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NWT Environmental Research Bulletin (NERB)

NWT Cumulative Impact Monitoring Program (NWT CIMP)

A source of environmental monitoring and research in the NWT. The program coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT.

NWT Environmental Research Bulletin (NERB)

A series of brief plain language summaries of various environmental research findings in the Northwest Territories. If you're conducting environmental research in the NWT, consider sharing your information with northern residents in a bulletin. These research summaries are also of use to northern resource decision-makers.

Remote Sensing of the Scotty Creek Basin

Accurate land cover maps are critical to our understanding of how water moves across the landscape and necessary to predict impacts of climate change on water resources. Wilfrid Laurier University researchers created and tested a new method to map land cover types – such as forests, bogs and fens – in the headwaters of the Scotty Creek basin, located in the southern Taiga Plains ecozone approximately 55 kilometres south of Fort Simpson, Northwest Territories (NWT).

Why is this research important?

This work helps predict the continued impacts of climate warming on water resources in the southern Taiga Plains ecozone. Previous research in the region has linked climate warming with permafrost thaw and changes to water flow. Scientists and residents wonder how permafrost and water flow will change in the future. To predict future water flow, researchers use numerical models. These models need accurate land cover and water flow information from the present to make good future predictions. This research collected data from sensors on aircraft and satellites to create more accurate land cover maps of the Scotty Creek headwaters, which can be used for permafrost and water flow models.

What did we do?

To generate an accurate snapshot of current land cover, we used remote sensing tools such as Light Detection and Ranging (LiDAR) data and World View multispectral image data. We used the remote sensing data to identify different landforms in headwaters areas, including treed permafrost plateaus, bogs, fens, uplands and open water (ponds, lakes). We took field measurements at some locations in the study area to check our classification. We also compared our new approach to existing land cover maps, which were made using traditional methods of mapping the terrain, such as aerial photography.

What did we find?

The land classification approach used in this research described key landforms very accurately. For example, when compared with our field measurements, the new method found edges of a fen to within two metres 60% of the time. This is better than traditional methods, which were within two metres only 40% of the time. This improvement in mapping accuracy has significant benefits for reducing the uncertainty of hydrological models that require land cover maps.

Aerial view of land cover types near Scotty Creek Research Station, NWT.
(Photo credit: Cold Regions Research Centre, Wilfrid Laurier University)

What does this mean?

A detailed description of land cover is necessary to understand and predict water flow. It is also information critical to understanding the impacts of climate change on the landscape. For instance, the detailed description of the landscape demonstrated in this research could be used to reduce the uncertainty involved in modelling the impacts of future climate warming in the sub-arctic.

What do we do next?

The data and maps produced in this project provide a strong foundation for ongoing research in the Taiga Plains region. The information will be used by researchers in a partnership between the Government of the Northwest Territories (GNWT) and Wilfrid Laurier University (www.nwtwlu.com) to create new knowledge for use by NWT communities and decision-makers.

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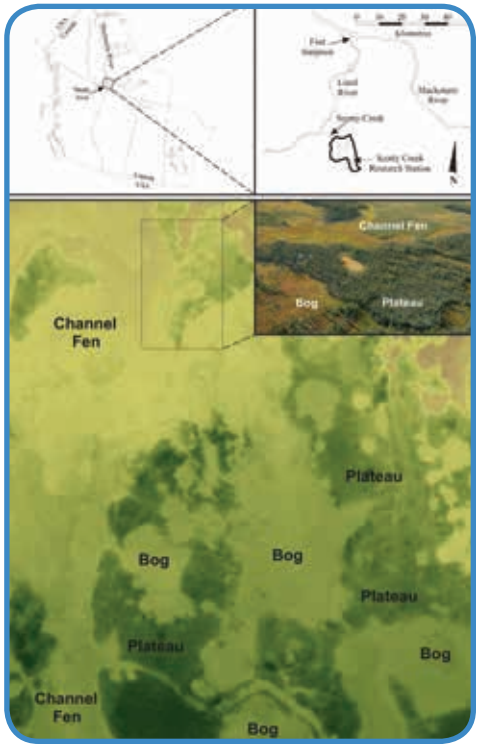
What is LiDAR and World View multispectral imagery?

Light Detection and Ranging (LiDAR) is a tool used to scan the earth from a satellite. It works on the principle of radar – sensing things by bouncing radio signals off of them; however, it uses light from a laser instead of radio waves. World View is a satellite that can capture very high resolution images over many different wavelengths, including those that cannot be seen by the human eye. Both LiDAR and World View imagery can be used to provide detailed information about vegetation, surface water and landforms. However, the imagery is currently expensive, so it is usually used for relatively small areas.



Recommended Reading

Chasmer, L., Hopkinson, C., Veness, T., Quinton, W.L. and Baltzer, J.L. 2014. A decision-tree classification for low-lying complex land cover types within the zone of discontinuous permafrost. Remote Sensing of Environment. 143:73-84.