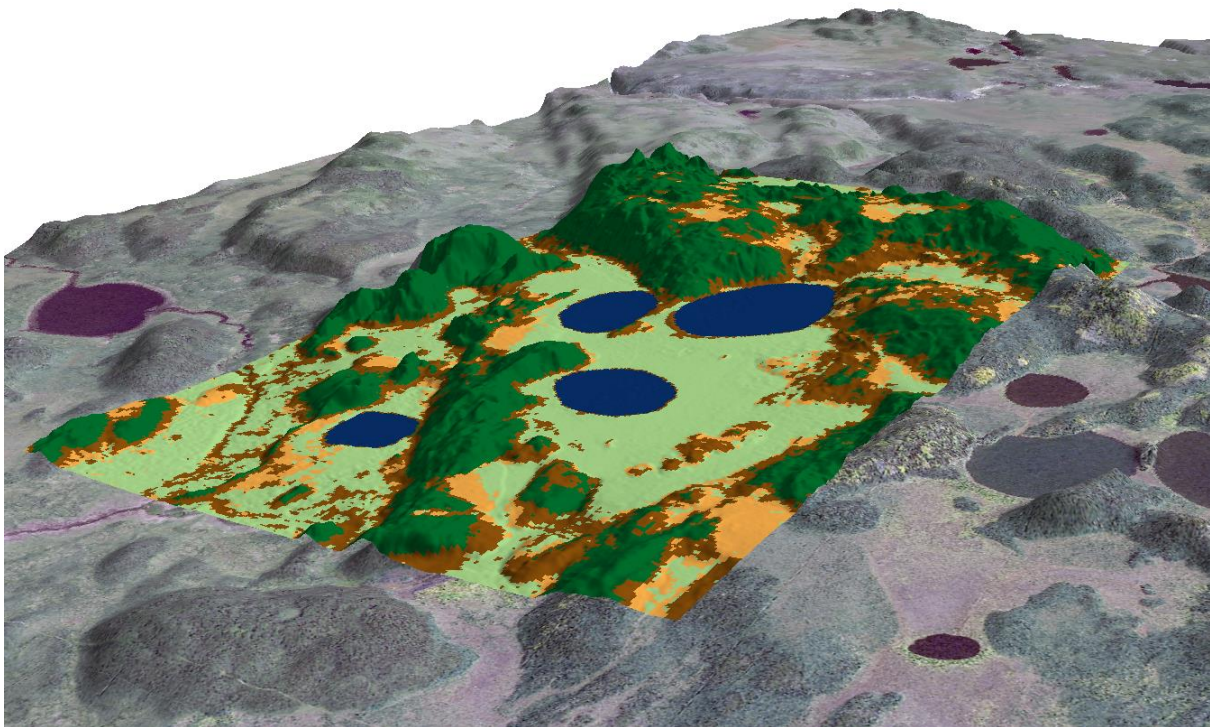


Advanced Landcover Prediction and Habitat Assessment (ALPHA) 1.0 – metadata

“ALPHA_OS_10.tif”

ABMI Geospatial Centre

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1. Overview

1.1 Summary

The Advanced Landcover Prediction and Habitat Assessment (ALPHA) is a geospatial sensor system built using a fusion of optical, Radar, LiDAR DEM, and other DEMs. The ALPHA System is enabled through machine learning and provides clients with high quality information to support their business needs. The product divides 60% of Alberta into five landcover classes (open water, upland, mineral wetland, fen, and bog). Km²

1.2 Description

ALPHA predicts five land cover classes across 60% of Alberta, Canada at a 10m resolution. It utilizes open source Sentinel-1 and -2 data provided by the European Space Agency, a LiDAR Digital Elevation Model (DEM) provided by the government of Alberta (Government of Alberta, 2006), and an SRTM DEM from the USGS (USGS, 2006). The Boosted Regression Tree (Elith *et al.*, 2008) machine learning predictive model is trained with ABMI 3x7 photo plots (ABMI, 2016). The version available for download represent the fully open source version of ALPHA and does not use proprietary LiDAR data. For sharing of the LiDAR based version please contact the ABMI Geospatial Centre (abmigg@ualberta.ca).

1.3 Credits

This dataset was developed and generated by the ABMI's Geospatial Centre Research Team.

1.4 Citation

This product should be cited with the following document:

Alberta Biodiversity Monitoring Institute. 2018. "Advanced Landcover Prediction and Habitat Assessment (ALPHA) 1.0 – metadata." Edmonton, Alberta, Canada.

An additional scientific publication citation can also be given:

Hird, J., DeLancey, E.R., McDermid, G.J., and Kariyeva, J. 2017. "Google Earth Engine, Open-Access Satellite Data, and Machine Learning in Support of Large-Area Probabilistic Wetland Mapping." *Remote Sensing*, Vol. 9(No.12): pp. 1315.

1.5 Contact Information

If you have questions or concerns about the data, please contact:

Geospatial Centre

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1.6 Keywords

Alberta, Boreal Natural Region, remote sensing, spatial modelling, boosted regression trees, wetlands, Synthetic Aperture Radar, Sentinel-1, Sentinel-2, LiDAR, ALPHA, machine learning, cloud computing, Google Earth Engine.

2. Use Limitations

This dataset was based on freely available open source Sentinel-1, -2, and SRTM data. The LiDAR DEM was provided by the Government of Alberta and is proprietary data. This data set, ALPHA, may be freely used if cited properly.

2.1 Proprietary Sourced Data

This dataset contains data originating from proprietary sources, which has subsequently been enhanced through computer processing. The Proprietary Sourced Data shall not be used or reproduced in whole or in part or in any form. By accessing the Proprietary Sourced Data, you agree to indemnify and hold harmless the ABMI and the ABMI's subsidiaries, affiliates, related parties, officers, directors, employees, agents, independent contractors, advertisers, partners, and co-branders, from any and all actions, proceedings, claims, demands, liabilities, losses, damages, and expenses which may be brought against or suffered by the ABMI or which it may sustain, pay or incur, arising or resulting from your violation of this clause. The Proprietary Sourced Data is provided on an "As Is" and "As Available" basis and the ABMI does not guarantee that the Proprietary Sourced Data will be suitable for your purposes or requirements. The ABMI further states that the Proprietary Sourced Data is subject to change, and the ABMI gives no guarantee that the content is complete, accurate, error or virus free, or up to date. The ABMI disclaims all warranties, conditions, and other terms of any kind, whether express or implied, whether in contract, tort (including liability for negligence) or otherwise, including, but not limited to any implied term of satisfactory quality, fitness for a particular purpose, and any standard of reasonable care and skill.

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2.3 Exclusive ABMI Sourced Data

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3. Data Product Specifications

3.1 Spatial resolution

The Sentinel visible and near infrared data has a resolution of 10m, the LiDAR DEM has a spatial resolution of 1m, SRTM DEM has a resolution of 30m. All layers were resampled to a common resolution of 10m for spatial modelling.

3.2 Processing Environment

Google Earth Engine code editor (Goerlick *et al.*, 2017), R 3.3.1 (R Core Team, 2016), and Microsoft Windows 7 Version 6.1 (Build 7601) Service Pack 1; Esri ArcGIS 10.3.0.4322.

3.3 Extents

West: -120.73°

East: -109.08°

North: 60.10°

South: 51.43°

3.4 Resource Maintenance

Maintenance will be implemented as needed if errors are noticed. New versions will be completed for future years with improvements to the modelling or variable inputs.

3.5 Spatial Reference

North_American_1983_Transverse_Mercator

WKID: 3400 Authority: EPSG

Projection: Transverse Mercator

False Easting: 500000.0

False Northing: 0.0

Central Meridian: -115.0

Scale Factor: 0.9992

Latitude of Origin: 0.0

Linear Unit: Meter (1.0)

Geographic Coordinate System: GCS_North_American_1983

Angular Unit: Degree (0.0174532925199433)

Prime Meridian: Greenwich (0.0)

Datum: D_North_American_1983

Spheroid: GRS_1980

Semimajor Axis: 6378137.0

Semiminor Axis: 6356752.314140356

Inverse Flattening: 298.257222101

4. Lineage

This represent the first version (1.0)/prototype phase of the ALPHA product. Updated will be made annually or biannually as needed. Additionally full coverage of Alberta is anticipated in future versions.

5. Data and symbology

Table 1 summarizes the numerical values as landcover classes and shows the colours used for the ABMI produced figures.

Table 1: The associated landcover name, description, and suggested symbology of the five numerical values found in the ALPHA data.

Value	Landcover class	description	Symbology (R,G,B and HEX)
0	Open water	Open water delineated by the Boreal surface water inventory.	RGB - 8,48,107 HEX - #08306b
1	Upland	All non-wetland land types which includes: upland forest, grasslands, human footprint, and barren ground.	RGB - 0,109,44 HEX - #006d2c
2	Mineral wetlands	Swamps, marshes, and shallow open water. Shallow water classes may be contained in the open water class in many cases.	RGB - 140,81,10 HEX - #8c510a
3	Fen	All types of fen habitat.	RGB - 173,221,142 HEX - #addd8e
4	Bog	All types of bog habitat.	RGB - 254,178,76 HEX - #feb24c

6. Methods

The ALPHA product is the summary of four separate products: Boreal Surface water inventory, Boreal Wetland probability, Boreal Peatland probability, and Boreal Fen probability. These products and their full technical documentation can be found on the ABMI website here (<http://www.abmi.ca/home/data-analytics/da-top/da-product-overview/GIS-Land-Surface.html>). Information of how the land cover classes can be found in the documentation of associated products.

Once data was compiled from all four products they were summarized into five distinct classes and assigned an integer value according to Table 1. The resulting product was then generalized further to create smoother landcover classes by using a 5x5 pixel (50x50m) modal filter.

7. Results

Overall the ALPHA data achieved 72.8% accuracy to ABMI 3x7 photo plot data. Table 2 shows the confusion matrix for all five classes. Figure 1 shows the ALPHA product predicted across 60% of Alberta. In total, 60% of the region is upland, 18% mineral wetland, 12% fen, 5% bog, and 4% open water.

Table 2: Confusion matrix of the five classes for the ALPHA product. Producer and user accuracy are in green and overall accuracy is in bolded green.

	Open water	Upland	Mineral wetland	Fen	Bog	User accuracy
Open water	14308	165	197	76	0	97.0
Upland	913	161361	7481	5997	257	91.7
Mineral wetland	754	22349	13957	15882	1493	25.6
Fen	95	4271	6329	24308	2637	64.6
Bog	3	1716	4095	6849	4158	24.7
Producer accuracy	89.0	85.0	43.5	45.8	48.7	72.8

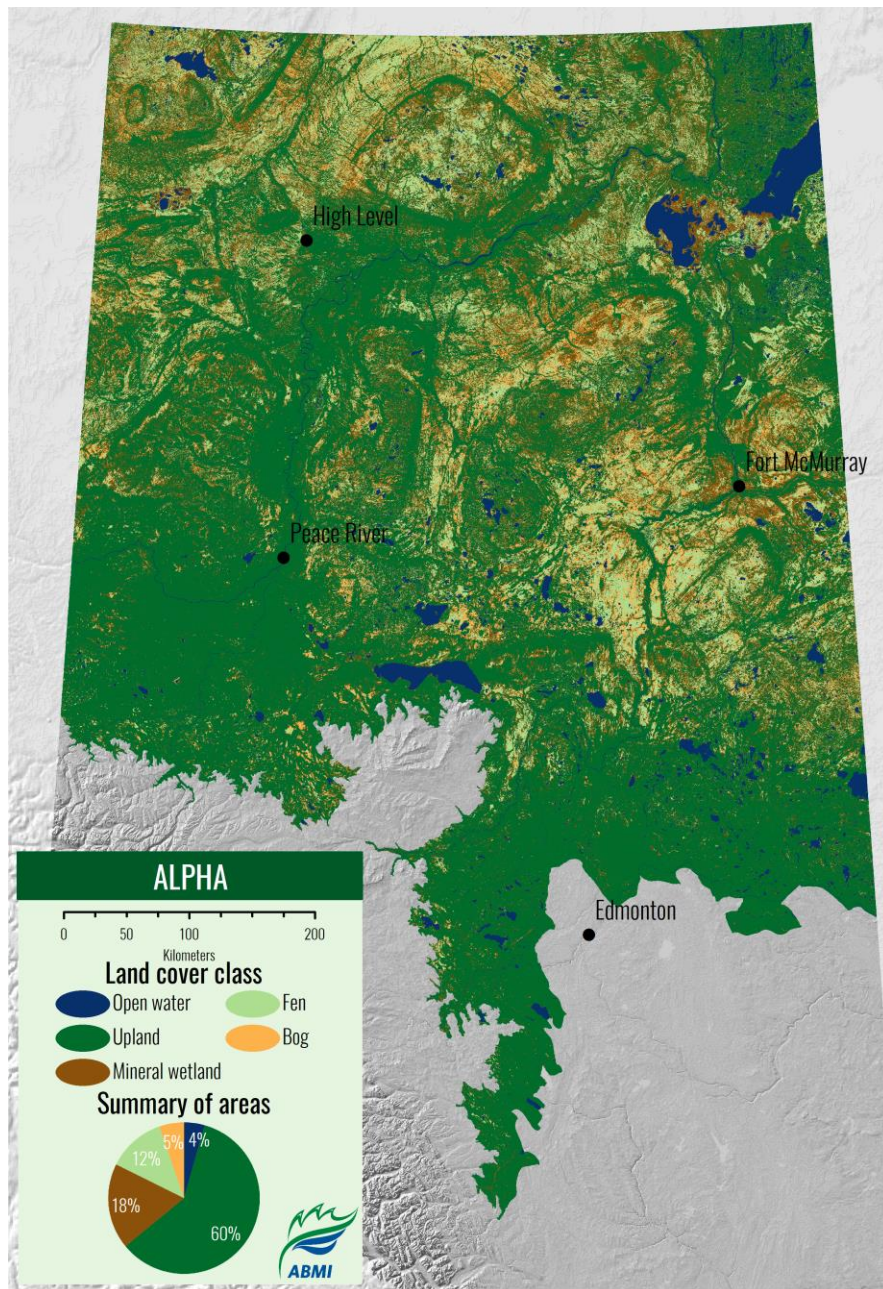


Figure 1: The ALPHA product across 60% of Alberta.

8. References

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