EQUATIONS AND FORTRAN IV PROGRAM FOR THE 1976 METRIC VERSION OF THE FOREST FIRE WEATHER INDEX

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ABSTRACT

This report presents the equations for the new 1976 metric version of the Canadian Forest Fire Weather Index. In addition to the changes needed to accommodate metric weather data, several mathematical improvements are introduced as well. These eliminate certain anomalies in the original version, but their overall effect is slight enough that no serious problems in comparing new and old indexes should arise. Also presented is a Fortran IV program showing how the equation may be processed by computer.

RESUME

L'auteur fournit les équations de la version métrique de 1976 de l'Indice canadien forêt-météo. Outre les changements que nécessitent les données météorologiques nouvelles (métriques), l'auteur apporte plusieurs améliorations mathématiques. Ces améliorations éliminent certaines anomalies de l'indice original, mais leur effet global est assez faible et il ne créera pas de problèmes sérieux de comparaison entre l'ancien et le nouveau. L'auteur fournit aussi une programmation de Fortran IV montrant comment les équations peuvent être programmées avec un ordinateur.

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C.E. Van Wagner[1/] and T.L. Pickett[2/]

INTRODUCTION

In the spring of 1976 the Canadian Forestry Service will issue a second edition of the Forest Fire Weather Index tables for use with metric weather observations. The equations on which this new version is based are presented in this report. Also included is a computer program for calculating a season's indexes from weather data. It is written in Fortran IV for the DEC PDP-11.

This report can be considered a replacement of the appendices in Canadian Forestry Service Publication 1333, "Structure of the Canadian Forest Fire Weather Index" (Van Wagner 1974), which contain the equations for the original 1970 version. The new equations are for use with metric weather observations as follows:

Temperature	- degrees Celsius	(^{o}C)
Relative humidity	- percent	(%)
Wind speed	- kilometres per hour	(km/h)
Rainfall	- millimetres	(mm)

Also, one index has a new name. The former Adjusted Duff Moisture Code (ADMC) is now called the Buildup Index (BUI).

In addition to the changes necessary to accommodate metric weather readings, several mathematical improvements were made in order to correct certain weaknesses in the original version. These are:

1) Change in Equation 4, the EMC for wetting in the FFMC, to eliminate an anomaly at very high RH.
2) Replacement of Equations 7 and 8, the original temperature correction in the FFMC, with separate temperature effects on EMC and log drying rate k. These appear in Equations 2b, 3, and 4.
3) Increase in the amount of rain discarded in the DC from 0.06 in (1.524 mm) to 2.8 mm (0.1102 in).
4) Change in the buildup function, f(D), at BUI values over 80, in order to cause the FWI to level off in extreme drought. (Equation 27).

These changes are all in the direction of more logical behaviour of the moisture codes and indexes, especially during unusual or abnormal weather. They are slight enough that no problems of data compatibility

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between old and new fire danger records should arise, except perhaps in those regions of Canada that experience very long rainless periods with BUI values substantially over 100. At a given ISI, the FWI now reaches 90% of its potential value at BUI 160, and even an infinite BUI will then yield no more than a further 10% increase. FWI's over 100 will now be much rarer, and will in fact only be possible at ISI values over 45.

The Fortran IV program is included as an example of how these equations may be handled by computer. The basic mathematical operations can be accomplished in a fairly small computer with storage capacity as little as 4K. This program was written mainly for research purposes requiring the computation of one season's indexes at a time for one station only. The arrangements for input and output would naturally be quite different in a program designed for daily operation with many stations.

SYMBOLS IN THE EQUATIONS

All quantities used in the numbered equations are represented in the following list by single letters, sometimes with subscript. The symbols are arranged in groups according to their place in the whole. All moisture contents are in percent.

Weather

T - noon temperature, degrees C

H - noon relative humidity, percent

W - noon wind speed, km/h

r_o - rainfall in open, measured at noon, mm

r_e - effective rainfall, DMC

r_d - effective rainfall, DC

Fine Fuel Moisture Code (FFMC)

m_o - fine fuel moisture content from previous day

m - fine fuel moisture content after drying

E_d - fine fuel EMC for drying

E_w - fine fuel EMC for wetting

k_o - intermediate step in calculation of k

k - log drying rate, FFMC, $\log_{10}$ m/day

$f(r_o)$ - rainfall function in FFMC

C - correction term in FFMC rain effect

F_o - previous day's FFMC

F_r - FFMC after rain

F - FFMC

Duff Moisture Code (DMC)

M_o - duff moisture content from previous day

M_r - duff moisture content after rain

M - duff moisture content

K - log drying rate in DMC, $\log_{10}$ M/day

L_e - effective day length in DMC, hours

b - slope variable in DMC rain effect

P_o - previous day's DMC

P_r - DMC after rain

P - DMC

Drought Code (DC)

Q - moisture equivalent of DC, units of 0.254 mm

Q_o - moisture equivalent of previous day's DC

Q_r - moisture equivalent after rain

V - potential evapotranspiration, units of 0.254 mm water per day

L_f - day length adjustment in DC

D_o - previous day's DC

D_r - DC after rain

D - DC

Fire Weather Index (FWI)

$f(W)$ - wind function

$f(F)$ - fine fuel moisture function

$f(D)$ - duff moisture function

R - Initial Spread Index (ISI)

U - Buildup Index (BUI)

B - FWI (intermediate form)

S - FWI (final form)

EQUATIONS AND PROCEDURES

Note: The equations are numbered the same as their counterparts in Pub. 1333. Nos. 7 and 8 no longer appear because of a revision in the mathematics of the FFMC.

Fine Fuel Moisture Code (FFMC)

$$F = 101 - m \tag{1}$$

$$k_o = 0.424[1 - (H/100)^{1.7}] + 0.0694\ W^{0.5}[1 - (H/100)^8] \tag{2a}$$

$$k = k_o \times 0.463e^{0.0365T} \tag{2b}$$

$$E_d = 0.942H^{0.679} + 11e^{(H-100)/10} + 0.18(21.1-T)(1-e^{-0.115H}) \tag{3}$$

$$E_w = 0.618H^{0.753} + 10e^{(H-100)/10} + 0.18(21.1-T)(1-e^{-0.115H}) \tag{4}$$

$$m = E_d + (m_o - E_d)10^{-k} \tag{5}$$

$$m = E_w - (E_w - m_o)/1.9953 \tag{6}$$

$$F_r = (F_o/100)\ f(r_o) + 1 - C \tag{9}$$

$$f(r_o) = 123.85 - 55.6 \ln (r_o + 1.016) \qquad , 0.50 < r_o \le 1.45 \tag{10a}$$

$$f(r_o) = 57.87 - 18.2 \ln (r_o - 1.016) \qquad , 1.45 < r_o \le 5.75 \tag{10b}$$

$$f(r_o) = 40.69 - 8.25 \ln (r_o - 1.905) \qquad , r_o > 5.75 \tag{10c}$$

$$C = 8.73\ e^{-0.1117F_o} \tag{11}$$

The FFMC is calculated as follows:

1) Previous day's F becomes F_o.

2a) If $r_o > 0.50$, calculate $f(r_o)$ by one of Equations 10a, 10b, or 10c, according to value of r_o.

b) Calculate C by Equation 11.

c) Calculate F_r by Equation 9.

3) Calculate m_o from F_o (or F_r if $r_o > 0.50$) by Equation 1.

4) Calculate E_d by Equation 3.

5a) If $m_o > E_d$, calculate k by Equations 2a and 2b.

b) Calculate m by Equation 5.

6a) If $m_o < E_d$, calculate E_w by Equation 4.

b) If $m_o < E_w$, calculate m by Equation 6.

7) If $E_d > m_o > E_w$, let $m = m_o$.

8) Calculate F from m by Equation 1. This is today's FFMC.

There are two restrictions on the use of the FFMC equations:

1) Equations 9 to 11 must not be used unless $r_o > 0.50$; that is, in dry weather the rainfall routine must be skipped.

2) F_r cannot theoretically be less than zero. Negative results from Equation 9 must be raised to zero.

Duff Moisture Code (DMC)

$$P = 244.72 - 43.43 \ln (M - 20) \tag{12}$$

$$r_e = 0.92\, r_o - 1.27 \quad , r > 1.5 \tag{13}$$

$$M_r = M_o + 1{,}000\, r_e/(48.77 + br_e) \tag{14}$$

$$b = 100/(0.5 + 0.3\, P_o) \quad , P_o \leq 33 \tag{15a}$$

$$b = 14 - 1.3 \ln P_o \quad , 33 < P_o \leq 65 \tag{15b}$$

$$b = 6.2 \ln P_o - 17.2 \quad , P_o > 65 \tag{15c}$$

$$K = 1.894\, (T + 1.1)(100 - H)\, L_e \times 10^{-6} \tag{16}$$

$$P = P_o \text{ (or } P_r\text{)} + 100K \tag{17}$$

The DMC is calculated as follows:

1) Previous day's P becomes P_o.

2a) If $r_o > 1.5$, calculate r_e by Equation 13.

b) Calculate M_o from P_o by Equation 12.

c) Calculate b by the appropriate one of Equations 15a, 15b, or 15c.

d) Calculate M_r by Equation 14.

e) Convert M_r to P_r by Equation 12.

3) Take L_e from Table 2 in Pub. 1333.

4) Calculate K by Equation 16.

5) Calculate P from P_o (or P_r if $r_o > 1.5$) by Equation 17. This is today's DMC.

There are three restrictions on the use of the DMC equations:

1) Equations 13 to 15 must not be used unless $r_o > 1.5$; that is, the rainfall routine must be skipped in dry weather.

2) P_r cannot theoretically be less than zero. Negative values resulting from Step 2e above must be raised to zero.

3) Values of T less than -1.1 must not be used in Equation 16. If $T < -1.1$, let $T = -1.1$.

Drought Code (DC)

$$Q = 800\, e^{-D/400} \quad (18)$$

$$r_d = 0.83\, r_o - 1.27 \qquad , r_o > 2.8 \quad (19)$$

$$Q_r = Q_o + 3.937\, r_d \quad (20)$$

$$V = 0.36\, (T + 2.8) + L_f \quad (21)$$

$$D = D_o\ (\text{or } D_r) + 0.5\, V \quad (22)$$

The DC is calculated as follows:

1) Previous day's D becomes D_o.

2a) If $r_o > 2.8$, calculate r_d by Equation 19.

b) Calculate Q_o from D_o by Equation 18.

c) Calculate Q_r by Equation 20.

d) Convert Q_r to D_r by Equation 18.

3) Take L_f from Table 3 in Pub. 1333.

4) Calculate V by Equation 21.

5) Calculate D from D_o (or D_r if $r_o > 2.8$) by Equation 22. This is today's DC.

There are three restrictions on the use of the DC equations, analogous to those in the DMC:

1) Equations 19 and 20 must not be used unless $r_o > 2.8$; that is, in dry weather the rainfall routine must be skipped.

2) D_r cannot theoretically be less than zero. Negative values resulting from Step 2d above must be raised to zero.

3) Values of T less than -2.8 must not be used in Equation 21. If $T < -2.8$, let $T = -2.8$.

Initial Spread Index (ISI)

$$f(W) = e^{0.05039W} \quad (23)$$

$$f(F) = (91.9\ e^{-0.1386m})\ (1 + m^{4.65}/7,950,000) \quad (24)$$

$$R = 0.208\ f(W)\ f(F) \quad (25)$$

Buildup Index (BUI)

$$U = 0.8\ PD/(P + 0.4D) \quad , P \leq 0.4D \quad (26a)$$

$$U = P - [1 - 0.8D/(P + 0.4D)]\ [0.92 + (0.0114P)^{1.7}], \ P > 0.4D \quad (26b)$$

Fire Weather Index (FWI)

$$f(D) = 0.626U^{0.809} + 2 \quad , U \leq 80 \quad (27a)$$

$$f(D) = 1,000/(25 + 108.64\ e^{-0.023U}) \quad , U > 80 \quad (27b)$$

$$B = 0.1\ R\ f(D) \quad (28)$$

$$\ln S = 2.72\ (0.434\ \ln B)^{0.647} \quad , B > 1 \quad (29a)$$

$$S = B \quad , B \leq 1 \quad (29b)$$

The ISI, BUI, and FWI are calculated as follows:

1) Calculate f(W) and f(F) by Equations 23 and 24.

2) Calculate R by Equation 25. This is today's ISI.

3) Calculate U by Equation 26a if $P \leq 0.4D$, or by Equation 26b if $P > 0.4D$. This is today's BUI.

4) Calculate f(D) by Equation 27a for values of U up to 80. If $U > 80$, use Equation 27b.

5) Calculate B by Equation 28.

6) If $B > 1$, calculate S from its logarithm, given by Equation 29a. If $B \leq 1$, let $S = B$ according to Equation 29b. S is today's FWI.

THE COMPUTER PROGRAM

The computer program presented here is descended originally from one written by Simard (1970)[1] at the Forest Fire Research Institute, Ottawa. It was designed to process weather data from many stations for a whole season. There is provision for missing data and correcting abnormal data. It is a complex program requiring a large computer.

In 1971 that program was simplified by Engisch and Walker[2] to handle one season's verified data for one station only in a small computer, the DEC PDP-8L. Kean (1975)[3] subsequently revised this version, incorporating several mathematical changes. The recent decision to issue the second edition of the FWI tables for use with metric weather data (plus one or two further math changes) has unfortunately rendered Kean's version obsolete. The present program replaces it and represents the standard mathematical form of the new metric FWI. It is written in Fortran IV and is used in a DEC PDP-11 at Petawawa.

To operate the program, data are read in in three sections. The first section consists of three columns: the number of days in each month of the year, the daylength factors for the DMC, and the daylength factors for the DC. The second gives the standard starting values of the three moisture codes (FFMC, DMC, and DC), plus the starting month and the number of days for which weather data are provided in that month. Thus, on the input page following, the starting moisture code values are 85, 6, and 15; the starting month is April and data are provided for the last 8 days of the month. The third input section lists the daily weather readings in the order temperature (°C), relative humidity (%), wind (km/h), and rain (mm). Temperature and rain are given to the nearest tenth, the other two in whole numbers.

The output is listed in ten columns: the original four weather data, the three moisture codes, and the ISI, BUI, and FWI. The computer stops automatically after the last day's weather listed. The program includes no limits on the input data other than those needed to prevent mathematical anomalies. All moisture codes are carried from day to day in precise floating-point format, as are all intermediate quantities leading to the daily FWI. Only when printed out are all codes and indexes rounded to the nearest whole number. The output is thus in the purest possible mathematical form and constitutes a reference against which calculations from the tables or other computer programs may be compared. The following pages list the program, and samples of input and output.

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[1] Simard, A.J. 1970. Computer program to calculate the Canadian Forest Fire Weather Index. Can. Forest. Serv., Forest Fire Res. Inst. Intern. Rep. FF-12.

[2] Engisch, R.L., and J.D. Walker. 1971. PDP-8L Version of Simard's Fire Weather Index Program. Can. Forest. Serv., Petawawa Forest Exp. Sta. Intern. Rep. PS-23.

[3] Kean, W.A. 1975. A PDP-8L Program for calculating the Fire Weather Index. Can. Forest. Serv., Petawawa Forest Exp. Sta. Inform. Rep. PS-X-57.

SYMBOLS IN THE PROGRAM

FFMC

FO	-	starting or yesterday's FFMC
F	-	rain function
C	-	correction term in rainfall routine
FR	-	FFMC after rain
WMO	-	starting moisture content
WM	-	today's final moisture content
ED	-	EMC for drying
EW	-	EMC for wetting
Z	-	intermediate value of X
X	-	log drying rate
FFM	-	today's FFMC

DMC

PO	-	starting or yesterday's DMC
RK	-	drying factor
EL(J)	-	daylength factor for month J
PR	-	DMC after rain
WMI	-	moisture content
B	-	function in rain effect
RW	-	effective rain

DC

DOT	-	starting or yesterday's DC
PE	-	drying factor
FL(J)	-	daylength factor for month J
RW	-	effective rain
SMI	-	moisture equivalent of DC
DR	-	DC after rain

Indexes

FM	-	today's fine fuel moisture content
SF	-	fine fuel moisture function
SI	-	ISI
W	-	wind
P	-	ratio function to correct BUI when less than DMC
CC	-	DMC " " " " " " " "
BB	-	intermediate form of FWI
SL	-	logarithm of final FWI

PROGRAM

```
C      PROGRAM NO.: F-4

C      FORTRAN IV PROGRAM TO CALCULATE CANADIAN FOREST
C      FIRE WEATHER INDEX FOR A D.E.C. PDP 11 AT P.F.E.S.
C      READS DATA AND PRINTS OUT IN METRIC UNITS.
       DIMENSION LMON(12), EL(12), FL(12)
       WRITE(7,1004)
1004   FORMAT(2X,'PROGRAM NO.: F-4'///)
100    FORMAT(I2,2F4.1)
101    FORMAT(F4.1,2I4,F4.1)
102    FORMAT(3F6.1,2I2)
C      READS LENGTH OF MONTHS, AND DAY LENGTH FACTORS
       DO 20 J=1,12
       READ(2,100) LMON(J), EL(J), FL(J)
20     CONTINUE
C      READS INITIAL VALUES OF FFMC, DMC, DC, STARTING MONTH AND NUMBER
C      OF DAYS OF DATA IN STARTING MONTH.
       READ(2,102) FO, PO, DOT, M, NDAYS
       DO 25 J=M,12
       NN=LMON(J)
1002   FORMAT(10(/),1X,'  DATE   TEMP   RH   WIND  RAIN   FFMC   DMC   DC
     1    ISI   BUI   FWI'/)
       IF(J.EQ.M) GO TO 304
       IDAYS=1
       GO TO 302
304    IDAYS=LMON(J)-NDAYS+1
C      READS DAILY WEATHER DATA
```

```
302   L=0
      DO 25 I=IDAYS,NN
      L=L+1
      READ(2,101,END=2000) T,IH,IW,R
      IF(L.NE.1.) GO TO 301
      WRITE(7,1002)
301   TX=T
      H=IH
      W=IW
      RAIN=R
C     FINE FUEL MOISTURE CODE
      IF(R.GT.0.5) GO TO 10
      R=0.0
      FR=FO
      GO TO 150
10    RA=R
      IF(RA.LE.1.45) GO TO 6
      IF(RA-5.75) 9,9,12
6     F=123.85-(55.6*ALOG(RA+1.016))
      GO TO 13
9     F=57.87-(18.2*ALOG(RA-1.016))
      GO TO 13
12    F=40.69-(8.25*ALOG(RA-1.905))
13    C=8.73*EXP(-0.1117*FO)
      FR=(FO/100.)*F+(1.0-C)
      IF(FR.GE.0.) GO TO 150
```

```
      FR=0.0
150   WMO=101.-FR
      ED=0.942*(H**0.679)+(11.*EXP((H-100.)/10.))+0.18*(21.1-T)
     1*(1.-1./EXP(0.115*H))
      IF(WMO-ED) 26,27,28
26    EW=0.618*(H**0.753)+(10.*EXP((H-100.)/10.))+0.18*(21.1-T)
     1*(1.-1./EXP(0.115*H))
      IF(WMO.LT.EW) GO TO 29
27    WM=WMO
      GO TO 30
28    Z=0.424*(1.-(H/100.)**1.7)+(0.0694*(W**0.5))*(1.-(H/100.)**8)
      X=Z*(0.463*(EXP(0.0365*T)))
      WM=ED+(WMO-ED)/10.**X
      GO TO 30
29    WM=EW-(EW-WMO)/1.9953
30    FFM=101.-WM
      IF(FFM.GT.101.) GO TO 32
      IF(FFM) 33,34,34
32    FFM=101.
      GO TO 34
33    FFM=0.0
C     DUFF MOISTURE CODE
34    IF(T+1.1.GE.0.) GO TO 41
      T=-1.1
41    RK=1.894*(T+1.1)*(100.-H)*(EL(J)*0.0001)
43    IF(R.GT.1.5) GO TO 45
```

```
      PR=PO
      GO TO 250
45    RA=R
      RW=0.92*RA-1.27
      WMI=20.0+280./EXP(0.023*PO)
      IF(PO.LE.33.) GO TO 50
      IF(PO-65.) 52,52,53
50    B=100./(0.5+0.3*PO)
      GO TO 55
52    B=14.-1.3*ALOG(PO)
      GO TO 55
53    B=6.2*ALOG(PO)-17.2
55    WMR=WMI+(1000.*RW)/(48.77+B*RW)
      PR=43.43*(5.6348-ALOG(WMR-20.))
250   IF(PR.GE.0.) GO TO 61
      PR=0.0
61    DMC=PR+RK
C     DROUGHT CODE
      IF(T+2.8.GE.0.) GO TO 65
      T=-2.8
65    PE=(.36*(T+2.8)+FL(J))/2.
      IF(R.LE.2.8) GO TO 300
      RA=R
      RW=0.83*RA-1.27
      SMI=800.*EXP(-DOT/400.)
      DR=DOT-400.*ALOG(1.+((3.937*RW)/SMI))
```

```
      IF(DR.GT.0.) GO TO 83
      DR=0.0
83    DC=DR+PE
      GO TO 350
300   DR=DOT
      GO TO 83
350   IF(DC.GE.0.) GO TO 85
      DC=0.0
C     INITIAL SPREAD INDEX, BUILDUP INDEX, FIRE WEATHER INDEX
85    FM=101.-FFM
      SF=19.115*EXP(-0.1386*FM)*(1.+FM**4.65/7950000.)
      SI=SF*EXP(0.05039*W)
93    BUI=(0.8*DC*DMC)/(DMC+0.4*DC)
      IF(BUI.GE.DMC) GO TO 95
      P=(DMC-BUI)/DMC
      CC=0.92+(0.0114*DMC)**1.7
      BUI=DMC-(CC*P)
      IF(BUI.LT.0.) BUI=0.
95    IF(BUI.GT.80.) GO TO 60
      BB=0.1*SI*(0.626*BUI**0.809+2.)
      GO TO 91
60    BB=0.1*SI*(1000./(25.+108.64/EXP(0.023*BUI)))
91    IF(BB-1.0.LE.0.) GO TO 98
      SL=2.72*(0.43*ALOG(BB))**0.647
      FWI=EXP(SL)
      GO TO 400
```

```
98      FWI=BB
400     IDC=DC+0.5
        IFFM=FFM+0.5
        IDMC=DMC+0.5
        ISI=SI+0.5
        IBUI=BUI+0.5
        IFWI=FWI+0.5
        WRITE(7,1001) J,I,TX,IH,IW,RAIN,IFFM,IDMC,IDC,ISI,IBUI,IFWI
1001    FORMAT(1X,2I3,F6.1,I4,I6,F7.1,6I6)
        FO=FFM
        PO=DMC
        DOT=DC
25      CONTINUE
2000    STOP
        END
```

INPUT

```
31 6.5-1.6
28 7.5-1.6
31 9.0-1.6
3012.8 0.9
3113.9 3.8
3013.9 5.8
3112.4 6.4
3110.9 5.0
30 9.4 2.4
31 8.0 0.4
30 7.0-1.6
31 6.0-1.6
   85.0   6.0   15.0 4 8
APR 23  3.9   98   14 8.9
        7.2   34   1810.7
       12.2   23   11  .0
       10.0   28   14  .0
       21.7   22   13  .0
       22.8   42   13  .0
       15.0   62    5  .0
APR 30  9.4   67    6  .8
MAY 1   3.3   42   31 8.9
       10.6   23   16  .0
        6.1   96   16  .3
        4.4   34   27 2.0
        7.2   40    8  .3
        3.3   91   1814.0
        4.4   83    622.6
        7.2   64    8  .8
        6.7   93    616.8
        6.7   71   14 7.9
       10.0   53   18  .0
       11.7   98    314.2
        8.3   79   1811.2
       10.6   81   19 4.6
       14.4   94    515.5
       13.9   40   14  .0
       19.4   41   16  .3
       12.2   40   18  .0
       10.0   41   16  .0
       16.1   32    8  .0
       18.9   36   10  .0
       28.9   46   10  .0
       23.3   54   13  .0
       18.3   44   14 1.0
       11.1   60   14  .3
       10.0   64    8 1.3
       15.6   50    6 3.0
       18.3   35    6  .0
       12.2   88    6 5.1
       16.1   46    8  .0
       20.6   59   23  .0
```

NO. OF DAYS IN MONTHS

DMC DAYLENGTH FACTORS

DC DAYLENGTH FACTORS

STARTING FFMC

STARTING DMC

STARTING DC

STARTING MONTH

NO. OF DAYS IN STARTING MONTH

OUTPUT

DATE	TEMP	RH	WIND	RAIN	FFMC	DMC	DC	ISI	BUI	FWI
4 23	3.9	98	14	8.9	25	3	4	0	2	0
4 24	7.2	34	18	10.7	55	2	2	1	2	0
4 25	12.2	23	11	0.0	78	5	5	2	4	1
4 26	10.0	28	14	0.0	86	6	8	5	6	4
4 27	21.7	22	13	0.0	92	11	13	10	10	10
4 28	22.8	42	13	0.0	91	14	18	10	14	11
4 29	15.0	62	5	0.0	89	16	22	4	15	6
4 30	9.4	67	6	0.8	82	16	24	2	16	3

DATE	TEMP	RH	WIND	RAIN	FFMC	DMC	DC	ISI	BUI	FWI
5 1	3.3	42	31	8.9	58	9	15	1	9	1
5 2	10.6	23	16	0.0	80	11	19	3	11	3
5 3	6.1	96	16	0.3	76	11	23	2	11	2
5 4	4.4	34	27	2.0	70	11	26	2	11	2
5 5	7.2	40	8	0.3	79	12	29	2	12	1
5 6	3.3	91	18	14.0	30	5	11	0	5	0
5 7	4.4	83	6	22.6	24	2	3	0	2	0
5 8	7.2	64	8	0.8	49	3	7	0	3	0
5 9	6.7	93	6	16.8	20	1	4	0	1	0
5 10	6.7	71	14	7.9	39	1	4	0	1	0
5 11	10.0	53	18	0.0	66	2	8	1	2	0
5 12	11.7	98	3	14.2	17	0	5	0	1	0
5 13	8.3	79	18	11.2	36	1	4	0	1	0
5 14	10.6	81	19	4.6	42	1	4	0	1	0
5 15	14.4	94	5	15.5	20	0	5	0	0	0
5 16	13.9	40	14	0.0	64	3	10	1	3	0
5 17	19.4	41	16	0.3	82	6	16	4	6	3
5 18	12.2	40	18	0.0	86	8	20	6	8	6
5 19	10.0	41	16	0.0	87	10	25	6	10	6
5 20	16.1	32	8	0.0	89	13	30	6	13	7
5 21	18.9	36	10	0.0	90	16	36	7	16	9
5 22	28.9	46	10	0.0	90	20	43	7	20	10
5 23	23.3	54	13	0.0	89	23	50	7	23	12
5 24	18.3	44	14	1.0	85	26	56	4	26	8
5 25	11.1	60	14	0.3	85	27	60	4	27	8
5 26	10.0	64	8	1.3	74	28	64	1	28	2
5 27	15.6	50	6	3.0	65	24	67	1	25	1
5 28	18.3	35	6	0.0	81	28	72	2	28	4
5 29	12.2	88	6	5.1	41	18	70	0	22	0
5 30	16.1	46	8	0.0	70	20	75	1	24	1
5 31	20.6	59	23	0.0	81	23	81	5	27	8