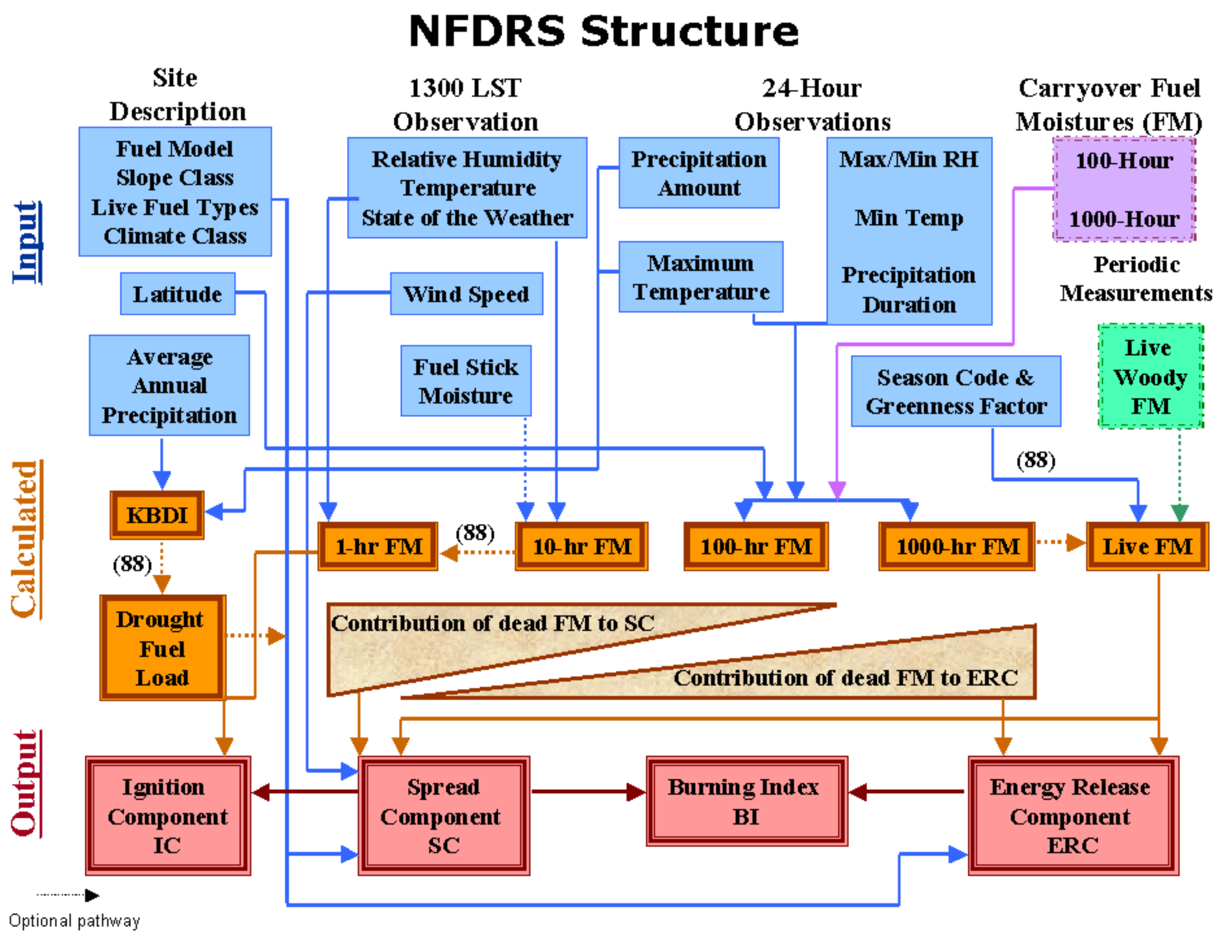
Appendix F. Detailed NFDRS inputs into WIMS

The WIMS User Guide demonstrates how to use the FastPaths, how to create a new station, how to enter and edit observations, how to recalculate a station and what the various screens are displaying.

With that in mind, this appendix gives detailed information and examples for using WIMS to produce valid NFDRS outputs.

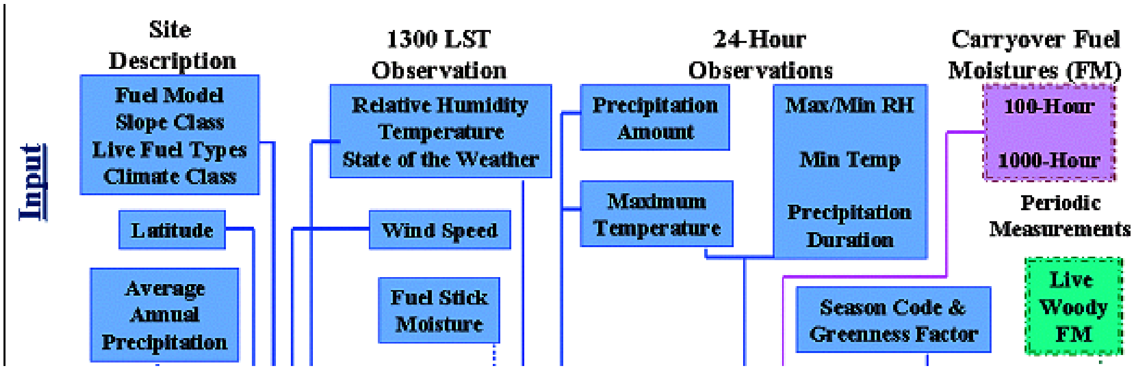
The NFDRS Structure Chart illustrates how each piece of data is used in the NFDRS calculations. This appendix will explore each piece of the Structure Chart and how and where WIMS fits into the process.



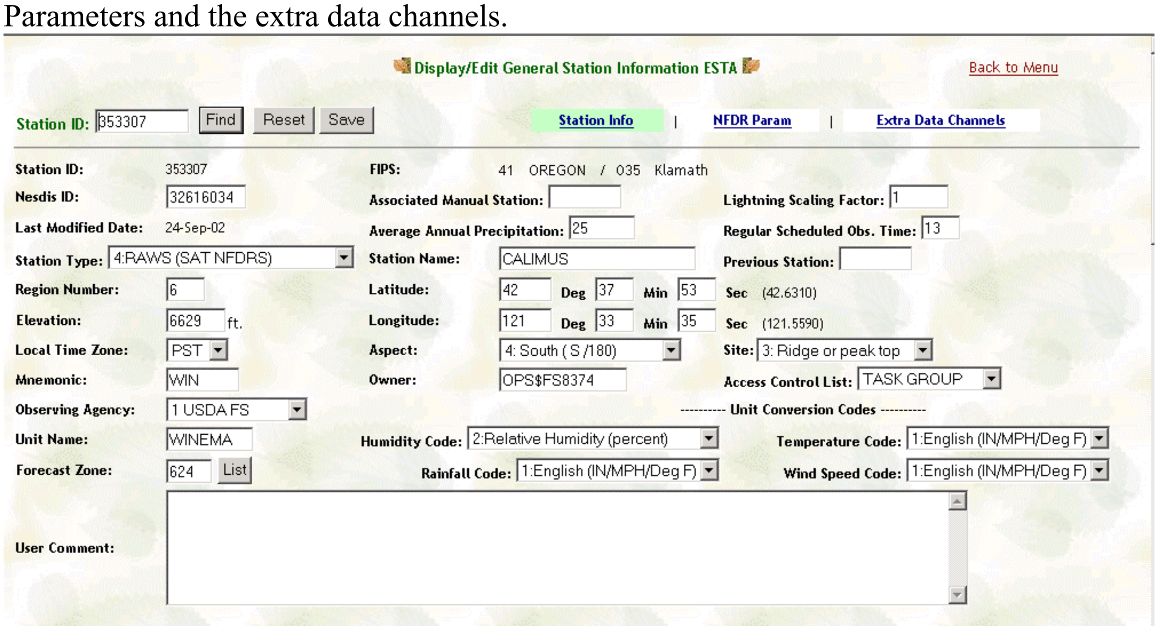
The NFDRS Structure chart is broken into three sections Input, Calculated and Output. Each section of the Structure Chart will be looked at in depth showing the ties to WIMS.

INPUT

Site Description



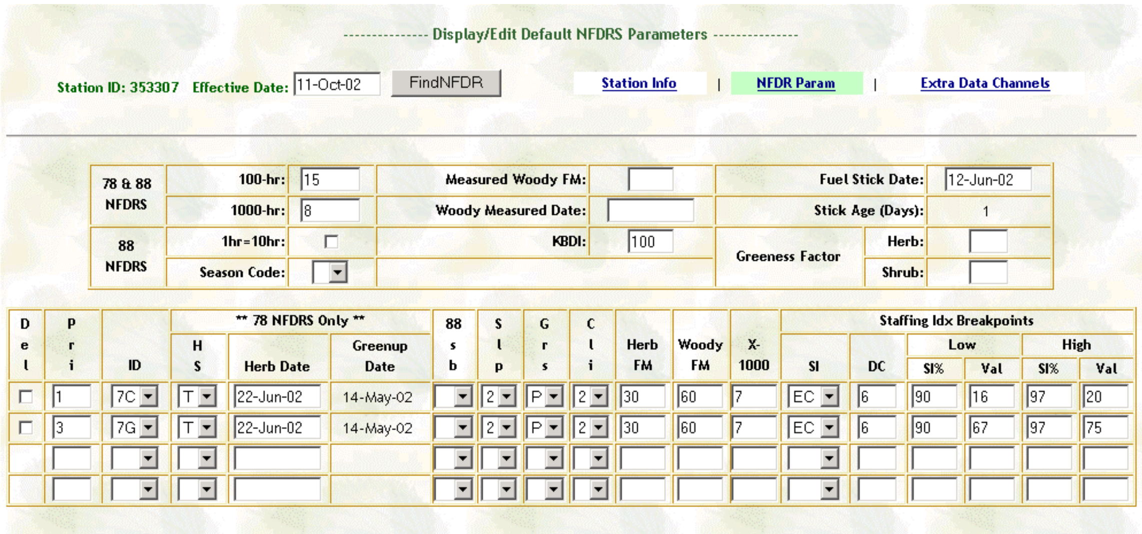
The site description information contains generally constant values based on the location of the weather station, but more importantly, describing the fire danger rating area. For example, slope class represents the topography of the area in which initiating fires are of concern. One station may represent the gentle foothills surrounding a town site while another might represent higher elevation mountainous terrain. Information contained in the Site Description is derived from the Station Catalog (NSTA or ESTA). The Station Catalog is made up of three types of information, the Station Information, the NFDRS Parameters and the extra data channels.



Specific NFDRS Structure (Inputs) entered into the Station Information screen include:

Field	**Description and action to be taken**
Latitude Longitude	This is the latitude at the weather station. This is used with the calendar date to calculate day length to establish the length of fuel drying period. The latitude and longitude also provide the required information for WFAS (Wildland Fire Assessment System) to plot the location of the weather station on the map. *Latitude and longitude are required entries in the station catalog.*
Average Annual Precipitation	The Average Annual precipitation at the weather station is used to calculate Keetch-Byram Drought Index (KBDI). NFDRS cannot calculate KBDI without this catalog value. *Average Annual Precipitation is a required entry in the station catalog.*

Fuel Model, slope class, live fuel types and climate class are also in the Site Description. These items can be found in the station catalog (ESTA) in the Edit NFDR parameters screen or by using the FastPath ENFDR.



Specific NFDRS Structure (Inputs) found in the NFDRS Parameters include:

Field	Description and action to be taken
Fuel Model (ID)	This field identifies the fuel model set(s) being used for danger-rating calculations. The NFDRS processor will accommodate both the 1978 and 1988 fuel models. A 7 or 8 is added to the alphabetic fuel model to designate the set of fuel models being utilized; for example 7C would indicate the 1978 version of fuel model C and 8G would indicate the 1988 version of fuel model G. The 1978 and 1988 fuel model sets may be run simultaneously on the same station. There are differences in the inputs, the outputs, and how the danger rating processor deals with live fuel moisture between the 1978 and 1988 fuel models. More classes of fuels are passed between the live and dead categories in the 1988 fuel models than the 1978 fuel models. The 1988 fuel models account for seasonal midflame wind speed changes based upon vegetation and reduced burning potential after periods of precipitation at other than scheduled observation time. *Review USDA-Forest Service Research paper SE-273 for more detailed information on the differences between the 1978 and 1988 fuel models.* *See Gaining and Understanding of the National Fire Danger Rating System PMS 932 for more detailed information.*

Field	Description and action to be taken
Climate Class (Cli)	The purpose of understating climate, as it relates to NFDRS, is to select the proper seasonal response of fuel moisture prediction models to environmental conditions. Latitude, elevation and time of year can affect these conditions; all of which are factors of climate. A climate class must be specified for each fire-danger rating area. Although the Unites States can be divided into many climatic zones, the NFDRS has adopted four climate classes (from C.W. Thornewaite's "The Climates of North America according to a New Classification", Geographic Review) judged adequate for the purpose of rating fire danger, these include:

NFDRS Climate Class	Thornewait Humidty Province	Characteristic Vegetation	Regions
1	Arid	Desert (sparse grass and scattered shrubs)	Sonoran deserts of western New Mexico, southwest Arizona, southern Nevada, and western Utah; and the Mojave Desert of California.
1	Semiarid	Steppe (short grass and shrubs)	Short grass prairies of the Great Basin; the sage brush steppes and pinyon-juniper woodlands of Wyoming, Montana, Idaho, Utah, Arizona, Washington, and Oregon; and the grass steppes of the central California valley.
2	Subhumid (rainfall deficient in summer)	Savanna (grasslands, dense brush and open conifer forests)	The Alaska interior; the chaparral of Colorado, Arizona, New Mexico, and Sierra Neveda foothills, and Southern California; oak woodland of California; ponderosa pine woodlands of the West; and mountain valleys of the Northern and Central Rockies.
3	Subhumid (rainfall adequate in all seasons)	Savanna (grasslands and open hardwood forests)	Blue stem prairies and blue oak-hickory savanna of Iowa, Missouri, and Illinois.
3	Humid	Forests	Almost the entire eastern U.S., and those higher elevations in the West that support forests.
4	Wet	Rain forest (redwoods and spruce-cedar-hemlock)	Costs of Northern California, Oregon, Washington, and southern Alaska.

Climate class is used to define the different linear drying rates for annuals, perennials, and woody plants. However, within a particular climate class, a single drying rate is assumed for live woody plants throughout a growing season. In the live herbaceous plants, the drying rate varies in two stages: The GREEN stage (1978 models) or summer season (1988 models) where the herbaceous fuel moisture exceeds 120 percent, and transition stage (1978 models) or the Fall season (1988 models) where the herbaceous moisture ranges from 30 to 120 percent. In the GREEN stage/Summer season annuals and perennials dry at the same rate, but in the transition stage/Fall season annuals exhibit faster drying rates than perennials.

- The length of the Greenup was scaled to the climate class because plants growing in drier climates typically respond quicker to favorable growing conditions than do plants in wetter climates.

The rules for selecting a climate class are flexible. The objective is to select the climate class that best fits the live fuel moisture conditions in the rating area. Adjustments of climate class are allowed during the course of the fire season if the observed live fuel characteristics deviate from the model. for example, if NFDRS is drying the live fuels too rapidly, go to the next lower climate class, namely 2 from

Conversely, if NFDRS is not drying the live fuels rapidly enough, use the next higher climate class, for instance a 4 instead of a 3. The reason for this is due to the fact that plants adapted to moist environments lose moisture faster during drought than those from dry environments. If temperature patterns over a fire season are not typical or the normal climate pattern for an area, NFDRS permits the option of bypassing the models and allow direct entry of live moisture values.

One method of selecting the proper climate class is through FireFamily Plus runs for key stations using several climate classes. Select the climate class that produces the best fit between the predicated and observed fuel conditions.

The following default values are set when a station is created or set to Pregreen:

Cli	Herb FM	Woody FM	X-1000	100-hr	1000-hr
1	30	50	15	10	15
2	30	60	20	15	20
3	30	70	25	20	25
4	30	80	30	25	30

See Gaining and Understanding of the National Fire Danger Rating System PMS 932 for more detailed information.

See The 1978 National Fire-Danger Rating System: Technical Documentation for more detailed information.

<table>
<tr><th>Field</th><th>Description and action to be taken</th></tr>
<tr><td>Live Fuel Types

(GRS)

Sb (88)</td><td>Herbaceous and/or woody vegetation type is chosen through the fuel model selected. Herbaceous vegetation eventually cures and becomes fine dead fuel (potentially boosting fire danger) while some or all of the woody vegetation will reach a low dormant, but not dead fuel value.

Herbaceous – select "A" annual or "P" perennial in the station catalog information set. Annual vegetation cures more rapidly than perennial.

Wood – if '88 models are selected then select evergreen or deciduous from within the station catalog information set. Evergreen vegetation does not add fuel to the dead fuel load while deciduous woody fuel contributes a load representing leaves to the dead fuel load.

Note: Fuel Model A must be given an annual designation and Fuel Model L must be given a perennial designation.

See <u>Gaining and Understanding of the National Fire Danger Rating System PMS 932</u> for more information.</td></tr>
</table>

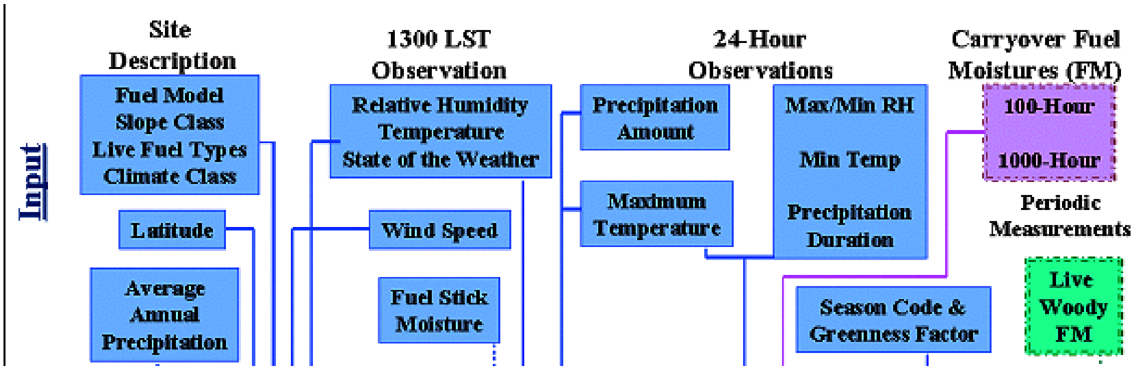
<table>
<tr><th>Field</th><th>Description and action to be taken</th></tr>
<tr><td>Slope Class
(Slp)</td><td>There are 5 slope classes. The slope class is selected to represent the topography of the base area where initial attack is commonly made, not necessarily describing weather station site topography.

<table>
<tr><td>Class</td><td>Slope %</td></tr>
<tr><td>1</td><td>0 – 25</td></tr>
<tr><td>2</td><td>26 - 40</td></tr>
<tr><td>3</td><td>41 - 55</td></tr>
<tr><td>4</td><td>56 - 75</td></tr>
<tr><td>5</td><td>greater than 75</td></tr>
</table>

Slope classes were created in such a way that the effect of the slope class selected doubles the effect of slope in the spread equation from one class to the next in the calculations.

See <u>Gaining and Understanding of the National Fire Danger Rating System PMS 932</u> for more information.</td></tr>
</table>

Observations



Ideally weather is observed at 1300 local standard time to represent the "worst case" weather situation. The cumulative observations from the previous 24-hour period ending 1300 LST are collected from some elements, such as maximum and minimum temperature and relative humidity. However, weather may actually be taken much earlier than the time of actual worst case conditions. Examples: Automatic stations that do not transmit hourly observations may report as early as 11:59. That observation will show up as an 1100 obs in WIMS. Actual worst-case weather typically occurs in the late afternoon. The time needed to transmit observations requires some observations to be sent in very early for stations on a 3-hour schedule.

1300 LST Observation

Field	**Description**
State of the Weather (W)	State of the weather, a measure of cloudiness, is an input with far reaching effects that is used to adjust fuel moisture values as they are calculated within the weather station shelter to match more closely the actual fuel moisture values within the fuel bed on the ground. State of the Weather Codes: 0 – Clear, less than 1/10 cloud cover 1 – Scattered clouds, 1/10 to 5/10 cloud cover 2 – Broken clouds, 6/10 to 9/10 cloud cover 3 – Overcast – more than 9/10 cloud cover 4 – Fog 5 – Drizzle or misty 6 – Rain 7 – Snow or sleet 8 – Showers 9 – Thunderstorms

Effects of state of the weather on NFDRS.

Corrections are made to the measured temperature and relative humidity to adjust it to reflect the fuel values on the surface of the ground and exposed to the weather.

Effects of State of the Weather – Sunny (0, 1, 2, 3)

SOW	Temperature	RH Adjustment Factor
0	+ 25 degrees	X .75
1	+19 degrees	X .83
2	+ 12 degrees	X .92
3	+ 5 degrees	X 1.00

1. The temperature adjustment is added to the observed temperature value.
2. The observed relative humidity is multiplied by the RH adjustment factor.

Effects of State of the Weather – Foggy (4)

1. State of the weather 4, foggy, will raise fuel moisture and decrease indices and components.

Effects of State of the Weather – Wet (5, 6, 7)

1. SC, BI, and IC are set to zero.
2. 1-hr fuel moisture is set to 35
3. 10-hr fuel moisture is set at 35 (or the measured value is used if snow and ice have been removed.
4. 100-hr and 1000-hr fuel moistures are calculated as usual if it is snowing or raining but not thawing.
   i. If thawing is occurring, the 100-hr and 1000-hr fuel moistures are calculated with precipitation duration listed as the duration of the thawing and maximum and minimum RH reported as 100%.
   ii. If it is snowing or fuels are ice covered, fuel moistures are calculated with precipitation duration = 0 and maximum and minimum RH = 100%.

Effects of State of the Weather 8 or 9

1. State of the weather categories 8 and 9 do not set fuels to wet condition so an observer must manually set the wet flag to Yes IF showers were present in the are that would have the wet fuels.

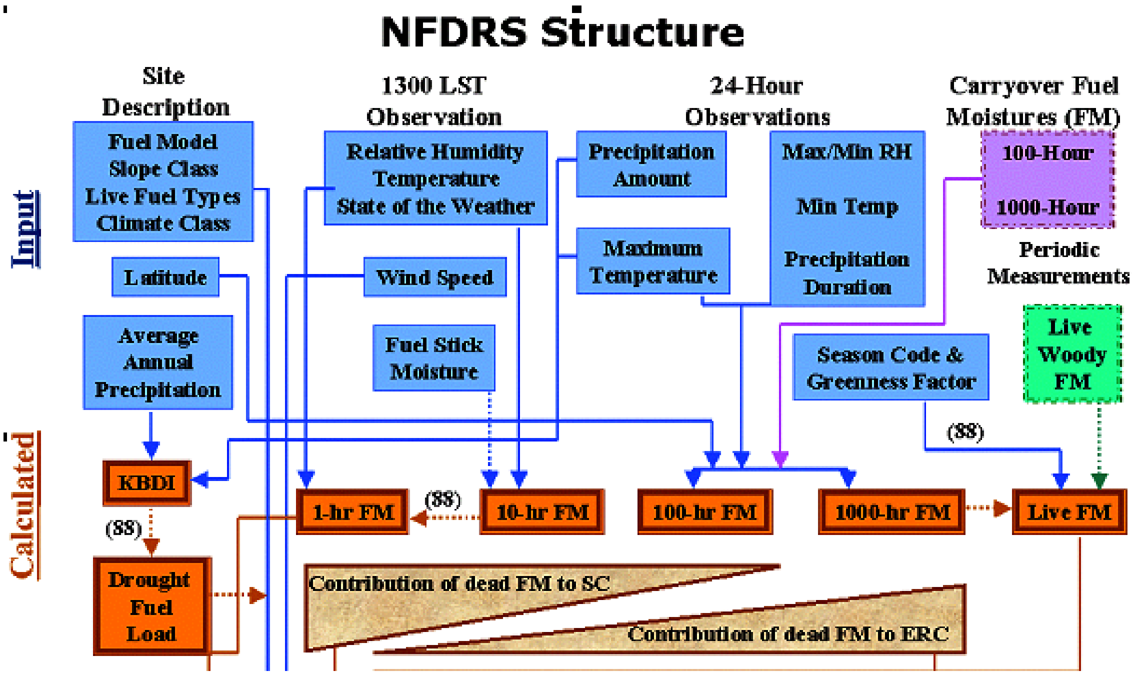
Dry Temp	The 1300 dry temp reading is a direct input into the 1 HR Fuel Moisture.
RH	The 1300 RH reading is a direct input into the 1 HR Fuel Moisture.
Wind Speed (Wind SP)	1. Wind Speed is a direct input to the primary driver of Spread Component. 2. Wind speed is in indirect input to Ignition Component and Burning Index through Spread Component.
Fuel Stick Moisture	If a fuel stick moisture value is present it inputs into the 10-hr fuel moisture. If the fuel stick moisture value is not present the 10-hr fuel moisture is a calculation.

<u>24-Hour Observations</u>

Field	**Description and Action to be taken**
Min/Max RH Min/Max Temp Precip Duration	Maximum and minimum temperature, maximum and minimum relative humidity, and precipitation duration are used in calculating fuel moisture contents for larger fuels and live fuels. The temperature and relative humidity extremes establish the maximum and minimum EMC (Equilibrium Moisture Content) values the fuels experience each day. Day length is used to weight the values toward dry or moist conditions depending on the time of year. Because large fuels gain more moisture during prolonged light rain than sudden thunderstorm downbursts, precipitation duration is used rather than amount in calculating large fuel moisture content.
Precipitation Amount	The 24 hour precipitation amount is a direct input into KBDI.

<u>Carryover Fuel Moistures</u>

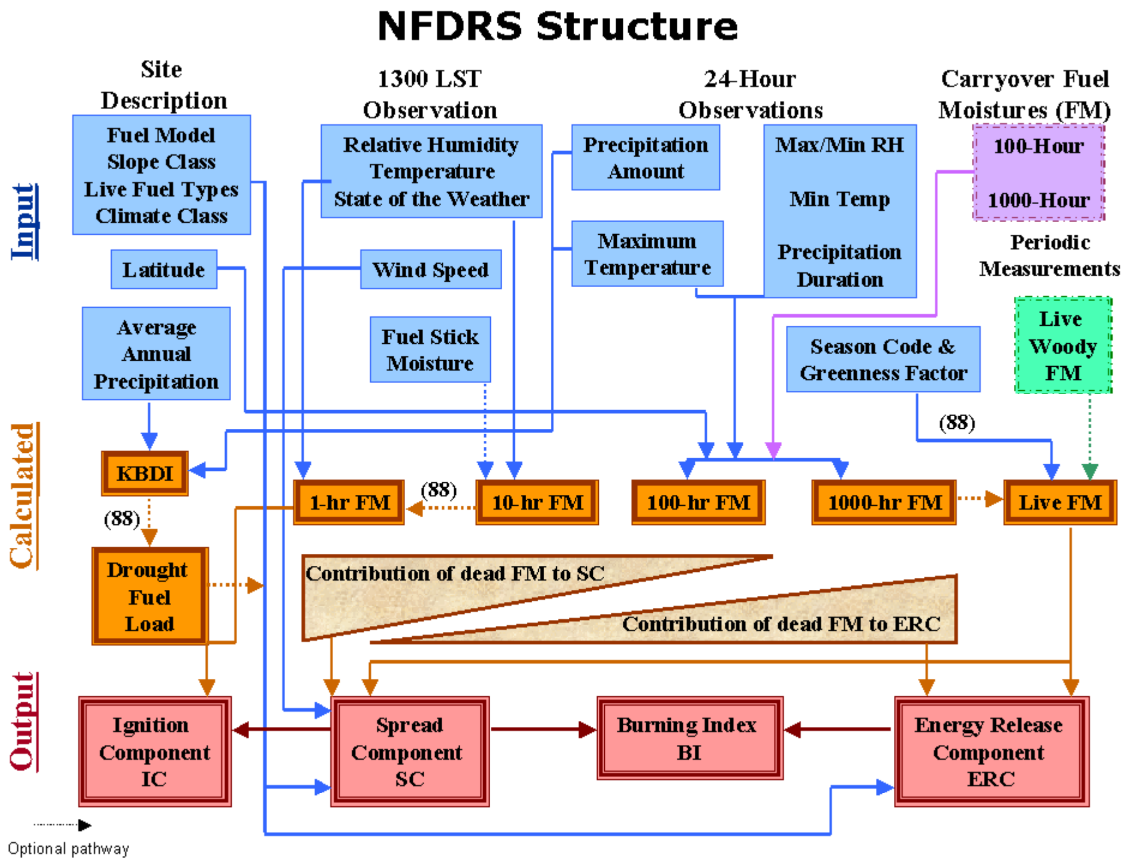
Field	
100 HR 1000 HR	Carryover fuel moisture values or periodic live woody fuel moisture (FM) – provided information to calculate current large fuel moisture values and to assess live fuel moisture content, either directly or through calculation.



<u>Calculated Values</u>

The calculated portion of the NFDRS Structure chart contains the intermediate calculated fuel moisture values. There are three parts: Dead Fuel Moisture, Live Fuel Moisture and KBDI.

1. Dead Fuel Moisture or the 1-hr, 10-hr, 100-hr and 1000-hr fuel moistures. These values are expressed as percent moisture content based on the dry weight of the fuel. Notice that the 1300 LST observation and the 24-hour observation feed into each of the dead fuel moisture calculations.
2. Live Fuel Moisture – calculated specifically to represent annual, perennial, or woody vegetation as noted, either through the selection of the fuel model or the selection of switches within the station catalog (i.e. Season Code and Greenness Factor for the 1988 NDRS.)
3. KBDI is a stand-along index that is used to adjust 1988 drought fuel load. KBDI uses Average Annual Precipitation, Maximum Temperature and Precipitation Amount for the calculation. Even though the KBDI adjusts the 1988 NFDRS drought fuel load, it is calculated on the 1978 NFDRS as well.



Outputs

The Output section of the NFDRS Structure chart is the components or simply the outputs that are based in fire behavior description, but expressed in the broader context of fire danger rating.

1. Spread Component (SC) – Displays a value numerically equivalent to the predicted forward rate of spread of a head fire in feet per minute. The SC is a function of fuel model characteristics, live fuel moistures, the 0 to 3 inch dead fuel moisture (heavily weighted to the 1-hour timelag fuels), wind speed and slope class.
   a. A SC of 31 indicates 31 feet per minute, which is almost equivalent to 31 chains per hour.
   b. The SC is very sensitive to fuel model characteristics – loading, compaction, particle size (fineness), heat of combustion and mineral content.
   c. The SC is highly variable due to the effects of relative humidity, wind and live fuel moisture.

2. Ignition Component (IC) – Displays the probability of a firebrand causing an ignition requiring a suppression action. The IC consists of two parts: (1) the probability that a firebrand will produce a successful start in dead fine fuels, and (2) the probability that a reportable fire will occur, give an ignition. It is calculated from the probability of ignition, which is a function of the fire fuel moisture and fuel temperature; the SC which is a function of fuel model, fuel moistures, slope class and wind speed, the fuel model dependent maximum probable spread which is a fuel model dependent variable.
    a. The probability of ignition can range from 0 in cool damp conditions, to 100 in dry windy conditions with abundant fine dead fuels.
    b. The ignition component will default to "0" when state of the weather codes "5", "6", or "7" are entered in the observation.
    c. The ignition component in danger-rating is <u>different</u> than the one used in fire behavior.
3. Burning Index (BI) – Displays a number related to the contribution of fire behavior to the effort of containing a fire. The value is a function of the SC and the Energy Release Component.
    a. The burning index has been scaled such that a BI value of 55 would indicate a predicted flame length of 5.5 feet.
    b. If the fuels are wet or covered by snow or ice at observation time, the BI is set to zero.
4. Energy Release Component (EC) – Displays a number related to the available energy (Btu) per unit area (square foot) within the flaming front at the head rate of a fire. The EC is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of the flaming which are a function of the fuel model, the live fuel moistures and the 1000-hour timelag fuel moisture.
    a. One unit value of energy release is equivalent to 25 BTU of available energy per square foot.
    b. The EC is very sensitive to the fuel model characteristics – loading, compaction, particle size, heat of combustion and mineral content.
    c. Day to day variability is good as the value is not affected by wind speed.
    d. The condition of the larger fuels has a greater influence on the component than the finer fuels.

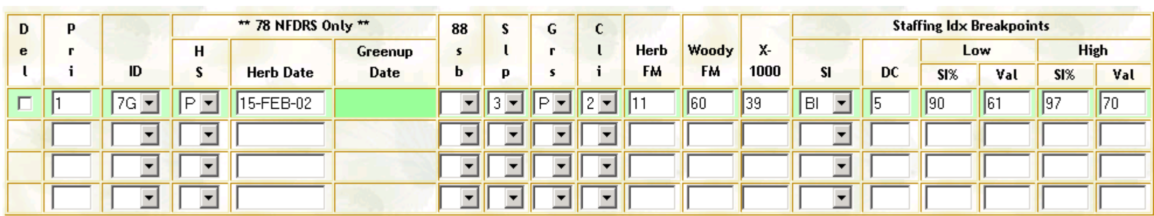
Managing the NFDRS Model – 1978 Version

After the station has been established in WIMS, the user must supply daily weather observations to use NFDRS. In order to have meaningful outputs the user must manage the model. In other words, the user must enter NFDR parameters into WIMS to produce meaningful outputs.

1978 models Greenup Process

30-45 days prior to greenup enter a "P" for pregreen into the Herbaceous State (HS). Enter observations everyday for 30 to 45 days to establish the carryover values (100-hr and 1000-hr fuel moistures).

To set the station to Pregreen select FastPath ENFDR. Enter the desired Station ID and the desired date. In the HS (Herbaceous State) box select the "P" for pregreen. Enter the desired date (the current date) and click Save.



When a station is set to Pregreen, the default values for the herbaceous, woody, 100-hr and 1000-hr are automatically established. The default values are determined by the climate class.

Cli	Herb FM	Woody FM	100-hr	1000-hr
1	30	50	10	15
2	30	60	15	20
3	30	60	20	25
4	30	80	25	30

The 1-hr and 10-hr should be equal in the Pregreen stage.

To verify a station is in Pregreen, view the DIDM or the DIDX. Notice in this view of the DIDM that the HRB FM, 1H fm, and 10 FM are the same. The Wdy FM remains at 60. The HU FM and TH FM are fluctuating depending on any precipitation amounts. The WF (Wet Flag) shows any precipitation (Y=Yes, N=No).

Station ID	Obs Date	O T	MSGC	WDY FM	Meas W FM	HRB FM	1H FM	10 FM	HU FM	TH FM	XT FM	SN CD	Grn GR	Grn SH	KBDI	W F
40218	030702	O	7G3P2	60		13	13	35	23	36	36		0	0	38	Y
40218	030602	O	7G3P2	60		16	16	35	23	35	35		0	0	39	Y
40218	030502	O	7G3P2	60		10	10	12	19	34	34		0	0	38	N
40218	030402	O	7G3P2	60		5	5	7	22	35	35		0	0	35	N
40218	030202	O	7G3P2	60		9	9	35	26	35	35		0	0	33	Y
40218	030102	O	7G3P2	60		9	9	35	22	35	35		0	0	32	Y
40218	022802	O	7G3P2	60		2	2	5	17	34	34		0	0	31	N
40218	022702	O	7G3P2	60		3	3	6	19	35	35		0	0	27	N
40218	022602	O	7G3P2	60		6	6	8	21	36	36		0	0	24	N
40218	022502	O	7G3P2	60		5	5	8	23	37	37		0	0	22	N
40218	022402	O	7G3P2	60		7	7	11	26	37	37		0	0	20	N
40218	022202	O	7G3P2	60		16	16	35	30	38	38		0	0	19	Y
40218	022102	O	7G3P2	60		16	16	35	28	37	37		0	0	17	Y
40218	022002	O	7G3P2	60		18	18	35	25	36	36		0	0	16	Y
40218	021902	O	7G3P2	60		26	26	35	21	35	35		0	0	82	Y
40218	021802	O	7G3P2	60		8	8	10	17	34	34		0	0	86	N
40218	021702	O	7G3P2	60		10	10	12	17	34	34		0	0	85	N
40218	021602	O	7G3P2	60		7	7	9	18	36	36		0	0	84	N
40218	021502	O	7G3P2	60		5	5	7	21	37	37		0	0	82	N

To set the station to Greenup, use the FastPath ENFDR.
Set the HS (Herbaceous State) to "G" and change the Herb Date to the current date. Click Save to retain the changes. The Greenup Date will display after the changes are Saved.

Del	Pri	ID	** 78 NFDRS Only **			88 sb	Slp	Grs	Cli	Herb FM	Woody FM	X-1000	Staffing Idx Breakpoints					
			HS	Herb Date	Greenup Date								SI	DC	Low		High	
															SI%	Val	SI%	Val
☐	1	7G	G	01-MAY-02	01-MAY-02		3	P	2	19	60	22	BI	5	90	61	97	70

To verify a station is in Greenup, view the DIDM or the DIDX. Notice in this view of the DIDM that the 1H fm and 10 FM are starting to differ. The WDY FM and HRB FM are starting to raise. The HU FM and TH FM are fluctuating depending on any precipitation amounts. The WF (Wet Flag) shows any precipitation (Y=Yes, N=No). The HRB FM can rise to 250% if the conditions warrant. Remember the length of greenup depends on the climate class.

Station ID	Obs Date	O T	MSGC	WDY FM	Meas W FM	HRB FM	1H FM	10 FM	HU FM	TH FM	XT FM	SN CD	Grn GR	Grn SH	KBDI	W F
40218	052602	O	7G3P2	142		153	4	4	8	18	18		0	0	89	N
40218	052502	O	7G3P2	145		157	3	4	9	18	18		0	0	82	N
40218	052402	O	7G3P2	147		162	3	4	11	19	19		0	0	74	N
40218	052302	O	7G3P2	150		166	3	4	13	19	19		0	0	67	N
40218	052202	O	7G3P2	152		170	4	6	14	19	19		0	0	63	N
40218	052102	O	7G3P2	157		175	8	9	15	20	20		0	0	61	N
40218	052002	O	7G3P2	161		179	13	35	15	20	20		0	0	60	Y
40218	051402	O	7G3P2	138		144	4	4	7	18	18		0	0	58	N
40218	051302	O	7G3P2	135		138	4	4	7	19	19		0	0	54	N
40218	051202	O	7G3P2	132		133	3	4	8	19	19		0	0	46	N
40218	051102	O	7G3P2	128		126	3	4	9	20	20		0	0	40	N
40218	051002	O	7G3P2	124		117	4	5	8	20	20		0	0	36	N
40218	050902	O	7G3P2	122		114	3	4	9	21	21		0	0	33	N
40218	050802	O	7G3P2	119		107	1	3	10	22	22		0	0	29	N
40218	050702	O	7G3P2	111		94	3	5	12	23	23		0	0	26	N
40218	050602	O	7G3P2	104		82	4	6	15	23	23		0	0	22	N
40218	050502	O	7G3P2	96		68	4	6	17	24	24		0	0	18	N
40218	050202	O	7G3P2	69		21	5	7	20	24	24		0	0	12	N
40218	050102	O	7G3P2	60		13	13	35	23	25	25		0	0	8	Y

<u>Transition</u>

Transition occurs when the HRB FM falls below 120%. The system automatically changes the HS (Herbaceous State) in the ENFDR screen and records the date when the station went into transition. The station will remain in Transition until the HRB FM reaches 30%. At this time the station changes to Cured.

Del	Pri	ID	** 78 NFDRS Only ** HS	Herb Date	Greenup Date	88sb	Slp	Grs	Cli	Herb FM	Woody FM	X-1000	Staffing Idx Breakpoints SI	DC	Low SI%	Low Val	High SI%	High Val
☐	1	7G	T	07-Jun-02	01-May-02		3	P	2	30	60	9	BI	5	90	61	97	70

Station ID	Obs Date	O T	MSGC	WDY FM	Meas W FM	HRB FM	1H FM	10 FM	HU FM	TH FM	XT FM	SN CD	Grn GR	Grn SH	KBDI	W F
40218	061002	O	7G3P2	115		111	4	4	8	15	15		0	0	139	N
40218	060902	O	7G3P2	118		115	4	5	8	15	15		0	0	135	N
40218	060802	O	7G3P2	120		117	4	4	7	15	15		0	0	133	N
40218	060702	O	7G3P2	122		119	4	4	7	16	16		0	0	129	N
40218	060502	O	7G3P2	124		122	4	4	7	16	16		0	0	124	N

Cured

Cured occurs when the HRB FM falls below 30%. The system automatically changes the HS (Herbaceous State) in the ENFDR screen and records the date when the station went into Cured. The station will remain in Cured until the station is manually set into Frozen or Pregreen. It is not recommended to go from Cured to Greenup without first setting the station into Frozen or Pregreen.

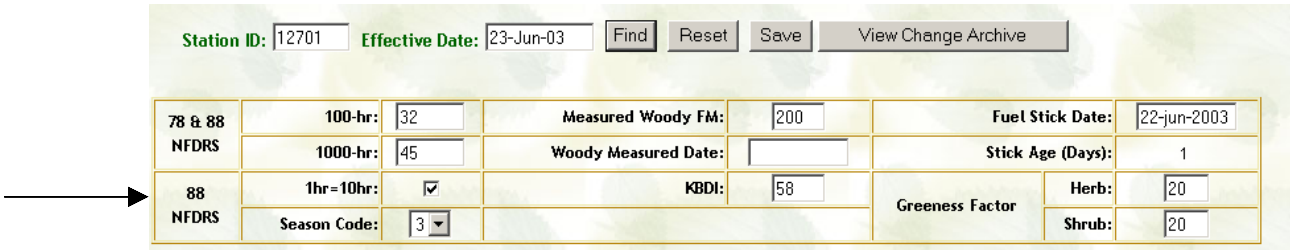
			** 78 NFDRS Only **										Staffing Idx Breakpoints					
															Low		High	
Del	Pri	ID	HS	Herb Date	Greenup Date	88 sb	Slp	Grs	Cli	Herb FM	Woody FM	X-1000	SI	DC	SI%	Val	SI%	Val
☐	1	7G	C	05-Aug-02	01-May-02		3	P	2	30	60	9	BI	5	90	61	97	70

Station ID	Obs Date	O T	MSGC	WDY FM	MEAS W FM	HRB FM	IHR FM	10H FM	100 FM	1000 FM	x1000 FM	SN CD	Grn GR	Grn SH	KBDI	W F
<?> 101708	080802	O	7G3P3	50		30	4	4	5	7	8		0	0	537	N
<?> 101708	080702	O	7G3P3	50		30	4	4	5	7	7		0	0	535	N
<?> 101708	080602	O	7G3P3	50		30	4	4	5	7	7		0	0	533	N
<?> 101708	080502	O	7G3P3	50		30	4	4	5	7	8		0	0	531	N
<?> 101708	080402	O	7G3P3	50		31	4	4	4	7	8		0	0	528	N
<?> 101708	080302	O	7G3P3	50		32	3	3	4	7	8		0	0	524	N
<?> 101708	080202	O	7G3P3	50		33	2	2	4	7	8		0	0	521	N
<?> 101708	080102	O	7G3P3	50		34	2	2	4	8	8		0	0	517	N

Managing the NFDRS Model – 1988 Version

The 1978 Version of NDRS tends to over estimate fire danger in the fall and after rainfall, causing problems for humid regions and areas with split fire seasons in the United States. The 1988 Version of NFDRS was developed to accommodate those areas with the following key points in mind.

- Improve the ability of NFDRS to respond to drought in humid environments.
- Improve system flexibility to reflect greening and curing of live fuels.
- Correct the problem of overrating fire danger in the fall.
- Correct the problem of overrating fire danger after rainfall.
- Adjust fuel models to better predict fire danger in humid environments.



The 88 NFDRS needed items are located in the 88 NFDRS area.

<u>KBDI</u>

- KBDI is used as an independent output to register the deep drying in duff and litter on a scale of 0 (totally saturated soil) to 800 (as dry as possible).
- KBDI is used to modify the available dead fuel load, thus increasing ERC and BI NFDRS output values as KBDI increased, simulating the addition fuel load that burns in the flaming front as deep dryings occurs through a dry season.

Daily weather inputs required for KBDI to function correctly are Maximum dry bulb temperature and the last 24 hours of rainfall. Average Annual Rainfall is also a required input. Average Annual Rainfall is entered in the station catalog.

For more information see <u>A Drought Index for Fore Fire Control</u>. Southeastern Forest Exp. Sta., USDA Forest Service, Research Paper SE-38.

<u>Season Codes</u>

- 1 – Winter – use when herbaceous fuels are cured and shrubs are dormant. Greenness factors should be set to 0.
- 2 – Spring – use when herbaceous plants and/or shrubs begin a season's growth. Continue to use Spring until the herbaceous plants complete the spring growth flush. Greenness factors should be raised gradually from 0 to a maximum of 20.
- 3 – Summer – use when growth flush is complete until shrubs begin to show signs of fall curing. Greenness factors should fluctuate gradually, dependant on the relative greenness of the vegetation.
- 4 – Fall – use when deciduous shrubs being to lose their leaves or evergreens enter dormancy. As fall progresses, greenness factors should gradually be reduced.

<u>Greenness Factors</u>

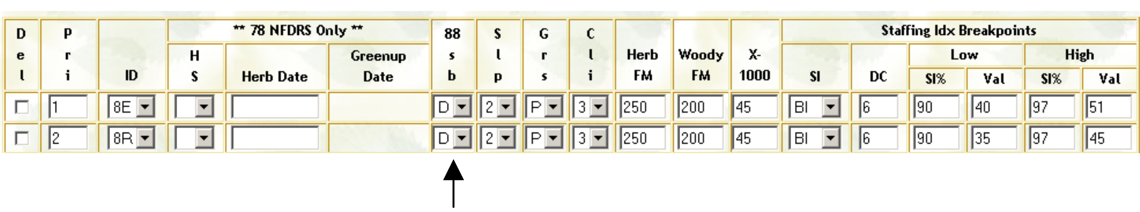
- Greenness factors are set dependant on the relative greenness of herbaceous and wood vegetation.
  - Greenness factors range from 0 – dormant to 20 – maximum greenness.
  - Avoid large changes

- Increase/decrease gradually.
- Greenness Factors may remain constant for several days.
- Generally increase in Spring.
- Fluctuate in Summer.
- Decrease in Fall.

- Spring Greenness Factors
  - Herb and shrub greenness factors do not have to be equal.
  - Increase greenness factors according to the rate of green up for critical species.
- Summer Greenness Factors
  - Fluctuate greenness factors according to the plants response to the environment.
    - Annuals vs. perennials
  - Avoid large changes
- Fall Greenness Factors
  - Greenness factors should slowly decrease to follow curing.
- Winter Greenness Factors
  - Use when the herbaceous plants or shrubs are dormant.

<u>1hr = 10hr Fuel Moistures</u>

- 1hr = 10hr
  - This can be set on te ENFDR screen
  - If selected, 1hr will always equal 10hr
    - Use if conifer needles/hardwood leaves are present
    - Do not select this option if modeling grasses.
  - If not selected, 1hr will equal 10hr the day of, and day after a precipitation event.
- Consider using if the 1978 system has overrated fire danger in the past.



Del	Pri	ID	** 78 NFDRS Only ** HS	Herb Date	Greenup Date	88 sb	Slp	Grs	Cli	Herb FM	Woody FM	X-1000	Staffing Idx Breakpoints SI	DC	Low SI%	Low Val	High SI%	High Val
☐	1	8E				D	2	P	3	250	200	45	BI	6	90	40	97	51
☐	2	8R				D	2	P	3	250	200	45	BI	6	90	35	97	45

<u>Selecting Deciduous or Evergreen Shrubs</u> – select an "E" for evergreen or "D" for deciduous.

- Deciduous shrubs will increase the fuel loading in an E Fuel Model during the Fall season code.
- This will also effect the wind reduction factor.

Year round Maintenance of Date

- Remember to "freeze" the station once during the year. Set the Season Code to 1 - Winter for 1 day.
- Change the Season Codes with the vegetation. Do not tie to calendar dates.
- Monitor vegetation and slowly change the greenness factors accordingly.
- Monitor and validate the NFDRS outputs.