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Updates on Applications of the FWI System

Introducing the Next Generation
Canadian Fire Weather Index System

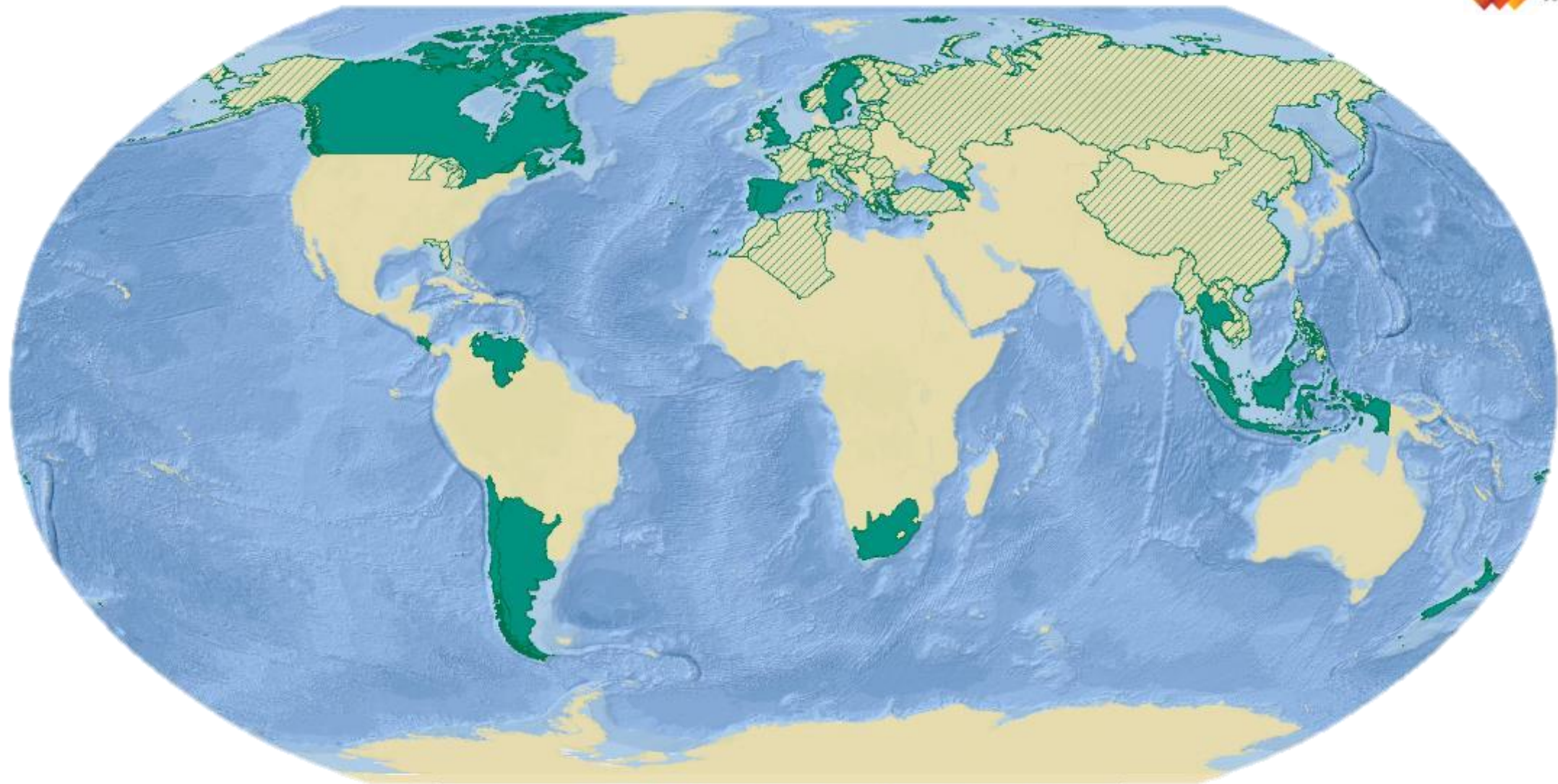
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Social Participation and Local Fire Governance
through International Networks

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Canadian Forest Fire Danger Rating System around the world

■ National System ▨ Regional System

Sistema de Alerta Temprana por Incendios Forestales



Fire Management Applications Costa Rica

- Costa Rica – Ministry of Environment and Energy (SINAC) in charge of forests and federal fire management.
- SINAC had a clear vision of fire management application – consolidating different aspects of fire management planning.
- Series of meetings, workshops, knowledge exchange sessions with developers, fire management and local communities.



Fire danger rating system Costa Rica Protected Forests



FWI System – Costa Rica



Knowledge Exchange session – Costa Rica 2020

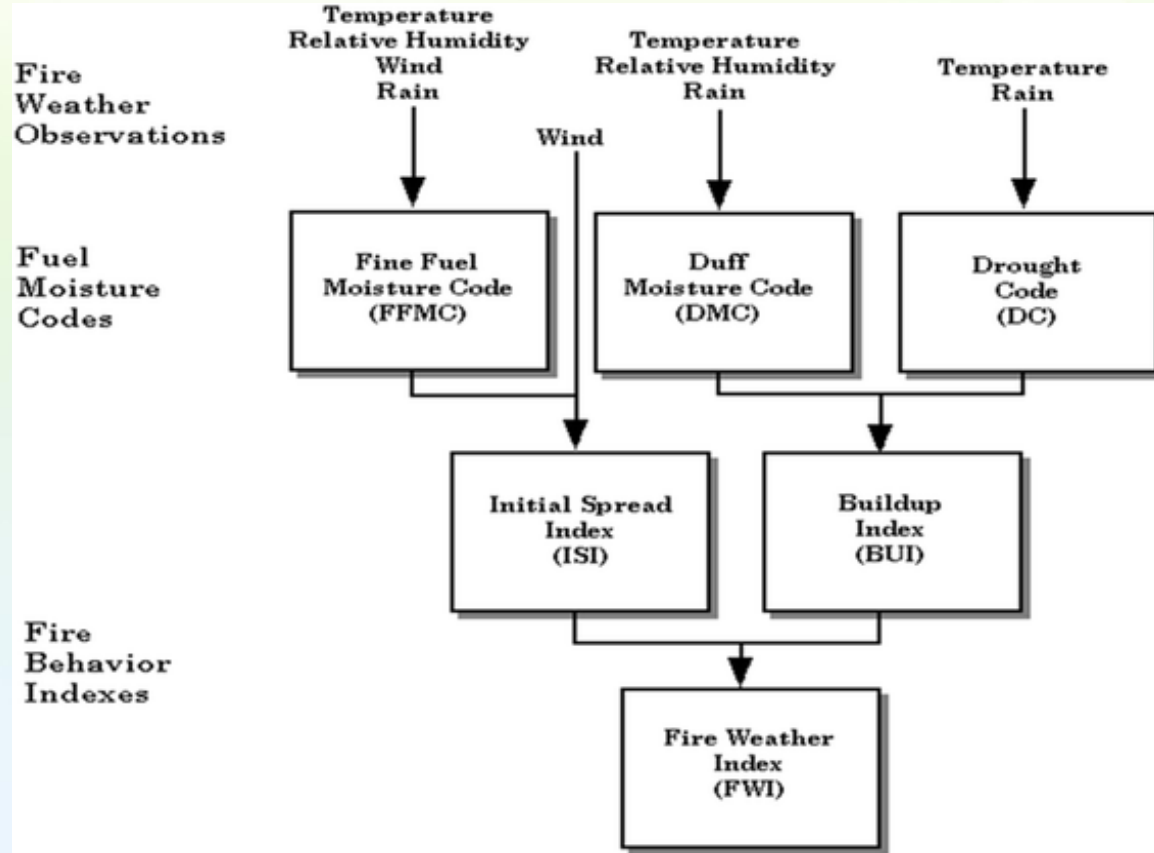


Fire danger rating system workshop – San Jose 2020

- System Development: Working with third party software developer, utilizing existing FWI System code (Python) to create a custom application.
- The Canadian Fire Weather Index components provides a systematic method to keep track of elements influencing fire behaviour.
 - Weather variables as inputs: Temperature, relative humidity, precipitation, wind speed.
 - Outputs: six components, each assess the fuel moisture or general fire behaviour important in fire management decision making.



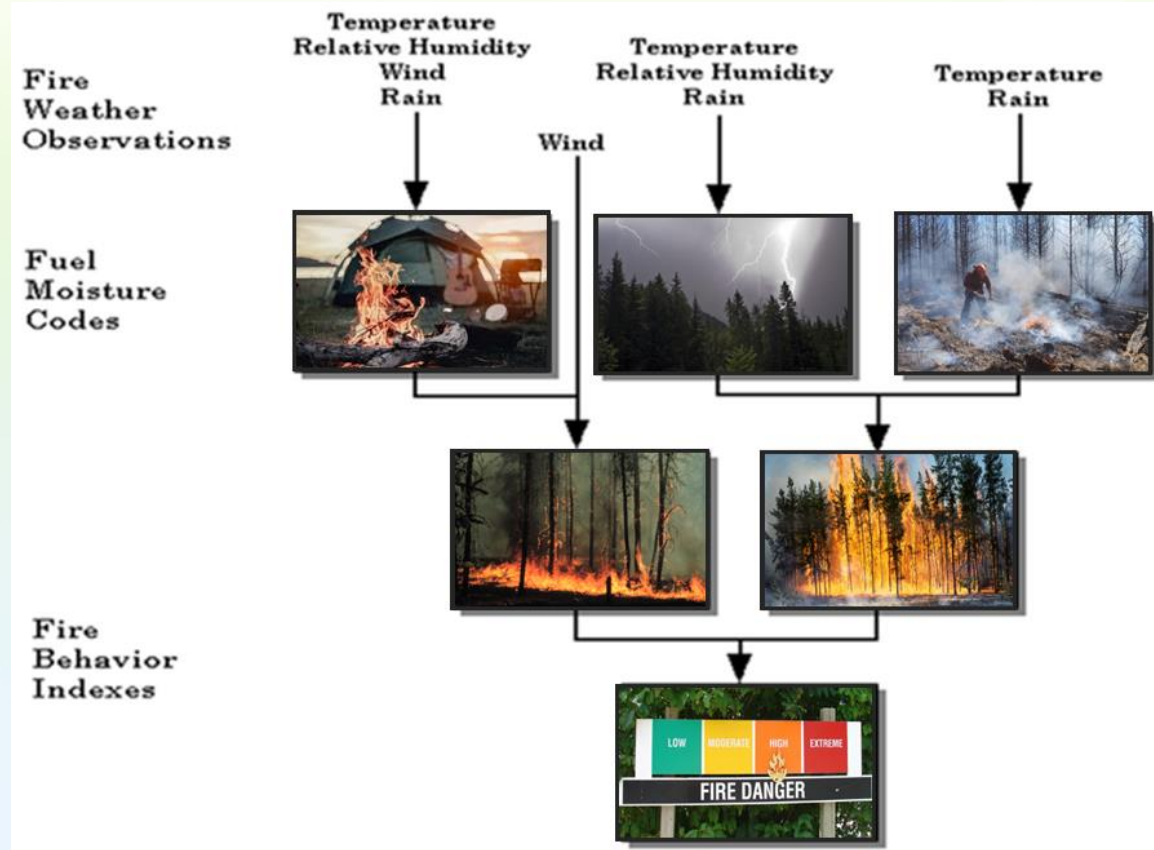
The Canadian Fire Weather Index (FWI) System



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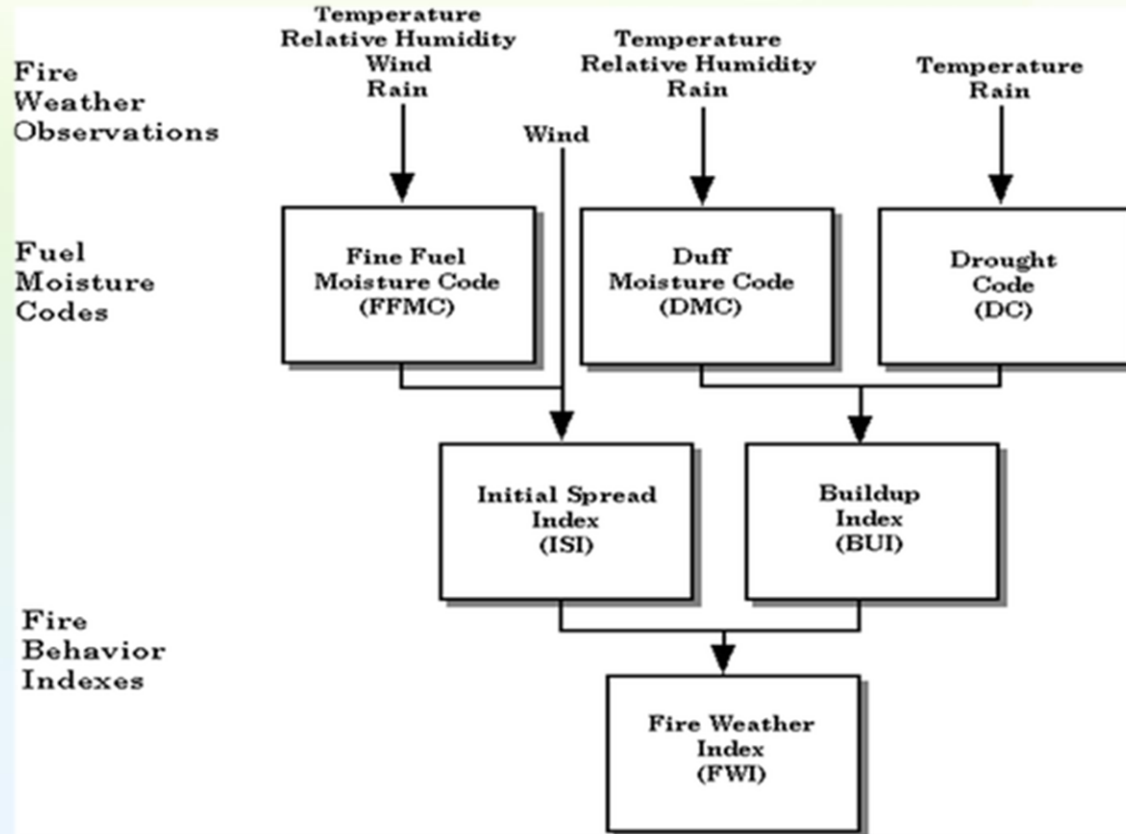
Using Fire Danger to quantify a Detection Decision-Aid

Probability of Fire Start	FFMC	Detection Activity
<30%	<70	No detection
30-60%	70-80	Towers 1-4pm
60-80%	80-86	Towers all day Patrols 1-4pm
80+%	87+	Towers all day Patrols am, pm

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Current FWI System

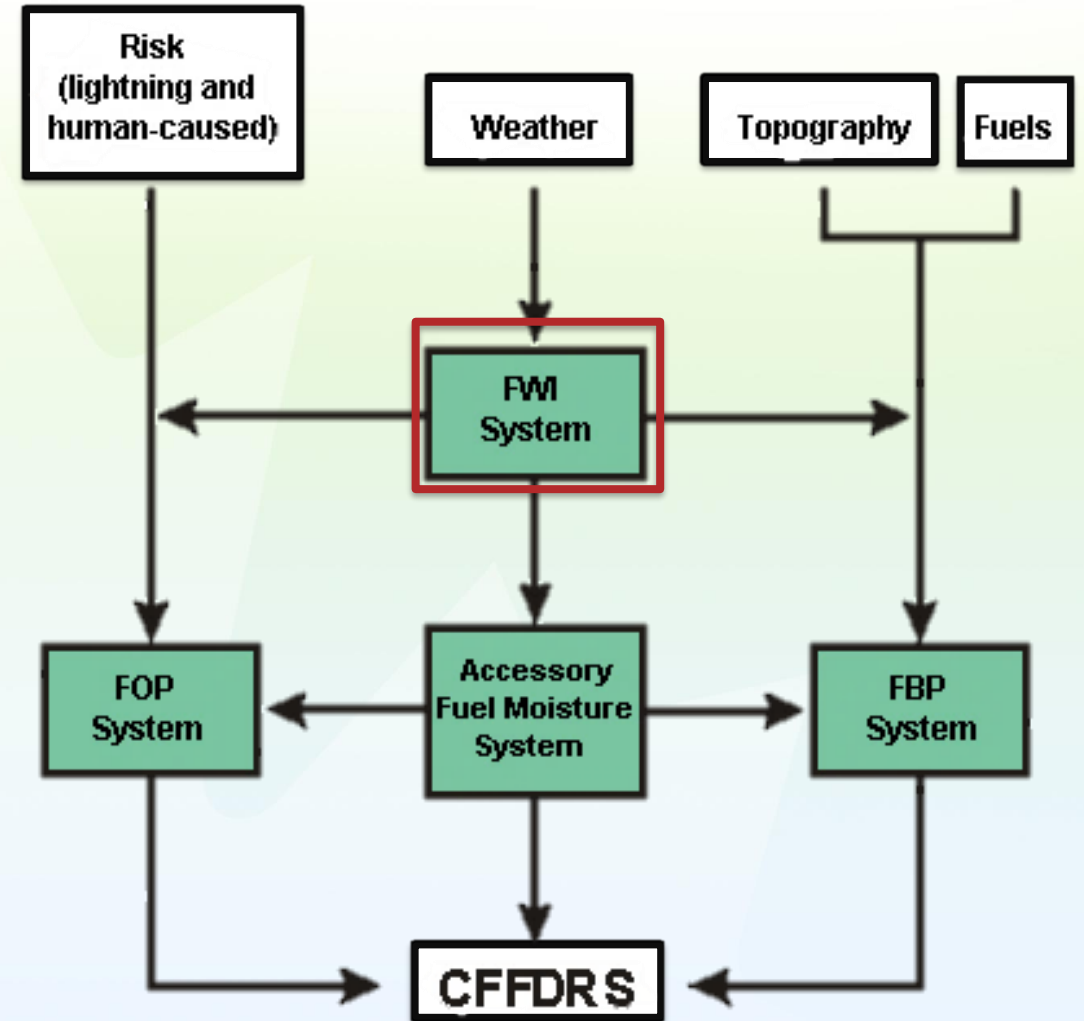


For the last sixty years, Canadian users have been using this standard system.

- Few changes over the last decades
 - Supplementary codes like Grass Fuel Moisture Code, and Sheltered Duff Moisture Code
 - Hourly FFMC documented but not formally adapted into the system.

Current CFFDRS

- The FWI System is part of the larger, Canadian Forest Fire Danger Rating System (CFFDRS).
- CFFDRS is a series of modules, each focussing on providing different fire behaviour information
 - Scale
 - Inputs
 - Purpose



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CFFDRS-2025 Conceptual Structure

Next Generation CFFDRS program underway to implement changes

**** CFFDRS-2025 ****

Goal of CFFDRS-2025:

- Integrate research from the last thirty years and standardize new technology/ data sources.
- Introduce more flexibility, while maintaining options for standard/simplified inputs.

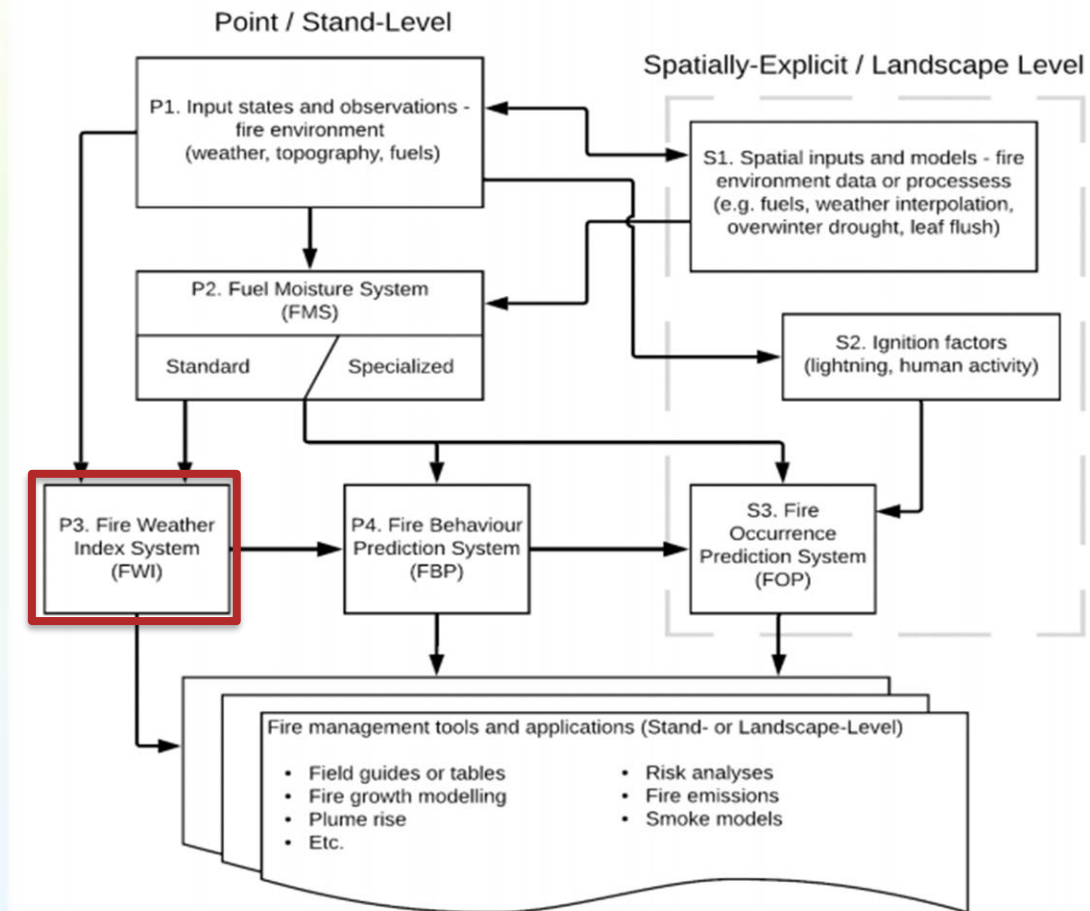


Figure 1. An overview of the next generation of the Canadian Forest Fire Danger Rating System. (Information Report GLC-X-26 2021)

Canadian Fire Weather Index System

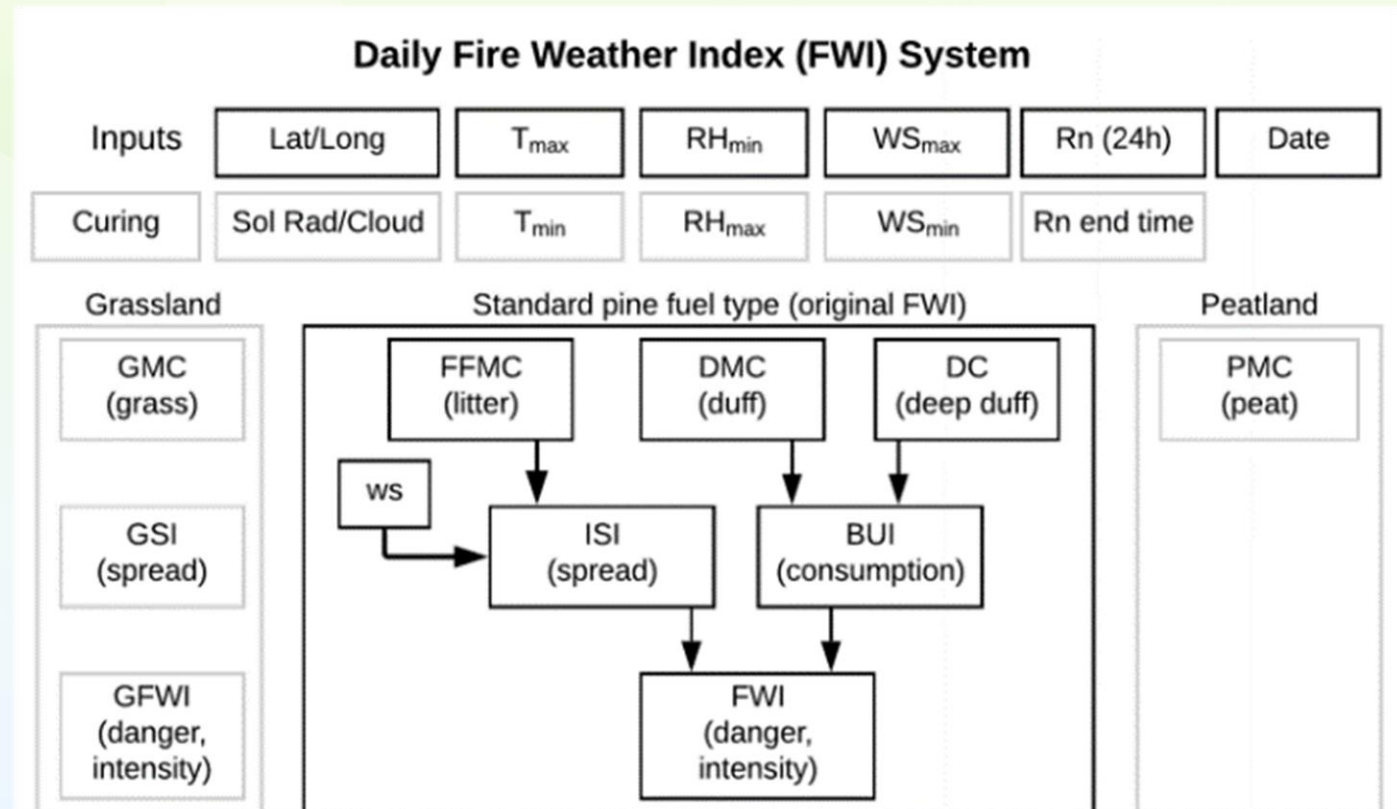
Part of the Next Generation Canadian Forest Fire Danger Rating System (CFFDRS-2025)

What will stay the same

- Six main components with four weather observations.
- Noon-hour weather observation input optional.
- Output relative danger code interpretation remains similar.

What's new

- Weather observation standard will be daily minimum and maximum.
- Weather observations can be hourly.
- Four new components.



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Why introduce changes to the FWI System?

Weather Observations

- Noon-hour weather observations is a legacy, the FWI System was introduced before forecasts were common and noon hour observations allowed for afternoon planning.
- Moving to hourly forecasting, or daily forecast of maximums and minimums aligns better with meteorological practice.
- Estimating the change in fuel moisture content and peak burn time is more accurate using minimum and maximum weather variables.
- Reconciles the known differences between the daily FFMC and hourly FFMC calculation methods.

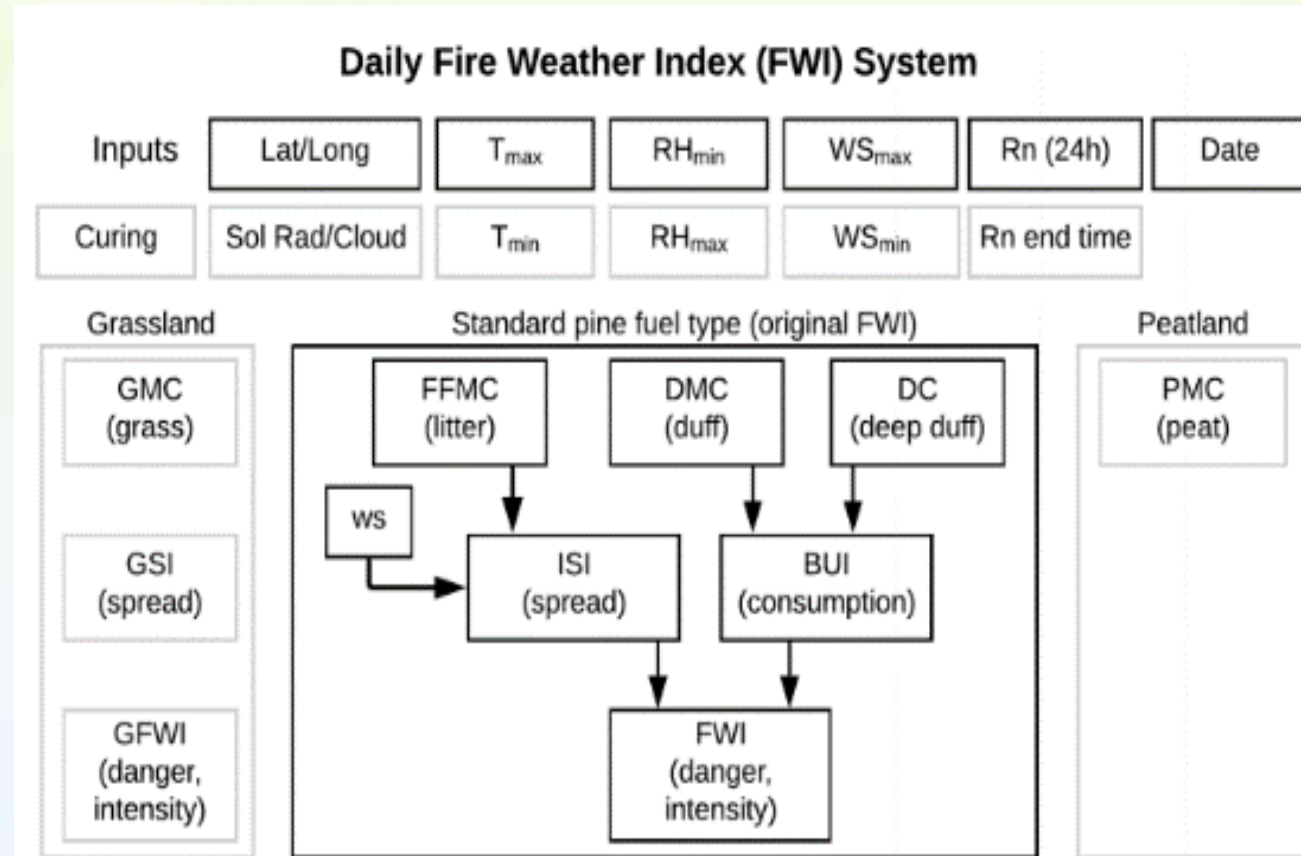
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New FWI System Indices

Part of the Next Generation Canadian Forest Fire Danger Rating System (CFFDRS-2025)

- Grassland Codes
 - Grassland Moisture Code (GMC)
 - Grassland Spread Index (GSI)
 - Grassland Fire Weather Index (GFWI)
 - Additional Inputs:
 - ✓ Solar Radiation (estimate o.k.)
 - ✓ Estimate of degree of curing of grassland (Similar to FBP System)
- Peatland Moisture Code (PMC)
 - Forested peatlands.
 - Designed to capture a slower drying process compared to codes in current system.



International use of FWI System

CFFDRS-2025

- More flexibility in weather observation timing.
- Added components (grassland, peatland) for different fuel-types.
- Added flexibility in the Fire Behaviour Prediction System Fuel Types – for those who want it.

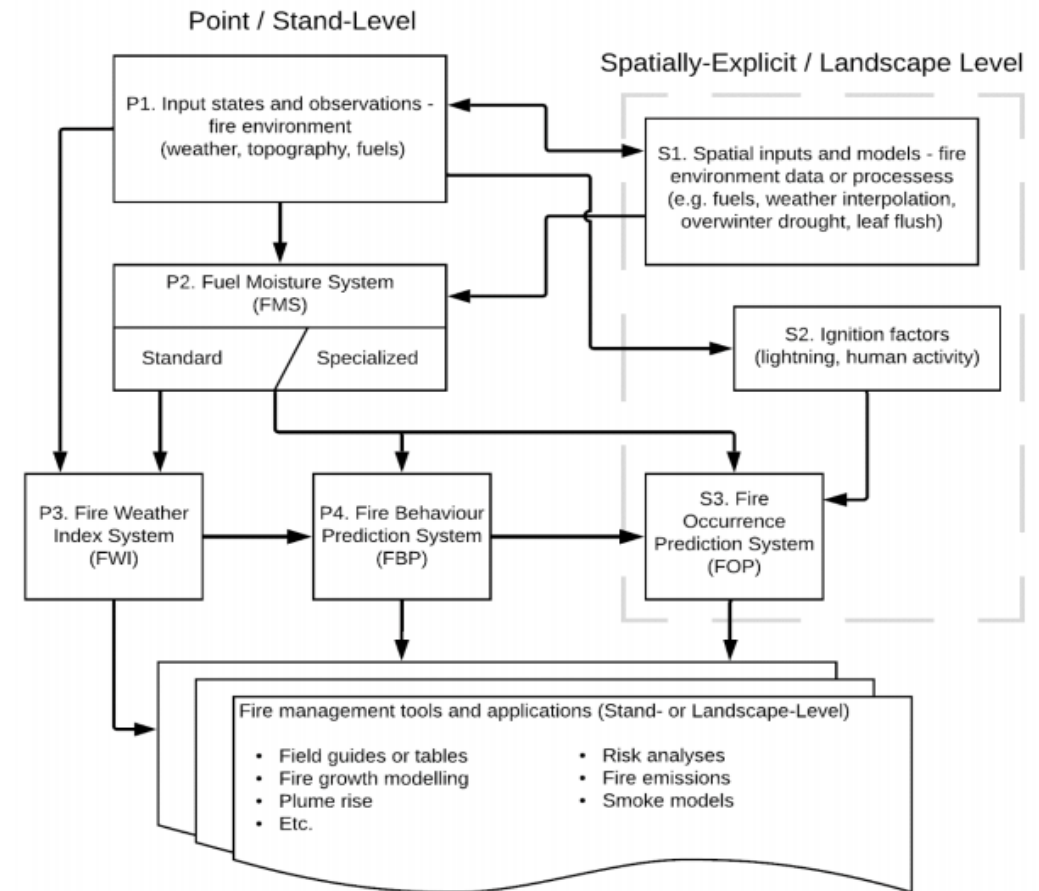


Figure 1. An overview of the next generation of the Canadian Forest Fire Danger Rating System. (Information Report GLC-X-26 2021)

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FWI System to Fire Behaviour Prediction

- Ongoing work to bridge the gap between FWI System users and Fire Behaviour Prediction (FBP)
 - Deciduous
 - Conifer
 - Grassland
- Deciduous FWI System codes
 - Address fuel difference from Canadian Boreal Pine standard.
 - Seasonal changes in landscape.

WIND 15 BUI 20

Deciduous EFFECTIVE FFMC

Spring---->>>>Summer (canopy/surface green) >>>>---Fall-winter

no Percentage of the Green up (combination of forest floor and canopy)

FFMC	no	0	10	25	40	50	80	65	45	35	15	0
60	60	60	52	1	1	0	0	1	2	53	60	
65	65	65	54	11	7	1	3	9	13	56	65	
70	70	69	58	46	31	6	13	39	46	60	70	
72	72	71	59	48	46	9	20	46	49	62	72	
74	73	73	62	50	47	12	29	48	51	65	74	
76	75	75	65	52	48	16	38	50	54	68	75	
78	77	77	69	54	50	19	45	52	57	73	77	
80	79	79	74	56	51	22	46	53	59	75	79	
81	80	80	75	57	51	23	46	54	60	77	80	
82	81	81	76	58	52	25	46	55	61	78	81	
83	83	82	78	59	53	27	47	56	63	79	83	
84	84	83	79	61	54	30	47	58	65	81	84	
85	85	85	81	64	56	35	48	60	69	82	85	
86	86	86	82	69	59	42	49	63	73	83	86	
87	87	87	83	74	62	46	51	68	76	85	87	
88	88	88	85	77	67	47	53	74	79	86	88	
89	89	89	86	79	74	48	56	77	81	87	89	
90	90	90	87	82	77	49	59	80	84	88	90	
91	91	91	89	84	79	51	63	82	85	90	91	
92	92	92	90	86	81	53	68	84	87	91	92	
93	93	93	91	87	83	55	73	85	89	92	93	
94	94	94	92	89	85	58	76	87	90	93	94	
95	95	95	93	90	86	61	78	88	91	95	95	
96	96	96	94	91	87	63	79	89	92	95	96	
97	97	97	95	92	88	65	80	90	93	96	97	
98	98	97	96	92	89	68	81	91	94	97	98	
99	99	98	97	93	89	70	82	91	95	98	99	

A first step for interpretation of the FWI System outputs in Deciduous forest types. 'Effective' refers to the change in expected *fire behaviour* rather than actual moisture content.



International
Model Forest
Network

**30 YEARS FOR
LANDSCAPES,
PARTNERSHIPS AND
SUSTAINABILITY**

Concluding thoughts...

The Next Generation Fire Danger Rating System is set to be released in 2025 as 'CFFDRS-2025'.

The CFFDRS was originally created to provide fire management with tools to help in daily decision making and planning. As the fire landscape changes, and fire management are challenged with new questions, work will continue and the CFFDRS will continue to evolve as the fire landscape evolves.



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