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ABOVE: Burn Severity, Fire Progression, Landcover and Field Data, NWT, Canada, 2014

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Summary

This data set provides peatland landcover classification maps, fire progression maps, and vegetation community biophysical data collected from areas that were burned by wildfire in 2014 in the Northwest Territories, Canada. The peatland maps include peatland type (bog, fen, marsh, swamp) and level of biomass (open, forested). The fire progression maps enabled an assessment of wildfire progression rates at a daily time scale. Field data, collected in 2015, include an estimate of burn severity, woody seedling/sprouting data, soil moisture, and tree diameter and height of burned sites and similar vegetation characterization at landcover validation sites.

The peatland classification at 10-m resolution (bog, fen, marsh, swamp) and level of biomass (open, forested) at each wildfire area was based on a pre-burn, multi-date (1997 - 2013), multi-sensor (Optical and L-band SAR) fusion approach.

The fire progression maps were 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 field data were collected at various sites across the study areas. All data were not collected at each site. Burn severity data, along with thaw and peat depths, were collected at 30 burned sites. Additional aboveground biomass, soil moisture, and woody seedling/sprouting data were collected at 17 of the same sites. The vegetation communities of 43 sites were characterized for validation of the peatland landcover classification.

There are five peatland type classification maps in GeoTIFF (*.tif) format and one fire progression file in shapefile (.shp) format. The field data are provided in six comma-separated (.csv) files. In addition, companion shapefile (.shp) and Google Earth (.kmz) files provide geo-located photos taken at the study sites, with location and field of view files.



Figure 1. Field work at burned site (ZF-17) to collect burn severity, thaw and peat depths, biomass, soil moisture, and woody seedling/sprouting data in 2015.

Citation

Bourgeau-Chavez, L.L., N.H.F. French, S. Endres, L. Jenkins, M. Battaglia, E. Serocki, and M. Billmire. 2016. 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>

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1. Data Set Overview

Project: ABoVE

This data set provides peatland landcover classification maps, fire progression maps, and vegetation community biophysical data collected from areas burned by the 2014 wildfires in the Northwest Territories, Canada. The peatland maps include peatland type (bog, fen, marsh, swamp) and level of biomass (open, forested). The fire progression maps enabled an assessment of progression rates at a daily time scale. Field data include burn severity, woody seedling/sprouting data, soil moisture, and tree diameter and height of burned sites and similar vegetation characterization at landcover validation sites.

The peatland classification at 10-m resolution (bog, fen, marsh, swamp) and level of biomass (open, forested) at each wildfire area was based on a pre-burn, multi-date (1997 - 2013), multi-sensor (Optical and L-band SAR) fusion approach.

The fire progression maps were 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 field data were collected at various sites across the study areas. All data were not collected at each site. Burn severity data, along with thaw and peat depths, were collected at 30 burned sites. Additional aboveground biomass, soil moisture, and woody seedling/sprouting data were collected at 17 of the same sites. The vegetation communities of 43 sites were characterized for validation of the peatland landcover classification.

The Arctic-Boreal Vulnerability Experiment (ABoVE) 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.

2. Data Characteristics

Spatial Coverage: Northwest Territories, Canada.

- Site
- Domain: Core ABoVE
- State/territory: NWT
- Grid cells: Ah2v1.Bh0v5, Ah2v1.Bh1v4, Ah2v1.Bh1v5, Ah2v1.Bh2v5, and Ah2v2.Bh0v0
- Region: Great Slave Lake
- Locale: Yellowknife

Spatial Resolution

- Peatland type maps are 10-m resolution.
- Fire progression maps (shapefiles) are 1-km resolution
- Validation field sites are points in the center of 0.5-acre plots at selected locations. Validation locations were selected based on map classes in mostly unburned regions to provide better assessments of peatland types.
- Aboveground biomass, biophysical site characteristics, burn severity, soil moisture, and woody seedling/sapling data were collected in six plots along two transects representing each 1-ha site.

Temporal Coverage

- The peatland type maps were based on multi-date, multi-sensor fusion (Optical and L-band SAR) from 1997-07-07 to 2013-08-04.
- Field data were collected from 2015-06-04 to 2015-07-15.
- Fire progression maps cover the period 2014-06-06 to 2014-09-22.

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Northwest Territories, Canada	-121.2030	-111.178540	64.301420	60.5

Data File Information

There are five peatland type maps in GeoTIFF (*.tif) format and one fire progression file in shapefile (.shp) format (individual wildfire progression maps can be extracted from this shapefile). The field data are provided in six comma-separated (.csv) files.

Peatland Type Maps

There are five peatland type landcover maps of the wildfire areas in GeoTIFF (*.tif) including peatland type (bog, fen, marsh, swamp) and level of biomass (open, forested). The focus area of this study covered nine wildfire areas: SS03, SS68, SS130, FS33, FS26, ZF46, ZF85, ZF70, and ZF17. The maps are named according to the area names. Note-additional fire areas (due to close proximity-they were in the same scene) included SS33 (partial), SS15, SS70, SS97, SS81, SS82, SS152, SS96, FS49, ZF126, ZF143, ZF124, ZF92 (partial), and ZF45 (partial).

Table 1. Peatland type landcover maps as displayed in Figure 4 for wildfire areas shown in Figure 3.

File Name	Wildfire Area
NWT_Wildfire_sites_zf20_zf85_zf46.tif	ZF20, ZF85, and ZF46
NWT_Wildfire_sites_zf17.tif	ZF17
NWT_Wildfire_sites_ss68.tif	SS68
NWT_Wildfire_sites_ss03_ss130.tif	SS03, SS130

NWT_Wildfire_sites_fs33_fs26.tif	FS33, FS26
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Fire Progression Maps

The fire progression maps are in shapefile format (.shp) provided in the zip file (*.zip) **2014_NWT_fireprogression.zip**.

Shapefile: 2014_NWT_fireprogression.shp.

This shapefile shows the overall spatial extent and date (DOY) burned of 1-km pixels of selected fires over the period June 6 - September 22, 2014 . Fire progression was based on observed active fire detections from both the Terra and Aqua satellites using the MODIS active fire product.

Properties

When unzipped, the shapefile contains six files (*.shx, *.dbf, *.prj, *.sbn, *.sbx, and *.shp).

Parameters of the shapefile:

Geometry Type: Polygon

Geographic Coordinate System: GCS_WGS_1984

Datum: _WGS_1984

Prime Meridian: Greenwich

Angular Unit: Degree

Extent:

North: 64.301420

South: 60.649240

West: -120.729210

East: -111.178540

Attributes of the shapefile:

FID: Shapefile feature ID

Shape: Feature type

Date: Date burned

mtbs_id: Monitoring trends in burn severity index ID

fire name: Year of burn and district-fire number

JulianDay: Burned date in julian day (added to visualize in arc map)

Field Data - Burned Sites

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

Burn severity was measured at 30 sites located in five 2014 wildfire areas (SS3, SS82, ZF17, ZF20, and ZF46).

Seventeen sites were selected for more additional measurements which are found in the biophysical, inventory, seedling and soil moisture data files.

Note: Photos were taken at the sites (noted in three of the burned site data files) and are provided in companion files (.shp and .kmz formats). A description of the companion files is provided at the end of this section.

Table 2. Summary listing of wildfire areas, burned sites, and data types collected at each site.

Wildfire Area	Site	Plots per site	Latitude	Longitude	Condition	Burn severity	Biophysical	Inventory	Seedling sprouting	Soil moisture
SS3	SS3-10	6	60.88	-117.39	burned	X	X	X	X	X
	SS3-28	6	60.95	-117.38	burned	X				
	SS3-29	6	60.95	-117.37	burned	X				
	SS3-30	6	60.95	-117.37	burned	X				
	SS3-40**	6	60.95	-117.33	burned	X	X	X	X	X
	SS3-42	6	60.96	-117.32	burned	X	X	X	X	X
	SS3-64	6	60.92	-117.03	burned	X				
	SS3-65	6	60.92	-117.02	burned	X				
SS82	SS82-1	6	61.15	-119.09	burned	X	X	X	X	X
	SS82-2	6	61.15	-119.10	burned	X	X	X	X	X
ZF17	ZF17-1	2	62.36	-113.06	burned	X	X	X	X	X
	ZF17-15	6	62.38	-113.10	burned	X	X	X	X	X
	ZF17-22	5	62.40	-113.13	burned	X	X	X	X	X
	ZF17-40	4	62.39	-113.13	burned	X	X	X	X	X
	ZF17-6	6	62.36	-113.07	burned	X	X	X	X	X
	ZF17-7	6	62.35	-113.08	burned	X	X	X	X	X
	ZF17-9	4	62.35	-113.10	burned	X				
	ZF17-9	4	62.35	-113.09	burned	X	X	X	X	X
ZF20	ZF20-10	6	61.72	-116.89	burned	X				
	ZF20-12	6	61.74	-116.86	burned	X				
	ZF20-15	6	61.75	-116.83	burned	X				
	ZF20-26	6	61.77	-116.79	burned	X				
	ZF20-27	6	61.77	-116.79	burned	X	X	X	X	X
	ZF20-3	6	61.62	-117.13	burned	X				
	ZF20-4	6	61.62	-117.13	burned	X	X	X	X	X
	ZF20-40	6	61.81	-116.72	burned	X	X	X	X	X
	ZF20-41	6	61.81	-116.72	burned	X				
ZF20-47	6	62.03	-116.31	burned	X	X	X	X	X	
ZF46	ZF46-14	6	62.67	-116.38	burned	X				
	ZF46-15	6	62.56	-116.38	burned	X				
	ZF46-5	6	62.48	-116.50	burned	X	X	X	X	X

This table is also provided in *.csv format as the companion file [NWT_CANADA_Wildfires_2014_generaltable.csv](#)

**The SS3-40 site is also the field validation site SS3-40-1.

Burn Severity Data:

This file provides burn severity data collected from 30 sites located in five areas: SS3, SS82, ZF17, ZF20, and ZF46. Data not provided or not reported are recorded as -9999; data not applicable are recorded as not_applicable.

File: [NWT_Wildfires_burn_severity_2015.csv](#)

Variable	Units	Description
Site_Name		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.
Plot		Plot number within the site; there are up to 6 plots per site
Date	YYYYMMDD	Sampling date
Time	HH:MM	Time at which field work began in local time (MDT)
Latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Observer		Initials of person(s) who collected the data
		Type of ecosystem; where the site included multiple

Ecosystem		ecosystem types they are all reported. See documentation for ecosystem characteristics.
Thaw_Depth	cm	Depth of soil to frozen ground layer reported in centimeters from surface
Peat_Depth	cm	Thickness of organic peat soil layer reported in centimeters
Ash		Amount of ash present on ground surface. Reported as: No, Light, Moderate, or Heavy
Moss_Unburned	percent	Percent of moss in plot (10 x 10-m area) that is unburned
Moss_Singed	percent	Percent of moss in plot (10 x 10-m area) that is singed
Moss_Light	percent	Percent of moss in plot (10 x 10-m area) that is lightly burned
Moss_Moderate	percent	Percent of moss in plot (10 x 10-m area) that is moderately burned
Moss_Severe	percent	Percent of moss in plot (10 x 10-m area) that is severely burned
Litter_Unburned	percent	Percent of litter in plot (10 x 10-m area) that is unburned
Litter_Singed	percent	Percent of litter in plot (10 x 10-m area) that is lightly singed
Litter_Charred	percent	Percent of litter in plot (10 x 10-m area) that is charred
Litter_Ashed	percent	Percent of litter in plot (10 x 10-m area) that is ashed
Shrub_Unburned	percent	Percent of shrubs in plot (10 x 10-m area) that is unburned
Shrub_Scorched	percent	Percent of shrubs in plot (10 x 10-m area) that is lightly scorched
Shrub_LimbsLeft	percent	Percent of shrubs in plot (10 x 10-m area) with some limbs left
Shrub_Consumed	percent	Percent of shrubs in plot (10 x 10-m area) that is consumed
Live_trees	percent	Percent of trees in plot (10 x 10-m area) live and undamaged
Dead_foliage_intact	percent	Percent of trees in plot (10 x 10-m area) dead but with no foliage consumed
Dead_foliage_burned	percent	Percent of trees in plot (10 x 10-m area) dead with needles and small branches burned
Dead_trees_secondary	percent	Percent of trees in plot (10 x 10-m area) dead with only some secondary branches remaining
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
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
Dead_trees_charred_pole	percent	Percent of trees in plot (10 x 10-m area) dead with no primary branches and a charred pole
Root1_ht	cm	Height from current ground level up to first randomly selected adventitious root reported in meters
Root2_ht	cm	Height from current ground level up to second randomly selected adventitious root reported in meters
Root3_ht	cm	Height from current ground level up to third randomly selected adventitious root reported in meters
Root4_ht	cm	Height from current ground level up to fourth randomly selected adventitious root reported in meters
NadirCover_ShrubLive	percent	Percent ground cover composed of live shrubs. 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
NadirCover_ShrubDead	percent	Percent ground cover composed of dead shrubs. 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
NadirCover_WoodyDebris	percent	Percent ground cover composed of woody debris. 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
NadirCover_HerbaceousLive	percent	Percent ground cover composed of live herbaceous plants. 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
NadirCover_HerbaceousDead	percent	Percent ground cover composed of dead herbaceous plants. 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
NadirCover_MossLive	percent	Percent ground cover composed of live moss. 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
NadirCover_MossDead	percent	Percent ground cover composed of dead moss. 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
Tree_ht1	m	Height of tree 1 reported in meters
Tree_Condition1		Condition of tree 1: live or dead
Tree_ht2	m	Height of tree 2 reported in meters
Tree_Condition2		Condition of tree 2: live or dead
Tree_ht3	m	Height of tree 3 reported in meters
Tree_Condition3		Condition of tree 3: live or dead
Camera_ID		Camera name used to photograph the site. This is also the companion folder-file name where a photo would be found. Described in the companion files table at the end of this document section
North_Photo		North facing photo id number
East_Photo		East facing photo id number
South_Photo		South facing photo id number
West_Photo		West facing photo id number
Nadir_Photo		Nadir facing photo id number
Notes		additional comments

Vegetation Biophysical Data:

This file provides vegetation community biophysical data collected from five sites in 2015. Data not applicable are reported as not_applicable.

File: NWT_Wildfires_Biophysical_2015.csv

Variable	Unit	Explanation
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.
Plot		Plot number within site
Plot_Size		Size of sampling plot reported in meters by meters
Date	YYYYMMDD	Sampling date

Observer	text	Initials of person(s) who collected the information
Burn_Severity		Burned or no
Latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Time	HH:MM	Time that data collection at that location began in local time MDT (UTC-6)
Live_Canopy_Cover	percent	Percent of canopy (tree) cover classified as live
Dominant_Cover		Description of the dominant cover type. Choices included: forested; shrub; herbaceous or some combination of these cover types
Ecosystem_Type		Ecosystem type(s) represented in the plot: bog; fen; lowland; upland see table for defining characteristics
Ground_Wetness		Description of the soil moisture status: dry, moist, soggy, standing water, or some combination of these conditions
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
Soil_Live_moss_thickness	cm	Thickness of the live moss component of the organic soil layer reported in centimeters
Soil_Dead_moss_layer_thickness	cm	Thickness of the dead moss component of the organic soil layer reported in centimeters
Soil_Upper_duff_layer_thickness	cm	Thickness of the upper duff component of the organic soil layer reported in centimeters
Soil_Lower_duff_layer_thickness	cm	Thickness of the lower duff component of the organic soil layer reported in centimeters
Total_Peat_depth	cm	Depth of entire peat layer calculated as the sum of the previous 4 columns reported in centimeters from surface
Low_Shrubs_coverage	percent	Percent of ground covered in low shrubs reported as percent of total plot area
Low_Shrubs_distribution		Pattern of distribution of low shrubs: reported as E (even), P (peripheral), or patchy
Woody_debris_coverage	percent	Percent of ground covered in woody debris reported as percent of total plot area
Woody_debris_distribution		Pattern of distribution of low shrubs: reported as E (even), P (peripheral), or patchy
Sphag_coverage	percent	Percent of ground covered in Sphagnum moss reported as percent of total plot area
Sphag_distribution		Pattern of distribution of Sphagnum moss: reported as E (even), P (peripheral), or patchy
Reindeer_lichen_coverage	percent	Percent of ground covered in reindeer lichen reported as percent of total plot area
Reindeer_lichen_distribution		Pattern of distribution of reindeer lichen: reported as E (even), P (peripheral), or patchy
Grasses_coverage	percent	Percent of ground covered in grasses reported as percent of total plot area
Grasses_distribution		Pattern of distribution of grasses: reported as E (even), P (peripheral), or patchy
Herbaceous_coverage	percent	Percent of ground covered in herbaceous plants reported as percent of total plot area
Herbaceous_distribution		Pattern of distribution of herbaceous plants: reported as E (even), P (peripheral), or patchy

Open_water_coverage	percent	Percent of ground covered in open water reported as percent of total plot area
Open_water_distribution		Pattern of distribution of open water: reported as E (even), P (peripheral), or patchy
other_type		Description of other ground cover type
other_coverage	percent	Percent of ground covered in other ground cover reported as percent of total plot area
other_distribution		Pattern of distribution of other ground cover: reported as E (even), P (peripheral), or patchy
Camera_ID		Camera name used to photograph the site. This is also the companion folder-file name where a photo would be found. Described in the companion files table at the end of this document section
Photo_ID_North		North facing photo id number
Photo_ID_East		East facing photo id number
Photo_ID_South		South facing photo id number
Photo_ID_West		West facing photo id number
Photo_ID_Nadir		Nadir facing photo id number
Photo_other		ID number of additional photos where taken
Notes		Description of additional photos or other field notes

Soil Moisture and Temperature Data:

This file provides soil moisture and temperature data collected from five sites in 2015. Data not provided or missing are reported as -9999.

File: **NWT_Wildfires_soil_moisture_2015.csv**

Variable	Unit	Explanation
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.
Plot		Plot number. Each site had up to six plots
Date	YYYYMMDD	Sampling date
Start_Time	HH:MM	Time that data collection at that location began in local time MDT (UTC-6)
Observers	Initials	Person(s) who collected data
Latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Longitude	decimal degrees	Longitude of plot Coordinates were taken with a handheld GPS unit in a plot corner
Probe_depth	cm	The depth to which the tip of the data probe was inserted
Probe_angle		The angle the data probe was inserted into the soil. 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.
Sampling_period	Seconds	The time in seconds taken to record the volumetric water content (VMC)
VWC	Percentage	Volumetric Water Content of the soil reported in percentage. Soil moisture was measured with two Campbell Scientific CS620 Hydrosense handheld probes: one 12 cm long the other 20 cm long.
Soil_T	Degrees Celsius	Temperature of soil reported in degrees Celsius. Soil temperature was measured at 11.5-cm depth using a Hannah Instruments HI 145 probe. Note temperatures were recorded in degrees Fahrenheit and then converted.

Seedling and Sprouting Data:

This file provides observations of woody vegetation seedling/saplings and sprouting of mosses and lichen collected from five sites in 2015.

File: NWT_Wildfires_seedling_sprouting_2015.csv

Variable	Unit	Explanation
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.
Plot		Plot number. Each site had up to six plots
Date	YYYYMMDD	Sampling date
Observers		Initials of person(s) who collected data
Latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Species		Scientific name of vegetation species measured
Veg_stage		Growth stage of vegetation: seedling or sprouting
Number		Number of seedlings or sproutings recorded. For mosses and lichens where number was difficult to determine four codes were used: -1111 indicating a small patch of approximately 10 by 15 cm; -2222 indicating 20 percent of the plot area covered; -3333 indicating less than 10 percent of the plot area covered; -4444 indicating 35 percent of the plot area covered
Seedbed		Seedbed type: sphagnum, unburned organic material (duff and litter), thick burned organic material, thin burned organic material, or exposed mineral soil
Camara_ID		Camera name used to photograph the site. This is also the companion folder-file name where a photo would be found. Described in the companion files table at the end of this document section
Photo_ID		Plot photo id number(s)

Plot Vegetation Inventory Data:

This file provides site/plot observations, species inventory, diameter, and height data collected from five sites in 2015. Data not provided or missing are reported as -9999.

File: NWT_Wildfires_Inventory_2015.csv

Variable	Unit	Explanation
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.
Plot		Plot number. Each site had up to six plots
Date	YYYYMMDD	Sampling date
Observer		Initials of person(s) who collected the information
Burn_severity		Burn severity classification either burned or no
Plot_size	m x m	Size of sampling plot reported as meters by meters
Life_form		Life form: shrub or tree
Condition		Stem condition either live or dead
Species		Scientific name of stem measured
Diameter_type		Diameter was measured at one of three locations on the trunk: dbh measured at 1.3 meters above the ground, 1 meter above the ground, and basal diameter measured at ground level
Diameter	cm	Diameter reported in centimeters

Height	m	Height of stem reported in meters
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Field Data - Validation Sites

This file provides vegetation community characterization data collected from 43 field sites in 2015; one the sites was a burned site and five others were large unburned patches adjacent to burned sites. Data were collected at the additional SS82 and SS70 sites but were not collected the SS68 or FS33 sites.

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

Table 3. Summary listing of wildfire areas, validation sites, and data types collected at each site.

Wildfire Area	Site	Plots per site	Latitude	Longitude	Condition	Burn severity	Biophysical	Inventory	Seedling sprouting	Soil moisture	Field validation
FS26	FS26-34	1	61.1369	-119.8092	unburned						X
	FS26-39	1	61.144	-119.7786	unburned						X
	FS26-50	1	61.1519	-119.7002	unburned						X
	FS26-54	1	61.1499	-119.6772	unburned						X
	FS26-55	1	61.1483	-119.6748	unburned						X
	FS26-60	1	61.1537	-119.733	unburned						X
SS130	SS130-13	1	60.7362	-116.4976	unburned						X
	SS130-17	1	60.7142	-116.4699	unburned						X
	SS130-2	1	60.8693	-116.7282	unburned						X
	SS130-3	1	60.8662	-116.7167	unburned						X
	SS130-4	1	60.8661	-116.7152	unburned						X
SS3	SS3-1	1	60.9406	-117.3871	unburned						X
	SS3-10**	1	60.9287	-117.0036	unburned						X
	SS3-2	1	60.9691	-117.3096	unburned						X
	SS3-3	1	60.9778	-117.2197	unburned						X
	SS3-40**	6	60.95	-117.33	burned	X	X	X	X	X	X
SS70	SS70-14	1	60.8946	-116.7909	unburned						X
SS82	SS82-1**	1	61.0586	-118.5154	unburned						X
	SS82-3	1	61.1553	-119.0934	unburned						X
ZF17	Val-ZF17-2C	1	62.3333	-113.1011	unburned						X
	Val-ZF17-4C	1	62.3358	-113.0997	unburned						X
	Val-ZF17-5C	1	62.3393	-113.1003	unburned						X
	Val-ZF17-6C	1	62.337	-113.0848	unburned						X
	Val-ZF17-7C	1	62.3369	-113.0823	unburned						X
ZF20	ZF20-1	1	61.41	-117.4253	unburned						X
	ZF20-11	1	61.5502	-117.1833	unburned						X
	ZF20-12**	1	61.5512	-117.1771	unburned						X
	ZF20-17	1	61.9951	-116.3638	unburned						X
	ZF20-18	1	62.0528	-116.3146	unburned						X
	ZF20-19	1	62.0577	-116.3181	unburned						X
	ZF20-2	1	61.4134	-117.4198	unburned						X
	ZF20-26**	1	61.7691	-116.7878	unburned						X
	ZF20-33	1	61.7887	-116.756	unburned						X
	ZF20-34	1	61.7909	-116.7562	unburned						X
ZF20-47**	1	62.0287	-116.3146	unburned						X	
ZF46	ZF46-10	1	62.556	-116.4165	unburned						X
	ZF46-11	1	62.7714	-115.8946	unburned						X
	ZF46-3	1	62.2588	-116.3709	unburned						X
	ZF46-6	1	62.5427	-116.4458	unburned						X
ZF85	ZF85-1	1	62.7245	-115.6351	unburned						X
	ZF85-15	1	62.5047	-114.7926	unburned						X
	ZF85-6	1	62.6611	-115.5971	unburned						X
	ZF85-7	1	62.5683	-115.1224	unburned						X

** The SS3-40 site in the field validation file corresponds to the SS3-40-1 site in the burned field data files. Five other sites are large unburned patches adjacent to burned sites and have the same site name in the burned field data files.

* This table is also provided in *.csv format as the companion file **NWT_CANADA_Wildfires_2014_generaltable.csv**

Vegetation Community Characterization Data:

Data not provided or not reported are recorded as -9999; data not applicable are recorded as not_applicable.

File: NWT_Wildfires_fieldvalidation_2015.csv

Variable Name	Unit	Explanation
Site_Name		Unique name given to a field point
Date	YYYYMMDD	Sampling date
Time	HH:MM	Time at which field work began in local time (MDT)
Latitude	decimal degrees	Latitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Longitude	decimal degrees	Longitude of plot. Coordinates were taken with a handheld GPS unit in a plot corner
Observers	Text	Initials of person(s) who collected data
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.
Peat_Depth	cm	Depth of organic peat soil reported in centimeters
Soil_pH		pH units
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
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)
Vegetation		List of vegetation species present
Dense_trees	percent	Percent of plot covered in dense trees. Plot areas were 0.5 acre
Dense_trees_dist		Description of dense tree distribution: E (evenly distributed), C (center only), and P (peripheral)
Moderate_trees	percent	Percent of plot covered in moderate trees. Plot areas were 0.5 acre
Moderate_trees_dist		Description of moderate tree distribution: E (evenly distributed), C (center only), and P (peripheral)
Sparse_trees	percent	Percent of plot covered in sparse trees. Plot areas were 0.5 acre
Sparse_trees_dist		Description of sparse tree distribution: E (evenly distributed), C (center only), and P (peripheral)
Open_water	percent	Percent of plot covered in open water. Plot areas were 0.5 acre
Open_water_dist		Description of open water distribution: E (evenly distributed), C (center only), and P (peripheral)
Shrubby	percent	Percent of plot covered in shrubs. Plot areas were 0.5 acre
Shrubby_dist		Description of shrub distribution: E (evenly distributed), C (center only), and P (peripheral)
Moss	percent	Percent of plot covered in moss. Plot areas were 0.5 acre
Moss_dist		Description of moss distribution: E (evenly distributed), C (center only), and P (peripheral)
Grass_sedge	percent	Percent of plot covered in grass/sedge. Plot areas were 0.5 acre
Grass_sedge_dist		Description of grass/sedge distribution: E (evenly distributed), C (center only), and P (peripheral)
Other_descrip		Description of other vegetation cover
Other	percent	Percent of plot covered in other vegetation. Plot area is 0.5 acre
Other_dist		Description of other vegetation distribution: E (evenly distributed), C (center only), and P (peripheral)
Dom_spp1	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
Density_spp1	percent	Percent of area covered by dominant species 1
Live_spp1	percent	Percent of dominant species 1 live (by area)
Dead_spp1	percent	Percent of dominant species 1 dead (by area)
Stage_spp1		Growth Stage for dominant species: dormant, emerging, seedling, immature, mature, flowering
Dom_spp2	genus_species	Scientific name of 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
Density_spp2	percent	Percent of area covered by dominant species 2
Live_spp2	percent	Percent of dominant species 2 live (by area)
Dead_spp2	percent	Percent of dominant species 2 dead (by area)
Stage_spp2		Growth Stage for dominant species: dormant, emerging, seedling, immature, mature, flowering
Lowest_branch_ht	m	Height of average lowest living branch reported in meters
Soil_live_moss	cm	Depth of live moss layer present in 40-cm soil profile
Soil_dead_moss	cm	Depth of dead moss layer present in 40-cm soil profile
Soil_upper_duff	cm	Depth of upper duff layer present in 40-cm soil profile
Soil_lower_duff	cm	Depth of lower duff layer present in 40-cm soil profile
Camera_ID		Camera name used to photograph the site- this is also the companion folder-file name where a photo would be found. Described in the companion files table at the end of this document section
North_Photo	North facing photo id number	North facing photo id number
East_Photo	East facing photo id number	East facing photo id number
South_Photo	South facing photo id number	South facing photo id number
West_Photo	West facing photo id number	West facing photo id number
Nadir_Photo	Nadir facing photo id number	Nadir facing photo id number
Notes		

Companion Files

- **NWT_CANADA_Wildfires_2014_generaltable.csv**: A summary of site names, plots, latitude, longitude, site condition, and variables measured at each site
- **Wildfires_2014_NWT_Canada.pdf**: This document in pdf format
- **2014_NWT_fireprogression.kmz**: The shapefile **2014_NWT_fireprogression.shp** provided in .kmz format for visualization in Google Earth

Site Photograph Companion Files

Photographs were taken at many of the sites; they were **numbered**, and are contained in five folders. The folder names correspond to the camera used to take the photo, called **Camera_ID** in the data files. Different cameras were not used for each site so the **Camera_ID** does not correspond to particular sites. Also, the photo numbers in the first two folders below overlap, however, the sites are provided in the data files so each photo number and camera ID correspond to a site in each particular file. See the example provided at the end of this section.

Folder names (also Camera_ID name) and photo numbers:

- **june_1326:** contains photos numbered 52-885
- **june_1327:** contains photos numbered 3-384
- **june_eastern:** contains photos numbered 5727-5817
- **july_1326:** contains photos numbered 959-1341
- **july_eastern:** contains photos numbered 5896-5985

Each folder contains the following files (named with the folder name):

- The photos provided in*.kmz format for visualization in Google Earth
- A zip file with the photos in *.jpg format
- A zip file which contains a shapefile (*.shp) of the field of view of the photo
- A zip file which contains a shapefile (*.shp) of the locations of the photos.

Example folder and file names in the folder:

Folder **june_eastern** (photos numbered 5727-5817) contains:

- **june_eastern.kmz:** photos provided for visualization in Google Earth
- **june_eastern_photos.zip:** photos in .jpg format
- **june_eastern_field_of_view.zip:** zipped shapefile contains polygon representations of the field of views of the photos with ID's numbered 5727-5817
- **june_eastern_photo_locations.zip:** zipped shapefile contains point locations of the photos with ID's numbered 5727-5817

Data files with photos include:

- **NWT_Wildfires_Biophysical_2015.csv**
- **NWT_Wildfires_seedling_sprouting_2015.csv**
- **NWT_Wildfires_fieldvalidation_2015.csv**
- **NWT_Wildfires_burn_severity_2015.csv**

Example data file content showing Camera_ID and Photo_ID: NWT_Wildfires_seedling_sprouting_2015.csv

Site	Plot	Date	Latitude	Longitude	Observers	Species	Condition	Number	Seedbed	Camera_ID	Photo_ID
SS3-10	1	20150605	60.87818	-117.394	MB	Populus balsamifera	Seedling	1	Burned Thick	june_1326	129

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 fires in Northwest Territories.

4. Quality Assessment

The overall accuracy for all peatland type maps was 90.8%. Twenty percent of supervised training data were reserved for the validation assessment.

The total accuracy for the ZF20/ZF85/ZF46 maps was 92%, ZF17 86%, SS68 88%, SS03/SS130 91%, and FS33/FS26 was 94%.

Classified	Ground Truthed Values											Sum	Commission	User Acc.
	Water	Marsh	Swamp	Open Fen	Treed Fen	Bog	Upland Forest	Barren	Ag	Developed				
Water	2615	0	0	0	0	0	0	6	0	0	2621	0%	100%	
Marsh	10	2346	5	68	48	8	4	15	0	0	2504	6%	94%	
Swamp	0	3	2140	0	0	21	53	11	0	0	2228	4%	96%	
Open Fen	0	91	1	2312	438	32	0	7	0	0	2881	20%	80%	
Treed Fen	0	48	3	197	2042	90	9	29	0	0	2418	16%	84%	
Bog	0	25	0	69	20	2406	36	8	0	2	2566	6%	94%	
Upland Forest	0	77	260	8	76	42	2541	42	0	2	3048	17%	83%	
Barren	0	17	0	0	0	9	30	2503	0	33	2592	3%	97%	
Ag	0	16	0	0	0	0	0	0	199	9	224	11%	89%	
Developed	0	0	0	0	0	0	0	5	0	557	562	1%	99%	
Sum	2625	2623	2409	2654	2624	2608	2673	2626	199	603				
Omission	0%	11%	11%	13%	22%	8%	5%	5%	0%	8%				
Prod. Acc.	100%	89%	89%	87%	78%	92%	95%	95%	100%	92%				

Figure 2. Combined overall accuracy for Northwest Territories peatland type maps.

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 in the North Slave, South Slave, and Dehcho Regions of Northwest Territories, Canada. The main focus areas were nine 2014 wildfires: FS33, FS26, SS03, SS130, SS68, ZF17, ZF20, ZF85, and ZF46. Additional fires (because of proximity) included SS33 (partial), SS15, SS70, SS97, SS81, SS82, SS152, SS96, FS49, ZF126, ZF143, ZF124, ZF92 (partial), and ZF45 (partial). 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 the ABoVE Grid Reference: <https://above.maps.arcgis.com/home/item.html?id=ad3dc7c0ecef41bb8e2d928ce2ed7a48>

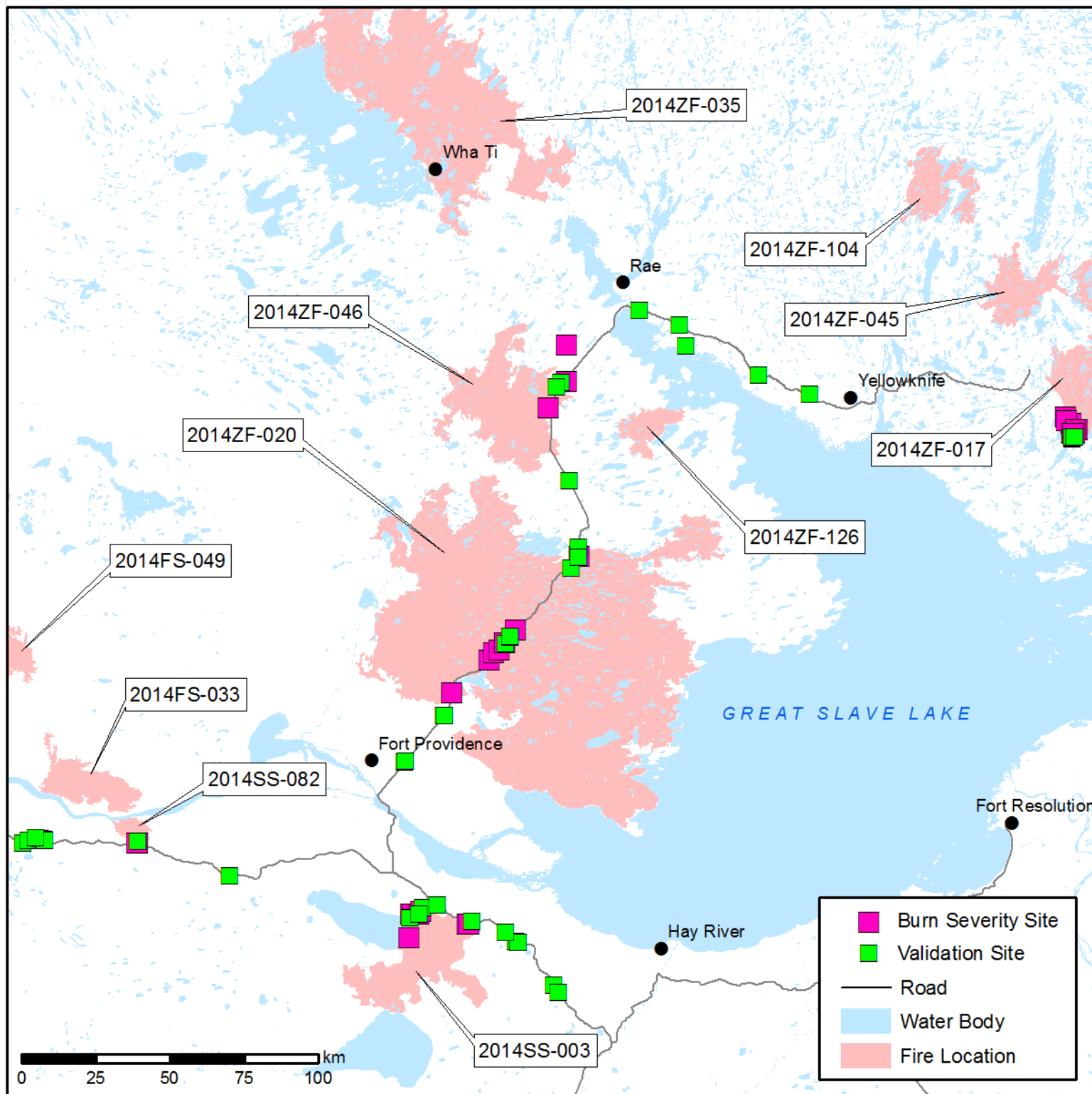


Figure 3. Wildfire areas (from 2014_NWT_fireprogression.shp) with burned and validation field site locations

(from NWT_CANADA_Wildfires_2014_generaltable.csv) in the Northwest Territories.

Peatland Type Mapping

The peatland classification (bog, fen, marsh, swamp) and level of biomass (open, forested) at each site was based on a pre-burn multi-date, multi-sensor fusion (Optical and L-band SAR) approach. A Random Forest classifier was used to generate a group of independent classification trees and the pixel class was determined by a majority vote of the trees. This classifier is a machine learning algorithm that takes advantage of an ensemble of classifiers that are built using training data. The training data were created through aerial photo interpretation combined with field data.

Classification Schematic

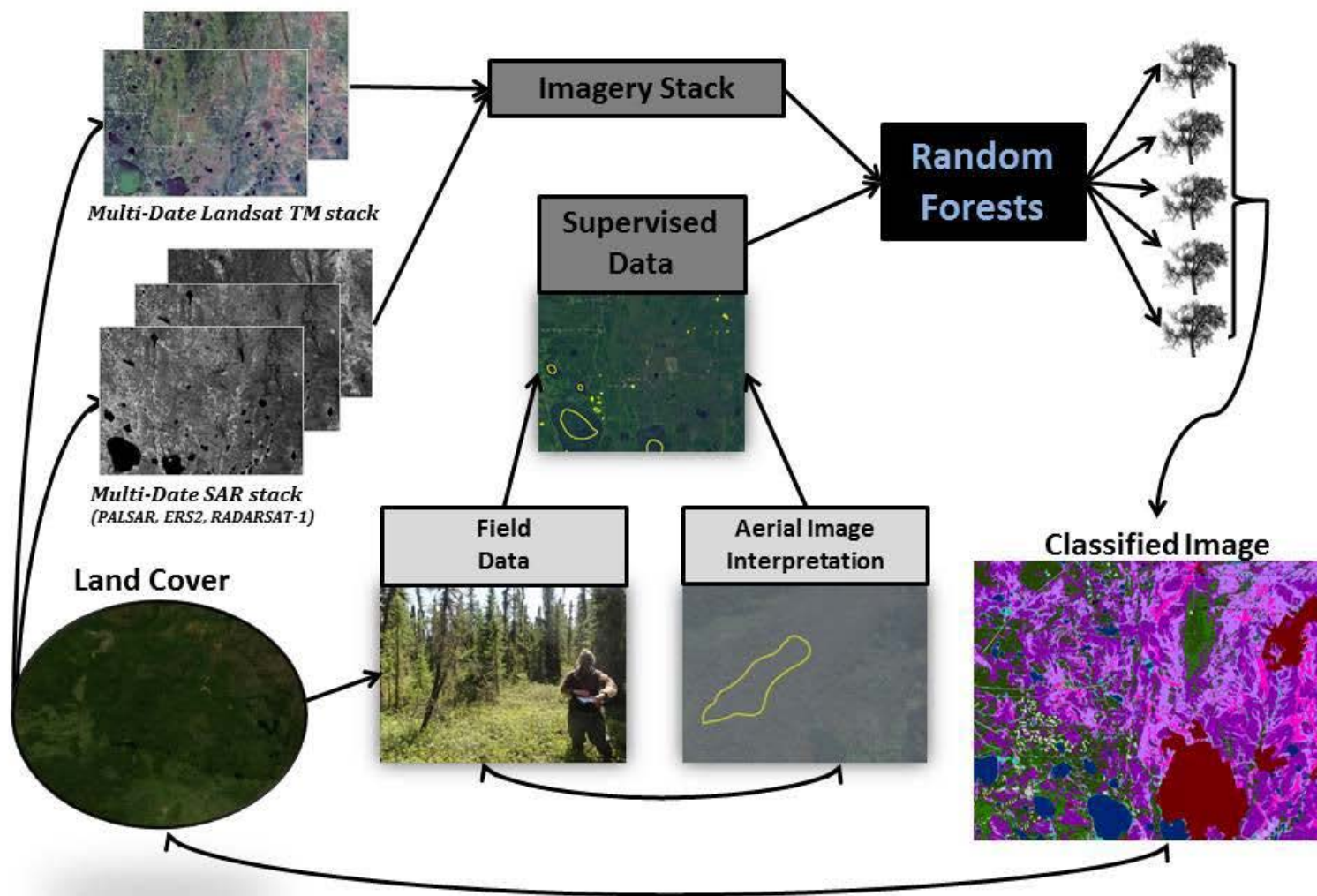


Figure 4. Classification schematic showing the mapping methodology from field data, aerial image interpretation, and imagery to classified map with a table of class id information.

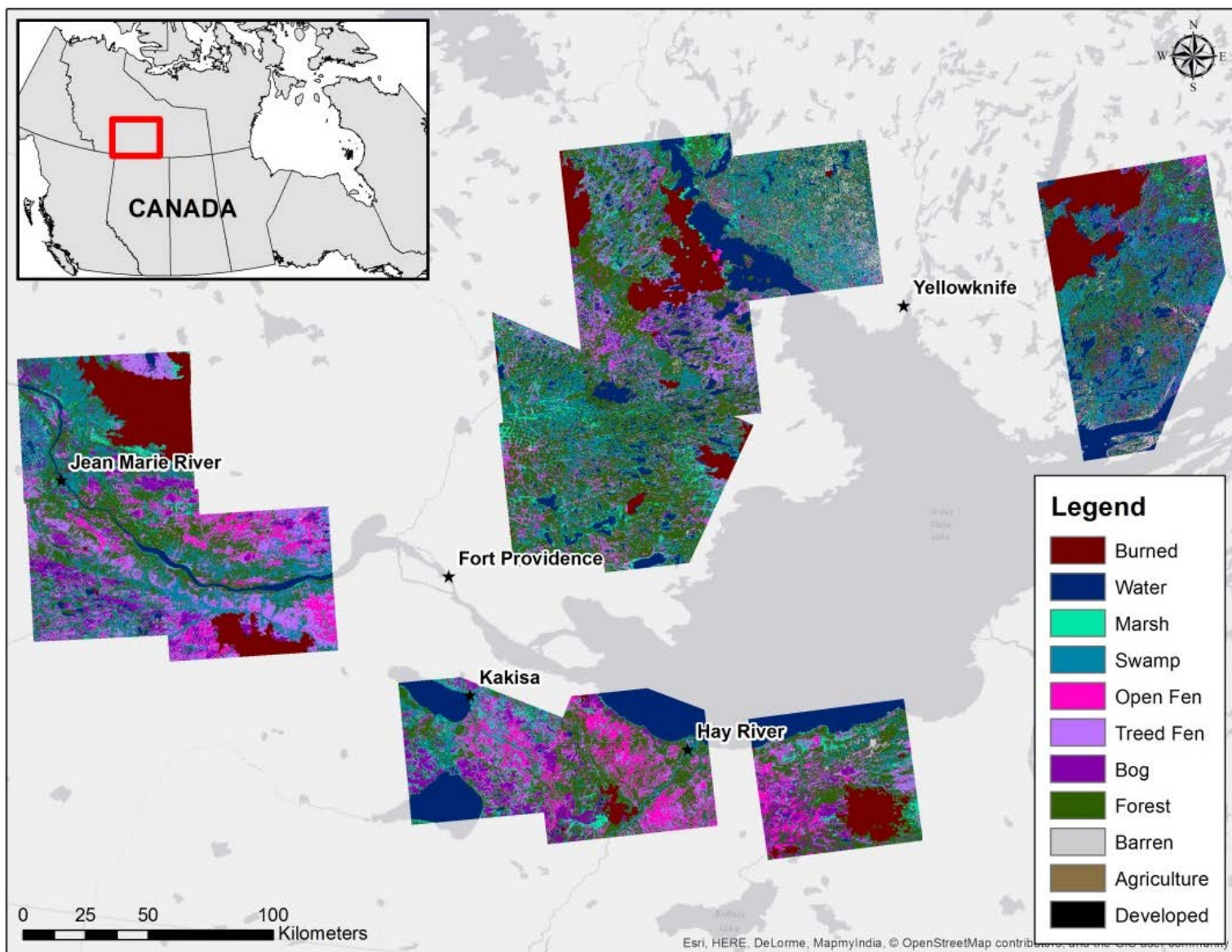


Figure 5. Peatland classification maps of the wildfire study areas in the Northwest Territories. Figure includes maps from all five peatland type landcover data files provided with the data set.

Peatland Type Validation

A total of 43 field locations were sampled in NWT, Canada to validate the peatland type maps. Field points were selected based on map classes. Of these 43 locations, one was a burned site (SS3-40) and five other locations represent measurements taken in large unburned patches adjacent to burned sites with the same name in other field data files. Data collections 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.

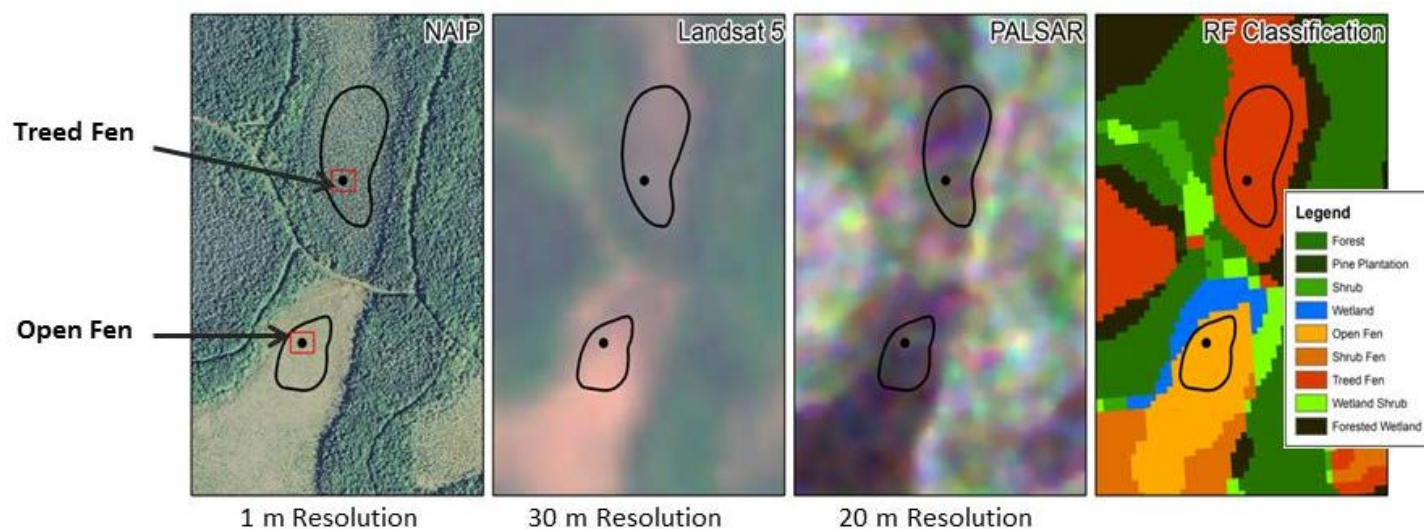


Figure 6. Field validation sampling plot in relation to the 30-m resolution Landsat, 20-m resolution SAR and the output map product. The red box shows a field-measured 40 x 50-m plot. The black dot is the center of the plot. Black outline polygons are air photo interpreted areas for training data in the classifier.

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.

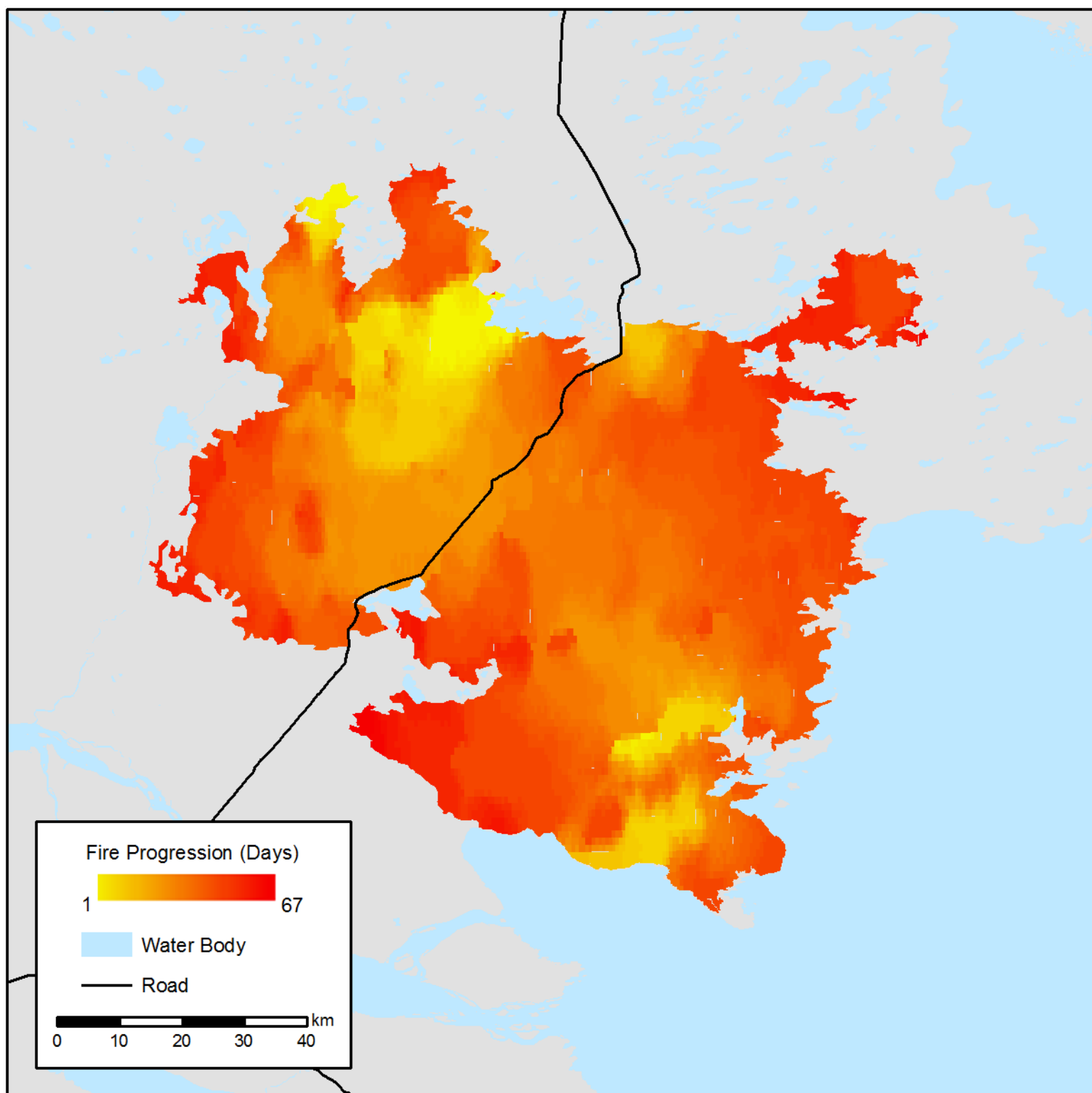


Figure 7. Fire progression of a 2014 wildfire at area ZF-020 (refer to Figure 3 for area location).

Field Data

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

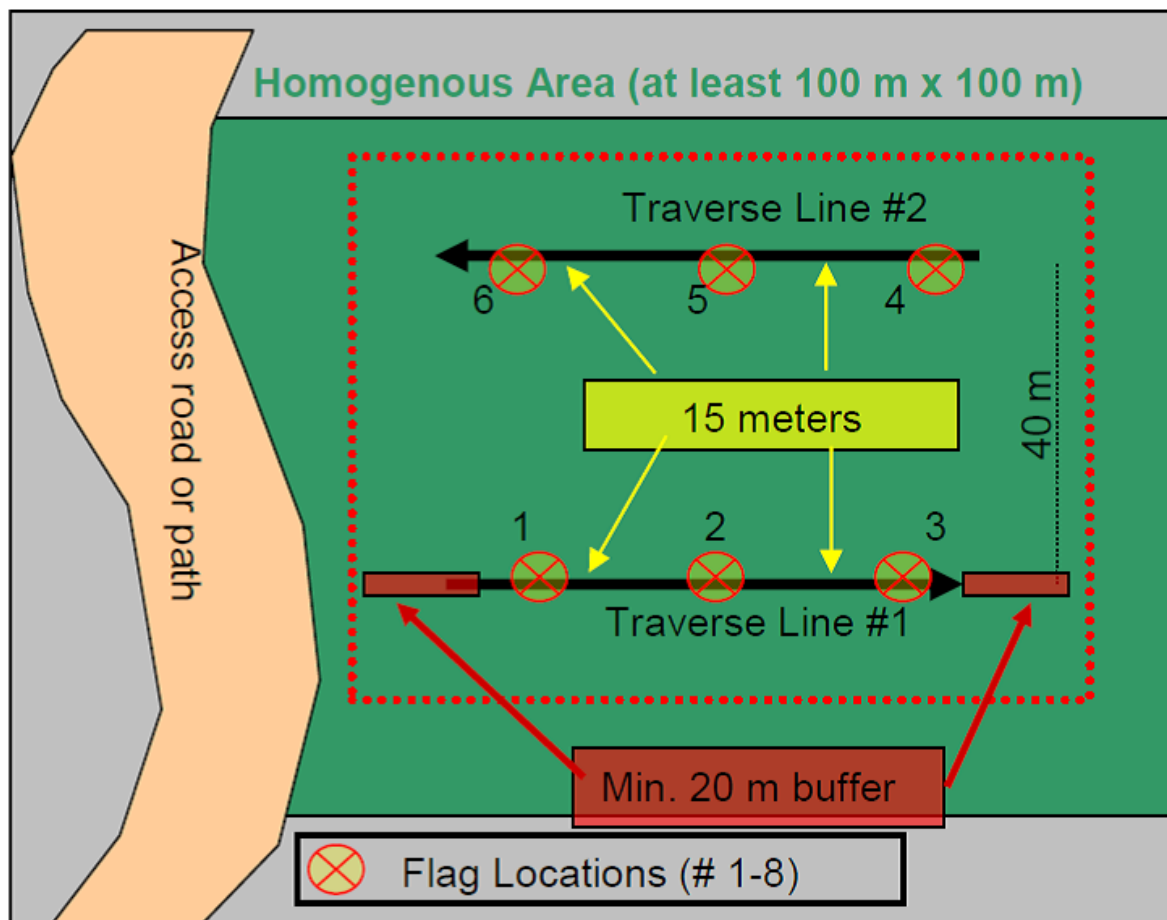


Figure 8. Plot set-up of homogeneous area of 100-m by 100-m with two transects of three plots for field sampling.

Burn Severity

A total of 30 sites were sampled. A 10-m x 10-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 four adventitious root heights were recorded. Peatland type, thaw depth, and peat thickness as well as ash presence are also reported for all plots.



Figure 9. Photo of a burned site in area ZF-17 (refer to Figure 3 for area location).

Biophysical Characteristics

At the same 17 sites where aboveground biomass was measured, field surveys noted 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. In addition five field photos were taken for each site and photo identifications were recorded.

Soil Moisture

A total of 17 sites were sampled. Five measurements were made at each depth for each plot.

Soil moisture data were collected with a Campbell Scientific CS620 Hydrosense handheld probe. 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 %VWC were collected at two to six points within each plot. For validation of remote sensing data, the moisture data were collected during Radarsat-2 overpasses.

Woody Seedling/Sprouting

A total of 17 sites were sampled. A 1-m x 1-m plot was set up in the corner of each site, where all woody seedling and sprouting vegetation was recorded along with the ground cover type. A nadir photo was also taken of the plot.

Inventory-Aboveground Biomass

A total of 17 sites were sampled. At each site a plot was taped off (varying in size between 5-m by 5-m and 10-m by 10-m) and each standing tree/shrub was measured. The tree/shrub species and DBH or basal diameter was recorded along with the height of at least five representative trees.

6. Data Access

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

[ABOVE: Burn Severity, Fire Progression, Landcover and Field Data, NWT, Canada, 2014](#)

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.

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.



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