

Wildfire Research Glossary

August 2026



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Wildfire and Atmospheric Sciences Team
Bioeconomy Science Institute Maiangi Taiao
Tuhiraki
19 Ellesmere Junction Road
Lincoln 7608

www.bioeconomyscience.co.nz
www.ruralfireresearch.co.nz

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1 Preface

Preface to Wildfire Research Glossary

This glossary has been compiled to explain key scientific terms commonly used by Bioeconomy Science Institute wildfire researchers focusing on wildfire and atmospheric science relevant to New Zealand. Many of these terms have alternative words that are used interchangeably both nationally and internationally, which are noted throughout the glossary. For terms specific to the sciences, we provide precise definitions. For more common terms, we indicate their context by noting "(fire)" in front of the word, with definitions relevant to wildfire science.

Purpose and Objectives:

- Consolidation of terms: This glossary compiles existing definitions from various reputable sources into a single comprehensive collection. Where no consistent definition exists, we have refined or developed a definition solely for use within our wildfire research team. This process is not intended to redefine terms within the broader biological or forestry disciplines. See the appendices for a full list of sources.
- Addressing synonyms and misrepresentation: We clarify terms with multiple synonyms and similar terms that are often misrepresented using the methodology shown below.
- Consistency in publications and media: By providing consistent terminology, this glossary supports coherence in publications, media, data sets, and models produced by our team.
- Relevance to New Zealand context: This glossary covers terms specific to New Zealand's wildfire and atmospheric sciences.
- Training and education: This glossary serves as a reference for consistent term usage in training and educational materials within the Bioeconomy Science Institute (BSI) and extends to fire behaviour teaching within Fire and Emergency New Zealand; we hope this will support future effective communication and knowledge sharing within the New Zealand wildfire and atmospheric sciences community.

Methodology:

The development of this glossary involved both internal expertise and contributions from external sources, including emergency response local knowledge. Definitions are primarily drawn from established glossaries but may have been simplified or reworded where necessary to improve understanding. When definitions are cited exactly as found, references are provided. Where no consistent definition exists, we have refined or developed a definition solely for use within our wildfire research team. These definitions underwent rigorous internal reviews within the BSI and were externally reviewed by the wildfire team members at Fire and Emergency New Zealand.

To ensure clarity and consistency, see specific annotations within the definitions:

- *See*: for preferred terms and definitions.
- *Also known as*: for alternative names, including international terms that are not described in the glossary.
- *See also*: used to link closely related concepts within the glossary. In most cases, terms link to broader concepts or key system terms rather than listing all related terms.
- (fire): Identifies that the definition is in the context of fire.
- Words in **bold** have their definition included in the glossary.
- Words underlined contain hyperlinks.

2 Glossary

Term	Definition
Accessory Fuel Moisture System (AFM)	A system that provides additional fuel moisture models to complement the standard fuel moisture codes contained in the Fire Weather Index (FWI) system (Fine Fuel Moisture Code (FFMC), Duff Moisture Code (DMC), and Drought Code (DC)). The AFM system is currently under development in New Zealand and is intended to improve understanding of fuel dryness (fuel moisture content) and fire potential (ignition and fire behaviour) of both live and dead fuels in different species and stand types. It may include hourly and diurnal FFMC values, FFMC slope/aspect adjustments, and live foliar moisture content. See image: New Zealand Fire Danger Rating System
Active crown fire	A crown fire that advances through the canopy in which both the surface fire and the crown fire are active with continuous surface-to-crown flames. Also known as: continuous crown fire, running crown fire See also: crown fire See image: Crown fire typologies
Area of origin	Where a fire starts. See also: parts of a fire See image: Parts of a fire
Atmospheric stability	A meteorological term referring to the resistance of the atmosphere to turbulence and vertical motion (upwards). With reference to fire management activities, the atmosphere is usually described as neutral, stable, or unstable.¹ See also: neutral atmosphere, stable atmosphere, unstable atmosphere
Available fuel load	The amount of fuel available to burn that would be consumed under specific burning conditions and that is mainly influenced by moisture content, size of the fuel particles, presence of dead fine material and/or chemical compounds in the foliage. Expressed in terms of weight per unit area (t/ha). Also known as: fuel load
Back burn	A fire response tactic that is used to combat a wildfire or to limit fire spread on a prescribed fire. A fire that is intentionally lit between a control line and the main fire with the aim of consuming available fuel and reducing the potential for the main fire to spread past the back burn. See also: burning out

Backing fire	The part of a fire that is burning back against the wind or down slope, where the flame height and rate of spread is slower than the head fire.
Base	Where the fire is burning at the lowest intensity, least intense. <i>See also:</i> parts of a fire <i>See image:</i> Parts of a fire
Bays	Indents between forward moving ‘fingers’ of the fire. ² <i>See also:</i> parts of a fire <i>See image:</i> Parts of a fire
Blackening out	The process of reinforcing a control line by completely extinguishing a continuous strip of burning material along a fire’s perimeter. This can be achieved by wetting down hotspots, removing burning materials, or other activities to isolate the main body of the fire from live fuels and limit the likelihood of further fire spread. <i>Also known as:</i> mopping up
Blow up (fire)	A sudden increase in fire intensity and rate of spread, sufficient to preclude fire control, or to upset existing suppression plans. It is often accompanied by powerful convection. ¹
Breakaway	When a contained fire crosses a fire line and escapes into unburnt areas. <i>Also known as:</i> escaped fire
Buildup Index (BUI)	A numerical rating, calculated in the Fire Weather Index (FWI) System, of the total amount of fuel available for combustion. It provides information on potential fire behaviour. It is calculated using the Duff Moisture Code (DMC) and Drought Code (DC) components of the FWI System. <i>See also:</i> Fire Weather Index System <i>See images:</i> Fire Weather Index System and Thresholds for FWI System codes & indices
Burn area	The area burnt by a fire. <i>See also:</i> burn scar <i>Also known as:</i> burnt area, area burned
Burn scar	The area burnt by wildfire and defined within a fire perimeter excluding areas of unburnt fuel. This can be delineated by on- or above-ground surveys or remote sensing. <i>See also:</i> fire scar , burn area
Burn plan	A prescription defining the location, ignition sequence and method, and specifications and conditions under which the prescribed burn operation is to be conducted.

Burning conditions	The environmental factors that influence a fire's behaviour and impact. Factors usually specified or documented include fuel type, fuel load, slope, weather, fire danger, topographical influences and time of day.
Burning out	A fire response tactic that is used to combat wildfire or as part of a controlled burn to intentionally light fires to consume islands of unburned fuel inside the fire perimeter. <i>See also:</i> back burn <i>Also known as:</i> burn off, burning off
Bushfire	<i>See:</i> wildfire
Canopy cover (fire)	The uppermost cover formed by the branches and leaves of trees and shrubs is an important indicator of fire behaviour. Dense canopy cover provides greater fuel continuity and increased fire spread potential.
Closed canopy fuels	The term 'closed canopy' refers to the situation where the uppermost branches and foliage (canopies) of trees or shrubs overlap to create a more-or-less continuous (closed) cover above the ground surface. ³ Closed canopy fuel models are common for forest fuel types. In New Zealand, mature pine, age 20+ years, and podocarp/broadleaf forest include closed canopy models.
Cloud cover	The amount of sky obscured by clouds.
Coarse fuels	Large, heavy, woody materials that burn slowly and provide sustained heat release, such as logs, large branches, and tree trunks (>7 cm in diameter). <i>See also:</i> fuels , woody debris <i>Also known as:</i> heavy fuels
Cold trailing	A method of determining if a fire is still burning, involving careful inspection, and feeling with the back of the hand, or by using a hand-held infrared scanner, or temperature probe to detect any heat source below the ground.
Combustion	The process of consumption of fuels by oxidation, producing heat in the form of flames.
Conduction	The process of heat transfer through direct contact between materials, where heat moves from a warmer object to a cooler one. <i>See also:</i> heat transfer
Consequence	The outcome of an event or situation expressed as a loss, injury, disadvantage, or gain. ¹
Contained	A fire is considered contained when its spread has been halted by establishment of a complete control line, but it may still be burning freely within the perimeter. <i>See also:</i> containment

Containment	The second of the four recognised stages to extinguish a fire (1. Knockdown, 2. Containment, 3. Control, 4. Mop-up/extinguish), as taught through NZQA Unit Standard 3285 to all firefighting personnel. Containment occurs after the fire intensity is reduced, the suppression resources contain the fire within the perimeter. See also: contained, fire suppression
Control	The third of the four recognised stages to extinguish a fire (1. Knockdown, 2. Containment, 3. Control, 4. Mop-up/extinguish), as taught through NZQA Unit Standard 3285 to all firefighting personnel. Control happens once the fire has been contained. The blacked-out perimeter is widened using hand tools and hose lines to prevent any break-out of fire. See also: fire suppression
Controlled (fire)	The stage at which the complete perimeter of a fire is secured, and no breakaway is expected.¹ Extinguishment of active burning may still be required. See also: control
Convection	The process of heat transfer through the movement of fluids (liquids or gases), where warmer fluid rises and cooler fluid sinks, creating a circulation pattern. See also: heat transfer
Convection column	The rising column of heated air, hot gases, smoke, firebrands, and other combustible byproducts generated by a fire.
Coordinated Incident Management System (CIMS)	The coordinated approach to emergency management used in New Zealand. The structure of the system includes a combination of facilities, equipment, personnel, procedures, and communications operating within a common organisational structure with responsibility for the management of allocated resources to effectively accomplish stated objectives relating to an incident. In Australia, a similar system is used, known as the Australasian Inter-service Incident Management System (AIIMS).
Crown fire	Fires that advance through the crown fuel layer, usually in conjunction with the surface fire. The fire spread and intensity in the tree crowns (tree canopy) encourages flames to spread uninterrupted from tree crown to tree crown. They advance quickly with intense flames, spotting, and convective activity. Crown fires can be classified according to their degree of dependence on the surface fire (passive, active and independent). See also: wildfire type, passive crown fire, active crown fire, independent crown fire, crown fuels See image: Wildfire type
Crown fraction burned	A theoretical concept relating to the proportion of tree crown burned that is used to model and classify crown fire type.

Crown fuels	Fuels found in the tree canopy, including foliage and branches. See also: crown fire, fuel layer Also known as: aerial fuels See image: Vertical arrangement of fuels
Crowning	The process by which a fire ascends into the crowns of trees and spreads from crown to crown.
Curing	Drying and browning of herbaceous vegetation due to drought, high temperatures, frost, mortality or senescence (process of aging in plants). See also: degree of curing Also known as: grass curing
Daily Severity Rating (DSR)	A numerical rating of the daily fire weather severity at a particular location, based on the Fire Weather Index (FWI).⁴ Can be averaged or summed over any given period to produce, for example, a Monthly Severity Rating (MSR), Seasonal Severity Rating (SSR), or Cumulative Daily Severity Rating (CDSR). Rating indicates the increasing control difficulty and amount of work required to suppress a fire as fire intensity increases. See image: Thresholds for FWI System codes & indices
Dead fuels	Organic materials that are no longer living and are susceptible to combustion. These fuels can be found attached to the plant or have fallen and are part of the surface fuels and can include branches, stems, leaves, twigs, litter and other plant matter. See also: fuels
Dead/live ratio	The ratio of dead (brown) to live (green) fuel. The proportion of dead to live material in a fuel affects the amount of fuel available, ease of ignition, fire spread fuel consumption and fire intensity. See also: fuel moisture content
Degree of curing	The proportion (%) of cured and/or dead plant material in a grassland fuel complex. This has a significant effect on the ease of ignition and rate of spread in grass fuels. Grass curing is often a major input for grassland fuel and fire behaviour models, including determining Grassland Fire Danger Rating. Note: In some systems the degree of curing may be used for herbs and shrubs as well. See also: curing
Depth of burn (DOB)	The reduction in forest floor thickness due to consumption by fire.⁵ This can also be measured as the depth of burning into large woody fuels such as logs or branches (cm or mm). See image: Flame dimensions⁶

Drought Code (DC)	A numerical rating of the average moisture content of deep, compact organic soil layers and large woody material. This component of the Fire Weather Index System indicates seasonal drought effects on forest fuels and amount of smouldering in deep duff layers, large logs and other coarse woody fuels. See also: Fire Weather Index System See images: Fire Weather Index System and Thresholds for FWI System codes & indices
Duff	The layer of partially and fully decomposed organic materials lying below the litter and immediately above the mineral soil.⁵ See image: Vertical arrangement of fuels
Duff Moisture Code (DMC)	A numerical rating of the average moisture content of loosely compacted organic soil layers (duff/humus) of moderate depth, and medium-sized woody material. This component of the Fire Weather Index System gives an indication of fuel consumption in moderate duff layers and medium-size woody material. See also: Fire Weather Index System See images: Fire Weather Index System and Thresholds for FWI System codes & indices
Ember	A small, hot, glowing particle consisting of carbon-based material such as wood or coal. Embers may remain during, after, or even precede a fire, retaining high temperatures and posing a risk for spreading fires. See also: ember transfer, firebrand
Ember transfer	The process of a fire producing embers that are carried by the wind, a fire whirl or convection column, or by gravity (e.g. rolling downhill) that fall beyond the main fire perimeter and result in spot fires. See also: ember, spot fire Also known as: spotting
Equilibrium moisture content (EMC)	The moisture content that a fuel element would attain if exposed for an infinite period in an environment of specified constant dry-bulb temperature and relative humidity. When a fuel element has reached its EMC, it neither gains nor loses moisture as long as conditions remain constant.⁷
Escaped fire	A prescribed fire that has burned beyond its intended area, or a wildfire that has breached containment or control lines.
Evacuation	The relocation of people and animals from dangerous or potentially dangerous areas to safer areas.
Exotic forest (fire)	Exotic forest fuels (tree species that have been introduced to New Zealand) are described in the plantation forest fuel models.
Extreme fire danger	Extreme and Very Extreme are the highest levels of fire danger indicated by New Zealand's Fire Weather System (FWS), as assessed by the New Zealand National Fire Danger Rating System (NZFDRS). This rating signifies a substantial threat of large wildfire outbreaks, necessitating extensive suppression efforts for control. See also: fire danger class

Extreme fire behaviour	A level of fire behaviour that often precludes any direct fire suppression action. It usually involves one or more of the following characteristics: high rate of spread, high fire intensity, crowning, prolific spotting, presence of large fire whirls, and/or a well-established convection column. Fires exhibiting such phenomena are often unpredictable, behaving in an erratic, sometimes dangerous, manner.
Extreme wildfire	Extreme wildfires are unpredictable and erratic, posing significant threats due to their size, intensity, and the difficulty in control. They can display challenging fire behaviours, such as fire whirls, spotting, and rapid spread. Extreme wildfires typically showcase extreme fire behaviour.
Fine fuels	Small, lightweight materials that ignite and burn quickly. They include grasses, leaves, needles, and small twigs (less than 1 cm in diameter). <i>See also:</i> fuels , woody debris
Fine Fuel Moisture Code (FFMC)	A numerical rating of the moisture content of litter and other cured fine fuels. This component of the Fire Weather Index System indicates the relative ease of ignition and flammability of fine fuels. <i>See also:</i> Fire Weather Index System <i>See images:</i> Fire Weather Index System and Thresholds for FWI System codes & indices
Fingers	The long narrow extensions of a fire projecting from the main body. ⁸ <i>See also:</i> parts of a fire <i>See image:</i> Parts of a fire
Fire	The chemical reaction between fuel, oxygen and heat. Heat is necessary to start the reaction and, once ignited, fire produces its own heat and becomes self-supporting. ⁷ <i>See image:</i> Fire triangle
Fire behaviour	The way fuel ignites, flames develop, and fire spreads as determined by the interaction of fuels, weather and topography. <i>See image:</i> Fire behaviour triangle
Fire Behaviour Prediction System (FBP System)	A fire behaviour or fire simulation system that provides quantitative fire behaviour characteristics for major fuel types and topographic situations based on the Fire Weather Index System outputs and fire weather observations for the time of the prediction. Originally based on the Canadian Forest Fire Behaviour Prediction (FBP) System. Part of the New Zealand Fire Danger Rating System (NZFDRS). <i>See also:</i> New Zealand Fire Danger Rating System (NZFDRS) , fire danger class , Fire Weather Index System <i>See images:</i> New Zealand Fire Danger Rating System , Fire Weather Index System and Thresholds for FWI System codes & indices

Fire behaviour models	Mathematical models, usually tailored to specific vegetation types that describe the way fire moves and spreads through those vegetation types.
Firebrand	An airborne piece of flaming or smouldering material (ember) capable of acting as an ignition source. ^{1,5} <i>See also:</i> ember
Firebreak	A natural or artificial physical barrier against the spread of fire from or into any area of continuous flammable material typically defined by an absence of fuel. Often selected or constructed to protect a high value area from fire. <i>See also:</i> fuel break , fireline
Fire cause	A source of ignition of wildfires. Can be divided into categories based on natural and human causes.
Fire climate	The long-term pattern of weather conditions that affect how fires behave and spread in a particular area. It considers the overall effects of various fire weather elements over time to understand the fire-prone nature of a region.
Fire climatology	Summary of historical fire weather and climate observations for a specific location, based on data collected at a weather station. As well as weather elements (temperature, relative humidity, wind speed and direction, rainfall), it usually also summarises fire danger conditions (such as Fire Weather Index (FWI) system codes and indices, and fire danger class frequency), for example, by month, fire season and/or year.
Fire danger	A general term used to express an assessment of fixed and variable factors of the fire environment that determine the ease of ignition, rate of spread, difficulty of control, and fire impact. ⁵
Fire danger class (FDC)	A segment of fire danger index scale identified by a descriptive term. In the New Zealand Fire Danger Rating System (NZFDRS) there are six classes—Low, Moderate, High, Very High, Extreme, and Very Extreme. The NZFDRS calculates FDC for forest, grassland and scrublands based on potential fire intensity and available fuel load (AFL), and rate of spread (ROS), derived using the models contained in the New Zealand FBP and Fire Weather Index (FWI) Systems. <i>See also:</i> New Zealand Fire Danger Rating System (NZFDRS) . <i>Also known as:</i> fire danger rating
Fire danger index	A quantitative indicator of one or more facets of fire danger, ^{5,9} expressed as a relative value within a numerical range. All six components of the Fire Weather Index (FWI) System (i.e. the Fine Fuel Moisture Code (FFMC), Duff Moisture Code (DMC), Drought Code (DC), Initial Spread Index (ISI), Buildup Index (BUI), and FWI) are fire danger indexes. <i>See also:</i> fire danger class , Fire Weather Index
Fire detection	A system for, or the act of, discovering, locating, and reporting wildfire. ⁵
Fire ecology	The study of the relationships between fire, the physical environment, and living organisms. ¹

Fire effects	The physical, biological and ecological impacts of fire on the environment. ⁸ <i>Also known as:</i> fire impact
Fire environment	The surrounding conditions, influences and modifying forces of topography, fuel, and fire weather that determine fire behaviour. ¹ <i>See image:</i> Fire behaviour triangle
Fire frequency	The average number of fires that occur per unit of time at a given point. ⁵ <i>See also:</i> fire regime
Fire front	The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smouldering combustion. ⁸ <i>See also:</i> head fire
Fire hazard	The resulting fire behaviour potential (fire intensity and/or rate of spread) based on the fire environment (fuel, topography, and weather) should an ignition occur. <i>See also:</i> wildfire risk, wildfire hazard potential <i>Also known as:</i> wildfire hazard
Fire history	The study and/or compilation of evidence (e.g. historical documents, fire reports, fire scars, tree growth rings, charcoal deposits) that records the occurrence and effects of past wildfires for an area. ⁵
Fire intensity	The rate of heat energy release per unit time per unit length of fire edge (kW/m). Fire intensity is usually calculated for the head of the fire where it is spreading the fastest (frontal or head fire intensity), but can be calculated for any point around the perimeter (i.e. flank fire intensity, backfire intensity). Numerically, it is the product of the net heat of combustion, the quantity of fuel consumed in the flaming front, and the rate of fire spread.
Fire intensity class	A range of Byram's fire intensity values exhibiting similar levels of fire behaviour and implications for fire suppression. In New Zealand, the six fire danger classes are based on fire intensity and suppression effectiveness, where: Low 0–10 kW/m, Moderate 10–500 kW/m, High 500–2000 kW/m, Very High 2000–4000 kW/m, Extreme 4000–10,000 kW/m, and Very Extreme >10,000 kW/m. <i>See also:</i> fire danger class <i>See image:</i> Fire intensity class
Fire management	The activities concerned with the protection of people, property, and the environment from wildfire, including the use of prescribed burning, for the attainment of land use goals and objectives, all conducted in a manner that considers environmental, social, and economic criteria.
Fire management plan	A statement of policy and prescribed actions with respect to a specific area (may include maps, charts, and statistical data). ⁵

Fire occurrence	A fire ignition event. Individual fire events/occurrences can be aggregated based on space and/or time to capture the number of fires in a specific area or across a specific time.
Fire Occurrence Prediction System (FOP)	A proposed system within the New Zealand Fire Danger Rating System (NZFDRS) designed to assess the likelihood of wildfires starting based on weather conditions, fuel moisture, and/or past fire data. It aims to provide insights into ignition risk across New Zealand's rural and forested areas. This system is still in development and not yet operational. <i>See images:</i> New Zealand Fire Danger Rating System
Fire perimeter	The entire outer edge boundary of a fire. ^{1,5}
Fire permit	A permit for the lighting of a fire in open air. ⁴ [Open air refers to outside and not inside of a building].
Fire prevention	Activities directed at reducing fire occurrence; includes public education, law enforcement, personal contact, and reduction of fire hazards and risks. ⁵
Fire regime	The combined properties (fire type, fire return interval, fire size, seasonality, and fire severity) of fire in a particular vegetation type across space and time. <i>See also:</i> fire frequency , fire return interval , fire rotation
Fire return interval (FRI)	The length of time between two successive fires on a specific area of land (can be a point or area of indeterminate size). Often used to designate an average of intervals. <i>See also:</i> fire regime
Fire rotation	The time required to burn a specified area. It is a measure of how long it takes for the area of land to burn. Measured as: (total time period) / (proportion of area burned in period). <i>See also:</i> fire regime
Fire run	A rapid advance of a fire front. It is characterised by a marked transition in intensity and rate of spread. ¹
Fire scar	An injury or wound on a tree caused or accentuated by fire. ⁵ This term may also be used for a scar on the landscape made by fire, although it is somewhat archaic. Therefore, the preference is to use fire scar for trees and burn scar for land. <i>See also:</i> burn scar

Fire season	1. The period of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control. Fire seasons are increasing in length, and many countries are moving away from this term because it is becoming harder to isolate a specific season. 2. A fire season can also refer to the period when fire restrictions are typically put in place to control unwanted fire starts. Fire and Emergency New Zealand uses three fire season status levels to inform people about restrictions for lighting fires: Open, where fires may be lit without restrictions; Restricted, when a fire permit is required; and Prohibited, when lighting of fires is not permitted.
Fire simulator	A method of evaluating fire scenarios to evaluate fire growth and/or smoke spread. Depending on the specific tool, these methods may also evaluate fire suppression methods on fire and smoke to instruct fire management personnel in different fire situations and fire suppression techniques. See also: simulation model
Fire suppression	All activities concerned with controlling and extinguishing a fire following its detection.⁵ In New Zealand, there are four recognised stages to extinguish a fire (1. Knockdown, 2. Containment, 3. Control, 4. Mop-up/extinguish), as taught through NZQA Unit Standard 3285 to all firefighting personnel. See also: knockdown, containment, control, mop-up
Fire storm	A large continuous area of intense burning characterised by violent fire-induced convection resulting in gale-force indraft surface winds near and beyond the fire perimeter, a towering convection column, and the occurrence of large fire whirls.⁵
Fire triangle	An instructional aid in which the sides of an equilateral triangle represent the three factors necessary for combustion and flame production (i.e. oxygen, heat, and fuel). When any one of these factors is removed, flame production is not possible or ceases. See image: Fire triangle
Fire weather	Weather conditions that influence fire ignition, behaviour, and suppression.⁸ See also: fire weather forecast
Fire weather forecast	A prediction of the future state of the atmosphere, which includes information on the weather elements relevant to wildfires. See also: fire weather
Fire Weather Index (FWI)	A numerical rating of fire intensity. The final index of the FWI System, it combines the Initial Spread Index (ISI) and Buildup Index (BUI) to indicate the potential head fire intensity of a spreading fire (on level terrain). See also: Fire Weather Index System, Initial Spread Index, New Zealand Fire Danger Rating System, Buildup Index, fire danger index

Fire Weather Index System (FWI System)	A weather-based system (originating from the Canadian model) that produces numerical ratings of fire potential in a standard fuel type (i.e. a mature pine stand) on level terrain, using meteorologically based observations. It is made up of six components (<u>Fine Fuel Moisture Code (FFMC)</u>, <u>Duff Moisture Code (DMC)</u>, <u>Drought Code (DC)</u>, <u>Initial Spread Index (ISI)</u>, <u>Buildup Index (BUI)</u>, <u>Fire Weather Index (FWI)</u>) that provide relative indicators of fuel dryness (fuel moisture content) and fire behaviour potential throughout forested and rural areas of New Zealand. It is used as an input into the larger New Zealand Fire Danger Rating System (NZFDRS). See images: Fire Weather Index System, Thresholds for FWI System codes & indices and New Zealand Fire Danger Rating System
Fire whirl	A spinning, moving column of hot air and gases rising from a fire and carrying aloft smoke, debris, flame and firebrands. These range from less than one metre to several hundred metres in diameter. They may involve the entire fire area or only hotspots within or outside the fire perimeter.⁵
Fireline	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.⁷ See also: firebreak Also known as: control line
Flame angle	The angle formed between the flame at the fire front and the ground surface, expressed in degrees. Steep slopes and higher wind speeds cause the flame to have a greater horizontal tilt. See also: flame dimensions See image: Flame dimensions
Flame depth	The depth of the zone behind the fire edge within which continuous flaming occurs. See also: flame dimensions Also known as: depth of flame See image: Flame dimensions
Flame dimensions	Four important geometrical descriptors, namely, flame height (the average vertical extension of flames), flame depth (the depth of continuous flaming behind the fire edge), flame length (the average length of flames measured along the axis of the flame from the midpoint of the flame depth to the flame tip), and flame angle (the inclination of the flame to the ground surface). See also: flame height, flame length, flame depth, flame angle See image: Flame dimensions

Flame height	The average maximum vertical extension of flames; occasional flashes that rise above the general level of flames are not considered. See also: flame dimensions See image: Flame dimensions
Flame length	The length of flames measured along their axis at the fire edge; the distance between the flame height tip and the midpoint of the flame zone depth at the ground surface. Average flame length can be an observable, measurable indicator of fire intensity. See also: flame dimensions See image: Flame dimensions
Flammability	The ease with which a substance is set on fire.⁷ Flammability can be described using time to ignition (ignitability), flame duration and smouldering duration (sustainability), rate of spread, flame height, flame temperature (combustibility), and fuel load and proportion of mass consumed (consumability).
Flanks	The left and right outside edges of the fire.² See also: parts of a fire See image: Parts of a fire
Flare up	Any sudden acceleration of fire spread, or intensification of fire, flame size or a part of the fire. A flare up is of relatively short duration and does not radically change existing control plans.⁸
Flashover	The rapid combustion and/or explosion of trapped, unburned gases usually occur in poorly ventilated areas. The flashover phenomenon is normally associated with structural or urban fires; however, it can occur in forest fires (although rare) when gases are trapped in topographic pockets or accumulate over a broad area when there is a temporary lull in air movement.⁵
Forest fuels (fire)	Forest-specific New Zealand fuel models include plantation forests and indigenous forests as well as mixed fuels. These fuel models are all based on trees as the dominant vegetation. Understory vegetation, including smaller trees, shrubs, herbaceous plants and/or grasses, may or may not be present. Compared with other fuels, mature forests can be harder to ignite and have slower rates of spread but can burn at high intensity depending on fuel availability and weather conditions.
Forest fire	A fire burning mainly in forest and/or woodland.⁷
Forest floor (fire)	The organic material that can ignite and burn on the surface and ground layers of a forest. The combined duff (if present) and litter layers (needles, twigs, etc.) contribute to sub-surface (ground) and surface fire spread. See also: litter, organic layer
Front	In meteorology, the boundary between two air masses of different density. A cold front represents the leading edge of colder air replacing warmer air; the reverse of this is a warm front.¹

Fuels (fire)	The materials that ignite and burn in a fire. This includes live or dead combustible materials of plants, downed logs and sticks, grasses, scrub, litter, and duff, as well as non-organic material such as human structures. See also: dead fuels, fine fuels, medium fuels, coarse fuels
Fuel arrangement	A general term referring to the horizontal and vertical distribution of all combustible fuels.¹ See also: fuel layer
Fuel break	A natural or anthropogenic feature on the landscape defined by a change in fuel type (less flammable based on species or structure) designed to change fire behaviour and provide opportunities for suppression. See also: firebreak Also known as: green fire break.
Fuel bulk density	The dry weight of combustible materials per unit volume. Numerically, it is equal to available fuel load divided by the depth of the particular fuel layer (e.g. duff, litter, tree crown foliage). The standard units used in New Zealand are kilograms per cubic metre (kg/m³).
Fuel description	A description of the fuel properties that are important for assessing potential fire behaviour (e.g. fuel arrangement, fuel load, fuel moisture content).⁵ See also: fuel type
Fuel layer	The vertical strata of combustible material, which can be characterised as ground, surface, ladder, or crown fuels. See also: ground fuels, surface fuels, ladder fuels, crown fuels, fuel arrangement See image: Vertical arrangement of fuels
Fuel load	The amount of fuel present, expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually dry weight.⁸ See also: Available fuel load Also known as: fuel loading
Fuel management	The planned manipulation and/or reduction of living or dead fuels for land management. Fuel management commonly occurs in forests but also occurs in grasslands and scrublands. See also: fuel treatment

Fuel moisture content	A measure of the amount of water in a fuel (vegetation), expressed as a percentage of the oven dry weight of the fuel.¹ Live fuels typically have higher moisture content than dead fuels. Dead fuel moisture content is strongly influenced by absorption or evaporation of atmospheric moisture (relative humidity and precipitation). The ratio of dead to live fuel moisture content is important in assessing fire behaviour and its potential to ignite and sustain a fire. See also: dead/live ratio
Fuel treatment	Reduction/removal of fuels to reduce the likelihood of fire, and the potential damage. Common control measures include, but are not limited to, thinning, delimbing, chipping, crushing, piling, burning, grazing, mowing. See also: fuel management
Fuel type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that exhibit similar fire behaviour under defined burning conditions. See also: fuel description
Grassland fuels (fire)	Grassland-specific New Zealand fuel models include pasture grasslands, tussock grasslands, and crop stubble. These fuels are dominated by grasses and herbaceous plants and when dry they are susceptible to rapid fire spread due to the high flammability of dry grasses and limited woody vegetation.
Grass fire	Any fire in which the predominant fuel is grass or grass like.⁷
Ground fire	Fire that burns below ground in roots, duff, buried wood and peat. These fires are sustained by glowing combustion and can go undetected for a long time due to the slow spread and absence of flames. Also known as: subsurface fire See also: wildfire type, ground fuels See image: Wildfire type
Ground fuels	All combustible materials below the litter layer of the forest floor that normally support smouldering or glowing combustion associated with ground fires (e.g. duff, roots, buried punky wood, peat).⁵ Also known as: subsurface fuels See also: fuel layer, ground fire See image: Vertical arrangement of fuels
Head	The front of the fire.² See also: parts of a fire See image: Parts of a fire

Head fire	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.⁷ See also: fire front, parts of a fire
Head fire intensity	The rate of heat energy released at the head of the fire (kW/m).⁵ Also known as: frontal fire intensity
Heat of combustion	The potential heat energy available for release by the combustion process expressed as fuel per unit weight (kJ/kg). In head fire intensity calculations, the heat of combustion value used is subject to several possible reductions, chiefly because of the presence of moisture in the fuel.
Heat transfer	The transfer of thermal energy from one physical system to another, or burning to unburned fuels, by conduction, convection, or radiation. See also: conduction, convection, radiation
Holdover Fire	A fire that starts up again after appearing to have been extinguished or one that is detected after a significant amount of time following an ignition opportunity. These fires are often ground fires that remain dormant smouldering until favourable weather conditions align. Also known as: zombie fire, reignition fire
Hotspot	1. A particularly active part of a fire; 2. A small area of smouldering or glowing combustion, which may be exhibiting smoke, located on or within the fire perimeter, at or below the surface; a term commonly used during the mop-up stage of a fire; 3. A satellite detection of an area of active flaming combustion. See also: smouldering
Ignition	The beginning of flame production or smouldering combustion; the starting of a fire.⁵
Incident	An occurrence or event, natural or manmade, that requires a response to protect life or property.⁵
Independent crown fire	Occurs (rarely) where fire spreads only in the tree canopy. This may occur where tree crown loading, flammability, and weather is sufficient to carry fire through the canopy without surface fire contribution due to discontinuous vertical fuel arrangement with a lack of surface or ladder fuels. See also: crown fire See image: Crown fire typologies

Indigenous forest fuels	A forest fuel type. The indigenous forest fuel type includes beech forest and mixed podocarp/broadleaf forests. These forest fuels predominantly consist of plant species that are native to New Zealand and are characterised by their naturally occurring flora and fauna, which have evolved and adapted to the local environment. <i>Also known as:</i> native forest fuels
Infrared scanning	Use of an optical-electronic system for identifying or obtaining imagery of thermal infrared radiation to detect fires that are difficult to detect visually.⁷
Initial Spread Index (ISI)	A numerical rating, in the Fire Weather Index System, of the anticipated rate of fire spread soon after ignition. It combines the effects of wind and fine fuel moisture on the rate of spread, excluding the influence of varying fuel quantities. <i>See also:</i> Fire Weather Index System, Fine Fuel Moisture Code (FFMC), Fire Weather Index <i>See image:</i> Fire Weather Index System
Interface	An area where urban development directly abuts wildland, creating a sharp, distinct boundary between the built environment and natural vegetation. <i>See also:</i> intermix, rural-urban interface <i>Also known as:</i> true interface, rural urban fringe
Intermix	Any area where structures and other human development meet or intermingle with undeveloped land or vegetative fuels. A broad term that encompasses various types of interactions between buildings and rural areas. <i>See also:</i> interface, rural-urban interface
Inversion	A layer of the atmosphere in which temperature increases with increasing elevation. A condition of strong atmospheric stability.⁷
Knockdown	The first of the four recognised stages to extinguish a fire (1. Knockdown, 2. Containment, 3. Control, 4. Mop-up/extinguish), as taught through NZQA Unit Standard 3285 to all firefighting personnel. This is a concentrated initial suppression of the fire perimeter so that fire intensity is reduced and fire spread can be slowed or stopped. <i>See also:</i> fire suppression
Ladder fuels	Fuels that provide vertical continuity between surface fuels and crown fuels (e.g. tall shrubs, small trees, branches), thus contributing to the ease of torching, crowning and canopy fire spread. <i>See also:</i> fuel layer <i>See image:</i> Vertical arrangement of fuels
Lag time	The time delay in fuel moisture content responding to changing environmental conditions (for example, relative humidity). Technically, it is the time necessary for a fuel particle to lose approximately 63% of the difference between its initial moisture content and its equilibrium moisture content.⁷

Live fuels	Organic materials comprising living vegetation, including grasses, scrub, trees, and other plants that contain high moisture and contribute to fuel load in the landscape. <i>Also known as:</i> green fuels
Likelihood	The probability of an event occurring (e.g. ignition likelihood is the probability of an ignition occurring).
Litter	The uppermost part of the forest floor that consists of cast leaves or needles, sticks and twigs, which can contribute to rapid surface fire spread. <i>See also:</i> forest floor
Medium fuels	Fuels that are larger than fine fuels but smaller than coarse fuels, including branches, twigs, and small limbs (1 cm to 7 cm). Also, can include loosely compacted soil organic layers (duff). <i>See also:</i> fuels
Mop-up	The final of the four recognised stages to extinguish a fire (1. Knockdown, 2. Containment, 3. Control, 4. Mop-up/extinguish), as taught through NZQA Unit Standard 3285 to all firefighting personnel. Mop-up happens following control. The burning area is completely extinguished and the area is patrolled until there is no possibility of re-ignition. This may include digging out, cutting down, or cutting open smouldering fuels. <i>See also:</i> fire suppression <i>Also known as:</i> extinguish
Neutral atmosphere	A condition of the atmosphere in which the temperature decreases with increasing altitude at a rate equal to the Dry Adiabatic Lapse Rate (when a parcel of air being lifted is unsaturated) or at a rate equal to the Saturated Adiabatic Lapse Rate (when the parcel of air is saturated). <i>See also:</i> atmospheric stability
New Zealand Fire Danger Rating System (NZFDRS)	In New Zealand, fire danger is assessed using the New Zealand Fire Danger Rating System (NZFDRS). It is based on the Canadian Forest Fire Danger System (CFFDRS), which uses data from four systems to assess and forecast fire danger that can be used to aid decision making. Development of the NZFDRS has largely focused on adoption of the Fire Weather Index (FWI) System and development of the Fire Behaviour Prediction (FBP) System. <i>See also:</i> Fire Weather Index System , Fire Behaviour Prediction System , Fire Occurrence Prediction System , fire danger class <i>See image:</i> New Zealand Fire Danger Rating System
New Zealand fire registry	An online public information and planning resource designed to support operational decision-making for wildfires. This system includes automated fire growth and smoke dispersion forecasts based on satellite detected hotspot data. ¹⁰

Organic layer	The accumulated, partially to fully decomposed, organic matter below the soil surface. It corresponds to the fermentation (F) and humus (H) layers in forests (duff) and/or the peat (O) layer in wetlands.⁵ See also: duff, forest floor
Particulate matter (PM)	Particulate matter (PM) is the general term used for a mixture of solid particles and liquid droplets found in the air. Air monitoring measures the concentrations of PM, usually in weight per unit volume. Most monitoring focuses on PM 2.5 (fine particles) and PM 10 (includes both fine and coarse particles) where the number refers to the particle size in µm.¹¹
Parts of a fire	There are multiple parts of a fire, including area of origin, flanks, base, head, bays, and fingers. See also: area of origin, base, bays, fingers, flanks, head See image: Parts of a fire
Passive crown fire	Occurs where surface fire intensity is sufficient to ignite tree crowns. Individual trees or clumps of trees are intermittently torching, but winds are not sufficient to support propagation from tree to tree. See also: crown fire, torching Also known as: intermittent crown fire See image: Crown fire typologies
Perimeter growth rate (PGR)	The speed at which a fire increases its perimeter, expressed in terms of distance per unit of time.⁵ See also: rate of area growth, rate of spread Also known as: rate of perimeter growth
Point of origin	The location(s) within the fire perimeter where ignition first occurred.⁵ Also known as: point of ignition
Precipitation	Any or all of the forms of water, whether liquid (i.e. rain or drizzle) or solid (e.g. snow or hail), that fall from the atmosphere and reach the ground.⁵ See also: rain
Preheating phase	The phase of combustion where unburned fuel is raised to its ignition temperature and gaseous vapours begin to evolve.⁵
Prescribed burn	The intentional use of fire in a defined area, carried out under a burn plan and relevant policies to meet land management goals, such as reducing unwanted vegetation, controlling weeds, or improving grazing. Also known as: controlled burn, prescribed fire
Radiation	Transmission of heat through electromagnetic waves or moving particles, in a straight line and in all directions. See also: heat transfer Also known as: thermal radiation

Rain	Precipitation in the form of liquid water drops.⁵ See also: precipitation
Rate of area growth	The speed at which a fire increases its size, expressed in terms of area per unit of time (ha/h).⁵ See also: perimeter growth rate, rate of spread
Rate of spread (ROS)	The speed with which a fire moves across the landscape at a specified part of the fire perimeter, expressed in terms of distance per unit time (e.g. m/s, m/min, m/h) See also: rate of area growth, perimeter growth rate
Readiness	Developing systems and capabilities before an emergency happens, including community self-help and preparedness programmes for emergency services, lifeline utilities, and other agencies. Part of the 4Rs (Reduction, Readiness, Response, Recovery) used in fire and emergency management. See also: reduction, response, recovery See image: 4Rs emergency response
Recovery	1. Coordinated efforts to help people and communities recover after an emergency, covering immediate-, medium- and long-term support. Part of the 4Rs (Reduction, Readiness, Response, Recovery) used in fire and emergency management. See also: reduction, readiness, response See image: 4Rs emergency response 2. Can also refer to ecosystem recovery, which is the return of a functioning ecosystem to a pre-defined status after disturbance.
Reduction	Identifying and analysing long-term risks to life and property; taking steps to eliminate these risks if practicable or reduce their impact and likelihood. Part of the 4Rs (Reduction, Readiness, Response, Recovery) used in fire and emergency management. See also: readiness, response, recovery See image: 4Rs emergency response
Relative humidity (RH)	The ratio, expressed as a percentage, of the amount of water vapour or moisture in the air to the maximum amount of moisture that the air would hold at the same dry-bulb temperature and atmospheric pressure.⁵ A measure of the dryness of air, RH can vary from 0 to 100 percent.
Remote automatic weather station (RAWS)	A weather station at which the services of an observer are not required. A RAWS unit measures selected weather elements automatically and is equipped with telemetry apparatus for transmitting the electronically recorded data via radio, satellite, or by a land-line communication system at predetermined times or on a user request basis.⁵ Also known as: weather station, fire weather station

Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. ¹²
Response	Attending incidents and taking immediate action before, during or after an emergency to protect life, limit damage, protect the environment and help communities begin recovery. Part of the 4Rs (Reduction, Readiness, Response, Recovery) used in fire and emergency management. See also: reduction, readiness, recovery See image: 4Rs emergency response
Resprouting	Vegetative regeneration following a disturbance from a source of protected buds and meristems.
Risk management framework	Set of components that provide the foundations and organisational arrangements for designing, implementing, monitoring, reviewing and continually improving risk management throughout the organisation. ⁵ The ISO 31000 is an international standard that provides principles and guidelines for risk management.
Rural	Any area where residences and other developments are scattered and intermingled with forest, hill country, plains, or farm land and native vegetation or cultivated crops.
Rural-urban interface (RUI)	The zone where structures and other human development adjoin or overlap with undeveloped land such as forest, bush, scrub, or grasslands. The RUI can be further divided into the intermix (structures are interspersed among undeveloped land) and the interface (urban areas adjoin large areas of undeveloped lands). See also: interface, intermix, wildfire prone area Also known as: wildland urban interface (WUI)
Scorch	Browning of the needles or leaves in the crown of a tree or scrub, or browning of grasses and other low vegetation, caused by heat from a wildfire.
Scrub fuels (fire)	In New Zealand, the term ‘scrub’ is often used interchangeably with ‘shrub’, and refers to all vegetation types that are not grass or forest fuels. ¹³ There are currently four scrubland fuel models developed for New Zealand that are usually described according to the height of the uppermost canopy: Gorse, Mānuka/Kānuka, Heathlands/Wetlands, and Scrub hardwoods.
Scrub fire	A vegetation fire where the dominant fuel type carrying the fire is scrub (shrubs). Scrub fires differ from grass and forest fires due to the ability for wildfires to rapidly develop into extremely high intensity and fast-moving fires, under conditions that would not normally produce extreme fire in grass or forests.
Seral stage	Successional stages that a vegetation community undergoes from the beginning of establishment (early seral) to the climax/end community (old growth). The four stages identified include: early seral, mid seral, late seral, and old growth. In general, early seral stages have higher ignitability and rate of spread, and lower intensities. See image: Seral stages

Severity (fire)	Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time. ⁸
Simulation model	A representation of a system that can be used to mimic the system's processes under varying circumstances. <i>See also:</i> fire simulator
Slash (fuel model)	For the plantation forest slash fuel model, slash is the debris left because of vegetation being altered by commercial forest activities (e.g. timber harvesting, thinning and pruning). Slash includes material such as logs, chips, tree branches and tops, fallen needles and small branches, uprooted stumps, and broken or uprooted trees and shrubs. <i>See also:</i> woody debris (slash is man-made woody debris)
Slope angle	The upward or downward inclination of the earth's surface (i.e. the deviation in terrain from level or flat ground). ⁵ Commonly expressed in degrees, or sometimes as a percentage or gradient.
Smoke (fire)	The visible products of combustion rising above a fire, ⁵ mainly consisting of carbon and water vapour.
Smoke column	Smoke and other gases that form a column-shaped mass above a fire, characterised by sharply defined, billowed edges. ⁵
Smoke management	Used by land owners when planning a prescribed burn, to ensure that smoke does not cause problems downwind of the burn.
Smouldering	A phase of combustion characterised by smoke without flame. Generally stationary or very slow spreading (usually in organic ground fuels or duff). Smouldering can continue after flaming ceases and may persist in downed logs, duff layers, or root systems. <i>See also:</i> hotspot
Spot fire	Fire ignited by firebrands (embers) that are carried outside the main fire perimeter by air currents, gravity, and/or fire whirls. ⁵ <i>See also:</i> ember transfer <i>See image:</i> Parts of a fire
Spot weather forecast	A special forecast issued to fit the time, topography, and weather of a specific incident. These forecasts are issued at the request of the user agency and are more detailed, timely, and specific than regional forecasts. Usually, onsite weather observations or a close, representative observation is required for a spot forecast to be issued. ⁵
Stable atmosphere	Condition of the atmosphere in which the temperature decreases with increasing altitude at a <u>rate less than</u> the Dry Adiabatic Lapse Rate (when a parcel of air being lifted is unsaturated) or at a rate less than the Saturated Adiabatic Lapse Rate (when the parcel is saturated). In this condition, the atmosphere tends to suppress large-scale vertical motion. <i>Also known as:</i> stable air <i>See also:</i> atmospheric stability

Stand composition	The proportion of each tree species in a stand is expressed as a percentage of the total cover of the trees (e.g. 70% beech, 30% mānuka). For fire management, composition is important to understand flammability in the canopy and is often expressed as the percentage of the crown biomass.
Stand structure	The horizontal and vertical distribution of components of a forest stand including the crown layers and stems of trees, shrubs, herbaceous understory, snags (standing dead trees), and downed woody debris. ⁵
Suppression	Refers to the activities and strategies used to contain, control, and ultimately extinguish a wildfire.
Surface fire	Fire that burns loose debris on the ground surface, which includes dead branches, leaves, and low vegetation and litter. See also: wildfire type See image: Wildfire type
Surface fuels	All combustible materials lying above the duff layer between the ground and ladder fuels that are responsible for propagating surface fires. This includes dead branches, leaf or needle litter, and low vegetation. See also: fuel layer See image: Vertical arrangement of fuels
Synoptic chart	Any map on which weather data and analyses are presented depicting the state of meteorological conditions over a large area at the earth's surface and at various levels in the upper atmosphere, at a particular time. ⁵ See also: weather map
Torching	The ignition of a single tree or small group of trees from the bottom up; occurs where surface fire intensity is sufficient to ignite tree crowns, but winds or canopy cover are not sufficient to support propagation from tree to tree. See also: passive crown fire Also known as: candling
Thermal imagery	Visual presentation or printed document from an infrared detector. ⁵
Unstable atmosphere	Condition of the atmosphere in which the temperature decreases with increasing altitude at a rate greater than the Dry Adiabatic Lapse Rate (when a parcel of air being lifted is unsaturated) or at a rate greater than the Saturated Adiabatic Lapse Rate (when the parcel is saturated). In this condition, the atmosphere tends to support large-scale vertical motion and can contribute to significant increases in fire activity due to convection. See also: atmospheric stability
Ventilation index	A numerical measure relating to the potential of the atmosphere to disperse airborne pollutants from a stationary source. ⁵

Vortex turbulence	Horizontal whirlwind(s) created in the wake of fixed-wing and rotary-wing aircraft that are in flight. Under certain atmospheric conditions, this turbulent air can be projected to the ground and in turn adversely affect fire behaviour. A small fire or segment of a fire perimeter can unexpectedly flare up, particularly if the wind speed is light and an unstable atmosphere exists. ⁵
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. ¹⁴
Weather map	A map or chart depicting the meteorological conditions over a specific geographic area at a specific time. ⁵ <i>See also:</i> synoptic chart
Wildfire	A wildfire is any naturally caused or unplanned/escaped human-caused fire that is actively burning in the natural or urban environment and consuming natural fuels (such as forest, brush, tundra, or grass) and artificial (e.g. buildings, agricultural paddocks) fuels. Wildfires may originate in or spread to the built environment. <i>Also known as:</i> bushfire
Wildfire hazard potential (WHP)	Combination of the probability of ignition and the expected fire behaviour (fire intensity) based on the fire environment (fuel, topography, and weather). <i>See also:</i> fire hazard
Wildfire prone area	An area, often within the rural-urban interface (RUI), where wildfire poses an increased risk to people and buildings due to surrounding vegetation posing a high fire hazard and fire spread potential. <i>See also:</i> rural-urban interface <i>Also known as:</i> bushfire prone area
Wildfire risk	The probability (likelihood) of a wildfire event occurring and the associated impacts of consequences if it does, often expressed as probability x consequences. <i>See also:</i> fire hazard <i>Also known as:</i> fire risk
Wildfire Risk Analysis (WRA)	A wildfire decision support tool, which forms the foundational underpinning process for Wildfire Risk Management Planning and other wildfire/land management applications. Developed using a revised methodology based on the Wildfire Threat Analysis (WTA) that transitions from a threat-based tool to one that calculates risk based on likelihood and consequence. ⁴ <i>See also:</i> Wildfire Threat Analysis
Wildfire Threat Analysis (WTA)	A systematic method of identifying the level of wildfire threat a particular area faces from wildfire. The level of threat is generally related to a combination of ignition potential, potential fire behaviour and the values threatened. These factors may themselves be derived from other combinations of factors, for instance, potential fire behaviour can be determined from a

	combination of climate, topography and fuels.¹ Developed in the early 2000s, this methodology was implemented by Rural Fire Authorities but has now been replaced by a national-scale Wildfire Risk Analysis (WRA) methodology. <i>See also:</i> Wildfire Risk Analysis
Wildfire type	The three main types of wildfire are ground, surface, and crown fires. <i>See also:</i> ground fire, surface fire, crown fire
Wilding Conifers (fire)	Exotic conifer species that have self-seeded and spread across the landscape. Currently these fuels are modelled using a mix of grassland, scrubland, and plantation forests fuel models depending on the age and stage of the wildings. Development of specific wilding fuel models would improve fire behaviour predictions in this fuel type. <i>See also:</i> forest fuels (fire), exotic forest fuels (fire)
Wildland	An area in which development is essentially non-existent, except for roads, railroads, powerlines, and similar transportation facilities, and where structures, if any, are widely scattered.⁵ <i>Also known as:</i> rural
Wind direction	The direction the wind is blowing from (cardinal direction, or degrees).
Wind speed	The rate of horizontal motion of the air past a given point expressed in terms of distance per unit of time. For fire danger rating, wind speed is measured or adjusted to a standard height of 10 m in the open, preferably averaged over a 10-minute interval, and expressed in kilometres per hour (km/h).
Woody debris	A combination of coarse, medium and fine fuels that are usually found on the ground surface. <i>See also:</i> coarse fuels, medium fuels, fine fuels, slash

3 References

1. National Rural Fire Authority. (1998). *Glossary of New Zealand rural fire management terminology*.
2. New Zealand Qualifications Authority. (2021). *Demonstrate knowledge of working safely at vegetation fires (Unit Standard 3285)*. The Skills Organisation.
3. Land, Air, Water Aotearoa. (n.d.). Closed canopy.
<https://www.lawa.org.nz/learn/glossary/c/closed-canopy>
4. Fire and Emergency New Zealand. (2019). *Fire and Emergency New Zealand risk reduction strategy 2019–2029*.
<https://www.fireandemergency.nz/about-us/strategies-and-plans/risk-reduction-strategy/>
5. Canadian Interagency Forest Fire Centre. (2023). *CIFFC Canadian wildland fire glossary*.
<https://glossary.ciffc.ca/Home/DownloadGlossary/EN>
6. Alexander, M. E. (1982). Calculating and interpreting fire intensities. *Canadian Journal of Botany*, 60, 349–357.
<https://doi.org/10.1139/b82-048>
7. AFAC. (2012). *AFAC bushfire glossary*. Rural and Land Management Group for AFAC Agencies.
8. National Wildfire Coordinating Group. (2024). *NWCG glossary of wildland fire*.
9. Merrill, D. F., & Alexander, M. E. (Eds.). (1987). *Glossary of forest fire management terms* (4th ed.; NRCC No. 26516). National Research Council of Canada.
10. Bioeconomy Science Institute 2026. *Fire registry and smoke forecasts*. <https://www.ruralfireresearch.co.nz/resources/tools/fire-registry>
11. U.S. Environmental Protection Agency. (2025). *Particulate matter concentrations*.
https://cfpub.epa.gov/roe/indicator_pdf.cfm?i=9

12. United Nations Office for Disaster Risk Reduction. (2017). *Sendai Framework terminology on disaster risk reduction*.

<https://www.undrr.org/terminology>

13. Clifford, V. R., Pearce, H. G., & Anderson, S. A. J. (2014). *Guide to New Zealand fuels: A technical guide for selecting the most appropriate fuel type for fire behaviour predictions*. Scion.

14. Intergovernmental Panel on Climate Change. (2022). *Glossary*. In *Climate change 2022: Impacts, adaptation, and vulnerability*.

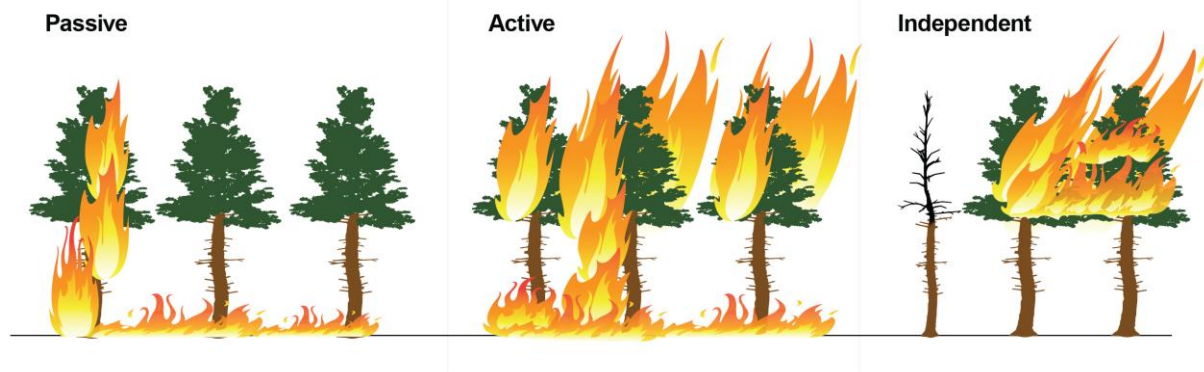
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4 Appendix – Figures and tables

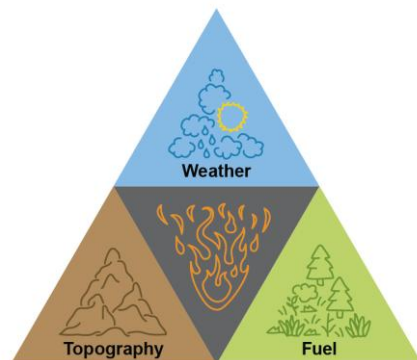
4Rs emergency response



Crown Fire Typologies



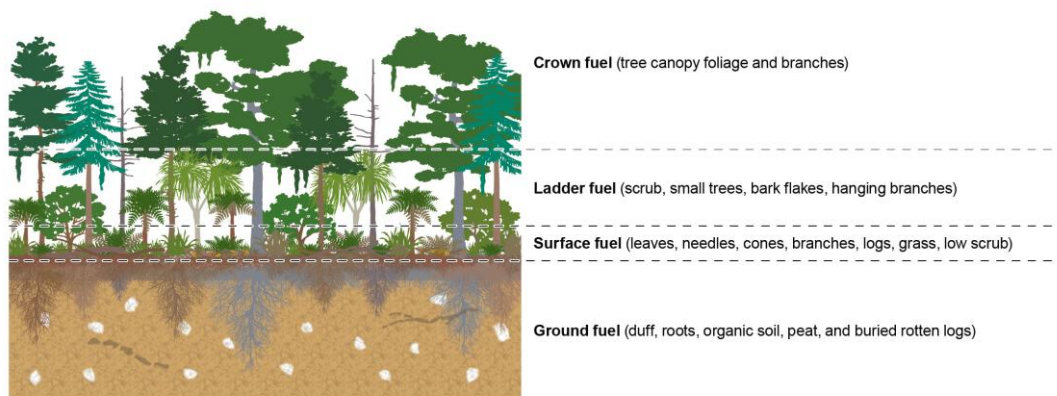
Fire Behaviour Triangle



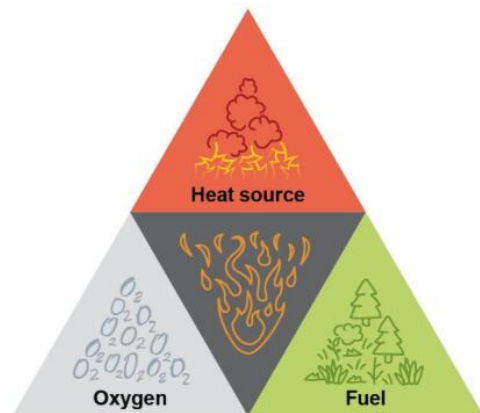
Fire behaviour triangle

The factors involved in influencing fire behaviour.

Vertical arrangement of fuels



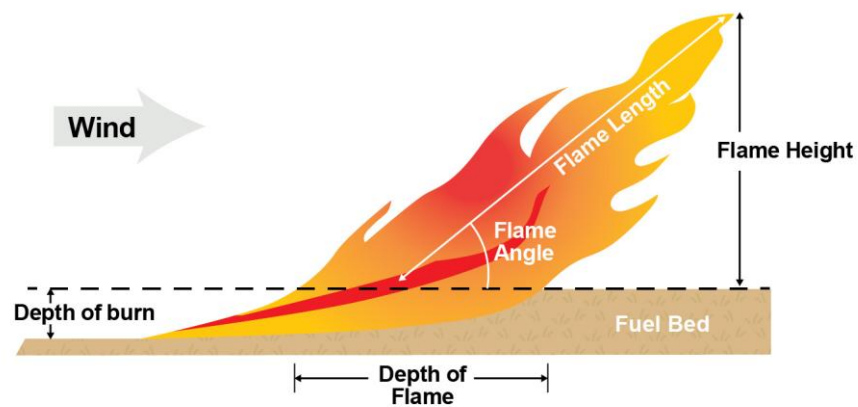
Fire Triangle



Fire triangle

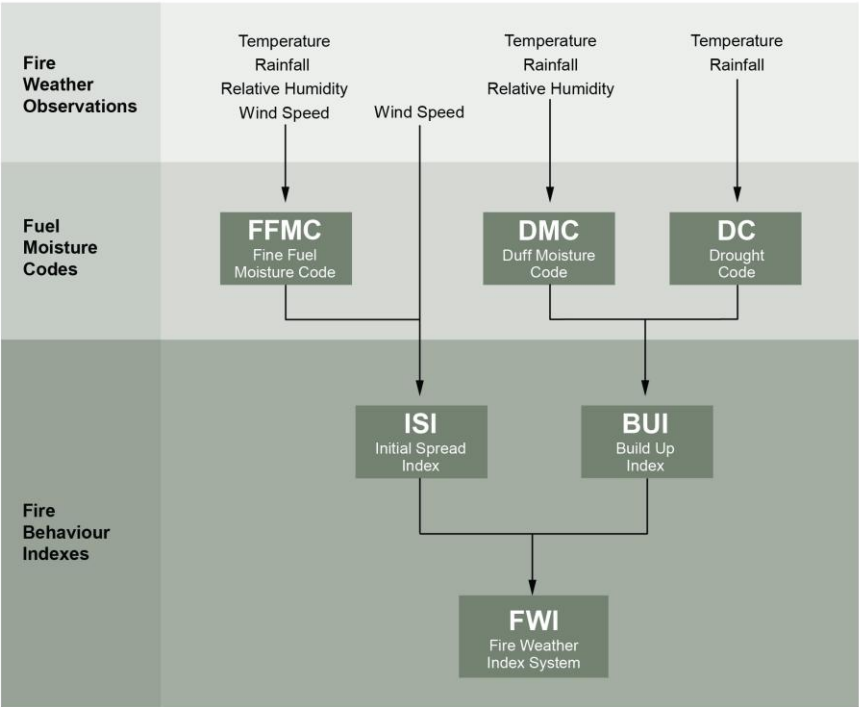
The components necessary to start and sustain a fire.
All three factors required for fire

Flame Dimensions



Adapted from Alexander, M.E. 1982. Calculating and interpreting fire intensities. Canadian Journal of Botany 60: 349-357.

**Fire Weather Index
System**



Thresholds for FWI
System codes & indices

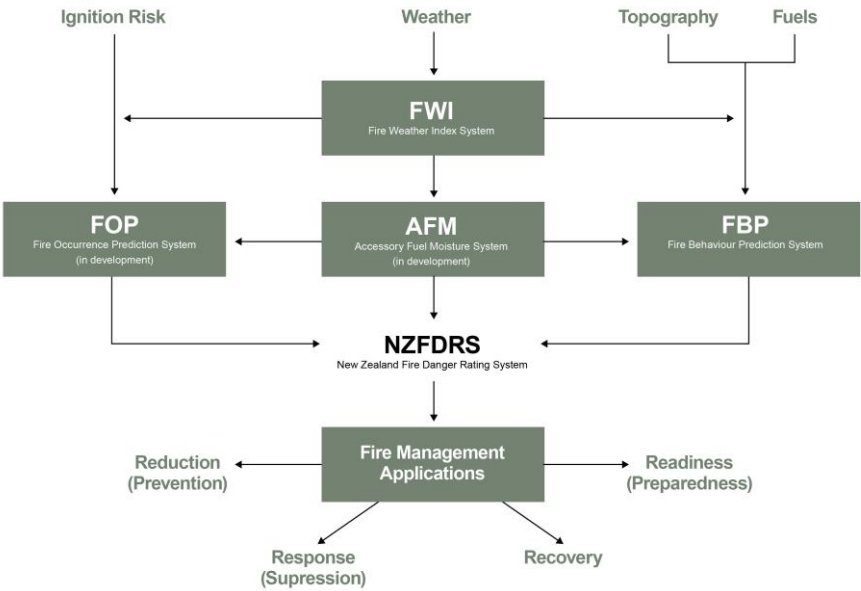
Note: The following are a general guide only. Threshold values will vary for different fuel types, and in different parts of the country based on fire climate severity.

Ignition potential:	Difficult	Moderate	Easy	Very Easy	Extremely Easy
Fine Fuel Moisture Code (FFMC)	0–74	75–84	85–88	89–91	92+
Rate of Spread:	Slow	Moderate	Fast	Very Fast	Extremely Fast
Initial Spread Index (ISI)	0–3	4–7	8–12	13–15	16+
Fuel availability:	Low	Moderate	High	Very High	Extremely High
Buildup Index (BUI)	0–15	16–30	31–45	46–59	60+
Fire Intensity:	Low	Moderate	High	Very High	Extremely High
Fire Weather Index (FWI)	0–5	6–12	13–20	21–29	30+
Difficulty of control:	Easy	Not difficult	Difficult	Very difficult	Extremely difficult
Daily Severity Rating (DSR)	0–0.9	1.0–2.9	3.0–4.9	5.0–6.9	7.0+
Mop-up needs:	Little	Moderate	Difficult	Difficult & extended	Difficult & extensive
Duff Moisture Code (DMC)	0–9	10–19	20–29	30–39	40+
Drought code (DC)	0–99	100–175	176–249	250–299	300+

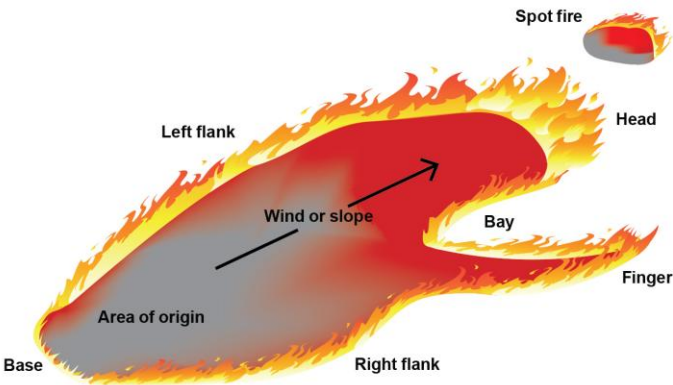
Fire Intensity Class

	Intensity range	Danger class	Suppression interpretation
	<10 kW/m	Low	Ground crew with handtools
	10 - 500 kW/m	Moderate	Ground crew with back-pack pumps
	500 - 2,000 kW/m	High	Water under pressure and heavy machinery
	2,000 - 4,000 kW/m	Very high	Head fire attack using aircraft and long term retardants may be effective, but it may be too dangerous for ground crews
	4,000 - 10,000 kW/m	Extreme	Head fire attack not likely to be effective and it will be too dangerous for ground crews
	>10,000 kW/m	Very extreme	

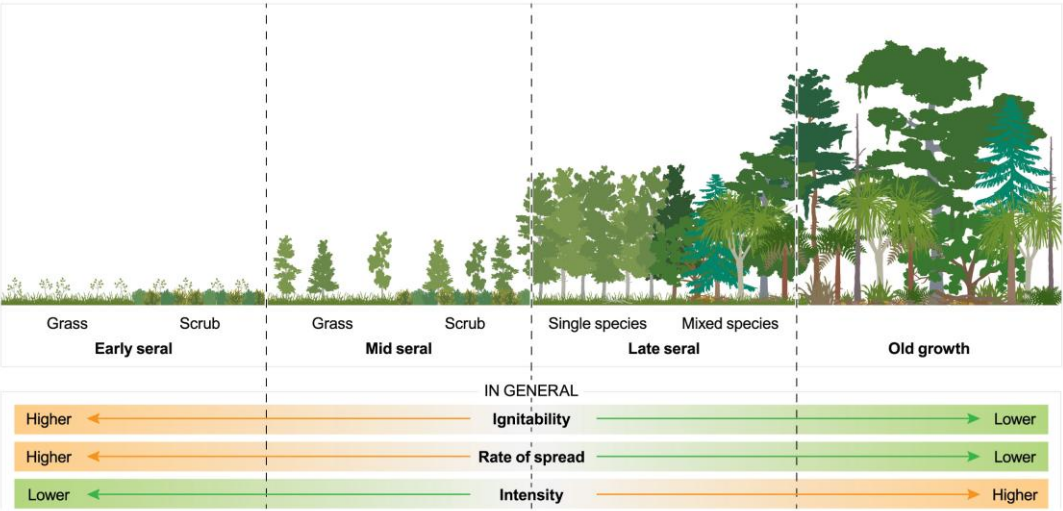
New Zealand Fire Danger Rating System



Parts of a Fire



Seral Stage



Wildfire Type

