annual Meeting of the Western Division of the Canadian Association of Geographers.
- Conference Organisation.
  - Web site creation and updating.
  - Conference Program.
  - Event Coordination.
- 2004                  **Member – Arts and Science Executive Committee** (6 Month Term).
- 2011 -Present  
2003 - 2009,      **Secretary/Treasurer**, Western Division of the Canadian Association of Geographers
- 2003 - 2009      **Department of Geography Curriculum Committee**
- Revision of the departmental curriculum.
  - Review of new courses.
- 2003 – 2010      **The University of Lethbridge Summer Science Camp**
- Basic Spectroscopy
  - Teaching introductory Soil Science.
  - Soil geography field trip.
  - Map interpretation.
  - Biogeography.
- 2002 – 2006      **Library Representative.**

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- Revision of department journal holdings.
- On-line journal access.

### **Service to Department of Geography, Simon Fraser University:**

- 1996 – 1998 **Graduate student representative** Departmental Policy Committee.
- Revision of department constitution.
  - Student representation on committees.
- 1997 – 1998 **Graduate student representative** Graduate studies committee.
- Role of graduate students on the graduate studies committee.
  - Restructuring of graduate student program.
- 1998 – 1999 **Secretary/Treasurer**, Geography Graduate Student Association.
- 1998 – 2000 **Co-chair**, Guest Lectures Committee.
- 1999 – 2000 **Graduate student representative**, Appointments Committee.
- 1999 – 2001 **President**, Geography Graduate Student Association.

### **Service to Academic Community:**

- 2012 Peer-Reviewer, Netherlands Space Office, European Space Agency.
- 2008 – Present – Peer Reviewer, IEEE -TGARS
- 2005-Present – Peer-reviewer, Remote sensing of Environment
- 2003 – Present - Peer-reviewer, Canadian Journal of Remote Sensing.
- 1998 – Present - Peer-reviewer, International Journal of Remote Sensing.
- 2004 – Present - Peer-reviewer, Canadian Geographer.
- 2005 – Present – Peer-reviewer, Geomatica, Canadian Institute of Geomatics.

### **Membership in Academic Community**

- 2005 – Present, Member, IEEE.
- 2002 – Present, Member, Canadian Remote Sensing Society.
- 1995 – Present, Member, American Society of Photogrammetry and Remote Sensing.
- 1995 – Present, Member of the Canadian Association of Geographers.