


ORNL DAAC
DISTRIBUTED ACTIVE ARCHIVE CENTER
FOR BIOGEOCHEMICAL DYNAMICS



About Us

Products

Data

Tools

Help

Home
Sign in
Data

DAAC Home > Data > Field Campaigns > NACP (North America) > Data Set Documentation

NACP Peatland Landcover Type and Wildfire Burn Severity Maps, Alberta, Canada

Get Data

Revision Date: August 25, 2015

Summary:

This data set provides landcover maps of (1) peatland type (bog, fen, marsh, swamp) with levels of biomass (open, forested) and (2) Burn Severity Index (BSI) (Dyrness and Norum, 1983) for four wildfire areas in northern Alberta, Canada. The four wildfire sites include the Utikuma fire site of 2011, Kidney Lake fire site of 2011, Fort McMurray west fire site of 2009, and Fort McMurray east fire site of 2009.

The peatland classification at 12.5-m resolution (fen vs. bog including treed vs. open vs. shrubby) at each wildfire site was based on a pre-burn 2007 multi-date, multi-sensor fusion (Optical-IR, C-band and L-band SAR) approach. Over 350 field locations were sampled in central Alberta to train and validate the peatland type maps. The additional site, Wabasca, was an unburned site.

Burn severity was measured in the field using the Burn Severity Index (BSI) (Dyrness and Norum 1987), a qualitative assessment of burnt moss that uses a 1-5 scale, with 1 being unburnt and 5 being severely burnt. The field data of ground consumption were correlated with Landsat pre- and post-burn imagery, specific to peatlands, to develop multivariate models for calculating burn severity and %-not-sphagnum-moss. These models were used to generate the Burn Severity Maps at 30-m resolution (percent unburned moss, and the burn severity index (BSI)).

All sites were visited in 2013 for field measurements and the Utikuma site was also visited in 2012 for field measurements. Additional biophysical data for the various peatlands (aboveground biomass – tree and shrub, plant heights, density, etc.) were collected and will be provided in another data set.

There are five peatland type maps in GeoTIFF (*.tif) format and six burn severity maps in GeoTIFF (*.tif) format with this data set. Field data from central Alberta used to train and validate the peatland type maps is included as a comma-separated (*.csv) file.

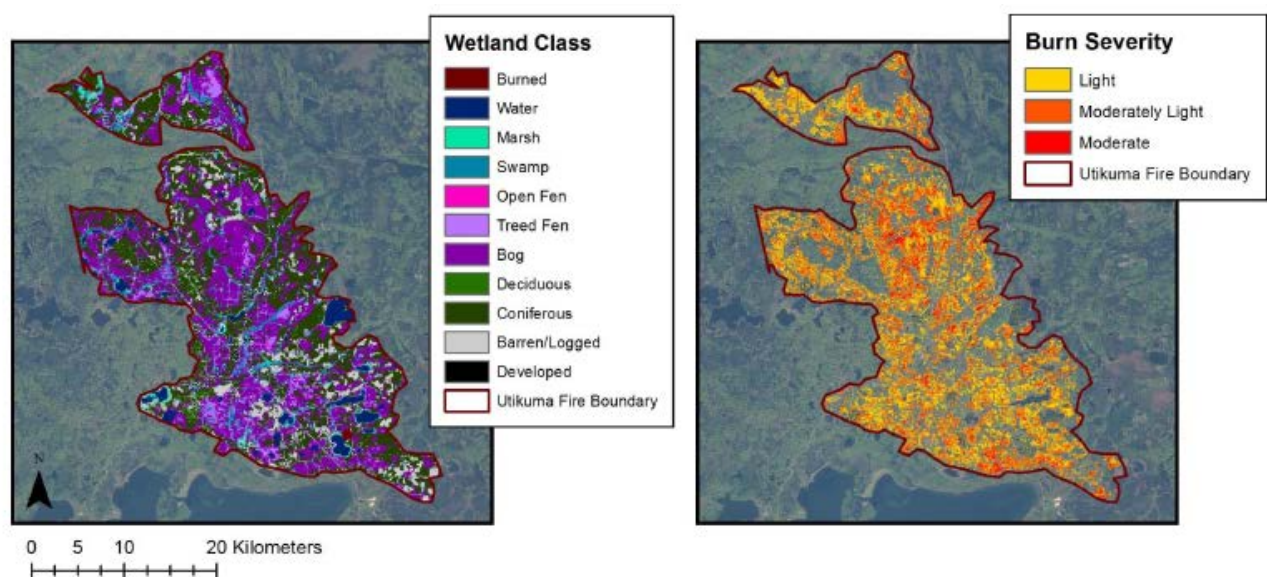


Figure 1. Utikuma site map showing peatland type for non-burned areas and modeled BSI for the Utikuma fire (Bourgeau-Chavez et al., 2015).

Data and Documentation Access:

Get Data: http://daac.ornl.gov/cgi-bin/dsvviewer.pl?ds_id=1283

Companion Files:

- NACP_Peatland_Burn-Severity.pdf: a pdf of this guide

Data Citation:

Cite this data set as follows:

Bourgeau-Chavez, L.L., S. Endres, E. Banda, R. Powell, M.R. Turetsky, B. Benscoter, and E.S. Kasischke. 2015. NACP Peatland Landcover Type and Wildfire Burn Severity Maps, Alberta, Canada. ORNL DAAC Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1283>

Table of Contents:

- [1 Data Set Overview](#)
- [2 Data Characteristics](#)
- [3 Applications and Derivation](#)
- [4 Quality Assessment](#)
- [5 Acquisition Materials and Methods](#)
- [6 Data Access](#)
- [7 References](#)

1. Data Set Overview:

Project: North American Carbon Program (NACP)

The NACP (Denning et al., 2005; Wofsy and Harriss, 2002) is a multidisciplinary research program to obtain scientific understanding of North America's carbon sources and sinks and of changes in carbon stocks needed to meet societal concerns and to provide tools for decision makers. Successful execution of the NACP has required an unprecedented level of coordination among observational, experimental, and modeling efforts regarding terrestrial, oceanic, atmospheric, and human components. The project has relied upon a rich and diverse array of existing observational networks, monitoring sites, and experimental field studies in North America and its adjacent oceans. It is supported by a number of different federal agencies through a variety of intramural and extramural funding mechanisms and award instruments.

This data set provides landcover maps including peatland type (bog, fen, marsh, swamp) and level of biomass (open, forested) and burn severity maps for four wildfire areas in Alberta, Canada. The four wildfire sites include the Utikuma fire site of 2011, Kidney Lake fire site of 2011, Fort McMurray west fire site of 2009, and Fort McMurray east fire site of 2009.

The Peatland Type Maps (fen vs. bog including treed vs. open vs. shrubby) were based on multivariate, multi-sensor fusion (Optical-IR, C-band and L-band SAR); the Burn Severity Maps (percent unburned moss, and a burn severity index (BSI)) were based on the ground consumption and Landsat pre- and post-burn imagery specific to peatlands. Over 350 field locations were sampled in central Alberta to train and validate the peatland type maps.

All sites were visited in 2013 for field measurements and the Utikuma site was also visited in 2012 for field measurements. Burn severity was measured in the field using the Burn Severity Index (BSI) (Dyrness and Norum 1987), a qualitative assessment of burnt moss that uses a 1-5 scale, with 1 being unburnt and 5 being severely burnt. The field data were correlated with Landsat data to develop multivariate models for calculating burn severity and %-not-sphagnum-moss. These models were used to generate the burn severity maps.

2. Data Characteristics:

Spatial Coverage

Central Alberta, Canada

Spatial Resolution

Peatland Landcover Type maps are at 12.5-m resolution and Wildfire Burn Severity Maps are 30-m resolution. Field sites are points in the center of 0.5-acre plots at selected locations across central Alberta within the map areas shown on Figure 2.

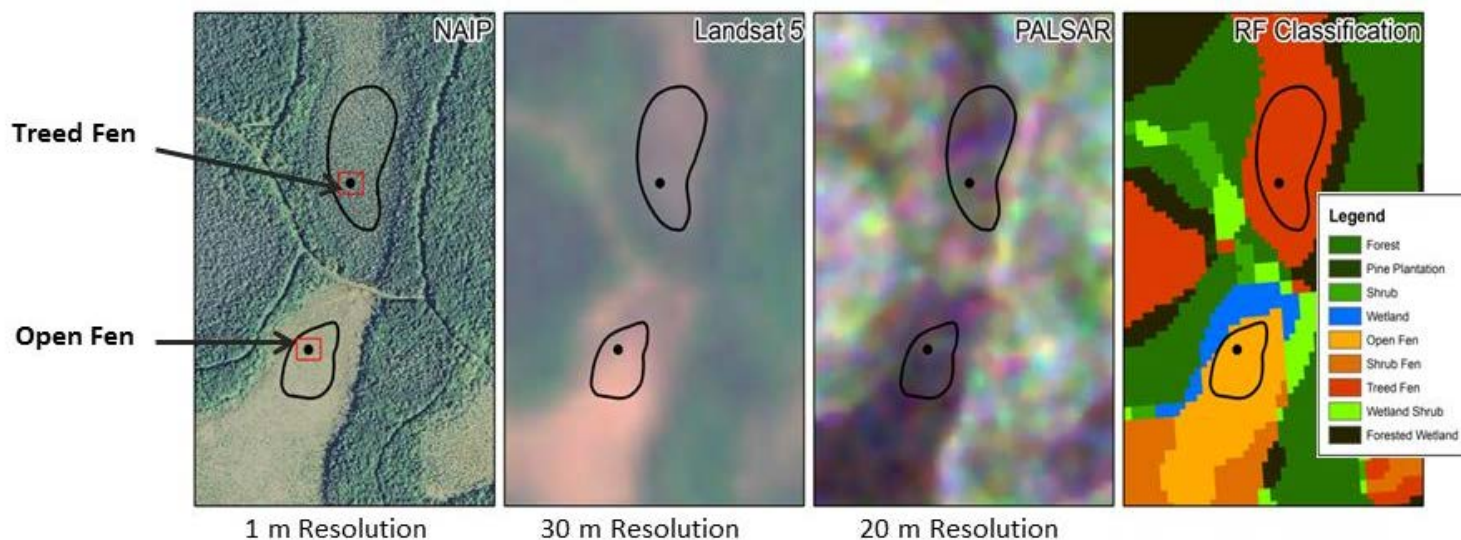


Figure 2. The field validation sampling plot (first image, the National Agricultural Imagery Program) in relation to the 30-m resolution Landsat, 20-m resolution SAR and the output map product. The red box shows a field measured plot of 40 x 50 m, black dot is the center of this plot. Black outline polygons are air photo interpreted areas for training data in the classifier.

Temporal Coverage

Field data were collected from 2010-06-17 to 2013-07-22

Temporal Resolution

These are one-time estimates of landcover and burn severity, based on one-time measurements at each field site.

Site boundaries: (All latitude and longitude given in decimal degrees, datum: WGS84)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Canada	-114.9007	-110.2864	57.2062	56.9053

Data File Information

There are 11 GeoTIFF files (*.tiff) and one comma-separated file (.csv) with this data set. The GeoTIFF files are landcover maps including peatland type (bog, fen, marsh, swamp) at 12.5-m resolution, and level of biomass (open, forested) and burn severity maps at 30-m resolution for four peatland wildfire areas in northern Alberta, Canada: Utikuma, Kidney Lake, Fort McMurray west, and Fort McMurray east. The .csv file provides field data from central Alberta used to train and validate the peatland type maps.

Table 1. GeoTIFF file names

File name
Peatland-type GeoTIFFS
peatland_type_fort_mcmurray_east.tif
peatland_type_fort_mcmurray_west.tif
peatland_type_kidney_lake.tif
peatland_type_wabasca.tif
peatland_type_utikuma.tif
Burn Severity GeoTIFFS
BSI_Kidney_Lake_2009.tif
BSI_MWF_2009.tif
BSI_Utikuma_2011.tif
pct-not-sphag_Kidney_Lake_2009.tif
pct-not-sphag_MWF_2009.tif
pct-not-sphag_Utikuma_2011.tif

Spatial Data Properties

Peatland-type GeoTIFFS-The spatial properties vary for each Peatland-type GeoTIFF with regards to their spatial extents, column numbers and rows. However the properties below are the same for all files:

Spatial Data Properties

Spatial Representation Type: Raster

Pixel Depth: 4 bit

Pixel Type: byte

Compression Type: LZW

Number of Bands: 1

Raster Format: TIFF

Source Type: discrete

No Data Value: 15

Scale Factor: 0.9996

Table 2. Spatial properties for each Peatland-type GeoTIFF

<p>File: peatland_type_fort_mcmurray_east.tif</p> <p>Spatial Data Properties</p> <p>Number Columns: 6896 Column Resolution: 12.5 meter Number Rows: 9727 Row Resolution: 12.5 meter Extent in the item's coordinate system North: 6278803.284 South: 6157215.784 West: 437201.645 East: 523401.645</p> <p>Spatial Reference Properties Type: Projected Geographic Coordinate Reference: WGS 1984 Projection: UTM_Zone_12_Northern_Hemisphere Open Geospatial Consortium (OGC) Well Known Text (WKT) PROJCS["UTM_Zone_12N", GEOGCS["WGS 84", DATUM["WGS_1984", SPHEROID["WGS 84",6378137,298.257223563, AUTHORITY["EPSG","7030"]], AUTHORITY["EPSG","6326"]], PRIMEM["Greenwich",0], UNIT["degree",0.0174532925 AUTHORITY["EPSG","4326"]], PROJECTION["Transverse_Mercator"], PARAMETER["latitude_of_origin",0], PARAMETER["central_meridian",-111], PARAMETER["scale_factor",0.9996], PARAMETER["false_easting",500000], PARAMETER["false_northing",0], UNIT["metre",1, AUTHORITY["EPSG","9001"]], AUTHORITY["EPSG","32612"]]</p> <p>File: peatland_type_fort_mcmurray_west.tif</p> <p>Spatial Data Properties</p> <p>Number Columns: 6906 Column Resolution: 12.5 meter Number Rows: 9743 Row Resolution: 12.5 meter Extent in the item's coordinate system North: 6279473.486 South: 6157685.986 West: 403546.17 East:489871.17</p>
--

Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: WGS 1984
Projection: UTM_Zone_12_Northern_Hemisphere
Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["UTM_Zone_12N",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433],
AUTHORITY["EPSG","4326"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",-111],
PARAMETER["scale_factor",0.9996],
PARAMETER["false_easting",500000],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],
AUTHORITY["EPSG","32612"]]]

File: peatland_type_kidney_lake.tif

Spatial Data Properties

Number Columns: 5482
Column Resolution: 12.5 meter
Number Rows: 9743
Row Resolution: 12.5 meter
Extent in the item's coordinate system
North: 6337775.277
South: 6269250.277
West: 595501.336
East:675951.336

Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: WGS 1984
Projection: UTM_Zone_11_Northern_Hemisphere
Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["UTM_Zone_11N",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433],
AUTHORITY["EPSG","4326"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",-117],
PARAMETER["scale_factor",0.9996],
PARAMETER["false_easting",500000],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],
AUTHORITY["EPSG","32612"]]]

File: peatland_type_utikuma.tif

Spatial Data Properties

Number Columns: 7,937

Column Resolution: 12.5 meter
Number Rows: 12,217
Row Resolution: 12.5 meter
Extent in the item's coordinate system
North: 6260024.076
South: 6107319.336
West: 576912.049
East: 676119.507

Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: WGS 1984
Projection: UTM_Zone_11_Northern_Hemisphere
Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["UTM_Zone_11N",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433],
AUTHORITY["EPSG","4326"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",-117],
PARAMETER["scale_factor",0.9996],
PARAMETER["false_easting",500000],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],
AUTHORITY["EPSG","32612"]]

File: peatland_type_wabasca.tif

Spatial Data Properties

Number Columns: 6,528
Column Resolution: 12.5 meter
Number Rows: 12,932
Row Resolution: 12.5 meter
Extent in the item's coordinate system
North: 6276847
South: 6115197
West: 313991.275
East: 395591.275

Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: WGS 1984
Projection: UTM_Zone_12_Northern_Hemisphere
Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["UTM_Zone_12N",
GEOGCS["WGS 84",
DATUM["WGS_1984",
SPHEROID["WGS 84",6378137,298.257223563,
AUTHORITY["EPSG","7030"]],
AUTHORITY["EPSG","6326"]],
PRIMEM["Greenwich",0],
UNIT["degree",0.0174532925199433],
AUTHORITY["EPSG","4326"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",-111],
PARAMETER["scale_factor",0.9996],
PARAMETER["false_easting",500000],
PARAMETER["false_northing",0],
UNIT["metre",1,
AUTHORITY["EPSG","9001"]],

AUTHORITY["EPSG","32612"]

Burn Severity GeoTIFFS

Table 3. The spatial properties do not vary for the burn severity GeoTIFFS and they are defined below.

Example file: **Utikuma_modeled_pct_not_Sphag_bound.tif**

```

Spatial Representation Type: Raster
Pixel Depth: 32 bit
Pixel Type: floating point
Compression Type: LZW
Number of Bands: 1
Raster Format: TIFF
Source Type: discrete
No Data Value: -3.40282346639e+038
Scale Factor: 0.9996

Number Columns: 2196
Column Resolution: 30 meter
Number Rows: 2986
Row Resolution: 30 meter

Extent in the item's coordinate system
North: 6278424.60221
South: 6188844.60221
West: 569284.295196
East: 635164.295196
Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: WGS 1984

Projection: UTM_Zone_11_Northern_Hemisphere
Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["WGS 84 / UTM zone 11N",
  GEOGCS["WGS 84",
    DATUM["WGS_1984",
      SPHEROID["WGS 84",6378137,298.257223563,
        AUTHORITY["EPSG","7030"]],
      AUTHORITY["EPSG","6326"]],
    PRIMEM["Greenwich",0],
    UNIT["degree",0.0174532925199433],
    AUTHORITY["EPSG","4326"]],
  PROJECTION["Transverse_Mercator"],
  PARAMETER["latitude_of_origin",0],
  PARAMETER["central_meridian",-117],
  PARAMETER["scale_factor",0.9996],
  PARAMETER["false_easting",500000],
  PARAMETER["false_northing",0],
  UNIT["metre",1,
    AUTHORITY["EPSG","9001"]],
  AUTHORITY["EPSG","32611"]]
    
```

Field Data Descriptions

Field data from central Alberta were used to train and validate the peatland type maps. Field data were compiled from the four fire sites and the Wabasca unburned site. Table 2 describes these data.

Missing values are represented as -9999.

Table 2. File description for **Alberta_field_validation_data_variable.csv**

Variable name	Units	Explanation
Site Name		Unique name given to a field point

Date	YYYY-MM-DD	
Latitude	decimal degrees	Latitude in decimal degrees of the center point of each plot. The locations (plots) represent a homogenous ½ acre area around point.
Longitude	decimal degrees	Longitude in decimal degrees of the center point of each plot. The locations (plots) represent a homogenous ½ acre area around point.
Time	HH:MM	Time at which field work began in local time (MDT)
Observers	Name	Person(s) who collected data
Peat_depth	cm	Estimate of depth of peat, using a peat probe (depth of rod pushed through the peat layer)
Peat_depth_flag		A flag of 1111 indicates a minimum value (i.e 200 cm indicates peat is greater than 200 cm in depth but actual depth was not measured) and a flag value of 2222 indicates values that were recorded as approximate in the field notes
Soil_ph		pH units, measured in the field, with pH probe at 30cm deep
Ecosystem		Type of ecosystem; Bog, Fen, Marsh, Swamp, Open Water, Upland, Floating Aquatic, Other
Wetness		Wetness of ground estimated by visual inspection: Dry (no moisture present); Moist (moisture present but not saturated); Soggy (saturated with water but no areas of standing water); Standing Water (visible standing water present in plot)
Vegetation		List of vegetation species present
Dense_trees	percent	Percent or range coding-Percent of plot (1/2 acre area) covered in dense trees.
Dense_trees_flag		In some plots tree coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Dense_trees_dist		Description of dense tree distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Moderate_trees	percent	Percent or range coding Percent of plot (1/2 acre area) covered in moderate trees.
Moderate_trees_flag		In some plots tree coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Moderate_trees_dist		Description of moderate tree distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Sparse_trees	percent	Percent of plot (1/2 acre area) covered in sparse trees.
Sparse_trees_flag		In some plots tree coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Sparse_trees_dist	percent	Description of sparse tree distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Open_water		Percent of plot (1/2 acre area) covered in open water.
Open_water_flag		In some plots open water coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Open_water_dist		Description of open water distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Shrubby	percent	Percent of plot (1/2 acre area) covered in shrubs.
Shrubby_flag		In some plots shrub coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555

Shrubby_dist		Description of shru distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Moss	percent	Percent of plot (1/2 acre area) covered in moss.
Moss_flag		In some plots moss coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Moss_dist		Description of moss distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Grass_sedge	percent	Percent of plot (1/2 acre area) covered in grass/sedge, based on a visual inspection.
Grass_sedge_flag		In some plots grass/sedge coverage was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Grass_sedge_dist		Description of grass/sedge distribution. Three patterns were common and are indicated where noted in field notes: Evenly distributed throughout the plot (E), found primarily in the center of the plot (C) and found primarily around the periphery of the plot (P)
Other	percent	Percent of plot (1/2 acre area) covered in other vegetation. Sometimes value is a percent and others is a range (High, Moderate, Low)
Other_flag		In some plots coverage of other vegetation was recorded as an estimated percent in others it was coded as high, moderate or low. For consistency a value of 75 % was recorded for those plots marked high, 50 % for those marked moderate and 25% for those marked low. Plots where the coverage was coded rather than estimated we have included a flag value of 5555
Other_dist		Description of other distribution: E (evenly distributed), C (center only), and P (peripheral)
Other_descr		Description of other vegetation cover
Dominant_spp_1	genus_species	Scientific name of dominant species (grasses and sedges not identified to species)
Live_ht_spp1	m	Average height of live dominant species 1
Dead_ht_spp1	m	Average height of dead dominant species 1
Areal_coverage_spp1	percent	Percent of area covered by dominant species 1
Percent_live_spp1	percent	Percent of dominant species 1 live (by area)
Percent_dead_spp1	percent	Percent of dominant species 1 dead (by area)
Growth_stage_spp1		Growth Stage for dominant species 1: dormant, emerging, seedling, immature, mature, flowering
Dominant_spp_2		Scientific name of second most dominant species (grasses and sedges not identified to species)
Live_ht_spp2	m	Average height of live dominant species 2
Dead_ht_spp2	m	Average height of dead dominant species 2
Areal_coverage_spp2	percent	Percent of area covered by dominant species 2
Percent_live_spp2	percent	Percent of dominant species 2 live (by area)
Percent_dead_spp2	percent	Percent of dominant species 1 dead (by area)
Stage of Growth		Growth Stage for dominant species 2: dormant, emerging, seedling, immature, mature, flowering
North		North facing photo id number
East		East facing photo id number
South		South facing photo id number
West		West facing photo id number
Nadir		Nadir facing photo id number
Other		ID numbers for other photos from the site
Notes		Comments on photos

3. Data Application and Derivation:

The goal was to integrate multispectral data, field observations, and modeling to develop high-quality maps that delineate the severity and occurrence of fire disturbance in northern boreal peatlands. The land cover classification maps were integrated with the burn severity maps to answer questions such as do peatlands burn as severely as upland forests.

4. Quality Assessment:

Over 350 field locations were sampled at the five field sites in central Alberta to train and validate the peatland type maps shown below. Overall map accuracy was 97% using a Random Forests classifier. Random Forests is a machine learning algorithm that uses a series of decision trees to classify individual pixels

The total accuracy for Utikuma was 96.0%, Kidney Lake was 92.5%, Wabasca was 88.5%, Fort McMurray East was 94.4%, and Fort McMurray West was 90.7%.

Classification	Ground Truthed Values											Sum	Comm- ission	User Acc.
	Water	Marsh	Swamp	Open Fen	Treed Fen	Bog	Deciduous Upland	Coniferous Upland	Logged/ Barren	Developed				
Water	1004	0	0	0	0	0	0	0	0	0	0	1004	0%	100%
Marsh	0	932	10	3	9	0	0	0	1	41	0	996	6%	94%
Swamp	0	18	944	1	4	0	6	3	35	2	0	1013	7%	93%
Open Fen	0	2	3	1007	59	10	0	0	0	0	0	1081	7%	93%
Treed Fen	0	21	33	16	893	81	0	0	0	8	0	1052	15%	85%
Bog	0	0	17	0	64	943	2	19	0	3	0	1048	10%	90%
Deciduous Upland	0	0	0	0	0	0	992	44	1	0	0	1037	4%	96%
Coniferous Upland	0	1	0	0	0	2	9	949	18	6	0	985	4%	96%
Logged/Barren	0	24	0	0	0	0	1	0	958	292	0	1275	25%	75%
Developed	0	5	0	1	1	0	0	0	2	667	0	676	1%	99%
Sum	1004	1003	1007	1028	1030	1036	1010	1015	1015	1019				
Omission	0%	7%	6%	2%	13%	9%	2%	7%	6%	35%				
Prod. Acc.	100%	93%	94%	98%	87%	91%	98%	93%	94%	65%				

Figure 3. Error matrix of overall map accuracy.

5. Data Acquisition Materials and Methods:

This data set provides landcover maps including peatland type (bog, fen, marsh, swamp) and level of biomass (open, forested) and burn severity maps for four wildfire areas in Alberta, Canada.

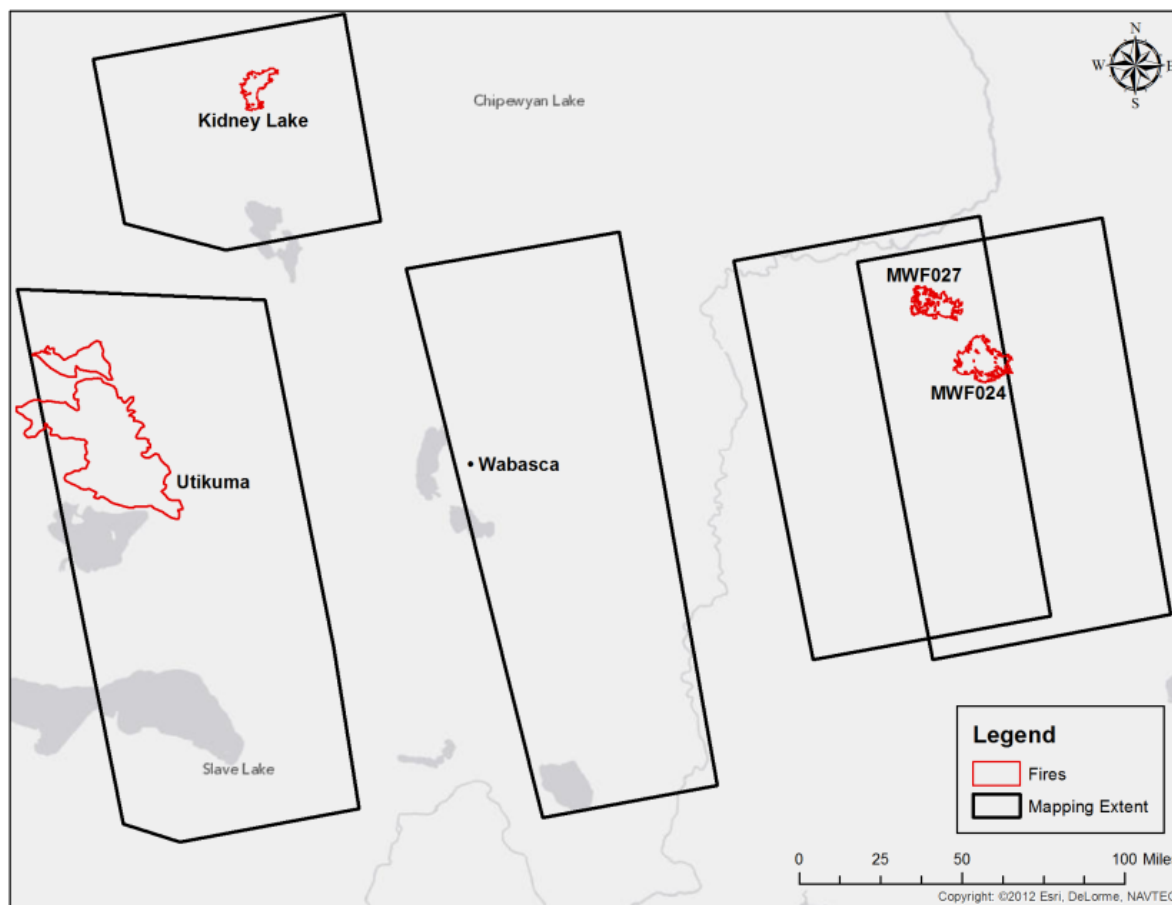


Figure 4. Location map of the four wildfire areas in northern Alberta, Canada (Bourgeau-Chavez et al., 2015).

Peatland Type Mapping (Bourgeau-Chavez et al., 2015)

The peatland classification (fen vs. bog including treed vs. open vs. shrubby) at each site was based on a pre-burn 2007 multi-date, multi-sensor fusion (Optical-IR, C-band and L-band SAR) approach. The Random Forests classifier was used which is a machine learning algorithm that takes advantage of an ensemble of classifiers that are built using training data. It generates a group of independent classification trees and the pixel class is determined by a majority vote of the trees. The training data was created through aerial photo interpretation combined with field data.

Over 350 field locations were sampled in central Alberta to train and validate the peatland type maps. Field points were selected based on map classes. Data collections followed a standardized protocol. Field crews used a hand held GPS, a GPS camera, maps of aerial photographs, and tape measurers. At each location, a vegetative index was constructed; ecosystem type was assigned, species diversity notes, dominant species composition assigned, water level measured, vegetation life stage recorded, and height and density measured for the over story. Additionally, hand drawn maps and delineation of laminated aerial photograph maps distinguished unique vegetation types and species transition areas. Geolocated photographs were taken in the four cardinal directions at a centralized location providing an additional layer of validation and ground truth for each location.

Landsat data were resampled to match the SAR data. The maps are provided at 12.5-m resolution.

Classification Schematic

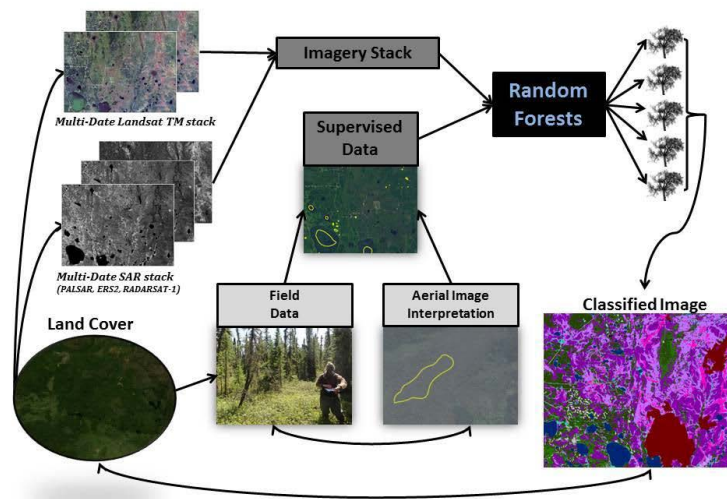


Figure 5. Classification schematic (Bourgeau-Chavez et al., 2015).

Burn Severity Mapping

In the spring of 2011, a 90,000-ha wildfire occurred near Utikuma Lake Alberta consuming large areas of peat. The fire was very patchy with low to moderate burn severity. In 2012, 48 field sites were sampled with intense measurements to understand fuel consumption. In 2013, this site and three additional burn sites, were visited to gather data focused on developing Landsat-based burn severity algorithms. The three additional wildfire burn sites were the Kidney Lake-fire site in 2011, and two sites at Fort McMurray, both had fires in 2009 (MWF027 and MWF024).

Burn severity was measured in the field in 2013 at the four sites using the Burn Severity Index (BSI) (Dyrness and Norum 1983), a qualitative assessment of burnt moss that uses a 1-5 scale. The classes are: 1- unburned moss, 2- singed moss, 3- light burned moss, 4- moderately burned moss, and 5- severely burned moss.

Within a plot the percent area in each of five burn severity classes to the ground layer were qualitatively assessed, then the burn severity index (BSI) was created by summing the fraction of each burn class times the index number (1-5) to create a single BSI value. The field data were correlated with Landsat data to develop multivariate models for calculating burn severity and %-not-sphagnum-moss. These models were used to generate the burn severity maps for the four wildfires.

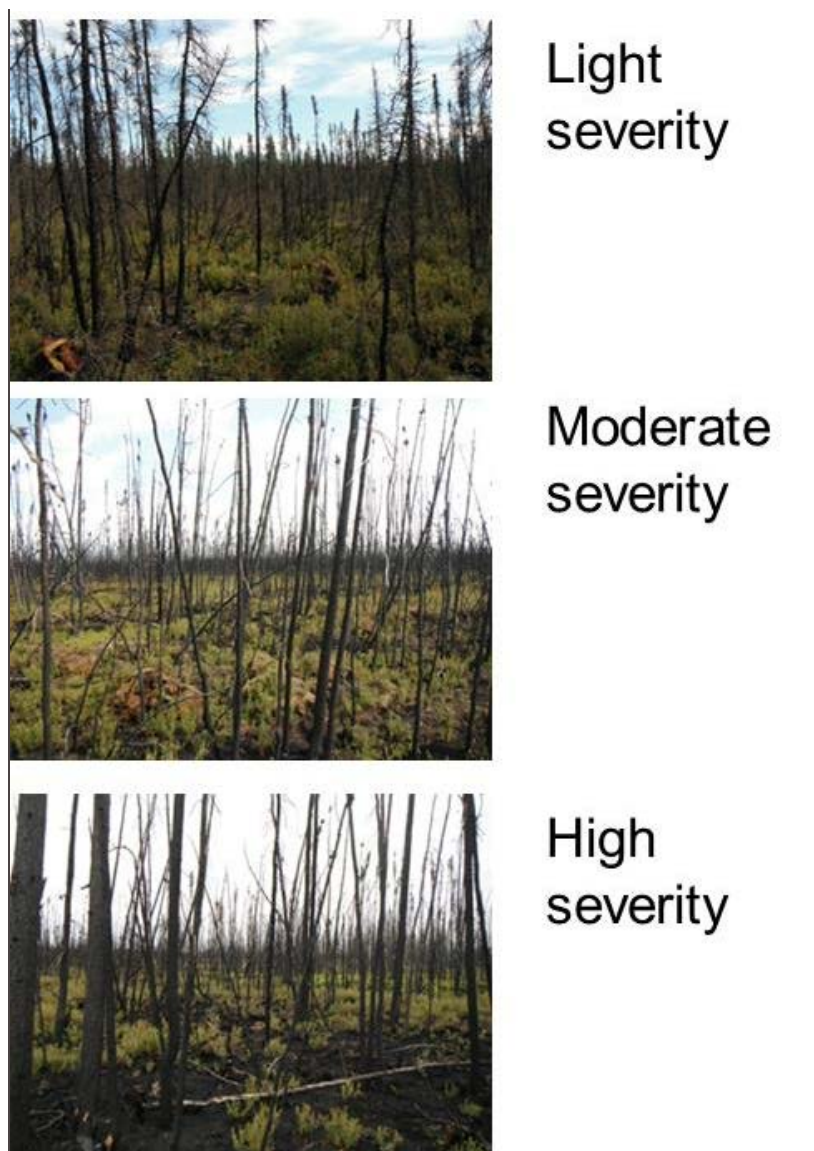


Figure 6. Photos one year post-burn showing examples of light, moderate and high burn severity (Bourgeau-Chavez et al., 2015).

Another variable measured in the field was percent unburned moss, which is typically sphagnum. This metric was also highly correlated to satellite Landsat data as was the reverse (1 - % unburned moss) or area not sphagnum. This is typically what burns, the non-sphagnum mosses.

Various Landsat bands and band combinations were tested to determine the best method for mapping burn severity from remote sensing satellite data. Traditional burn severity metrics (dNBR, rdNBR, tasseled cap greenness, brightness, and wetness) were also evaluated. Multivariate models were developed for each of four metrics determined to represent overall site burn severity-- %-unburned-moss, %-not-sphagnum moss, depth-of-burn, and burn severity index (BSI). Before developing the multivariate models, we conducted uni-variate analysis on individual bands and band combinations.

The models were based on data collected from all four wildfires. Variable selection for the multivariate models was achieved by examining the uni-variate correlation results, consulting a collinearity matrix to identify which variables were highly correlated with each other, and choosing sets of 4-8 non-collinear variables to evaluate via all-subsets regression (for models containing 2-4 variables). The top five results (by adj-R2) were examined in detail to find models for which all/most component variables were significant. The multivariate models for two of the four burn severity metrics tested (%-unburned-moss and depth-of-burn) were unsatisfactory due to low R2 values. The best fit model for BSI (with adj-R2=0.60) was:

$$BSI = 72.6 + 504 * \text{diff}4:5$$

The best fit model for %-not-sphagnum-moss (with adj-R2=0.57) was:

$$\% \text{-not-sphag} = -7.4 + (73.6 * \text{diff}2:7) + (70.6 * \text{diff}4:5)$$

We validated the models generated with the 2013 field data against the 2012 field data of the Utikuma Lake fire.

From these multivariate models we produced burn severity maps for each fire for each of the two satisfactory burn severity metrics.

6. Data Access:

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC)

Data Archive Center:

Contact for Data Center Access Information:

E-mail: uso@daac.ornl.gov

Telephone: +1 (865) 241-3952

7. References:

Denning, A.S., et al. 2005. Science implementation strategy for the North American Carbon Program: A Report of the NACP Implementation Strategy Group of the U.S. Carbon Cycle Interagency Working Group. U.S. Carbon Cycle Science Program, Washington, DC. 68 pp

Dyrness, C.T. and D.A.Norum. 1983. The effects of experimental fires on black spruce forest floors in interior Alaska. Canadian Journal of Forest Research, 1983, 13(5): 879-893, 10.1139/x83-118.

Laura L. Bourgeau-Chavez, Nancy H.F. French, Eric S. Kasischke, Merritt R. Turetsky, Liza K. Jenkins, Sarah Endres, Elizabeth Banda¹, Michael Billmire, and Bill de Groot. 2015. Poster. Vulnerability of North American Boreal Peatlands to Interactions between Climate, Hydrology, and Wildland Fires. Presented at NACP Principle Investigators Meeting 5, Jan 26 - 29, 2015.

Wofsy, S.C., and R.C. Harriss. 2002. The North American Carbon Program (NACP). Report of the NACP Committee of the U.S. Interagency Carbon Cycle Science Program. U.S. Global Change Research Program, Washington, DC. 56 pp.



[Privacy Policy](#) | [Feedback](#) | [FAQs](#) | [Site Map](#)

[Follow @ORNLDAAC](#)

- Home**
- About Us**
 - Who We Are
 - User Working Group
 - Biogeochemical Dynamics
 - Data Citation Policy
 - News
 - Newsletters
 - Workshops
- Products**
 - Product Overview
 - Field Campaigns
 - Validation
 - Regional/Global
 - Model Archive
- Data**
 - Complete Data Set List
 - Search for Data
 - Field Campaigns
 - Validation
 - Regional/Global
 - Model Archive
- Tools**
 - Data Search
 - Site Search
 - Search by DOI
 - WebGIS
 - SDAT
 - MODIS Land Subsets
 - THREDDS
- Help**
 - FAQs
 - Tutorials
 - Data Management
 - Archival Interest
- Contact Us**