ABoVE: Burn Severity, Fire Progression, and Field Data, NWT, Canada, 2015-2016

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Documentation Revision Date: 2017-09-27

Data Set Version: 1

Summary

This data set provides a fire progression map for year 2015 and measures of burn severity and vegetation community biophysical data collected from areas that were burned by wildfires in 2014 and 2015 in the Northwest Territories, Canada. Field data collected in 2016 include an estimate of burn severity, seedling/sprouting data, soil moisture, peat depth, thaw depth, and vegetation cover for selected sites.

The fire progression map was made using an algorithm that enabled an assessment of wildfire progression rates at a daily time scale. Fire progression was based on observed active fire detections from both the Terra and Aqua satellites using the MODIS active fire product (MCD14ML; Giglio et al. 2003). The fire progression map enabled an assessment of wildfire progression rates at a daily time step.

This data set includes one fire progression map in a compressed shapefile (.shp within a .zip file). The field data are provided in seven comma-separated (.csv) files. The shapefile data are also provided as a companion file in .kmz format for viewing in Google Earth.

Figure 1. Fire (ZF14) burning outside of Yellowknife, NWT.

Citation

Bourgeau-Chavez, L.L., S. Endres, L. Jenkins, M. Battaglia, E. Serocki, and M. Billmire. 2017. ABoVE: Burn Severity, Fire Progression, and Field Data, NWT, Canada, 2015-2016. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1548

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1. Data Set Overview

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Project: Arctic-Boreal Vulnerability Experiment (ABoVE)

The Arctic-Boreal Vulnerability Experiment is a NASA Terrestrial Ecology Program field campaign taking place in Alaska and western Canada between 2016 and 2021. Climate change in the Arctic and Boreal region is unfolding faster than anywhere else on Earth, resulting in reduced Arctic sea ice, thawing of permafrost soils, decomposition of long-frozen organic matter, widespread changes to lakes, rivers, coastlines, and alterations of ecosystem structure and function. ABoVE seeks a better understanding of the vulnerability and resilience of ecosystems and society to this changing environment.

Related data set

ABoVE: Burn Severity, Fire Progression, Landcover and Field Data, NWT, Canada, 2014. ORNL DAAC, Oak Ridge, Tennessee, USA. http://dx.doi.org/10.3334/ORNLDAAC/1307

This related data set provides peat landcover maps, fire progression maps, burn severity, and vegetation community biophysical data from areas in the Northwest Territories that were burned by wildfires in 2014.

2. Data Characteristics

Spatial Coverage: Northwest Territories, Canada. Partial coverage in North Slave, South Slave, and Dehcho Regions of Northwest Territories, Canada.

Domain: Core ABoVE

State/territory: NWT

Grid cells: Ah2v1.Bh0v5, Ah2v1.Bh1v4, Ah2v1.Bh1v5, Ah2v1.Bh2v5, and Ah2v2.Bh0v0

Region: Partial coverage in North Slave, South Slave, and Dehcho Regions

Locale: Yellowknife

Spatial Resolution

Fire progression map (shapefile) at 1 km resolution.

Validation field sites are points in the center of 0.5 acre plots.

Above ground biomass, biophysical site characteristics, burn severity, soil moisture, and seedling/sapling data were collected in six plots along two transects representing a 1 ha site.

Temporal Coverage

Field data were collected from 2016-07-09 to 2016-08-08.

Fire progression map covers the period 2015-05-20 to 2015-08-13.

Study Area: (all latitudes and longitudes given in decimal degrees)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Northwest Territories, Canada	-135.542822	-106.759164	68.326948	59.927009

Data File Information

There is one fire progression file in a compressed shapefile (.zip) format. Individual wildfire progression maps can be extracted from this shapefile. The field data are provided in seven comma-separated (.csv) files. The fire progression data are also provided in .kmz format for viewing in Google Earth.

The focus area of this study includes the 2014 NWT fires (ZF17, ZF20, SS3, SS15) and 2015 NWT Fires (ZF14, ZF2, SS50, SS81, SS28).

Most burned areas were divided into multiple sites (for example, SS3-64). Not all areas were visited for all measurements. Refer to **Table 4** for a listing of the sites and type of measurements taken which correspond to the .csv data files.

Table 1. File names and descriptions

File names	Descriptions
2015_NWT_fireprogression.zip	When unzipped, provides fire progression data for year 2015 in a shapefile. The data are also provided as a companion file in .kmz format for viewing in Google Earth.
NWT_wildfires_burn_severity_2016.csv	Provides observations of burn severity, adventitious root height, and landcover data. Photos of the plots are noted by number and camera ID in this file.
NWT_wildfires_biophysical_2016.csv	Provides biophysical and ground cover data.

NWT_wildfires_Seedling_Sprouting_2016.csv	Provides observations of vegetation seedling/saplings and sprouting of mosses and lichen.
NWT_wildfires_inventory_2016.csv	Provides site/plot observations, species inventory, diameter, and height.
NWT_wildfires_SoilMoisture_HydrosenseI_2016.csv	Provides soil data using a Hydrosense I instrument.
NWT_wildfires_SoilMoisture_HydrosenseII_2016.csv	Provides soil data using a Hydrosense II instrument.
NWT_wildfires_fieldvalidation_2016.csv	Provides vegetation observations from validation sites.

Fire Progression Map

The fire progression map is provided in the compressed shapefile, **2015_NWT_fireprogression.zip.** This shapefile shows the overall spatial extent and date (DOY) burned of 1-km pixels of selected fires over the period 2015-05-20 to 2015-08-13. Fire progression was based on observed active fire detections from both the Terra and Aqua satellites using the MODIS active fire product.

Table 2. Attributes of shapefile: 2015_NWT_fireprogression.shp.

FID	Shapefile feature
Shape	Feature type (polygon)
Date	Date burned
id	Monitoring trends in burn severity index ID
fire_code	Year of burn and district-fire number
fire_name	Year of burn and district-fire number (same as fire_code)
fuelbed_ec	Ecoregion parameter (“western or “southern”; all “western”)
fuel_moist	1000-hr fuel moisture (all 0)
fuel_moi_1	duff_fuel_moisture (all 0)
Julian	Day of the year
Month	Month

Table 3. Spatial Parameters: 2015_NWT_fireprogression.shp

Geographic coordinate system: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984

Extent of 2015_NWT_fireprogression.shp

West	East	North	South
-135.542822	-106.759164	68.326948	59.927009

Field Data

There are seven comma-separated files (.csv) of burn severity, inventory, seedling/sapling, soil moisture, and biophysical data collected in 2016 from selected 2014 and 2015 wildfire areas.

Burn severity was measured at 27 sites located in wildfire areas. Refer to Table 4 for a listing of the areas for all files. Different sites within each area are not listed in the table.

Note: Photos were taken at the sites and are provided in companion files. A description of the companion files is provided at the end of this section.

Table 4. Summary listing of wildfire areas and data types collected at each site.

Area	Burn Severity	Biophysical	Seedlings	Inventory	Validation	Soil measurements-Hydrosense 1	Soil measurements-Hydrosense 2
SSO						X	X
SS3	X	X	X	X		X	X
SS27					X	X	X
SS28	X	X	X	X	X	X	X
SS37					X	X	X
SS50	X	X	X	X	X	X	X
SS81	X	X	X	X	X	X	X
ZF2	X	X	X	X		X	X
ZF14	X	X	X	X	X	X	X
ZF17	X	X	X	X		X	X
ZF20	X	X	X	X		X	X

Burn Severity Data:

This file provides burn severity data collected from 27 locations in eight wildfire areas in July and August of 2016. Data not reported are recorded as -9999 or not_provided.

NOTE: For variables *nadircover_*: Nadir cover is from a birds-eye view of the plot so multiple layers are not considered and thus all nadir cover values must add to no more than 100 percent.

Table 5. File: NWT_wildfires_burn_severity_2016.csv

Column #	Variable	Units	Description
1	site		Unique name given to a field site. The initial alphanumeric code indicates site and fire number and the second part of the name is a site code designated by the research team.
2	plot		Plot number within the site; there are up to 6 plots per site
3	date	YYYYMMDD	Sampling date
4	time	HH:MM	Time at which field work began in local time (MDT)
5	fire_history		
	latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
6	longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
7	observer		Initials of person(s) who collected the data
8	ecosystem		Type of ecosystem; where the site included multiple ecosystem types they are all reported. See documentation for ecosystem characteristics.
9	field_notes_ecosystem		
10	thaw_depth	cm	Depth of soil to frozen ground layer reported in centimeters from surface
11	peat_depth	cm	Thickness of organic peat soil layer reported in centimeters
12	ash		Amount of ash present on ground surface. Reported as: No, Light, Moderate, or Heavy
13	moss_unburned	percent	Percent of moss in plot (10 x 10-m area) that is unburned

14	moss_singed	percent	Percent of moss in plot (10 x 10-m area) that is singed
15	moss_light	percent	Percent of moss in plot (10 x 10-m area) that is lightly burned
16	moss_moderate	percent	Percent of moss in plot (10 x 10-m area) that is moderately burned
17	moss_severe	percent	Percent of moss in plot (10 x 10-m area) that is severely burned
18	litter_unburned	percent	Percent of litter in plot (10 x 10-m area) that is unburned
19	litter_singed	percent	Percent of litter in plot (10 x 10-m area) that is lightly singed
20	litter_charred	percent	Percent of litter in plot (10 x 10-m area) that is charred
21	litter_ashed	percent	Percent of litter in plot (10 x 10-m area) that is ashed
22	shrub_unburned	percent	Percent of shrubs in plot (10 x 10-m area) that is unburned
23	shrub_scorched	percent	Percent of shrubs in plot (10 x 10-m area) that is lightly scorched
24	shrub_limbs	percent	Percent of shrubs in plot (10 x 10-m area) with some limbs left
25	shrub_consumed	percent	Percent of shrubs in plot (10 x 10-m area) that is consumed
26	live_trees	percent	Percent of trees in plot (10 x 10-m area) live and undamaged
27	dead_foliage_intact	percent	Percent of trees in plot (10 x 10-m area) dead but with no foliage consumed
28	dead_foliage_burned	percent	Percent of trees in plot (10 x 10-m area) dead with needles and small branches burned
29	dead_trees_secondary	percent	Percent of trees in plot (10 x 10-m area) dead with only some secondary branches remaining
30	dead_trees_minor_primary	percent	Percent of trees in plot (10 x 10-m area) dead with secondary branches burned and more than 30 percent of primary branches left
31	dead_trees_major_primary	percent	Percent of trees in plot (10 x 10-m area) dead with less than 30 percent of primary branches remaining
32	dead_trees_charred_pole	percent	Percent of trees in plot (10 x 10-m area) dead with no primary branches and a charred pole
33	root1_ht	cm	Height from current ground level up to first randomly selected adventitious root reported in meters
34	root2_ht	cm	Height from current ground level up to second randomly selected adventitious root reported in meters
35	root3_ht	cm	Height from current ground level up to third randomly selected adventitious root reported in meters
36	root4_ht	cm	Height from current ground level up to fourth randomly selected adventitious root reported in meters
37	root5_ht	cm	Height from current ground level up to fourth randomly selected adventitious root reported in meters
38	nadircover_shrublive	percent	Percent ground cover composed of live shrubs.
39	nadircover_shrubdead	percent	Percent ground cover composed of dead shrubs.
40	nadircover_livewoodydebris	percent	Percent ground cover composed live woody debris
41	nadircover_woodydebris	percent	Percent ground cover composed of woody debris.
42	nadircover_herbaceouslive	percent	Percent ground cover composed of live herbaceous plants.
43	nadircover_herbaceousdead	percent	Percent ground cover composed of dead herbaceous plants.
44	nadircover_mosslive	percent	Percent ground cover composed of live moss.
45	nadircover_mossdead	percent	Percent ground cover composed of dead moss.
46	nadircover_liverwortlive	percent	Percent ground cover composed of live liverwort

47	nadircover_liverwortdead	percent	Percent ground cover composed of dead liverwort.
48	nadircover_mineralsoil	percent	Percent ground cover composed of mineral soil
49	nadircover_equisetumlive	percent	Percent ground cover composed of live equisetum
50	tree_ht1	m	Height of tree 1 reported in meters
51	tree_condition1		Condition of tree 1: live or dead
52	tree_ht2	m	Height of tree 2 reported in meters
53	tree_condition2		Condition of tree 2: live or dead
54	tree_ht3	m	Height of tree 3 reported in meters
55	tree_condition3		Condition of tree 3: live or dead
56	soil_ph		Soil pH
57	camera_id		Camera name used to photograph the site. This is also the companion folder- filename where a photo would be found. Described in the companion files table at the end of this document section
58	north_photo		North facing photo id number
59	east_photo		East facing photo id number
60	south_photo		South facing photo id number
61	west_photo		West facing photo id number
62	nadir_photo		Nadir facing photo id number
63	nadir_seedling_photo		Nadir seedling photo
64	notes		Additional comments

Vegetation Biophysical Data:

This file provides vegetation community biophysical data collected 27 locations in eight wildfire areas in July and August of 2016. Data not provided are reported as not_provided.

Table 6. File: NWT_wildfires_biophysical_2016.csv

Column #	Variable	Unit	Description
1	site		Unique name given to a field site. The initial alphanumeric code indicates site and fire number and the second part of the name is a site code designated by the research team
2	plot		Plot number within site
3	plot_Size		Size of sampling plot reported in meters by meters
4	date	YYYY-MM-DD	Sampling date
5	observer	text	Initials of person(s) who collected the information
6	latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
7	longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
8	time	HH:MM	Time that data collection at that location began in local time MDT (UTC-6)
9	live_canopy_cover	percent	Percent of canopy (tree) cover classified as live
10	dominant_cover		Description of the dominant cover type. Choices included: forested; shrub; herbaceous or some combination of these cover types

11	ecosystem		Ecosystem type(s) represented in the plot: bog; fen; lowland; upland see table for defining characteristics
12	medium_shrub_cover	percent	Percent of medium shrubs present
13	ground_wetness		Description of the soil moisture status: dry, moist, soggy, standing water, or some combination of these conditions
14	soil_top_moss_condition		Notes on the condition of the top layer of organic soil (moss) with respect to burning: ash, burned, singed, charred, or unburned
15	soil_live_moss_thickness	cm	Thickness of the live moss component of the organic soil layer reported in centimeters
16	soil_dead_moss_layer_thickness	cm	Thickness of the dead moss component of the organic soil layer reported in centimeters
17	soil_upper_duff_layer_thickness	cm	Thickness of the upper duff component of the organic soil layer reported in centimeters
18	soil_lower_duff_layer_thickness	cm	Thickness of the lower duff component of the organic soil layer reported in centimeters
19	total_peat_depth	cm	Depth of entire peat layer calculated as the sum of the previous 4 columns reported in centimeters from surface
20	low_shrubs_coverage	percent	Percent of ground covered in low shrubs reported as percent of total plot area
21	low_shrubs_distribution		Pattern of distribution of low shrubs: reported as E (even), P (peripheral), or patchy
22	woody_debris_coverage	percent	Percent of ground covered in woody debris reported as percent of total plot area
23	woody_debris_distribution		Pattern of distribution of low shrubs: reported as E (even), P (peripheral), or patchy
24	sphag_coverage	percent	Percent of ground covered in Sphagnum moss reported as percent of total plot area
25	sphag_distribution		Pattern of distribution of Sphagnum moss: reported as E (even), P (peripheral), or patchy
26	reindeer_lichen_coverage	percent	Percent of ground covered in reindeer lichen reported as percent of total plot area
27	reindeer_lichen_distribution		Pattern of distribution of reindeer lichen: reported as E (even), P (peripheral), or patchy
28	grasses_coverage	percent	Percent of ground covered in grasses reported as percent of total plot area
29	grasses_distribution		Pattern of distribution of grasses: reported as E (even), P (peripheral), or patchy
30	herbaceous_coverage	percent	Percent of ground covered in herbaceous plants reported as percent of total plot area
31	herbaceous_distribution		Pattern of distribution of herbaceous plants: reported as E (even), P (peripheral), or patchy
32	feather_moss_coverage	percent	Percent of ground cover that was feather moss
33	feather_moss_coverage_distribution		Pattern of distribution of feather moss
34	other_lichen_coverage	percent	percent
35	other_lichen_coverage_distribution		Pattern of distribution of lichens
36-47	othertype_groundcoverX		Description of other ground cover types. There are four additional “other” ground cover types. Each ground cover type is followed by the columns othertype_groundcoverX_coverage and othertype_groundcoverX_distribution where X is 1, 2, 3, or 4. See

			the descriptions below
36-47	othertype_groundcoverX_coverage	percent	Percent of ground covered in other ground cover reported as percent of total plot areas. There are four additional “other” ground covers with the one variable described above and below
36-47	othertype_groundcoverX_distribution		Pattern of distribution of other ground cover: reported as E (even), P (peripheral), or patchy. There are four additional “other” ground covers with the two variables described above

Seedling and Sprouting Data:

This file provides observations of vegetation seedling/saplings and sprouting of mosses and lichen collected from 27 locations in eight wildfire areas in July and August of 2016. Missing or data not reported are provided as -9999 or not_provided.

Table 7. File: NWT_wildfires_seeedling_sprouting_2016.csv

Column #	Variable	Unit	Description
1	site		Unique name given to a field site. The initial alphanumeric code indicates site and fire number and the second part of the name is a site code designated by the research team.
2	plot		Plot number within the site; there are up to 6 plots per site
3	date	YYYY-MM-DD	Sampling date
4	observers		Initials of person(s) who collected data
5	plot_size	m	Plot sizes as meter x meter
6	species		Scientific name of vegetation species measured
7	veg_stage		Growth stage of vegetation: seedling or sprouting
8	number		Number of seedlings or sproutings recorded
9	seedbed		Seedbed type: sphagnum, unburned organic material (duff and litter), thick burned organic material, thin burned organic material, or exposed mineral soil
10	percent_cover	percent	Percent ground cover composed of species in plot. Percent cover used in cases where unable to count such as moss or lichens.

Plot Vegetation Inventory Data

This file provides site/plot observations, species inventory, diameter, and height data collected from eight wildfire areas and 27 sites in July and August of 2016. Data not provided or missing are reported as -9999.

Table 8. File: NWT_wildfires_inventory_2015.csv

Column #	Variable	Unit	Description
1	site		Unique name given to a field site. The initial alphanumeric code indicates site and fire number and the second part of the name is a site code designated by the research team.
2	plot		Plot number. Each site had up to six plots
3	date	YYYY-MM-DD	Sampling date
4	observer		Initials of person(s) who collected the information
5	plot_size	m x m	Size of sampling plot reported as meters by meters
6	life_form		Life form: shrub or tree
7	condition		Stem condition either standing or fallen
8	species		Scientific name of stem measured

9	basal_diameter	cm	Basal diameter measured at ground level
10	DBH	cm	Diameter at Breast Height (DBH) reported in centimeters measured at 1.3-meters above the ground
11	height	m	Height of stem reported in meters
12	status		Alive or dead

Soil Moisture and Temperature Data:

There are two files for soil data collected from the same 11 wildfire areas in July and August of 2016. One file provides measurements made with a Hydrosense I instrument, and the second file provides measurements made with a Hydrosense II. The same variables are provided in both files. The probe period and %VWC were collected at two to six points within each plot.

Data not provided or missing are reported as -9999.

Table 9. Data files: NWT_soil_moisture_hydrosense_1_2016.csv and **NWT_soil_moisture_hydrosense_2_2016.csv**

Column #	Variable	Units/format	Description
1	site		Unique name given to a field site
2	date	YYYY-MM-DD	Date of measurements
3	start_time	HH:min	Time of measurements
4	observers		Initials of person(s) who collected data
5	probe_depth		Depth of probe
6	soil_ temp_1		Soil temperature measurement
7	plot_1_period		
8	vmc_plot_1	%	Percent volumetric moisture content
9	soil_temp_2		Soil temperature measurement
10	plot_2_period		
11	vmc_plot_2	%	Percent volumetric moisture content
12	soil_temp_3		Soil temperature measurement
13	plot_3_period		
14	vmc_plot_3	%	Percent volumetric moisture content
15	soil_temp_4		Soil temperature measurement
16	plot_4_period		
17	vmc_plot_4	%	Percent volumetric moisture content
18	soil_temp_5		Soil temperature measurement
19	plot_5_period		
20	vmc_plot_5	%	Percent volumetric moisture content
21	soil_temp_6		Soil temperature measurement
22	plot_6_period		
23	vmc_plot_6	%	Percent volumetric moisture content

Vegetation Community Characterization Data:

Measurements were collected from six wildfire areas. Data not provided or not reported are recorded as -9999 or as not_provided.

Table 10. File: NWT_wildfires_fieldvalidation_2016.csv

Column #	Variable Name	Unit	Description
1	site		Unique name given to a field point
2	date	YYYYMMDD	Sampling date
3	time	HH:MM	Time at which field work began in local time (MDT)
4	latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
5	longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
6	observers	Text	Initials of person(s) who collected data
7	thaw_depth	cm	Depth of soil to frozen ground layer reported in centimeters. Measurements were made from the top of the ground cover at the 37 unburned sites.
8	peat_depth	cm	Depth of organic peat soil reported in centimeters
9	soil_pH		pH units
10	ecosystem		Type of ecosystem, individually or in combination; Bog/Bog Like, Fen/Fen Like, Treed Bog, Shrub Fen, Treed Fen, Open Fen, Upland, Marsh, Shrubby, Sparse Trees, Lowland White Pine
11	ground_wetness		Wetness of ground: Dry (no moisture present), Moist (moisture present but not saturated), Soggy (saturated with water but no areas of standing water), or Standing Water (visible standing water present in plot)
12	vegetation		List of vegetation species present
13	dense_trees	percent	Percent of plot covered in dense trees. Plot areas were 0.5 acre
14	dense_trees_dist		Description of dense tree distribution: E (evenly distributed), C (center only), and P (peripheral)
15	moderate_trees	percent	Percent of plot covered in moderate trees. Plot areas were 0.5 acre
16	moderate_trees_dist		Description of moderate tree distribution: E (evenly distributed), C (center only), and P (peripheral)
17	sparse_trees	percent	Percent of plot covered in sparse trees. Plot areas were 0.5 acre
18	sparse_trees_dist		Description of sparse tree distribution: E (evenly distributed), C (center only), and P (peripheral)
19	open_water	percent	Percent of plot covered in open water. Plot areas were 0.5 acre
20	open_water_dist		Description of open water distribution: E (evenly distributed), C (center only), and P (peripheral)
21	shrubby	percent	Percent of plot covered in shrubs. Plot areas were 0.5 acre
22	shrubby_dist		Description of shrub distribution: E (evenly distributed), C (center only), and P (peripheral)
23	moss	percent	Percent of plot covered in moss. Plot areas were 0.5 acre
24	moss_dist		Description of moss distribution: E (evenly distributed), C (center only), and P (peripheral)
25	grass_sedge	percent	Percent of plot covered in grass/sedge. Plot areas were 0.5 acre
26	grass_sedge_dist		Description of grass/sedge distribution: E (evenly distributed), C (center only), and P (peripheral)
27	herbaceous_cover	percent	Herbaceous cover
28	herbaceous_cover_dist		Distribution of herbaceous cover
29	other_descrip		Description of other types of ground cover

30	other	percent	Percent of plot covered in other vegetation. Plot area is 0.5 acre
31	other_dist		Description of other vegetation distribution: E (evenly distributed), C (center only), and P (peripheral)
32	spp1	genus_species	Scientific name of dominant species (grasses and sedges not identified to species)
33	spp1_live_ht	m	Average height of live dominant species 1
34	spp1_dead_ht	m	Average height of dead dominant species 1
35	spp1_density	percent	Percent of area covered by dominant species 1
36	spp1_live	percent	Percent of dominant species 1 live (by area)
37	spp1_dead	percent	Percent of dominant species 1 dead (by area)
38	spp1_stage		Growth Stage for dominant species: dormant, emerging, seedling, immature, mature, flowering
39	spp2	genus_species	Scientific name of dominant species (grasses and sedges not identified to species)
40	spp2_live_ht	m	Average height of live dominant species 2
41	spp2_dead_ht	m	Average height of dead dominant species 2
42	spp2_density	percent	Percent of area covered by dominant species 2
43	spp2_live	percent	Percent of dominant species 2 live (by area)
44	spp2_dead	percent	Percent of dominant species 2 dead (by area)
45	spp2_stage		Growth Stage for dominant species: dormant, emerging, seedling, immature, mature, flowering
46	ht_lowest_living_branch	m	Height of average lowest living branch reported in meters
47	soil_live_moss	cm	Depth of live moss layer present in 40-cm soil profile
48	soil_dead_moss	cm	Depth of dead moss layer present in 40-cm soil profile
49	soil_upper_duff	cm	Depth of upper duff layer present in 40-cm soil profile
50	soil_ lower_duff	cm	Depth of lower duff layer present in 40-cm soil profile
51 and columns 53, 55, 57, 59, 61, 63	sample_x_depth		Depth of sample for seven samples where X=sample1 to sample 7
52, and columns 54, 56, 58, 60, 62, 64	sample_x_horizon		Sample horizon for seven samples where X=sample1 to sample 7
65	camera_id		Camera name used to photograph the site- this is also the companion file name where a photo would be found. Described in the companion files table at the end of this document section
66	north_photo	North facing photo id number	North facing photo id number
67	east_photo	East facing photo id number	East facing photo id number
68	south_photo	South facing photo id number	South facing photo id number
69	west_photo	West facing photo id number	West facing photo id number
70	nadir_photo	Nadir facing photo id number	Nadir facing photo id number
71	other_photos		Additional photos
72	notes		Comments

Companion Files

File name	Description
1326_photos.zip	Compressed directory containing photos (in .jpg format) numbered 2910-3385 showing study areas in the data file **NWT_Wildfires_burn_severity_2016.csv**. The photos are noted as a number and by the camera used to take the photos (camera_id 1326) in the data file. For each photo, there is also the same photo stamped with the latitude and longitude (_tag.jpg), two map files for the site (_Map1 and _Map2.jpg), and a thumbnail image of the photo (_thm.jpg). This zip file also contains a pdf named **1326_temp_tag-Standard.pdf** which provides a compilation of all of the images and map files just described, and the file **1326_geo.kml** for viewing the photos in Google Earth.
1326_geo.zip	A compressed shapefile of point features (**1326_geo.shp**) that provides metadata about the photographs in **1326_photos.zip**: location, elevation, photo direction, timestamp, and camera model
1326_geo_FOV.zip	A compressed shapefile of polygon features (**1326_geo_FOV.shp**) that depict the fields of view of the photographs in **1326_photos.zip**
1327_photos.zip	Additional photos (*.jpg format) taken of the study sites not included in the data files. For each photo, there is also the same photo stamped with the latitude and longitude (_tag.jpg), two map files for the site (_Map1 and _Map2.jpg), and a thumbnail image of the photo (_thm.jpg). This zip file also contains a pdf named **1327_temp_tag-Standard.pdf** which provides a compilation of all of the images and map files just described, and the file **1327_geo.kml** for viewing the photos in Google Earth
1327_geo.zip	A shapefile of point features (**1327_geo.shp**) that provides metadata about the photographs in **1327_photos.zip**: location, elevation, photo direction, timestamp, and camera model
1327_geo_FOV.zip	A shapefile of polygon features (**1327_geo_FOV.shp**) that depict the fields of view of the photographs in **1327_photos.zip**
2015_NWT_fireprogression.kmz	The shapefile **2015_NWT_fireprogression.shp** provided in .kmz format for visualization in Google Earth
Wildfires_2014_NWT_Canada.pdf	This guide document in pdf format

3. Application and Derivation

The goal was to identify and collect remote sensing and field data to support the science necessary to investigate the impacts and consequences of the 2014 and 2015 fires in Northwest Territories.

4. Quality Assessment

5. Data Acquisition, Materials, and Methods

Study areas

This project used remote sensing and field data to characterize the impacts of wildfires that occurred in 2014 and 2015 in the North Slave, South Slave, and Dehcho Regions of Northwest Territories, Canada. The ABoVE Project grid locations of these study areas are Ah2v1.Bh0v5, Ah2v1.Bh1v4, Ah2v1.Bh1v5, Ah2v1.Bh2v5, and Ah2v2.Bh0v0. For additional information, refer to the ABoVE Grid Reference: https://above.maps.arcgis.com/home/item.html?id=ad3dc7c0ecef41bb8e2d928ce2ed7a48

The focus area of this study focuses on four 2014 NWT fires (ZF17, ZF20, SS3,SS15) and five 2015 NWT Fires (ZF14, ZF2, SS50, SS81, SS28).

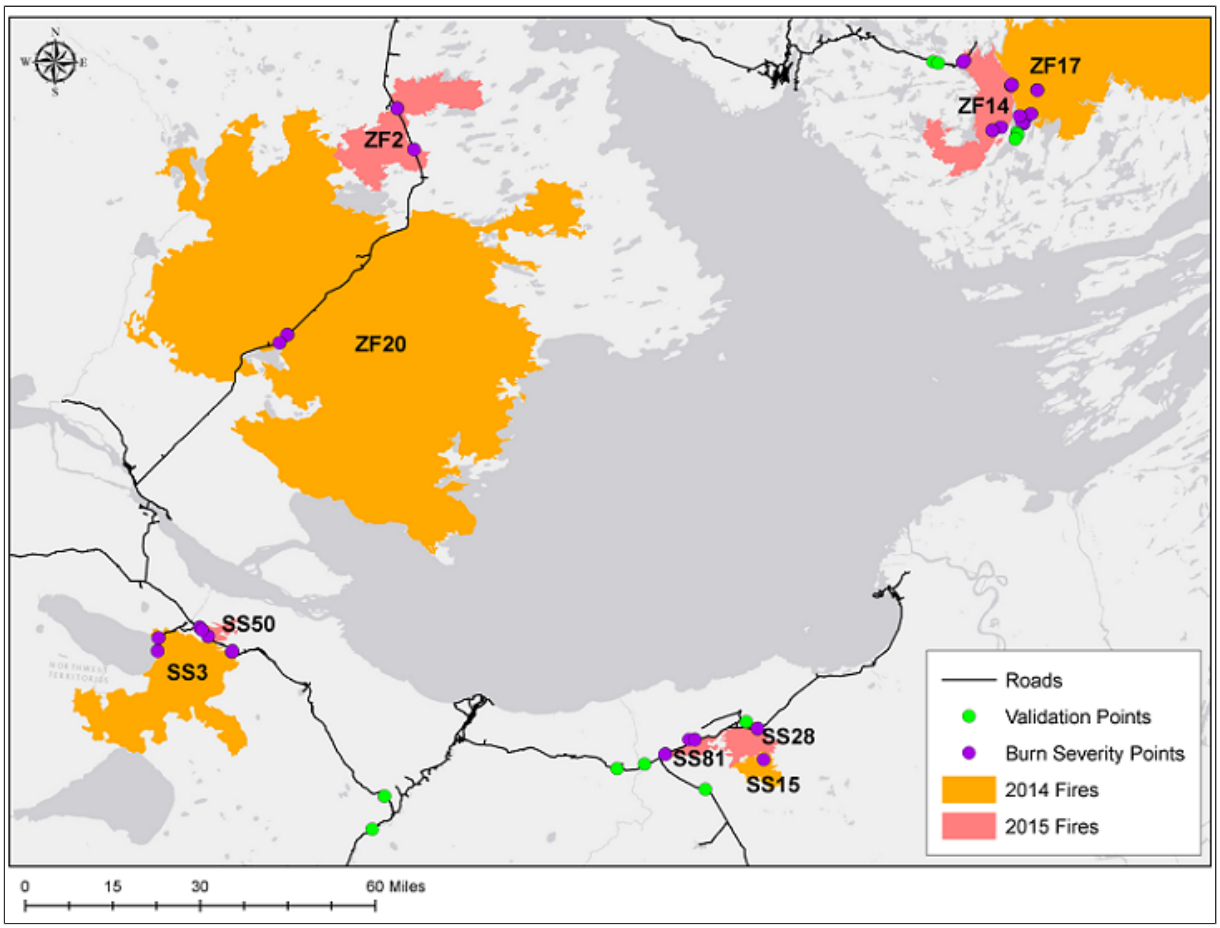

Figure 2. Wildfire areas with burned and validation field site locations in the Northwest Territories.

Validation areas

A total of 13 field locations at six wildfire areas were sampled in NWT, Canada as validation sites. None of the validation sites were burned but the sites were taken to train and validate the pre-burn peatland type map. Data collection followed a standardized protocol. Field crews used a hand held GPS, a GPS camera, maps of aerial photographs, and tape measures. At each location, a vegetative index was constructed, ecosystem type was assigned, species diversity noted, dominant species composition assigned, water level measured, vegetation life stage recorded, and height and density measured for the overstory. Thaw depth was measured with a peat rod from the top of the moss to the frozen layer. 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.

Fire Progression Maps

A fire progression algorithm was used that enabled an assessment of wildfire progression rates at a daily time scale. This algorithm was developed as a semi-automated approach suitable for developing daily estimates of area burned from satellite observations of fire occurrence. Fire progression was based on observed active fire detections from both the Terra and Aqua satellites using the MODIS active fire product (MCD14ML; Giglio et al., 2003). Fire progression was assessed at a daily time step and was based on the first observation of fire occurrence in a particular MODIS 1-km pixel within a burn scar. The algorithm was focused on modeling the approximate date of burning within the combined burned area product using the date/time information contained in the MODIS active fire product and adjusted for the local standard time correction.

Active fire detections were first processed using the Fire Spread Reconstruction (FSR) approach, which clusters individual fire points in space-time to identify contiguous fire events and groups of fire events creating a single burn scar (Loboda and Csiszar 2007). The clustered fire events were subsequently processed to separate the first date of fire detection within a specific MODIS pixel from subsequent detections, wherein the pixel continues to emit a sufficient amount of thermal energy to warrant the detection of on-going burning. The date of burning between adjacent dates of fire detections in fire progression surfaces was interpolated using the inverse distance mapping algorithm with a radius of 3 km.

Field Data (refer to Table 4 for a listing of the sites)

Biophysical site characteristics, burn severity, soil moisture, thaw depth, and seedling/sapling data were collected in up to six plots along two transects representing a homogenous area of 100 x 100-m.

Burn Severity

Burn severity was measured at 27 locations in eight wildfire areas. A 10 sq m plot was created using reel tape. Burn damage severity class was recorded for moss, litter, shrub and canopy. Nadir percent cover by vegetation class was recorded for live/dead shrubs, woody debris, herbaceous, and moss. Three representative tree heights were recorded and up to five adventitious root heights were recorded. Peatland type, thaw depth, and peat thickness as well as ash presence are also reported for all plots.

Figure 3. Photo of a burned site (fire SS3) near Kakisa.

Biophysical Characteristics

Field surveys were conducted at eight wildfire areas. The data file provides peatland type, wetness, thaw depth, soil organic layer thicknesses and the type of ground cover present as well as area covered by each ground cover type. Plot size varied from 1 sq m to 10 sq m.

Soil Moisture

Soil moisture data were collected at 11 wildfire areas with Hydrosense 1 and Hydrosense II instruments at the same 40 sites (refer to Table 4 for a listing of the sites). Five measurements were made at each depth for each plot.

Temperature was measured using a Hannah Instruments HI 145 probe. Two different lengths of probes were used: 20 cm and 12 cm. Both probes were placed straight down into the soil. In addition, at 6 cm depth, the 12 cm probe was placed at a 30- degree angle. The probe period and %VMC were collected at six points within each plot. For validation of remote sensing data, the moisture data were collected during Radarsat-2 overpasses.

Seedling/Sprouting

A total of eight wildfire areas were sampled. Plots of either 1 sq m or 0.5 sq m were set up in the corner of each site, where all seedling and sprouting vegetation was recorded along with the ground cover type.

Inventory-Aboveground Biomass

A total of 11 areas were sampled. At each site a plot was taped off (varying in size between 1 to 10 sq m) and each standing tree/shrub was measured. The tree/shrub species and DBH or basal diameter was recorded along with the height of representative trees.

6. Data Access

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

ABoVE: Burn Severity, Fire Progression, and Field Data, NWT, Canada, 2015-2016

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Giglio, L., Descloitres, J., Justice, C.O., and Y.J. Kaufman (2003) “An Enhanced Contextual Fire Detection Algorithm for MODIS.” Remote Sensing of Environment 87, no. 2-3, 276-282. https://doi.org/10.1016/S0034-4257(03)00184-6

Loboda TV, Csiszar IA (2007) Reconstruction of fire spread within wildland fire events in Northern Eurasia from the MODIS active fire product. *Global and Planetary Change* **56**, 258–273. https://doi.org/10.1016/j.gloplacha.2006.07.015