Satellite-Based Forest Inventory (SBFI) for Canada 2020
Data Dictionary

Reference:

Wulder, M.A., Hermosilla, T., White, J.C., Hobart, G.W., Bater, C.W., Bronson, S.C., 2024. Development and implementation of a stand-level Satellite-Based Forest Inventory (SBFI) for Canada. Forestry VV(III), PPP-PPP. https://doi.org/10.1093/forestry/cpad065

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1. Introduction

Effective management of forest resources relies upon timely and accurate knowledge of forest attributes. While satellite data inputs typically result in pixel-based products, many end users continue to require polygon-based forest inventory information. To meet this information need and have a spatial context for forest inventory attributes, image segmentation approaches were applied to produce a national-scale polygonal satellite-based forest inventory (SBFI). Using the same data, attributes, and temporal representation, the entirety of Canada's forest ecosystems were mapped resulting in a common vegetation inventory system of Canada's ~650 Mha forested ecosystems.

SBFI polygons represent homogeneous forest conditions akin to those of stands delineated in a strategic forest inventory. Through the National Terrestrial Ecosystem Monitoring System (NTEMS), utilizing medium spatial resolution imagery from Landsat, the forests of Canada from 1984 to 2020 have been characterized (Table 1). Many NTEMS attributes are produced on an annual time step and provide the information basis to populate SBFI polygons. Polygon boundaries were determined using the multiresolution segmentation algorithm from the Object Analyst module of Catalyst (PCI Geomatics, Canada). Image segmentation was performed on three bands from the 2020 Landsat surface-reflectance Best Available Pixel image composite (i.e., red, near infrared, and shortwave infrared; SWIR1) along with layers for year of fire and year of harvest, as found in the NTEMS forest disturbance product (Hermosilla et al., 2016). Inclusion of the year of stand replacing disturbance events, fire and harvest, encouraged the delineation of stands of similar maturity. A minimum map unit (MMU) of five pixel (0.45 ha) was defined and thus polygons smaller than the MMU were merged into the neighbouring polygon with the longest boundary.

The resulting polygons were partitioned into 150 × 150-km processing tiles by assigning each polygon to the tile covering the greatest area proportion inside the polygon. Contiguous polygons in each tile with 95% or more of their surface covered by water were combined. Following image segmentation, SBFI polygons were characterized with information from the NTEMS products (Table 1), polygon geometric characteristics, and ancillary datasets.

The SBFI comprises 25,081,813 polygons covering the 650 Mha of Canada's forested ecosystems. Each SBFI polygon contains 132 attributes describing its geometry, land cover, species, disturbance history, spectral recovery, forest structure and age, as well as some display suggestions. The size of the treed-dominated SBFI polygons ranges from 0.45 ha to 1,014.9 ha, with an average area of 29.7 ha.

Table 1. Key attributes of Canada's National Forest Inventory (NFI) and Carbon Accounting programs, and list of related National Terrestrial Ecosystem Monitoring System (NTEMS) products (after White et al., 2014). Products are available for download from the National Forest Information System website.

Attributes	NTEMS Products	Sources
Land cover	Annual land cover	(Hermosilla et al., 2018, 2022b)
Crown closure	Forest structure: canopy cover	(Matasci et al., 2018)
Age	Forest age	(Maltman et al., 2023)

Species	Tree species: leading species, class membership likelihoods	(Hermosilla et al., 2022a)
Height	Forest structure: canopy height, height variability, Lorey's height	(Matasci et al., 2018)
Volume	Forest structure: gross stem volume	(Matasci et al., 2018)
Biomass	Forest structure: aboveground biomass	(Matasci et al., 2018)
Pre-disturbance land cover	Annual land cover	(Hermosilla, et al., 2022b)
Post-disturbance land cover	Annual land cover	(Hermosilla, et al., 2022b)
Disturbance agent	Forest disturbances: change attribution	(Hermosilla et al., 2015, 2016)
Disturbance year	Forest disturbances: change detection	(Hermosilla et al., 2016)
Disturbance extent (area)	Forest disturbances: change detection	(Hermosilla et al., 2016)
Disturbance intensity	Forest disturbances: change magnitude	(Hermosilla et al., 2016)
Forest recovery	Spectral recovery	(White et al., 2017, 2022)
Forest extent	FAO forest	(Wulder et al., 2020)

2. Database Structure

The SBFI dataset is contained within one file geodatabase, a proprietary database format developed by Esri. Contained within this geodatabase are 388 feature classes, one for each SBFI tile, and one feature class containing tile references used to locate tiles and their identification numbers. Polygon features within SBFI tile feature classes contain 132 fields that are organized based on the source of their values. Fields inform on polygon identification, geometry, stratification, land cover, disturbance, recovery, age, forest structure, tree species, and symbology.

2.1. Polygon Identification

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
OBJECTID	Object Identification	Mandatory field of Esri feature classes depicting a unique object identification number.		Integer	
Shape	Shape	Mandatory field of Esri feature classes that identifies the feature type of the feature class and contains the geometry of the feature.		Text	
ID	Identification	Unique polygon identification number used to distinguish each polygon.		Integer	Format follows XXXxxxxxx. First three numbers correspond to tile number, last six numbers correspond to a unique number that identifies each SBFI polygon within the tile
TILE	Tile Number	Identification number corresponding to one of 388 tiles used to segment the forested areas of Canada.		Integer	Format follows XXX. Three numbers to identify each tile

2.2. Geometry

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
AREA_HA	Polygon Area	Area of polygon in hectares measured using Lambert Conformal Conic projection.	ha	Decimal	
PERIMETER_M	Polygon Perimeter	Perimeter of polygon in meters measured using	m	Integer	

		Lambert Conformal Conic projection.			

2.3. Stratification

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
JURISDICTION	Jurisdiction	Province or Territory within which the majority of the polygon is located.		Text	One of the following values. Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Northwest Territories, Nova Scotia, Nunavut, Ontario, Prince Edward Island, Quebec, Saskatchewan, Yukon, or " " (for ocean polygons)
ECOZONE	Ecozone	Forest-dominated ecozone within which the majority of the polygon is located.		Text	One of the following values. Atlantic Maritime, Boreal Cordillera, Boreal Plains, Boreal Shield East, Boreal Shield West, Hudson Plains, Montane Cordillera, Pacific Maritime, Taiga Cordillera, Taiga Plains, Taiga Shield East, Taiga Shield West
ECOPROVINCE	Ecoprovince	Ecoprovince within which the majority of the polygon is located.		Text	See Table A1 for list of possible values
ECOREGION	Ecoregion	Ecoregion within which the majority of the polygon is located.		Text	See Table A2 for list of possible values
MANAGEMENT	Management Zone	Management zone within which the majority of the polygon is located.		Text	One of the following values. Federal Reserves, Indian Reserves, Long-Term Tenure, Other, Private Forests, Protected Areas, Restricted Areas, Short-Term Tenure, Treaty and Settlement Lands, Water, or " "

2.4. Land Cover

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
LC.WATER	Water	Percent of polygon area occupied by the land cover water.	%	Decimal	Values range from 0 – 100
LC.SNOW_ICE	Snow/Ice	Percent of polygon area occupied by the land cover snow/ice.	%	Decimal	Values range from 0 – 100
LC.ROCK_RUBBLE	Rock/Rubble	Percent of polygon area occupied by the land cover rock/rubble.	%	Decimal	Values range from 0 – 100
LC.EXPOSED_BARREN	Exposed/ Barren Land	Percent of polygon area occupied by the land cover exposed/barren land.	%	Decimal	Values range from 0 – 100
LC.BRYOIDS	Bryoids	Percent of polygon area occupied by the land cover bryoids.	%	Decimal	Values range from 0 – 100
LC.SHRUBS	Shrubs	Percent of polygon area occupied by the land cover shrubs.	%	Decimal	Values range from 0 – 100
LC.WETLAND	Wetland	Percent of polygon area occupied by the land cover wetlands.	%	Decimal	Values range from 0 – 100
LC.WETLAND_TREED	Wetland-Treed	Percent of polygon area occupied by the land cover wetland-treed.	%	Decimal	Values range from 0 – 100
LC.HERBS	Herbs	Percent of polygon area occupied by the land cover herbs.	%	Decimal	Values range from 0 – 100
LC.CONIFEROUS	Coniferous	Percent of polygon area occupied by the land cover coniferous.	%	Decimal	Values range from 0 – 100
LC.BROADLEAF	Broadleaf	Percent of polygon area occupied by the land cover broadleaf.	%	Decimal	Values range from 0 – 100
LC.MIXEDWOOD	Mixedwood	Percent of polygon area occupied by the land cover mixedwood.	%	Decimal	Values range from 0 – 100
LC.TREED	Treed	Percent of polygon area occupied by treed land cover classes. Treed land cover includes coniferous, broadleaf, mixedwood, and wetland-treed land cover classes.	%	Decimal	Values range from 0 – 100
LC.FAO_FOREST	FAO Forested	Percent of polygon area occupied by forested land	%	Decimal	Values range from 0 – 100

		cover as defined by the Food and Agriculture Organization (FAO).			
LC.WETLAND_VEGETATION	Wetland Vegetation	Percent of polygon area occupied by wetland landcover classes. Wetland vegetation includes wetland, and wetland-treed land cover classes.	%	Decimal	Values range from 0 – 100

2.5. Disturbance

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
DISTURB.FIRE.PERC	Disturbance Fire Percent	Percent of polygon area that has experienced fire.	%	Decimal	Values range from 0 – 100
DISTURB.FIRE.YEAR	Disturbance Fire Year	Modal year of fire disturbances within the polygon.	Calendar Year	Integer	Values range from 1985 – 2020
DISTURB.FIRE.MAGNITUDE.MIN	Disturbance Fire Magnitude Minimum	Minimum fire magnitude value within the polygon.	dNBR/100	Decimal	Values range from 0 – 2.00
DISTURB.FIRE.MAGNITUDE.MAX	Disturbance Fire Magnitude Maximum	Maximum fire magnitude value within the polygon.	dNBR/100	Decimal	Values range from 0 – 2.00
DISTURB.FIRE.MAGNITUDE.AVG	Disturbance Fire Magnitude Average	Average of fire magnitude values within the polygon.	dNBR/100	Decimal	Values range from 0 – 2.00
DISTURB.FIRE.MAGNITUDE.SD	Disturbance Fire Magnitude Standard Deviation	Standard deviation of fire magnitude values within the polygon.	dNBR/100	Decimal	Values range from 0 – 2.00
DISTURB.FIRE.MAGNITUDE.MEDIAN	Disturbance Fire Magnitude Median	Median fire magnitude value within the polygon.	dNBR/100	Decimal	Values range from 0 – 2.00

DISTURB.HARVEST.PERC	Disturbance Harvest Percent	Percent of polygon area that has experienced harvesting disturbances.	%	Decimal	Values range from 0 – 100
DISTURB.HARVEST.YEAR	Disturbance Harvest Year	Modal year of harvesting disturbances within the polygon.	Calendar Year	Integer	Values range from 1985 – 2020

2.6. Recovery

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
RECOVERY.FIRE.MIN	Recovery Fire Minimum	Minimum percent recovery value within the polygon resulting from fire disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.FIRE.MAX	Recovery Fire Maximum	Maximum percent recovery value within the polygon resulting from fire disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.FIRE.AVG	Recovery Fire Average	Average of percent recovery values within the polygon resulting from fire disturbances.	%	Decimal	Values range from -250 - 250
RECOVERY.FIRE.SD	Recovery Fire Standard Deviation	Standard deviation of percent recovery values within the polygon resulting from fire disturbances.	%	Decimal	Values range from -250 - 250
RECOVERY.FIRE.MEDIAN	Recovery Fire Median	Median percent recovery value within the polygon resulting from fire disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.HARVEST.MIN	Recovery Harvest Minimum	Minimum percent recovery value within the polygon resulting from harvesting disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.HARVEST.MAX	Recovery Harvest Maximum	Maximum percent recovery value within the polygon resulting from harvesting disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.HARVEST.AVG	Recovery Harvest Average	Average of percent recovery values within the polygon resulting from harvesting disturbances.	%	Integer	Values range from -250 - 250
RECOVERY.HARVEST.SD	Recovery Harvest	Standard deviation of percent recovery values within the	%	Integer	Values range from -250 - 250

	Standard Deviation	polygon resulting from harvesting disturbances.			
RECOVERY.HARVEST.MEDIAN	Recovery Harvest Median	Median percent recovery value within the polygon resulting from harvesting disturbances.	%	Integer	Values range from -250 - 250

2.7. Age

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
AGE.MIN	Forest Age Minimum	Minimum forest age value within the polygon.	Years	Integer	Values range from 0 – 150
AGE.MAX	Forest Age Maximum	Maximum forest age value within the polygon.	Years	Integer	Values range from 0 – 150
AGE.AVG	Forest Age Average	Average of forest age values within the polygon.	Years	Decimal	Values range from 0 – 150
AGE.SD	Forest Age Standard Deviation	Standard deviation of forest age values within the polygon.	Years	Decimal	Values range from 0 – 150
AGE.MEDIAN	Forest Age Median	Median forest age value within the polygon.	Years	Integer	Values range from 0 – 150
AGE.0_10	Forest Age from 0 - 10 Years	Percent of polygon area occupied by forests between 0-10 years of age.	%	Decimal	Values range from 0 – 100
AGE.10_20	Forest Age from 10 - 20 Years	Percent of polygon area occupied by forests between 10-20 years of age.	%	Decimal	Values range from 0 – 100
AGE.20_30	Forest Age from 20 -30 Years	Percent of polygon area occupied by forests between 20-30 years of age.	%	Decimal	Values range from 0 – 100
AGE.30_40	Forest Age from 30 - 40 Years	Percent of polygon area occupied by forests between 30-40 years of age.	%	Decimal	Values range from 0 – 100
AGE.40_50	Forest Age from	Percent of polygon area occupied by forests between 40-50 years of age.	%	Decimal	Values range from 0 – 100

	40 - 50 Years				
AGE.50_60	Forest Age from 50 - 60 Years	Percent of polygon area occupied by forests between 50-60 years of age.	%	Decimal	Values range from 0 – 100
AGE.60_70	Forest Age from 60 - 70 Years	Percent of polygon area occupied by forests between 60-70 years of age.	%	Decimal	Values range from 0 – 100
AGE.70_80	Forest Age from 70 - 80 Years	Percent of polygon area occupied by forests between 70-80 years of age.	%	Decimal	Values range from 0 – 100
AGE.80_90	Forest Age from 80 - 90 Years	Percent of polygon area occupied by forests between 80-90 years of age.	%	Decimal	Values range from 0 – 100
AGE.90_100	Forest Age from 90 - 100 Years	Percent of polygon area occupied by forests between 90-100 years of age.	%	Decimal	Values range from 0 – 100
AGE.100_110	Forest Age from 100 - 110 Years	Percent of polygon area occupied by forests between 100-110 years of age.	%	Decimal	Values range from 0 – 100
AGE.110_120	Forest Age from 110 - 120 Years	Percent of polygon area occupied by forests between 110-120 years of age.	%	Decimal	Values range from 0 – 100
AGE.120_130	Forest Age from 120 - 130 years	Percent of polygon area occupied by forests between 120-130 years of age.	%	Decimal	Values range from 0 – 100
AGE.130_140	Forest Age from 130 - 140 Years	Percent of polygon area occupied by forests between 130-140 years of age.	%	Decimal	Values range from 0 – 100
AGE.140_150	Forest Age from 140 - 150 Years	Percent of polygon area occupied by forests between 140-150 years of age.	%	Decimal	Values range from 0 – 100
AGE.GT_150	Forest Age >150 Years	Percent of polygon area occupied by forests greater than 150 years of age.	%	Decimal	Values range from 0 – 100

2.8. Forest Structure

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
STRUCTURE.CANOPY_HEIGHT.MIN	Canopy Height Minimum	Minimum canopy height value within the polygon.	m	Decimal	
STRUCTURE.CANOPY_HEIGHT.MAX	Canopy Height Maximum	Maximum canopy height value within the polygon.	m	Decimal	
STRUCTURE.CANOPY_HEIGHT.AVG	Canopy Height Average	Average of canopy height values within the polygon.	m	Decimal	
STRUCTURE.CANOPY_HEIGHT.SD	Canopy Height Standard Deviation	Standard deviation of canopy height values within the polygon.	m	Decimal	
STRUCTURE.CANOPY_HEIGHT.MEDIAN	Canopy Height Median	Median canopy height value within the polygon.	m	Decimal	
STRUCTURE.CANOPY_COVER.MIN	Canopy Cover Minimum	Minimum canopy cover value within the polygon.	%	Decimal	Values range from 0 – 100
STRUCTURE.CANOPY_COVER.MAX	Canopy Cover Maximum	Maximum canopy cover value within the polygon.	%	Decimal	Values range from 0 – 100
STRUCTURE.CANOPY_COVER.AVG	Canopy Cover Average	Average of canopy cover values within the polygon.	%	Decimal	Values range from 0 – 100
STRUCTURE.CANOPY_COVER.SD	Canopy Cover Standard Deviation	Standard deviation of canopy cover values within the polygon.	%	Decimal	Values range from 0 – 100
STRUCTURE.CANOPY_COVER.MEDIAN	Canopy Cover Median	Median canopy cover value within the polygon.	%	Decimal	Values range from 0 – 100
STRUCTURE.LOREYS_HEIGHT.MIN	Lorey’s Height Minimum	Minimum Lorey's height value within the polygon.	m	Decimal	
STRUCTURE.LOREYS_HEIGHT.MAX	Lorey’s Height Maximum	Maximum Lorey's height value within the polygon.	m	Decimal	

STRUCTURE.LOREYS_HEIGHT.AVG	Lorey's Height Average	Average of Lorey's height values within the polygon.	m	Decimal	
STRUCTURE.LOREYS_HEIGHT.SD	Lorey's Height Standard Deviation	Standard deviation of Lorey's height values within the polygon.	m	Decimal	
STRUCTURE.LOREYS_HEIGHT.MEDIAN	Lorey's Height Median	Median Lorey's height value within the polygon.	m	Decimal	
STRUCTURE.BASAL_AREA.MIN	Basal Area Minimum	Minimum basal area value within the polygon.	m^2/ha	Decimal	
STRUCTURE.BASAL_AREA.MAX	Basal Area Maximum	Maximum basal area value within the polygon.	m^2/ha	Decimal	
STRUCTURE.BASAL_AREA.AVG	Basal Area Average	Average of basal area values within the polygon.	m^2/ha	Decimal	
STRUCTURE.BASAL_AREA.SD	Basal Area Standard Deviation	Standard deviation of basal area values within the polygon.	m^2/ha	Decimal	
STRUCTURE.BASAL_AREA.MEDIAN	Basal Area Median	Median basal area value within the polygon.	m^2/ha	Decimal	
STRUCTURE.BASAL_AREA.TOTAL	Basal Area Total	Total of basal area values within the polygon.	m^2	Decimal	
STRUCTURE.AGB.MIN	Above Ground Biomass Minimum	Minimum above ground biomass (AGB) value within the polygon. AGB values are calculated using species specific equations.	t/ha	Decimal	
STRUCTURE.AGB.MAX	Above Ground Biomass Maximum	Maximum above ground biomass (AGB) value within the polygon. AGB values are calculated using species specific equations.	t/ha	Decimal	
STRUCTURE.AGB.AVG	Above Ground Biomass Average	Average of above ground biomass (AGB) values within the polygon. AGB values are calculated using species specific equations.	t/ha	Decimal	
STRUCTURE.AGB.SD	Above Ground Biomass Standard Deviation	Standard deviation of above ground biomass (AGB) values within the polygon. AGB values are calculated	t/ha	Decimal	

		using species specific equations.			
STRUCTURE.AGB.MEDIAN	Above Ground Biomass Median	Median above ground biomass (AGB) value within the polygon. AGB values are calculated using species specific equations.	t/ha	Decimal	
STRUCTURE.AGB.TOTAL	Above Ground Biomass Total	Total of above ground biomass (AGB) values within the polygon. Total AGB values represent the sum of AGB calculated using species specific equations.	t	Decimal	
STRUCTURE.VOLUME.MIN	Stem Volume Minimum	Minimum stem volume value within the polygon. Stem volume values are calculated using species specific equations.	m^3/ha	Decimal	
STRUCTURE.VOLUME.MAX	Stem Volume Maximum	Maximum stem volume value within the polygon. Stem volume values are calculated using species specific equations.	m^3/ha	Decimal	
STRUCTURE.VOLUME.AVG	Stem Volume Average	Average of stem volume value within the polygon. Stem volume values are calculated using species specific equations.	m^3/ha	Decimal	
STRUCTURE.VOLUME.SD	Stem Volume Standard Deviation	Standard deviation of stem volume values within the polygon. Stem volume values are calculated using species specific equations.	m^3/ha	Decimal	
STRUCTURE.VOLUME.MEDIAN	Stem Volume Median	Median stem volume value within the polygon. Stem volume values are calculated using species specific equations.	m^3/ha	Decimal	
STRUCTURE.VOLUME.TOTAL	Stem Volume Total	Total of stem volume values within the polygon. Stem volume values are calculated using species specific equations.	m^3	Decimal	

2.9. Species

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
SPECIES.NUMBER	Number of Tree Species Present	Count of tree species preset within the polygon.		Integer	Values range from 0 – 5
SPECIES.1	Leading Tree Species	Name of the leading tree species based on treed area within the polygon.		Text	Format follows genus.species (Table A3)
SPECIES.1.PERC	Percent Leading Tree Species	Percent of treed area within the polygon that is occupied by the leading tree species.	%	Decimal	Values range from 0 – 100
SPECIES.2	2nd Leading Tree Species	Name of the 2nd leading tree species based on treed area within the polygon.		Text	Format follows genus.species (Table A3)
SPECIES.2.PERC	Percent 2nd Leading Tree Species	Percent of treed area within the polygon that is occupied by the 2nd leading tree species.	%	Decimal	Values range from 0 – 100
SPECIES.3	3rd Leading Tree Species	Name of the 3rd leading tree species based on treed area within the polygon.		Text	Format follows genus.species (Table A3)
SPECIES.3.PERC	Percent 3rd Leading Tree Species	Percent of treed area within the polygon that is occupied by the 3rd leading tree species.	%	Decimal	Values range from 0 – 100
SPECIES.4	4th Leading Tree Species	Name of the 4th leading tree species based on treed area within the polygon.		Text	Format follows genus.species (Table A3)
SPECIES.4.PERC	Percent 4th Leading Tree Species	Percent of treed area within the polygon that is occupied by the 4th leading tree species.	%	Decimal	Values range from 0 – 100

SPECIES.5	5th Leading Tree Species	Name of the 5th leading tree species based on treed area within the polygon.		Text	Format follows genus.species (Table A3)
SPECIES.5.PERC	Percent 5th Leading Tree Species	Percent of treed area within the polygon that is occupied by the 5th leading tree species.	%	Decimal	Values range from 0 – 100
SPECIES.CONIFEROUS.PERC	Percent Coniferous Trees	Percent of treed area within the polygon that is occupied by coniferous tree species (Table A3) based on the sum of percent leading species values.	%	Decimal	Values range from 0 – 100
SPECIES.CML.1	Leading Tree Species Class Membership Likelihood	Name of the leading tree species based on class membership likelihood values.		Text	Format follows genus.species (Table A3)
SPECIES.CML.1.PERC	Percent Class Membership Likelihood of Leading Tree Species	Percent of class membership likelihood values assigned to the leading tree species within the polygon.	%	Decimal	Values range from 0 – 100
SPECIES.CML.2	2nd Leading Tree Species Class Membership Likelihood	Name of the 2nd leading tree species based on class membership likelihood values.		Text	Format follows genus.species (Table A3)
SPECIES.CML.2.PERC	Percent Class Membership Likelihoo	Percent of class membership likelihood values assigned to the 2nd leading tree species within the polygon.	%	Decimal	Values range from 0 – 100

	d of 2nd Leading Tree Species				
SPECIES.CML.3	3rd Leading Tree Species Class Membership Likelihood	Name of the 3rd leading tree species based on class membership likelihood values.		Text	Format follows genus.species (Table A3)
SPECIES.CML.3.PERC	Percent Class Membership Likelihood of 3rd Leading Tree Species	Percent of class membership likelihood values assigned to the 3rd leading tree species within the polygon.	%	Decimal	Values range from 0 – 100
SPECIES.CML.4	4th Leading Tree Species Class Membership Likelihood	Name of the 4th leading tree species based on class membership likelihood values.		Text	Format follows genus.species (Table A3)
SPECIES.CML.4.PERC	Percent Class Membership Likelihood of 4th Leading Tree Species	Percent of class membership likelihood values assigned to the 4th leading tree species within the polygon.	%	Decimal	Values range from 0 – 100
SPECIES.CML.5	5th Leading Tree Species Class Membership Likelihood	Name of the 5th leading tree species based on class membership likelihood values.		Text	Format follows genus.species (Table A3)

SPECIES.CML.5.PERC	Percent Class Membership Likelihood of 5th Leading Tree Species	Percent of class membership likelihood values assigned to the 5th leading tree species within the polygon.	%	Decimal	Values range from 0 – 100
SPECIES.CML.CONIFEROUS.PERC	Percent Class Membership Likelihood of Coniferous Tree Species	Percent of treed area within the polygon occupied by coniferous tree species (Table A3) based on class membership likelihood values.	%	Decimal	Values range from 0 – 100
SPECIES.CML.ASSEMBLAGES	Class Membership Likelihood Species Assemblage	First and second leading tree species based on SPECIES.CML.1 and SPECIES.CML.2 values. Requires each of SPECIES.CML.1.PERC and SPECIES.CML.2.PERC to have values greater than 15%.		Text	Format follows genus.species_genus.species (Table A3**Error! Reference source not found.**)
SPECIES.CML.ASSEMBLAGES.PERC	Percent Class Membership Likelihood of Tree Species Assemblage	Sum of SPECIES.CML.1.PERC and SPECIES.CML.2.PERC values if they are both greater than 15%.	%	Decimal	Values range from 0 – 100

2.10. Symbology

Field Name	Full Name	Description	Units	Data Type	Permitted Values/Range
SYMB.LAND_BASE_LEVEL	Land Base Level Symbology	Used to visualize polygons following the VLCEs Land Base Level classification of land cover.		Text	One of the following values. Vegetated, or Non-Vegetated

SYMB.LAND_COVER_LEVEL	Land Cover Level Symbology	Used to visualize polygons following the VLCEs Land Cover Level classification of land cover.		Text	One of the following values. Vegetated Non-Treed, Vegetated Treed, or Non-Vegetated
SYMB.VEGETATION_LEVEL	Vegetation Level Symbology	Used to visualize polygons following the VLCEs Vegetation Level classification of land cover.		Text	One of the following values. Broadleaf, Bryoids, Coniferous, Exposed - Barren, Herbs, Mixedwood, Rock - Rubble, Shrubs, Snow - Ice, Water, Wetland, Wetland Treed
SYMB.DISTURBANCE	Disturbance Symbology	Used to visualize polygons based on disturbance type and year of occurrence. Requires more than 50% of the polygon to be disturbed. Depending on the dominant disturbance, disturbance year is either "DISTURB.HARVEST.YEAR" or "DISTURB.FIRE.YEAR"		Text	Format follows DisturbanceType_Year
SYMB.RECOVERY	Recovery Symbology	Used to visualize polygons based on disturbance type and median spectral recovery. Requires the year of disturbance to be more than five years prior to 2020 with more than 50% of the polygon being disturbed. Values are unitless but can be converted to "RECOVERY.HARVEST.MEDIAN" by subtracting 250 if the disturbance type is fire, or to "RECOVERY.FIRE.MEDIAN" by subtracting 1250 if the disturbance type is harvest. Values of 9999 indicate no disturbance or an area where disturbance did not meet the criteria for visualization.		Integer	Values range from 0 – 9999
SYMB.AGE	Age Symbology	Used to visualize polygons based on median forest age. Polygons are visualized if they are "Vegetated Treed" in		Integer	Values range from 0 – 151

		the "SYMB.LAND_COVER_LEVEL" field. If “AGE.GT_150” is >50% the value is 151. All other polygons are assigned the value of “AGE.MEDIAN”.			
Shape_Area	Shape Area	Mandatory field of Esri feature classes depicting polygon area. Automatically generated based on current projection.	m^2	Integer	
Shape_Length	Shape Length	Mandatory field of Esri feature classes depicting the length of polygon perimeter. Automatically generated based on current projection.	m	Integer	

References

Hermosilla, T., Bastyr, A., Coops, N. C., White, J. C., & Wulder, M. A. (2022a). Mapping the presence and distribution of tree species in Canada's forested ecosystems. *Remote Sensing of Environment*, *282*, 113276. https://doi.org/10.1016/j.rse.2022.113276

Hermosilla, T., Wulder, M. A., White, J. C., & Coops, N. C. (2022b). Land cover classification in an era of big and open data: Optimizing localized implementation and training data selection to improve mapping outcomes. *Remote Sensing of Environment*, *268*, 112780. https://doi.org/10.1016/j.rse.2021.112780

Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., & Hobart, G. W. (2015). Regional detection, characterization, and attribution of annual forest change from 1984 to 2012 using Landsat-derived time-series metrics. *Remote Sensing of Environment*, *170*, 121–132. https://doi.org/10.1016/j.rse.2015.09.004

Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., & Hobart, G. W. (2018). Disturbance-Informed Annual Land Cover Classification Maps of Canada's Forested Ecosystems for a 29-Year Landsat Time Series. *Canadian Journal of Remote Sensing*, *44*(1), 67–87. https://doi.org/10.1080/07038992.2018.1437719

Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., Hobart, G. W., & Campbell, L. B. (2016). Mass data processing of time series Landsat imagery: pixels to data products for forest monitoring. *International Journal of Digital Earth*, *9*(11), 1035–1054. https://doi.org/10.1080/17538947.2016.1187673

Maltman, J. C., Hermosilla, T., Wulder, M. A., Coops, N. C., & White, J. C. (2023). Estimating and mapping forest age across Canada's forested ecosystems. *Remote Sensing of Environment*, *290*, 113529. https://doi.org/10.1016/j.rse.2023.113529

Matasci, G., Hermosilla, T., Wulder, M. A., White, J. C., Coops, N. C., Hobart, G. W., Bolton, D. K., Tompalski, P., & Bater, C. W. (2018). Three decades of forest structural dynamics over Canada's forested ecosystems using Landsat time-series and lidar plots. *Remote Sensing of Environment*, *216*(July), 697–714. https://doi.org/10.1016/j.rse.2018.07.024

White, J. C., Hermosilla, T., Wulder, M. A., & Coops, N. C. (2022). Mapping, validating, and interpreting spatio-temporal trends in post-disturbance forest recovery. *Remote Sensing of Environment*, *271*, 112904. https://doi.org/10.1016/j.rse.2022.112904

White, J. C., Wulder, M. A., Hermosilla, T., Coops, N. C., & Hobart, G. W. (2017). A nationwide annual characterization of 25 years of forest disturbance and recovery for Canada using Landsat time series. *Remote Sensing of Environment*, *194*, 303–321. https://doi.org/10.1016/j.rse.2017.03.035

White, J. C., Wulder, M. A., Hobart, G. W., Luther, J. E., Hermosilla, T., Griffiths, P., Coops, N. C., Hall, R. J., Hostert, P., Dyk, A., & Guindon, L. (2014). Pixel-based image compositing for large-area dense time series applications and science. *Canadian Journal of Remote Sensing*, *40*(3), 192–212. https://doi.org/10.1080/07038992.2014.945827

Wulder, M. A., Hermosilla, T., Stinson, G., Gougeon, F. A., White, J. C., Hill, D. A., & Smiley,

B. P. (2020). Satellite-based time series land cover and change information to map forest area consistent with national and international reporting requirements. *Forestry: An International Journal of Forest Research*, *93*(3), 331–343. https://doi.org/10.1093/forestry/cpaa006

Appendix

Table A1. Forest-dominated ecoprovinces included in the Satellite-Based Forest Inventory.

Forest-Dominated Ecoprovinces of Canada		
Appalachian-Acadian Highlands	Hudson Bay Coastal Plains	Northumberland Lowlands
Boreal Foothills	Hudson-James Lowlands	Ogilvie Mountains
Central Boreal Plains	Labrador Uplands	Old Crow-Eagle Plains
Central Montane Cordillera	Lake of the Woods	Southern Boreal Cordillera
Columbia Montane Cordillera	Mackenzie Foothills	Southern Boreal Shield
Eastern Boreal Plains	Mackenzie-Selwyn Mountains	Southern Coastal Mountains
Eastern Boreal Shield	Mid-Boreal Shield	Southern Montane Cordillera
Eastern Taiga	Newfoundland	Western Boreal Cordillera
Fundy Uplands	Northern Boreal Cordillera	Western Boreal Shield
Georgia Depression	Northern Coastal Mountains	Western Taiga Shield
Great Bear Lowlands	Northern Montane Cordillera	Whale River Lowland
Hay-Slave Lowlands	Northern Yukon Mountains	Wrangel Mountains

Table A2. Forest-dominated ecoregions included in the Satellite-Based Forest Inventory.

Forest-Dominated Ecoregions of Canada		
Abitibi Plains	Hyland Highland	Old Crow Basin
Algonquin-Lake Nipissing	Iles-de-la-Madeleine	Old Crow Flats
Annapolis-Minas Lowlands	Interior Transition Ranges	Omineca Mountains
Anticosti Island	Interlake Plain	Pacific Ranges
Appalachians	James Bay Lowlands	Paradise River
Aspen Parkland	Kazan River Upland	Peace Lowland
Athabasca Plain	Keller Lake Plain	Peel River Plateau
Atlantic Coast	Kingarutuk-Fraser River	Pelly Mountains
Avalon Forest	Klondike Plateau	Prince Edward Island
Big Trout Lake	La Grande Hills	Queen Charlotte Lowland
Boreal Mountains and Plateaus	Lac Seul Upland	Queen Charlotte Ranges
Boreal Transition	Lac Temiscamingue Lowland	Rainy River
British-Richardson Mountains	Lake Melville	Riviere Rupert Plateau
Bulkley Ranges	Lake Nipigon	Ruby Ranges
Cape Breton Highlands	Lake of the Woods	Saint John River Valley
Cascade Ranges	Liard Basin	Selkirk-Bitterroot Foothills
Central Canadian Rocky Mountains	Long Range Mountains	Selwyn Lake Upland
Central Laurentians	Lower Mainland	Selwynn Mountains
Central Newfoundland	Mackenzie Delta	Sibbeston Lake Plain
Chilcotin Ranges	Mackenzie Mountains	Skeena Mountains

Churchill River Upland	Mackenzie River Plain	Slave River Lowland
Clear Hills Upland	Maritime Barrens	Smallwood Reservoir-Michikamau
Coastal Barrens	Maritime Lowlands	South Avalon-Burin Oceanic Barrens
Coastal Gap	Mecatina Plateau	South-central Nova Scotia Uplands
Coastal Hudson Bay Lowland	Mecatina River	Southern Laurentians
Columbia Mountains and Highlands	Mid-Boreal Lowland	Southern New Brunswick Uplands
Colville Hills	Mid-Boreal Uplands	Southern Rocky Mountain Trench
Coppermine River Upland	Mount Logan	Southern Ungava Peninsula
Eagle Plains	Muskwa Plateau	Southwest Nova Scotia Uplands
Eagle Plateau	Nahanni Plateau	Southwestern Newfoundland
Eastern Continental Ranges	Nass Basin	St.Elias Mountains
Eastern Vancouver Island	Nass Ranges	Strait of Belle Isle
Fort MacPherson Plain	New Brunswick Highlands	Tazin Lake Upland
Franklin Mountains	New Quebec Central Plateau	Thompson-Okanagan Plateau
Fraser Basin	Nipishish Lake	Thunder Bay-Quetico
Fraser Plateau	Norman Range	Ungava Bay Basin
Fundy Coast	North Ogilvie Mountains	Wabasca Lowland
George Plateau	Northeastern Newfoundland	Western Alberta Upland
Georgia-Puget Basin	Northern Alberta Uplands	Western Boreal
Grandin Plains	Northern Canadian Rocky Mountains	Western Continental Ranges
Great Bear Lake Plain	Northern Coastal Mountains	Western Vancouver Island
Great Slave Lake Plain	Northern Continental Divide	Yukon Plateau-Central
Harp Lake	Northern New Brunswick Highlands	Yukon Plateau-North
Hay River Lowland	Northern Penninsula	Yukon Southern Lakes
Hayes River Upland	Nova Scotia Highlands	Yukon-Stikine Highlands
Horn Plateau	Okanogan Highland	
Hudson Bay Lowland	Okanogan Range	

Table A3. Canada's National Forest Inventory (NFI) common and scientific names, tree species codes, and forest type for the 37 tree species included in the Satellite-based Forest Inventory.

Common species name	Scientific species name	NFI tree species code	Forest type
Amabilis fir	*Abies amabilis*	ABIE.AMA	Coniferous
Balsam fir	*Abies balsamea*	ABIE.BAL	Coniferous
Subalpine fir	*Abies lasiocarpa*	ABIE.LAS	Coniferous
Bigleaf maple	*Acer macrophyllum*	ACER.MAC	Broadleaf
Red maple	*Acer rubrum*	ACER.RUB	Broadleaf

Sugar maple	*Acer saccharum*	ACER.SAH	Broadleaf
Gray alder	*Alnus incana*	ALNU.INC	Broadleaf
Red alder	*Alnus rubra*	ALNU.RUB	Broadleaf
Yellow birch	*Betula allehaniensis*	BETU.ALL	Broadleaf
White birch	*Betula papyrifera*	BETU.PAP	Broadleaf
Yellow-cedar	*Chamaecyparis nootkatensis*	CHAM.NOO	Coniferous
Black ash	*Fraxinus nigra*	FRAX.NIG	Broadleaf
Tamarack	*Larix laricina*	LARI.LAR	Coniferous
Western larch	*Larix occidentalis*	LARI.OCC	Coniferous
Norway spruce	*Picea abies*	PICE.ABI	Coniferous
Engelmann spruce	*Picea engelmannii*	PICE.ENG	Coniferous
White spruce	*Picea glauca*	PICE.GLA	Coniferous
Black spruce	*Picea mariana*	PICE.MAR	Coniferous
Red spruce	*Picea rubens*	PICE.RUB	Coniferous
Sitka spruce	*Picea sitchensis*	PICE.SIT	Coniferous
Whitebark pine	*Pinus albicaulis*	PINU.ALB	Coniferous
Jack pine	*Pinus banksiana*	PINU.BAN	Coniferous
Lodgepole pine	*Pinus contorta*	PINU.CON	Coniferous
Ponderosa pine	*Pinus ponderosa*	PINU.PON	Coniferous
Red pine	*Pinus resinosa*	PINU.RES	Coniferous
Eastern white pine	*Pinus strobus*	PINU.STR	Coniferous
Balsam poplar	*Populus balsamifera*	POPU.BAL	Broadleaf
Largetooth aspen	*Populus grandidentata*	POPU.GRA	Broadleaf
Trembling aspen	*Populus tremuloides*	POPU.TRE	Broadleaf
Douglas-fir	*Pseudotsuga menziesii*	PSEU.MEN	Coniferous
Red oak	*Quercus rubra*	QUER.RUB	Broadleaf
Eastern white-cedar	*Thuja occidentalis*	THUJ.OCC	Coniferous
Western redcedar	*Thuja plicata*	THUJ.PLI	Coniferous
Eastern hemlock	*Tsuga canadensis*	TSUG.CAN	Coniferous
Western hemlock	*Tsuga heterophylla*	TSUG.HET	Coniferous
Mountain hemlock	*Tsuga mertensiana*	TSUG.MER	Coniferous
White elm	*Ulmus americana*	ULMU.AME	Broadleaf