Government of Saskatchewan

PERFORMANCE INDICATORS FOR WILDFIRE PREVENTION PROGRAM

Daniel Poirier
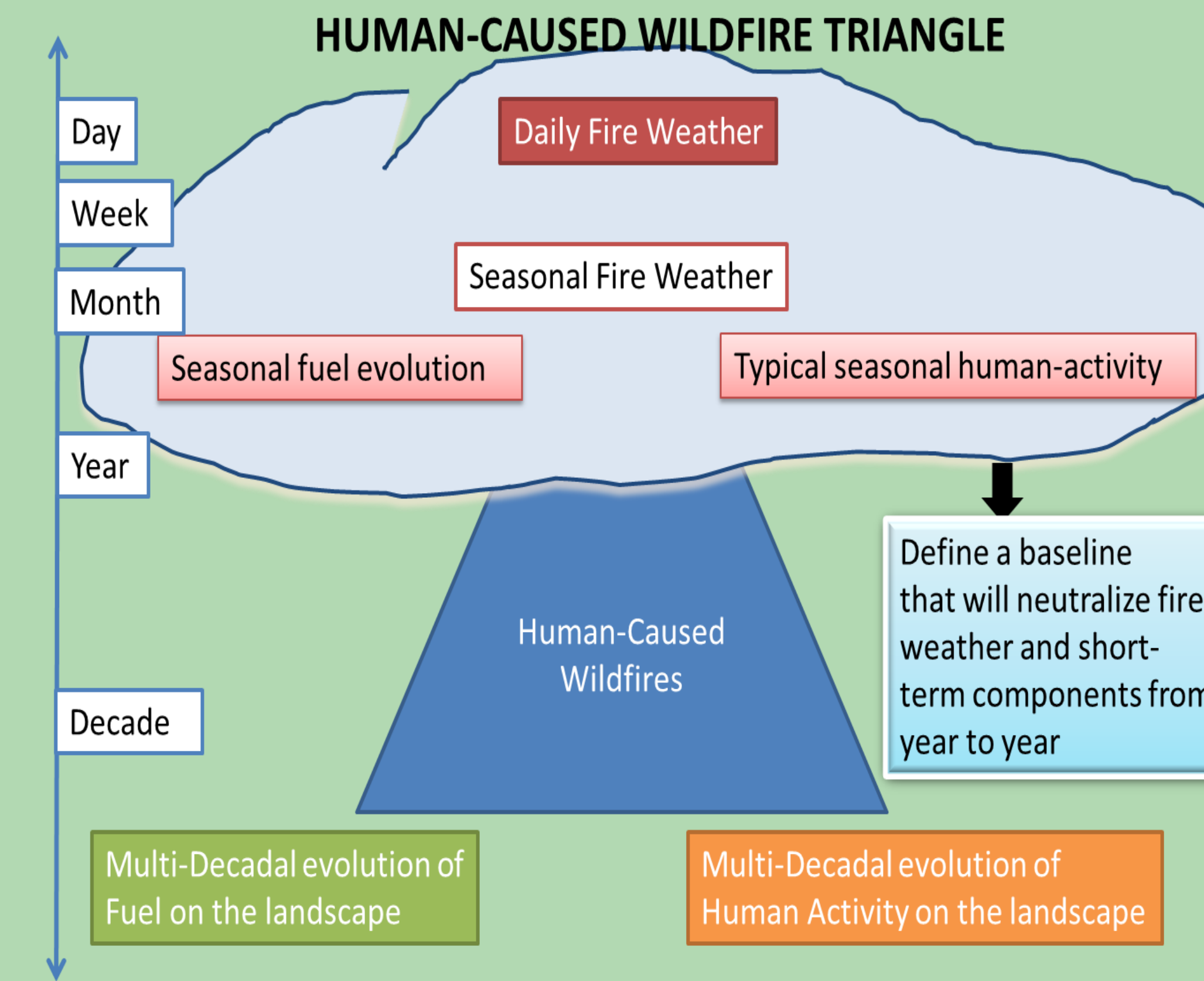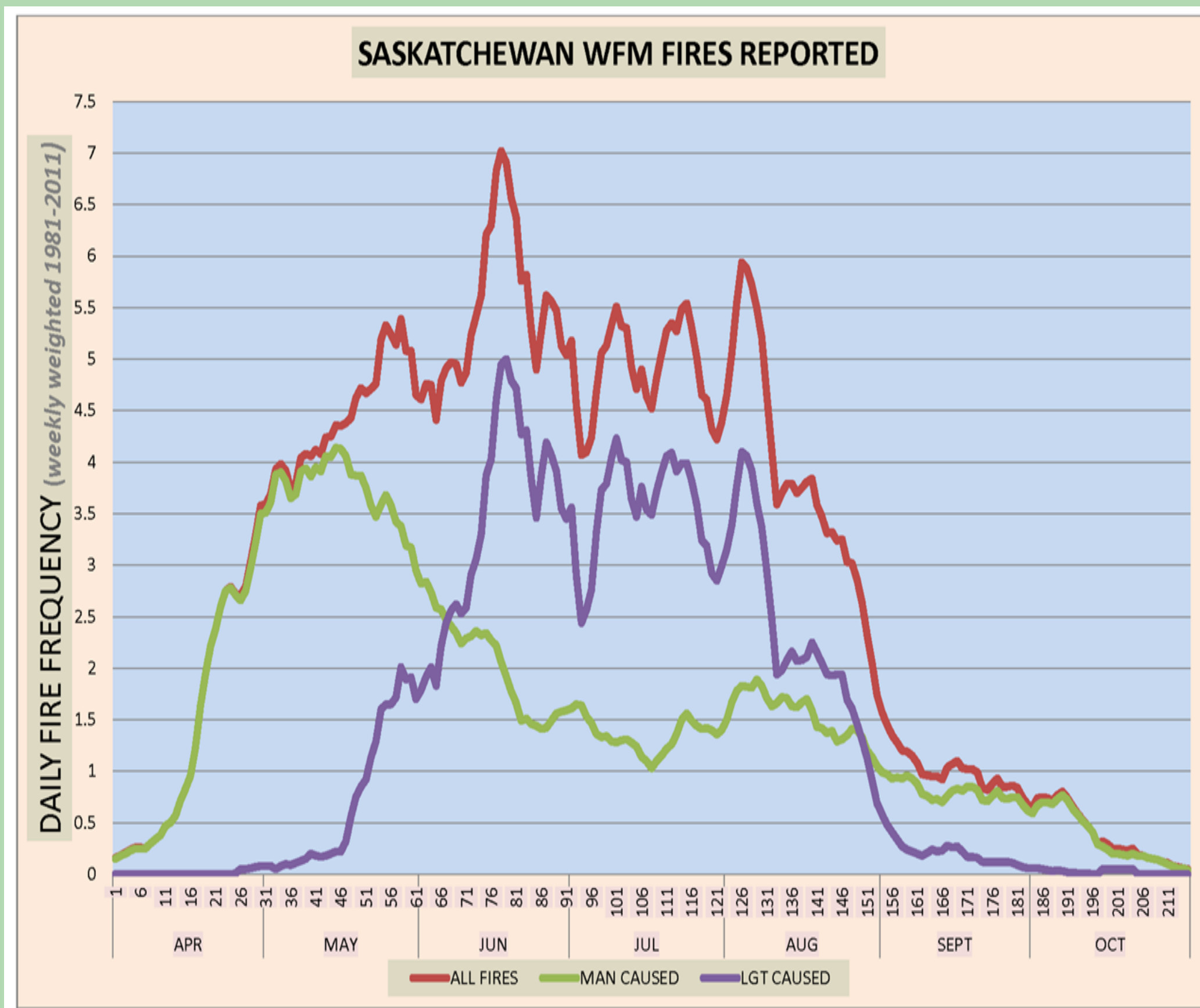Saskatchewan Ministry of Environment
Wildfire Management Branch

OBJECTIVES:

➢ Project human-caused wildfires specific to

❖ Regions of Saskatchewan
❖ Based on fire weather observed daily
❖ Using multi-decadal years of data

➢ The projection is a baseline that
→ Reflect expected human-caused wildfires based on historical activity for a region
→ Varies from year to year
  • Based on observed daily fire weather
    • calendar date specific
    • using multi observations within the region

Fire Weather at locations: Daily HFI-C2 >> PREP LEVEL

	CRITICAL VALUES:				
Categories	Extreme	Very High	High	Moderate	Low
Prep Level	5	4	3	2	1
Head Fire Intensity	HFI > 10,000	10,000 <= HFI < 4,000	4,000 <= HFI < 2,000	2,000 <= HFI < 500	HFI < 500

❖ PREP levels are calculated at every weather observing location
❖ PREP levels are categories of Head Fire Intensity for C2

Actual Noon for All Regions valid on 2014-09-24 at 12:00 — Issued on 2014-09-24

Fire Weather at Regions/Zones: PREP LEVEL >> Level-B Rankings

Level B & SCORE valid on 2014-09-24

❖ Daily Level-B Rankings are calculated for each region/zone
→ Using algorithm of Daily PREP levels observed within that region
→ Using weighting factor of each regions within zone

Preparedness Level-B Decision Tree

WEATHER REGIONS					
Full Response Zone	SS	NWB	WB	EB	CB
WEIGHTING FACTOR	20%	20%	20%	20%	20%
Modified Response Zone	ATH	NES			
WEIGHTING FACTOR	50%	50%			

SASKATCHEWAN WFM FIRES REPORTED



TO DEFINE THE BASELINE

DATASET YEARS: 1989-2008

➢ Wildfires and Fire Weather records during the 1989-2008 years

➢ The dataset, much like a climate 30-years normal, should be redefined every 5 or 10 years

➢ The dataset should capture a slice in the gradual evolution of human activity on the landscape as well as a slow motion snapshot of the state of the fuel evolution on the landscape

NOTE: The dataset was adjusted to 1995-2008 for the Northwest Boreal weather region due to unusually high incidences of arson wildfires during the 1989-1994 years

For each weather region: BASELINE

➢ A table of fireday dependant and Level-B dependant human-caused wildfire frequency

CENTRAL BOREAL
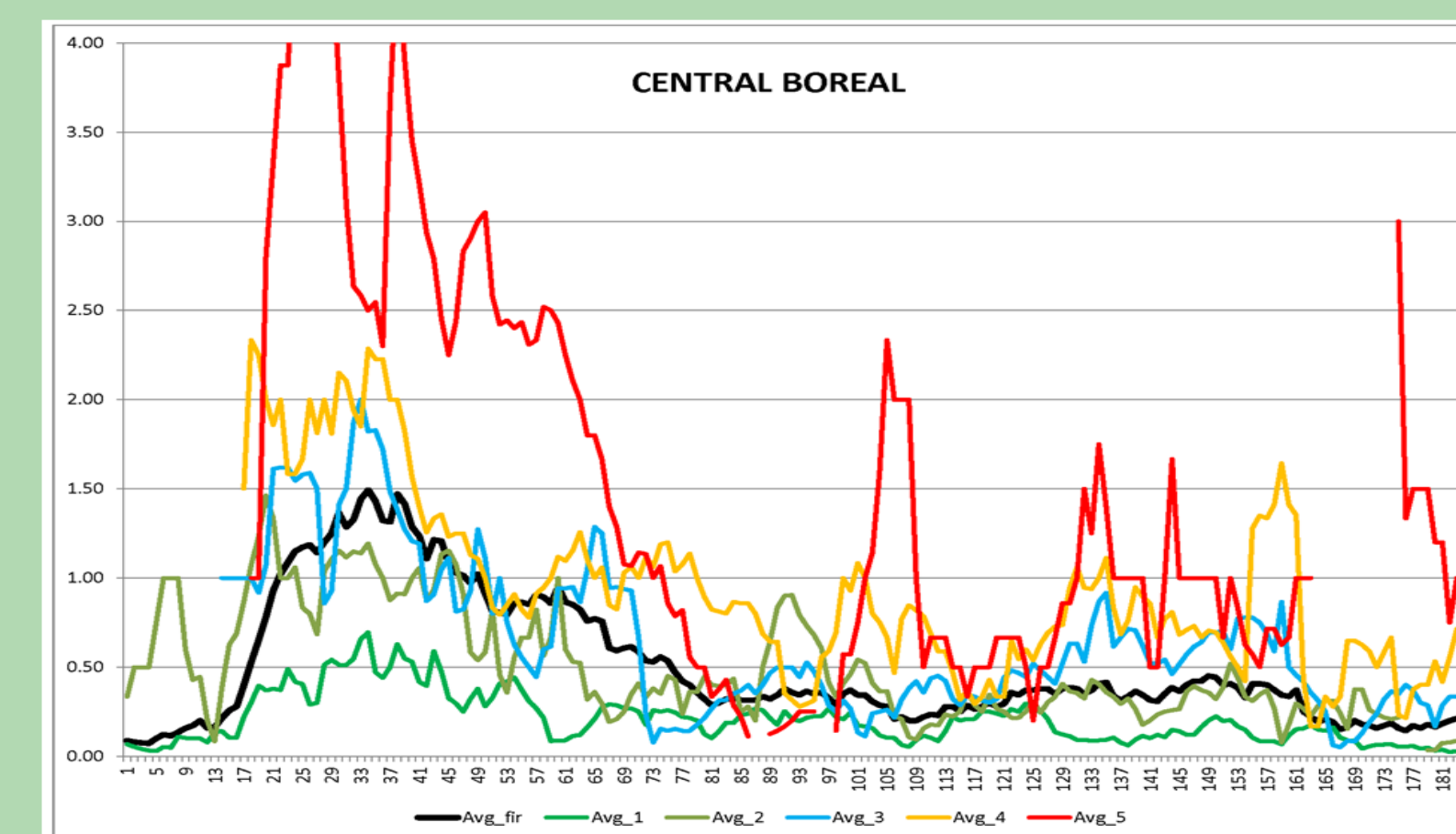
Comparing MODELS — RAW versus Percent-Average Models

MAY-JUNE AVERAGE		ATH	NES	SS	NWB	WB	CB	EB
1989-2008	ACTUAL	6.6	7.9	31.0	17.6	28.8	49.2	12.6
	RAW	6.2	7.5	31.6	17.4	29.4	51.3	13.2
	PERC	8.7	8.6	37.6	18.9	35.3	61.6	13.6
2009-2012	ACTUAL	5.8	10.5	34.0	16.3	34.8	47.8	7.8
	RAW	10.2	7.9	30.8	23.6	34.6	44.7	10.1
	PERC	13.7	10.3	38.6	26.4	40.8	54.1	11.4
JULY AVERAGE		ATH	NES	SS	NWB	WB	CB	EB
1989-2008	ACTUAL	2.5	2.9	8.4	3.1	3.0	9.1	1.1
	RAW	2.2	2.8	8.1	3.0	2.9	8.9	1.0
	PERC	3.3	2.9	6.7	2.3	1.9	6.3	0.6
2009-2012	ACTUAL	3.0	3.0	4.0	1.3	0.0	2.8	0.0
	RAW	2.1	2.3	6.8	2.6	2.6	8.5	1.1
	PERC	3.3	2.9	6.2	1.8	1.2	4.4	0.6
AUG-SEP AVERAGE		ATH	NES	SS	NWB	WB	CB	EB
1989-2008	ACTUAL	2.4	3.9	13.5	4.5	6.5	18.5	3.3
	RAW	2.5	3.4	13.4	4.4	6.2	18.2	3.1
	PERC	1.9	2.1	9.3	2.5	3.9	14.4	2.2
2009-2012	ACTUAL	1.5	4.3	13.0	2.0	1.5	6.5	0.5
	RAW	1.5	3.7	12.1	5.8	5.6	17.5	2.5
	PERC	1.3	2.4	7.4	2.9	3.4	11.4	1.7

HUMAN-CAUSED WILDFIRE TRIANGLE

Day / Week / Month / Year / Decade

Daily Fire Weather
Seasonal Fire Weather
Seasonal fuel evolution — Typical seasonal human-activity
Human-Caused Wildfires

Define a baseline that will neutralize fire weather and short-term components from year to year

Multi-Decadal evolution of Fuel on the landscape
Multi-Decadal evolution of Human Activity on the landscape

WEEKLY AVERAGING of FIREDAY Wildfires numbers:

➢ For each fireday, human-caused wildfires recorded within ±3 firedays were compiled for the 1989-2008 period

➢ This result in typically 20 X 7 = 140 years of data if the dataset was complete to evaluate weekly averaged human-caused wildfires for each fireday

➢ The dataset was further mined to evaluate frequency of human-caused wildfires for each Level-B rankings

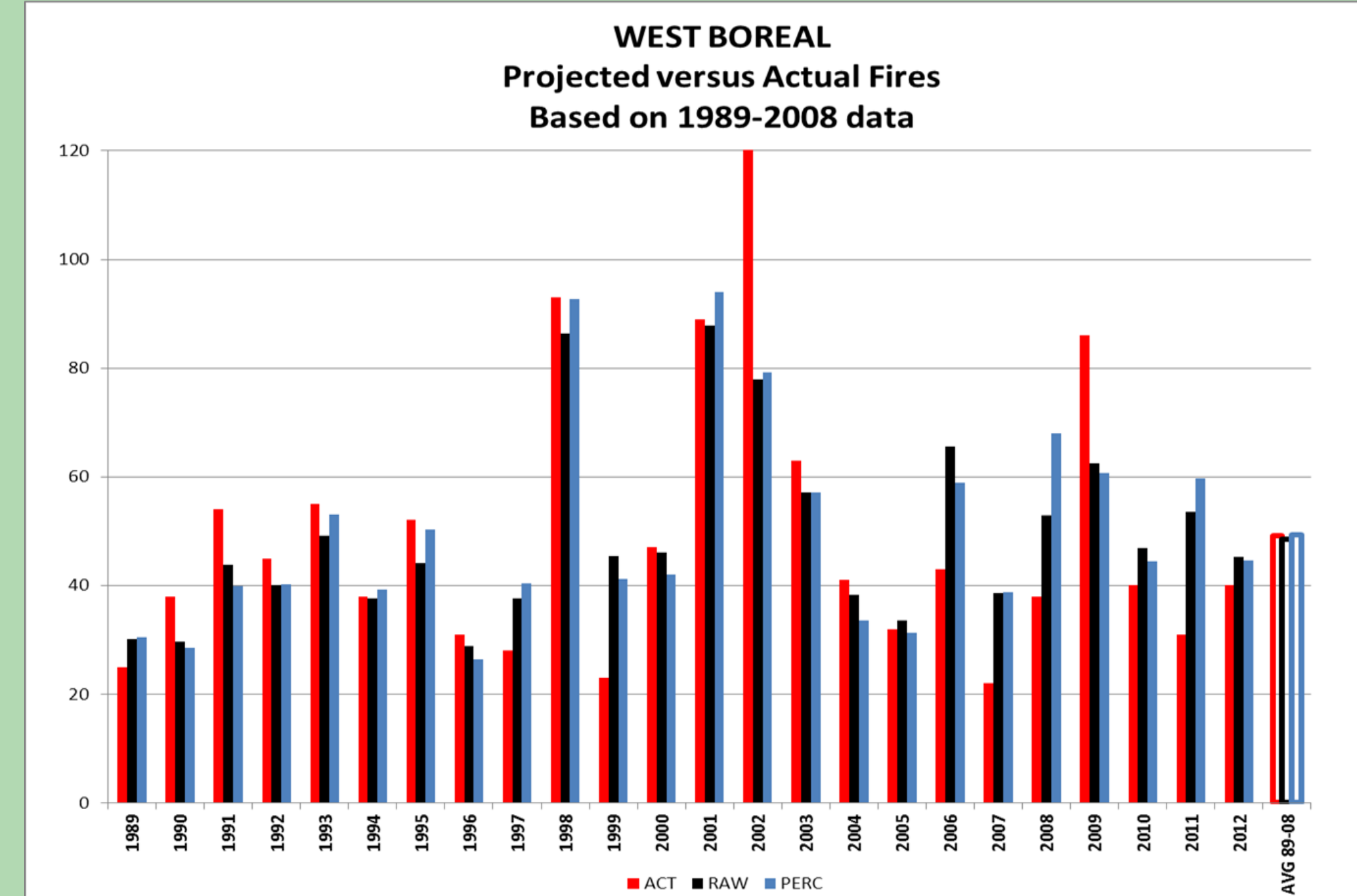| REGION	fireday	Level-B	# Years	# Fires	Daily fire frequency
6-CB	61	4	42	46	1.1
6-CB	61	5	20	45	2.25
6-CB	62	0	1	1	1
6-CB	62	1	44	5	0.11
6-CB	62	2	17	9	0.53
6-CB	62	3	20	19	0.95
6-CB	62	4	39	45	1.15
6-CB	62	5	19	40	2.11
6-CB	63	0	1	1	1

MODEL: PERCENT-AVERAGED BASELINE

❖ Evaluate the average fireday wildfire frequency independently of the Level-B
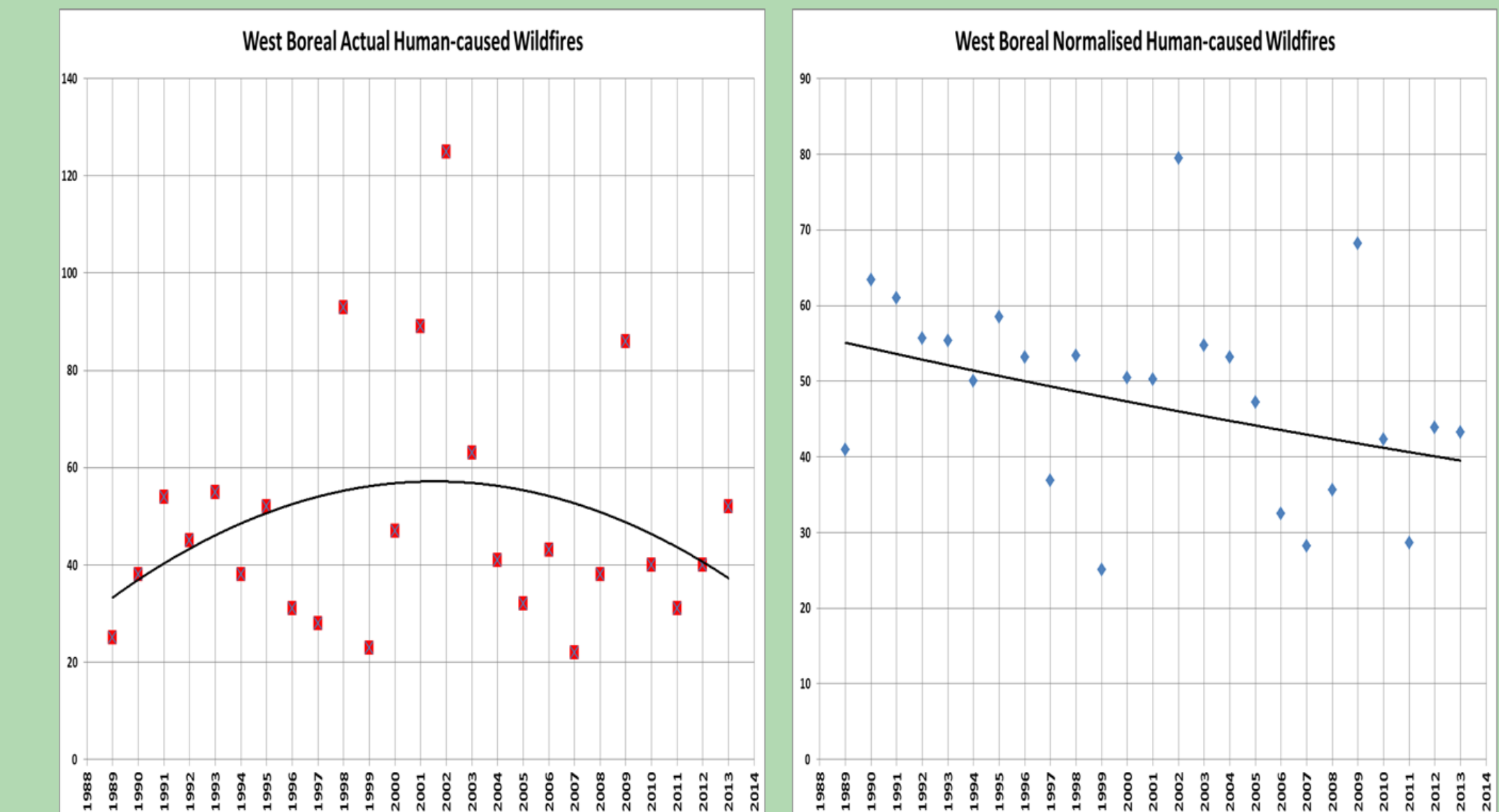❖ Associate a percentage of a fireday average frequency to each Level-B Rankings

LVL-B	% of AVERAGE
1	25%
2	50%
3	100%
4	200%
5	400%

→ Will associate a wildfire frequency at all fireday & Level-B cases
→ Simple methodology to implement
→ Better Representation of years outside dataset years
→ For some weather regions slightly overestimate yearly human-caused wildfires

YEARLY AVERAGE		ATH	NES	SS	NWB	WB	CB	EB
1989-2008	ACTUAL	11.6	14.8	55.9	29.4	49.1	92.4	21.5
	RAW	11.0	13.7	55.6	29.0	48.5	91.8	21.1
	PERC	14.0	13.7	55.3	27.0	49.3	93.7	19.0
2009-2012	ACTUAL	10.3	18.3	52.0	22.5	49.3	75.0	11.5
	RAW	13.8	13.9	50.9	33.8	52.0	84.3	17.3
	PERC	18.3	15.6	53.1	32.3	52.4	78.8	15.6

WEST BOREAL — Projected versus Actual Fires — Based on 1989-2008 data

Model Applications

➢ Provide better in-context facts to evaluate prevention program performance objectives after individual fire season

➢ Provide better historical background information to identify prevention program targets and performance objectives

➢ Provide methodology to evaluate contribution and trends of different human-caused wildfires sources in relation to the evolution of human activities on the landscape

➢ In combination with fire weather observations and forecast, provide Operations with real-time estimate of potential human-caused wildfires

Model Applications: Trends

West Boreal Actual Human-caused Wildfires

West Boreal Normalised Human-caused Wildfires

CENTRAL BOREAL 1998 — Human-Caused Fires — Cumulative projected versus actual fires
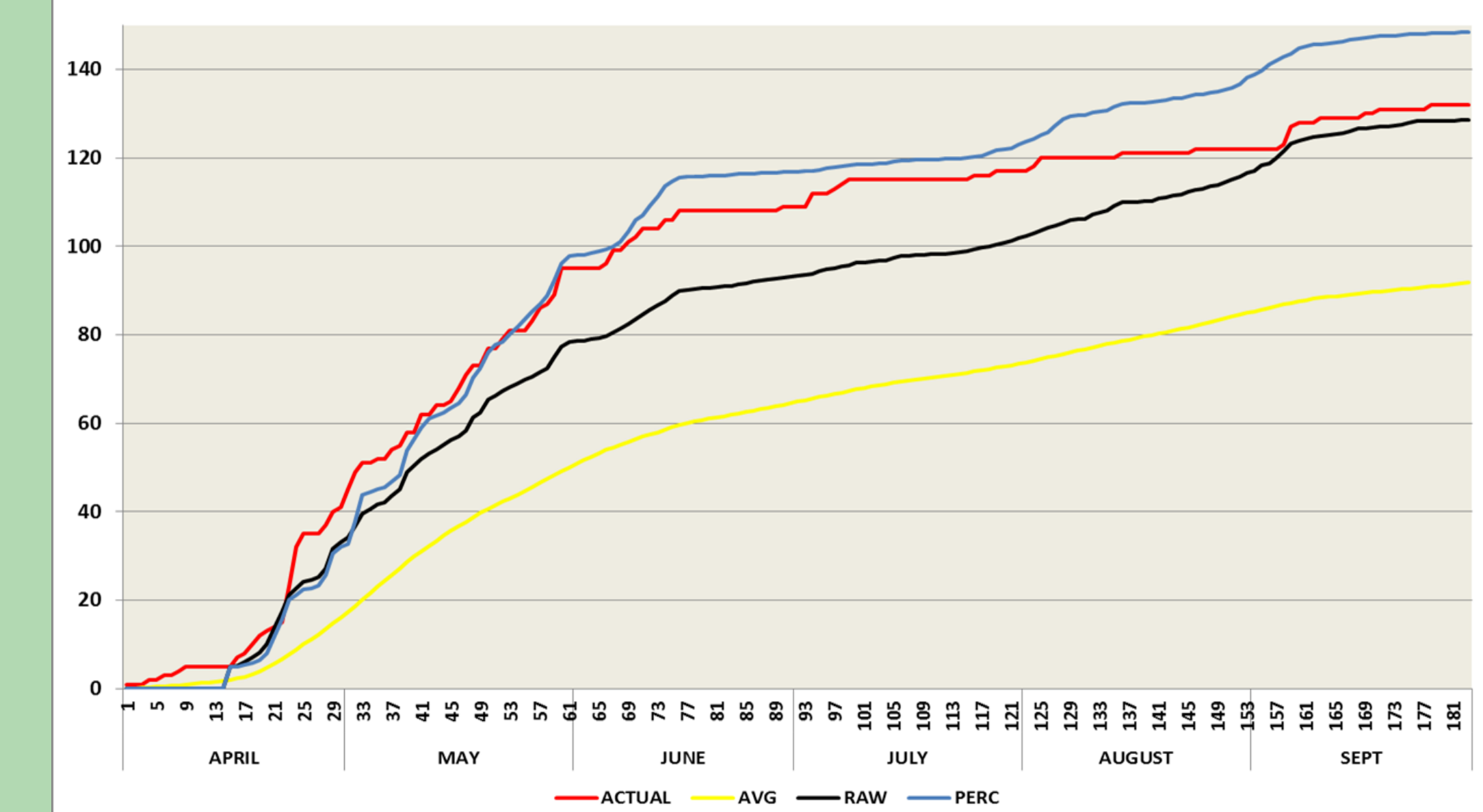
Potential Improvements:

➢ Create a PREP Level 6 and LVL-B ranking 6 to take into consideration extreme windy spring days where RH < 20%

Percent-Averaged Model (Increase complexity)
→ Could use different Percent-Average values for different weather regions
→ Could use fireday variable Percent-average values