4:50 Remote sensing for Earth Observation

Remote sensing is the science of observing the Earth with wireless sensors, usually far away from the observer. There are many sensors available that can be used for supporting many applications, from deforestation of the Amazon to an oil spill in the Gulf of Mexico, going through helping companies to optimize their activities and therefore reduce their impact in the environment. Among these sensors, we can use radar, sonar, laser or optical cameras. The former are the scope of study at the Centre for Earth Observation Science. We will present some of the cameras that we use and give some examples on how to use those cameras for environmental monitoring. Our working sites are tropical dry forests of Latin America, boreal forests in Northern Alberta and mining areas in Germany.

Dr. Virginia Garcia Millan has a Bachelor Degree in Environmental Sciences from the University Pablo de Olavide in Spain. She has two masters' degrees, one in Integrated Management of Coastal Ecosystems awarded by the Educom@Med project and another in GIS and Remote Sensing from the University Autonoma of Barcelona, Spain. She worked in two research centres in Spain, the Centre of Advanced Studies of Blanes (CEAB) and the Centre for Ecology and Forestry Applications (CREAF). She obtained her PhD at the University Pablo de Olavide, with the topic spectro-directional sensors for the study of tropical dry forests, supervised by Dr. Malvarez (Spain) Dr. Sanchez Azofeifa (U of A), in collaboration with the University of Alberta. She has also work in industry; she spent 3 years in Germany developing a project linked to mining using hyperspectral sensors.

5:10 The power of GIS, geovisualization and metadata for online historical collections

Over the past fifteen years many historical collections (textual, numerical, photos, maps) have been digitized and made available online. However, they often exist as either standalone platforms, isolated from other digital collections, or as databases that can be queried but not expressed spatially. By highlighting various #HGIS examples, the presentation will touch upon how thinking spatially and combining the power of GIS, geovisualization and metadata open up interesting ways of spatially linking, querying, and mapping online collections.

Mr.Laliberté is a librarian with over ten years' experience working with GIS and spatial data. As the GIS Librarian at the University of Alberta much of his work revolves around analyzing and synthesizing spatial information at many scales, across many disciplines, in various formats and under numerous licensing agreements.

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UofA GIS Day

Wednesday, November 18th, 2015

GIS day

A Showcase of GIS Applications at the University of Alberta

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Agenda

2:00	Welcome	*CCIS L1-160*
2:10	Integrating home range and density models can improve habitat predictions for Ferruginous Hawks (*Buteo regalis*)	**Janet Ng** *Biological Sciences*
2:30	Distinct hyperspectral mapping of tropical dry forest vegetation species in the thermal infrared (8µm-14µm)	**Dominica Harrison** *Centre for Earth Observation Sciences*
2:50	Wireless Sensor Networks and Unmanned Aerial vehicles for Spatial Analysis of Photosynthetic Light Fluxes in Forests	**Cassidy Rankine** *Centre for Earth Observation Sciences*
3:10	Spatial patterns of train-caused mortality for large mammals before and after adjacent highway mitigation in Banff National Park, Alberta, Canada	**Patrick Gilhooly** *Biological Sciences*
3:30	**Break**	
4:10	The Edmonton-Calgary Corridor: Simulating Future Land Cover Change Under Potential Government Intervention	**Kayla Stan** *Centre for Earth Observation Sciences*
4:30	Regenerative role of wildfires for ecosystems and impacts on natural cycles.	**François Robinne** *Renewable Resources*
4:50	Remote sensing for Earth Observation	**Dr. Virginia Garcia** *Centre for Earth Observation Sciences*
5:10	The power of GIS, geovisualization and metadata for online historical collections	**Larry Laliberté** *Libraries*
5:30	Closing	

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2:10 Integrating home range and density models can improve habitat predictions for Ferruginous Hawks (*Buteo regalis*)

Integrating home range and density models can be a hierarchical approach that incorporates landscape-scaled spatially-explicit population parameters with home range habitat selection. Our objective was to evaluate whether home range models for Ferruginous Hawks (*Buteo regalis*) can be scaled up to predict nest density and to evaluate whether conservation and recovery planning can benefit from integrated home range and density models. We developed a home range habitat selection model using nests (n= 1,309) that were used between 2004 -2010 and we also developed a density model using surveys conducted in 2012 and 2013 (n=223). Home ranges and density surveys were located across a gradient of landcover types and industrial development in Alberta and Saskatchewan, Canada. Results from our home range and density models show a hierarchical influence of landcover on Ferruginous Hawk habitat selection

Ms. Ng currently studies possible cumulative effects on Ferruginous Hawks in the Canadian Prairies. She completed her Master of Science at the University of Regina studying Common Nighthawk home range ecology. After finishing her masters, she worked as an environmental consultant and then as an environmental educator in Saskatchewan.

2:30 Distinct hyperspectral mapping of tropical dry forest vegetation species in the thermal infrared (8µm-14µm)

Relationships between vegetation classes have long been hypothesized to be divisible into functional groupings and have correlation to their local environments. Remote sensing applications have been deeply rooted in this field and indices have been used to map vegetation globally. With these indices it is very difficult and not fully capable of distinguishing plants to taxonomic levels in the visible and near infrared; however new research has revealed the thermal infrared (8µm-14µm) could potentially be species specific. The ecosystem of interest is the tropical dry forest (TDF) biome due to its sensitivity to climate change and underrepresentation in tropical biology literature. Our research was conducted in the TFD ecosystem of Santa Rosa National Park, Costa Rica. This investigation's primary question involves species specific discrimination via novel a wavelength in vegetation spectroscopy, the thermal infrared (TIR). Our findings reveal that the spectral signatures are significantly distinct.

Ms. Harrison holds a BSc in Biological Sciences (Specialization) from the University of Alberta and is currently working on her Master's in Science in the department of Earth and Atmospheric Science. Dominica is currently co-supervised by Dr. Arturo Sanchez-Azofeifa and Dr. Benoit Rivard in the Centre for Earth Observation Sciences (CEOS) at the University of Alberta. Her most recent investigation examines taxonomic discrimination of tree species with the use of physiological leaf traits and long wave infrared spectral finger prints.

2:50 Wireless Sensor Networks and Unmanned Aerial Vehicles for Spatial Analysis of Photosynthetic Light Fluxes in Forests

We describe the use of synchronized wireless sensor networks (WSNs) for continuous photosynthetically active radiation monitoring above and below broadleaf forest canopies to produce a spatio-temporally enhanced in-situ fAPAR and broadband NDVI products for the validation of remotely sensed vegetation products in seasonal forest ecosystems. Furthermore, the use of emerging consumer drone technologies, or micro-UAVs (unmanned aerial vehicles), is discussed for near-surface remote sensing applications with examples provided for forest canopy albedo characterization, study site mapping and photogrammetry, and RGB color space point cloud generation in the context of geographic information systems.

Mr. Rankine holds a BSc in Biological Sciences (Hons) and is currently a PhD Candidate in the Centre for Earth Observation Sciences (CEOS) at the University of Alberta, Edmonton, Alberta, Canada. Since 2009 he has been working under the supervision of Dr. Arturo Sanchez-Azofeifa in the development and extensive field testing of wireless sensor networks for monitoring spatially and temporally explicit patterns in phenology and micro-meteorological drivers of leaf expression in the endangered tropical dry forest ecosystems across Central and South America as part of the Tropi-Dry Project and the Inter-American Institute for Global Change Research.

3:10 Spatial patterns of train-caused mortality for large mammals before and after adjacent highway mitigation in Banff National Park, Alberta, Canada

Road mitigation in the form of fencing and wildlife crossing structures are well recognized and supported methods which have proliferated worldwide. Despite this unambiguous benefit for people and wildlife, road mitigation could have unintended collateral effects if it funnels wildlife movement toward adjacent but unmitigated risks, including other roads or railways. We examined temporal and spatial patterns of wildlife–train collisions of large mammalsover the past three decades in Banff National Park.

***Mr. Gilhooly** is a MSc student in the Department of Biological Sciences, supervised by Dr.Colleen Cassady St. Clair. He is currently a part of the University of Alberta Grizzly Bear Research and Mitigation Project, as part of the broader Canadian Pacific – Parks Canada Grizzly Bear Research Initiative.*

4:10 The Edmonton-Calgary Corridor: Simulating Future Land Cover Change Under Potential Government Intervention

The Edmonton-Calgary corridor in Alberta, Canada, contains rich agricultural land and is experiencing high rates of alteration due to urban expansion. Despite this rapid change, current provincial environmental policy has few restrictions on urban expansion and subsequent fragmentation of croplands and grasslands. Additionally, long-term land cover change (LCC) assessments have not been created for the province's agricultural belt to track the distribution of regional urbanization, making it difficult to predict future alteration. As a result of these knowledge gaps, the main goals of this study are to assess historical changes in the Edmonton-Calgary corridor from the past 30 years and simulate the future LCC under potential government intervention scenarios using the Dinamica Environment for Geoprocessing Objects (EGO) platform.

Ms. Stan is a PhD student in the Earth and Atmospheric Sciences department. Her research focuses on modelling environmental changes, especially land cover change (LCC), and predicting the future of the landscape. Her interest also includes incorporating socio-economic and legislative information into the model platform.

4:30 Regenerative role of wildfires for ecosystems and impacts on natural cycles.

There is always a wildfire burning somewhere on Earth, fulfilling its regenerative role for ecosystems, but also impacting the functioning of important natural cycles, such as the hydrological cycle. Consequently, surface freshwater resources, critical for human-kind and ecosystems, can be affected in their quantity, quality, and seasonality. Although well studied at the local scale, the potential extent of these effects has never before been examined at the global scale. We propose here a spatial risk framework, the global wildfire-water risk (GWWR) index, which consists of a spatially-explicit index of risk. We first selected several variables related to fire activity and water availability and normalized them in order to use them as risk indicators. We then carried out an additive aggregation of those indicators with all of them having an equal weight. The resulting index shows the highest risk scores in the tropical wet and dry forests. Intermediate scores are visible in mountain ranges and dry shrublands, whereas the lowest index scores are located mostly at high latitudes. We believe that such an approach can provide important insights in terms of water security and therefore guide global freshwater resource preservation.

Mr. Robinne got his BSc of Environmental Geography in Southern France. There, he started to learn about fire issues, highly critical in the Mediterranean due to deep historical changes in human population dynamics which transformed land-use and land-cover. It is this intersection of natural and social aspects of fire hazards that led him to achieve a MSc with a focus on wildfire risk assessment. After several years as a remote-sensing and GIS analyst for forest resource management in the private sector, he started a PhD in 2013. His research focuses on the spatial assessment of wildfire risks to water security. He intensively uses GIS technologies, data management, statistics and programming.