A Synthetic Aperture Radar, Optical and Lidar, Data Fusion Approach to Wetland Classification in a Boreal Environment of the Utikuma Regional Study Area, Alberta, Canada.

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ABSTRACT

The Utikuma Regional Study Area (URSA) is a boreal plains region located approximately 100 km north of Slave Lake in the Central Mixedwood Natural Subregion of Northern Alberta, Canada. Natural resources extraction, agricultural land cover change, and drying as a result of warmer climate conditions are all contributing to significant and some of the greatest boreal zone changes, especially in central Alberta. Wetlands are especially sensitive to disturbance and changes to hydrology, which are predominantly comprise of shallow ponds, treed fens and bogs on poorly drained organic soils. With increasing disturbance and changing hydrological patterns, accurate, high resolution classification of these boreal wetlands is required for understanding rates of boreal wetland change, many of which have yet to be accurately quantified.

Synthetic Aperture Radar (SAR) has proven to be an ideal sensor for surface water and flooded vegetation mapping due to increased contrast and reflectivity between land and water. High spatial resolution data fusion methods using other sensor data (Lidar & optical) provides increased accuracy for wetland extent mapping and wetland type classification. The objective of this study is to provide a new classification methodology for wetlands based on hydroperiod and riparian vegetation community using multi-temporal, multi-mode data from Lidar (Optech Titan, bathymetric), Synthetic Aperture Radar (Radarsat-2, single & quad polarisation), and optical (SPOT & RapidEye) sensors with similar acquisition dates. Ground data collection collected within several days of data acquisition provides spatial validation for riparian vegetation species, composition, and hydroperiod of surface water and flooded vegetation. A combination of statistical analyses and ground validation of the output classes is used to evaluate the data fusion approach for mapping the riparian ecology and surface water extent of wetlands. This presentation will describe how wetlands are changing seasonally and annually, and present the results of the data fusion approach to wetland classification.