WILDLAND FIRE DECISION SUPPORT SYSTEM (WFDSS)
FIRE SPREAD PROBABILITY (FSPRO) ANALYSIS
FOR
THE ALASKA FIRE SERVICE TANANA ZONE WFDSS PROTOTYPE EFFORT

Billy Creek Fire, June 21, 2004

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LANDSCAPE CONSIDERATIONS

Major Types in Tanana Zone Prototype Project Area

Because LANDFIRE landscape classification is not available at this time, the land cover was obtained from a coarse land cover classification, with best fit fuels derived using the "Fuel Model Guide to Alaska Vegetation."

- ***Coniferous Forest*** (27%): Assumed to be primarily black spruce, fuel was classified as (6) Open Black Spruce Forest with surface fuel model TU4-Dwarf Conifer With Understory, Canopy Cover of 45%, Canopy Base Height of 0.3m, Canopy Height of 8m, and Canopy Bulk Density of 0.2 $kg.m^3$.

  This category probably also includes areas of White Spruce in riparian and upland areas that probably have higher canopy cover, canopy base height, stand height and canopy bulk density.

- ***Mixed Forest*** (6%): Assumed to be mixtures of aspen, birch, and spruce, fuel was classified as (19) Spruce-Paper Birch-Aspen with surface fuel model TL6-Moderate Load Broad Leaf Litter, Canopy Cover of 75%, Canopy Base Height of 1.5m, Canopy Height of 8m, and Canopy Bulk Density of 0.15 $kg.m^3$.

- ***Deciduous Forest*** (6%): Assumed to be primarily Aspen, Paper Birch and Balsam Poplar, these forests were classified as (14) Closed Paper Birch-Quaking Aspen Forest with surface fuel model of TU1-Light Load Dry Climate Timber-Grass-Shrub, Canopy Cover of 75%, Canopy Base Height of 3.5m, Canopy Height of 8m, and Canopy Bulk Density of 0.05 $kg.m^3$.

Though the following three classifications include no canopy in their descriptions, they probably include significant areas with at least scattered black spruce and/or tamarack that could contribute to spread through torching and spotting. Many of them may be recent burns that will support significant fire behavior only under extreme conditions.

- ***Shrub/Scrub*** (30%): Classified as (28) Closed Low Birch/Birch-Willow/Ericaceous Shrub with surface fuel model of SH2-Moderate Load Dry Climate Shrub and no canopy.

- ***Dwarf Shrub*** (13%): Classified as (37) Dwarf Shrub Tundra with surface fuel model of GR1-Short, Sparse Dry Climate Grass and no canopy.

- ***Woody Wetlands*** (6%): Classified as (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog with surface fuel model of GR2-Low Load Dry Climate Grass and no canopy.

- ***Non-burnable*** (11%): Generally barren, agricultural, and developed lands.

Fire Behavior Modeling Using Canadian Fire Behavior Prediction System Fuel Types

With the landscape assuming that all ***Conifer Forests*** are Black Spruce, the typical CFFBP fuel type would be C2. Crown fire (passive or active) is modeled when flame lengths are at least 6.4 ft. ***Mixed Forests*** are modeled by M2 in the summer, with 25% conifer in this case. Crown fire (passive or active) is expected with flame length of at least 10.3 ft.

Conifer Forest: Rate of Spread for C2 (ch/hr)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	8.6	10.5	12.9	15.7	19.2	23.4	28.5	34.4	41.4	49.5
10	15.4	18.6	22.7	27.5	33.4	40.3	48.5	58	68.9	81.4
15	26.9	32.4	39.1	47	56.4	67.3	79.8	94	109.8	127.2
20	45.9	54.8	65.3	77.5	91.6	107.4	125	144.1	164.5	185.7
25	75.9	89.2	104.5	121.8	140.9	161.4	183	205.2	227.3	248.6

Conifer Forest: Flame Length for C2 (ft)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	9.8	10.9	12.1	13.4	14.8	16.4	18	19.8	21.6	23.5
10	13.2	14.6	16.1	17.7	19.5	21.4	23.3	25.3	27.5	29.7
15	17.5	19.2	21	23	25	27.2	29.4	31.7	34	36.4
20	22.7	24.7	26.8	29	31.3	33.7	36.1	38.6	41	43.4
25	28.7	30.9	33.3	35.7	38.2	40.6	43.1	45.4	47.6	49.6

* Crown fire expected at flame length of 6.4 ft.

Mixed Forest: Rate of Spread for M2 – 25% Conifer (ch/hr)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	2.4	3	3.6	4.5	5.4	6.6	8.1	9.8	11.8	14.1
10	4.3	5.3	6.4	7.8	9.5	11.5	13.8	16.6	19.7	23.3
15	7.6	9.2	11.1	13.4	16.1	19.3	22.9	27	31.6	36.7
20	13.1	15.7	18.7	22.2	26.3	30.9	36.1	41.7	47.7	54
25	21.7	25.6	30.1	35.1	40.7	46.8	53.2	59.8	66.4	72.8

Mixed Forest: Flame Length for M2 – 25% Conifer (ft)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	4	4.4	4.8	5.3	5.8	6.3	6.9	7.5	8.2	8.9
10	5.2	5.7	6.2	6.8	7.4	8.1	8.9	9.6	10.4	11.4
15	6.7	7.3	8	8.7	9.5	10.3	11.3	12.3	13.4	14.4
20	8.6	9.4	10.2	11.1	12.2	13.2	14.3	15.4	16.4	17.4
25	11	12	13.1	14.1	15.2	16.3	17.3	18.3	19.2	20

* Crown fire expected at flame length of 10.3 ft.

In the summer, ***Deciduous Forests*** are modeled by M2 as well, though with 0% conifer. With that designation, no crown fire is expected. However, there may be small admixtures of Spruce in the canopy or significant spruce in the understory which could lead to higher spread and flames. The variety of ***Openlands*** (Dwarf Shrub, Shrub/Scrub, and Woody Wetlands) can be represented by O1a, though in summer conditions, the curing % should be kept fairly low.

Deciduous Forest: Rate of Spread for M2 – 0% Conifer (ch/hr)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	0.3	0.3	0.4	0.5	0.7	0.8	1	1.3	1.5	1.9
10	0.5	0.6	0.8	1	1.2	1.5	1.8	2.2	2.7	3.2
15	1	1.2	1.4	1.8	2.1	2.6	3.2	3.8	4.5	5.3
20	1.7	2.1	2.5	3.1	3.7	4.4	5.2	6.2	7.2	8.3
25	3	3.6	4.3	5.1	6	7	8.2	9.4	10.6	11.9

Deciduous Forest: Flame Length for M2 – 0% Conifer (ft)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	1.3	1.4	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3
10	1.7	1.8	2	2.2	2.5	2.7	3	3.3	3.6	3.9
15	2.2	2.4	2.7	2.9	3.2	3.5	3.8	4.2	4.5	4.9
20	2.9	3.2	3.5	3.8	4.1	4.5	4.9	5.2	5.6	6
25	3.7	4.1	4.4	4.8	5.2	5.6	5.9	6.3	6.7	7.1

* Crown fire

Openlands : Rate of Spread for O1a– 2 t/ac, 60% Cured (ch/hr)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	4	4.8	5.8	7	8.5	10.2	12.2	14.5	17.2	20.4
10	6.9	8.2	9.8	11.8	14.1	16.8	20	23.5	27.6	32.1
15	11.5	13.7	16.3	19.4	22.9	27	31.6	36.7	42.3	48.3
20	19	22.3	26.3	30.8	35.8	41.4	47.5	54	60.8	67.7
25	30.1	35	40.4	46.4	52.9	59.8	66.8	73.9	80.8	87.2

Openlands: Flame Length for O1a – 2 t/ac, 60% Cured (ft)

10m Windspeed (mph)	FFMC (BUI = 80)									
	85	86	87	88	89	90	91	92	93	94
5	2.8	3	3.3	3.6	3.9	4.3	4.6	5	5.4	5.9
10	3.6	3.9	4.2	4.6	5	5.4	5.8	6.3	6.7	7.2
15	4.5	4.9	5.3	5.7	6.2	6.7	7.2	7.7	8.2	8.7
20	5.7	6.1	6.6	7.1	7.6	8.1	8.7	9.2	9.7	10.2
25	7	7.5	8	8.6	9.1	9.6	10.1	10.6	11.1	11.5

* Crown fire

These can be related to the CFFDRS-Fire Weather Index System's Initial Spread Index shown in the following table, an output produced daily for each of the RAWS stations.

Initial Spread Index (ISI)

10m Windspeed (mph)	FFMC 85	86	87	88	89	90	91	92	93	94
5	3.2	3.6	4.2	4.8	5.6	6.4	7.4	8.6	9.8	11.3
10	4.7	5.4	6.3	7.2	8.4	9.6	11.1	12.8	14.8	17
15	7.1	8.2	9.4	10.9	12.5	14.5	16.7	19.2	22.1	25.5
20	10.7	12.3	14.1	16.3	18.8	21.7	25	28.9	33.2	38.2
25	16	18.4	21.2	24.4	28.2	32.5	37.5	43.3	49.8	57.2

Fire Behavior Modeling Using US Fire Behavior Prediction System Fuel Models

The landscape developed for the project uses TU4 for the ***Conifer Forest***, with canopy characteristics designed to produce crown fire spread above threshold flames of 1.2 ft and Crown Spread Rates above 44.7 ch/hr.

Conifer Forest : Rate of Spread for TU4 (ch/hr)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%) 12	11	10	9	8	7	6	5	4	3
5	0	0.4	0.8	1.2	1.3	1.4	1.5	1.5	1.6	1.7
10	0	0.5	1.2	1.8	2	2.2	2.3	2.4	2.5	2.7
15	0	0.8	1.8	2.8	3.1	3.3	3.4	3.6	3.7	4
20	0	1.2	2.5	3.9	4.3	4.6	4.8	5	5.3	5.7
25	0	1.5	3.3	5.2	5.8	6.1	6.4	6.7	7.1	7.6

Conifer Forest : Flame Length for TU4 (ft)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%) 12	11	10	9	8	7	6	5	4	3
5	0	0.6	1.2	1.8	1.9	2	2.1	2.2	2.3	2.4
10	0	0.7	1.5	2.2	2.4	2.5	2.6	2.7	2.8	3
15	0	0.9	1.8	2.6	2.9	3	3.1	3.2	3.4	3.6
20	0	1	2.1	3.1	3.3	3.5	3.7	3.8	3.9	4.2
25	0	1.2	2.3	3.5	3.8	4	4.2	4.3	4.5	4.8

Crown Fire: Rate of Spread (ch/hr), Rothermel Crown Fire Model

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%) 12	11	10	9	8	7	6	5	4	3
5	8	8.2	8.4	8.6	8.9	9.2	9.6	10.1	10.6	11.2
10	17.9	18.3	18.7	19.2	19.8	20.5	21.4	22.4	23.6	25
15	30.2	30.9	31.6	32.5	33.5	34.7	36.1	37.8	39.9	42.3
20	44.4	45.4	46.6	47.8	49.3	51.1	53.2	55.7	58.7	62.2
25	60.3	61.7	63.2	64.9	67	69.3	72.2	75.6	79.7	84.5

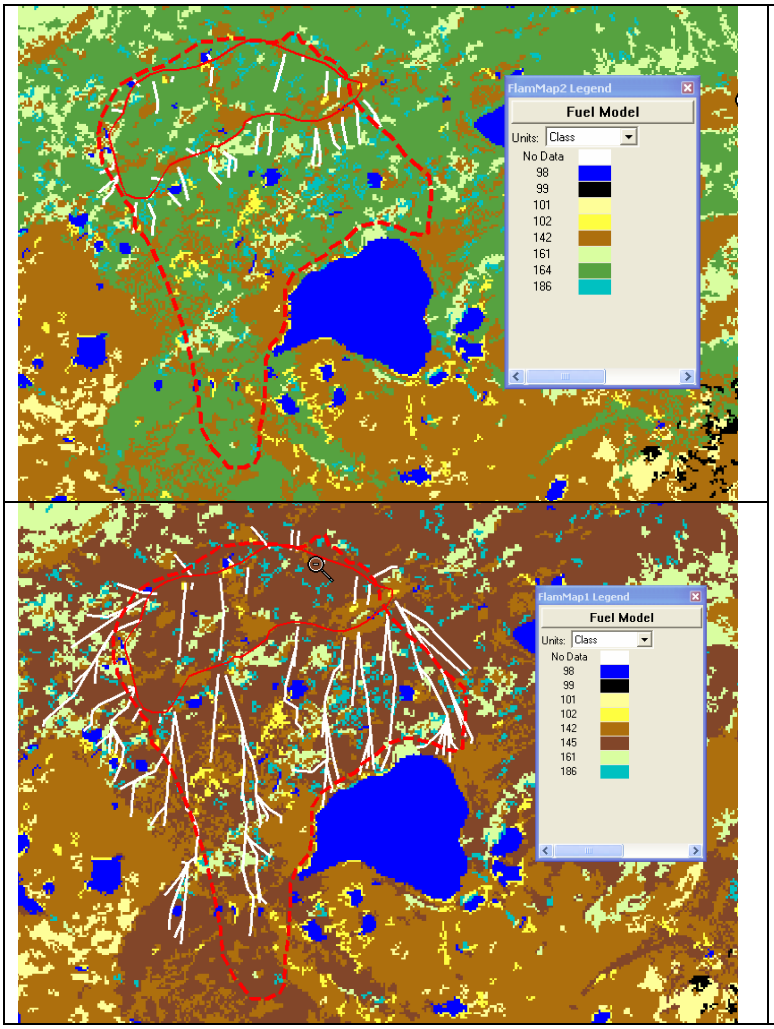
* Continuous Crown fire expected above 44.7 ch/hr

Calibration of Tanana Zone Prototype Project Area Landscape

Initial effort to calibrate the landscape was based on the Mooseheart fire, discovered on May 23, 2007. It spread actively through May 26th, with one additional significant spread event on June 6th. Two consecutive perimeters were utilized to simulate ignition and resulting observed growth on May 24th.

FARSITE was used initially with weather and wind streams from the Wein Lake RAWS. Despite reports of strong winds on the radio logs, the Wein Lake record showed only light winds. Wind streams from the Tanana ASOS station were considered as well, though few of the reported winds there were over 10 mph. With that, winds were assumed to be 15 mph for 8 hours using a FLAMMAP simulation.

Because TU4 produced generally slow spread and benign fire behavior, canopy characteristics were modified, reducing CBH to o.1m and increasing CBD to 0.4 kg/m^3. Fire behavior did not increase significantly. Use of another Fuel Model was considered, and SH5 was selected because it had similar fine fuel load, woody load, moisture of extinction and a higher fuelbed depth. Results are shown below.



In both images, the solid red line is the ignition source, the first perimeter recorded on May 24th. The dashed red line is the second perimeter recorded on May 24th. It is used as the actual growth observed during that period.

The upper image shows the spread through TU4, with the white lines indicating major flow paths. Even with modified canopy characteristics, spread was much too slow.

The lower image is includes SH5 as the fuel model for the conifer forest. The white flow paths appear to be a good fit.

Both runs used 90m distance resolution to allow it to skip over the deciduous forest and open fuels. Both also used the Finney transition model, though with the Scott Model, TU4 and SH5 produced similar flow paths.

Additional US Fire Behavior Prediction System Outputs

Conifer Forest : Rate of Spread for SH5 (ch/hr)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%)									
	12	11	10	9	8	7	6	5	4	3
5	3.7	5.5	6	6.3	6.4	6.5	6.6	6.8	7.1	7.5
10	7	10.3	11.4	11.9	12.1	12.3	12.6	12.9	13.4	14.2
15	10.7	15.7	17.4	18	18.4	18.8	19.1	19.7	20.4	21.5
20	14.5	21.5	23.7	24.6	25.2	25.6	26.1	26.9	27.9	29.4
25	18.6	27.5	30.3	31.5	32.2	32.8	33.5	34.4	35.7	37.6

Conifer Forest : Flame Length for SH5 (ft)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%)									
	12	11	10	9	8	7	6	5	4	3
5	3	4.2	4.6	4.8	4.9	5	5	5.2	5.3	5.6
10	4	5.7	6.2	6.4	6.6	6.6	6.8	6.9	7.2	7.5
15	4.8	6.9	7.5	7.8	7.9	8.1	8.2	8.4	8.7	9.1
20	5.6	8	8.7	9	9.2	9.3	9.5	9.7	10	10.5
25	6.3	8.9	9.8	10.1	10.3	10.4	10.6	10.9	11.2	11.8

Crown Fire: Rate of Spread (ch/hr), Rothermel Crown Fire Model

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%)									
	12	11	10	9	8	7	6	5	4	3
5	8	8.2	8.4	8.6	8.9	9.2	9.6	10.1	10.6	11.2
10	17.9	18.3	18.7	19.2	19.8	20.5	21.4	22.4	23.6	25
15	30.2	30.9	31.6	32.5	33.5	34.7	36.1	37.8	39.9	42.3
20	44.4	45.4	46.6	47.8	49.3	51.1	53.2	55.7	58.7	62.2
25	60.3	61.7	63.2	64.9	67	69.3	72.2	75.6	79.7	84.5

* Continuous Crown fire expected above 22.4 ch/hr

Mixed Forest : Rate of Spread for TL6 (ch/hr)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%)									
	12	11	10	9	8	7	6	5	4	3
5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	1	1.1
10	0.9	0.9	0.9	1	1	1.1	1.2	1.3	1.4	1.6
15	1.2	1.3	1.3	1.4	1.5	1.5	1.7	1.8	2	2.2
20	1.6	1.7	1.8	1.8	2	2.1	2.2	2.4	2.7	3
25	2.1	2.2	2.3	2.4	2.5	2.7	2.9	3.2	3.5	3.9

Mixed Forest : Flame Length for TL6 (ft)

20 ft Windspeed (mph)	1-h Moisture (WFM = 100%)									
	12	11	10	9	8	7	6	5	4	3
5	0.9	0.9	0.9	0.9	1	1	1.1	1.1	1.2	1.3
10	1	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.6
15	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.6	1.7	1.9
20	1.4	1.4	1.4	1.5	1.5	1.6	1.7	1.8	2	2.1
25	1.6	1.6	1.6	1.7	1.7	1.8	1.9	2	2.2	2.4

Deciduous Forest : Rate of Spread for TU1 (ch/hr)

		1-h Moisture (HFM = 90%, WFM = 100%)									
		12	11	10	9	8	7	6	5	4	3
20 ft Windspeed (mph)	5	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3
	10	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.6
	15	0.3	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.8	0.9
	20	0.4	0.4	0.4	0.5	0.7	0.9	1	1.1	1.2	1.2
	25	0.5	0.5	0.5	0.7	0.9	1.1	1.3	1.4	1.5	1.6

Deciduous Forest : Flame Length for TU1 (ft)

		1-h Moisture (HFM = 90%, WFM = 100%)									
		12	11	10	9	8	7	6	5	4	3
20 ft Windspeed (mph)	5	0.2	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.7
	10	0.3	0.3	0.3	0.4	0.5	0.7	0.6	0.8	0.8	0.9
	15	0.4	0.4	0.4	0.5	0.6	0.8	0.8	1	0.9	1.1
	20	0.4	0.4	0.4	0.6	0.7	1	0.9	1.2	1.1	1.2
	25	0.5	0.5	0.5	0.6	0.8	1.1	1	1.3	1.2	1.4

Shrub/Scrub : Rate of Spread for SH2 (ch/hr)

		1-h Moisture (WFM = 100%)									
		12	11	10	9	8	7	6	5	4	3
20 ft Windspeed (mph)	5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	1.1	1.6	1.9
	10	1	1.2	1.2	1.3	1.3	1.3	1.4	2.4	3.4	4.1
	15	1.7	1.9	2.1	2.1	2.2	2.2	2.3	4	5.7	6.8
	20	2.5	2.8	3	3.1	3.2	3.2	3.3	5.8	8.2	10
	25	3.4	3.8	4	4.2	4.3	4.3	4.4	7.8	11.1	13.4

Shrub/Scrub : Flame Length for SH2 (ft)

		1-h Moisture (WFM = 100%)									
		12	11	10	9	8	7	6	5	4	3
20 ft Windspeed (mph)	5	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.5	2.1	2.4
	10	1	1.1	1.2	1.2	1.2	1.2	1.3	2.1	2.9	3.5
	15	1.3	1.4	1.5	1.5	1.6	1.6	1.6	2.7	3.7	4.4
	20	1.5	1.7	1.8	1.8	1.8	1.9	1.9	3.2	4.4	5.3
	25	1.7	1.9	2	2.1	2.1	2.1	2.2	3.7	5.1	6

WEATHER & CLIMATOLOGY CONSIDERATIONS

Long term fire growth probability analysis cannot be based on weather forecasts alone. Detailed forecasts are generally not available for more than 7 days in the US, usually less than that in Alaska. Most assessments need to look ahead weeks, if not months. In those situations, local climatology or weather observation history provides a basis for bounding the range of possibilities and identifying trends within that range.

The selection of a wind record and its representative wind rose determines the likelihood of each windspeed and direction that will be applied to the fire spread model. It is more important to select the station that represents similar winds instead of automatically choosing the closest station. Experience with these historic records indicates that winds and fuel moistures may not be best represented by a single weather station record. Identify terrain influences in the fire area and look for stations situated similarly. Evaluate any local knowledge and insure that it is represented if appropriate.

To determine fuel moistures, the model utilizes actual weather for the selected RAWS to determine ERC and produce associated fuel moisture inputs for fire spread calculations on those days when ERC values are high enough to support spread. In the case of the Mooseheart analyses, for the period of interest, the resulting ERC climatology assumes that active fire spread occurs on approximately 40% of the days in the long run.

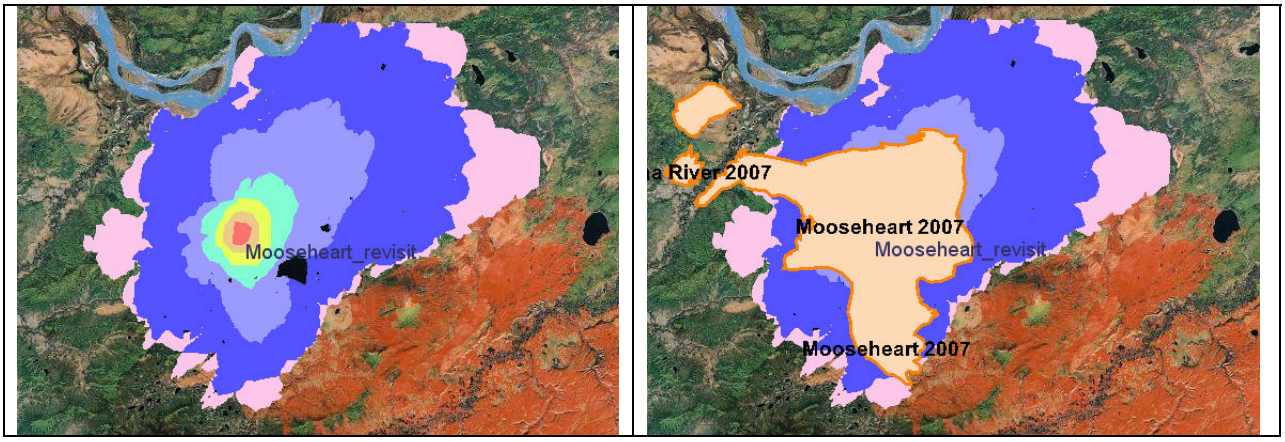
INTERPRETING FIRE SPREAD PROBABILITY (FSPRO) OUTPUTS

FSPro is now beginning its 3rd year, with many users handling outputs on fires in 2007. It is a spatial model that calculates the probability of fire spread from a current fire perimeter or point of ignition over a specified time period in the absence of suppression. The model uses climatology and probability to combine winds and fuel moistures to develop a specified number of alternative weather streams and landscape information to model individual spread sequences using the FLAMMAP Minimum Travel Time tool.

The output combines images of probability contours and histograms of possible fire sizes. Users are reminded that the contours do not represent fire perimeters or progression. Individual fire perimeters will not fit any of these shapes. Instead, these color contours represent bands of equal probability. Each of the acres within a particular color band has a similar likelihood of being burned by the current fire over the duration chosen, 14 days in this case. It does not mean that they will all burn on the same day or even in a particular sequence of days. It does not indicate that they will all burn under a given scenario. The histogram identifies an average and a median fire size, though the actual fire growth will frequently exceed or fall well short of these estimates because actual weather exceeds or falls short of typical sequences.

Nonetheless, these probability maps can be powerful tools. They may be used to identify values at risk and the likelihood they will be reached weeks ahead of a fire's arrival. These values can be combined with the associated probability to aid with the selection of appropriate strategy, tactics and resource allocations.

WFDSS FSPro Calibration Results



This simulation utilized TU4 for the Conifer Forest. Actual fire spread was largely limited to the conifer forest based on the final fire perimeter.

Actual final fire size was 21,508.3 ac with last significant spread event on the 14th day.

Average modeled size was 5,352 ac and the median modeled size was 2,514 ac.

Wildland Fire Decision Support System

FSPro Analysis Information

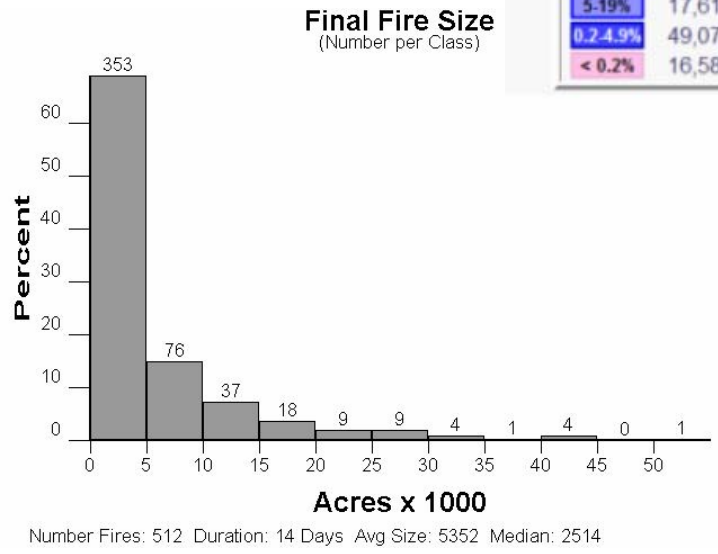
Incident:	Mooseheart_revisit	**Analysis:**	FM TU4 (164)
Author:	Ziel, Robert	**Analyst:**	Ziel, Robert
Requested:	06/12/2008 12:15	**Completed:**	06/12/2008 13:24
Latitude:	64.7833	**Longitude:**	151.2667
Geographic Area:	Alaska		
Burn Start:	5/23/07	**Duration:**	14 days
Resolution:	90 meters	**Simulations:**	512 fires
ERC Station:	500715 - WIEN LAKE	**Wind Station:**	500715 - WIEN LAKE

Probability Detail (acres)

Zone	In Zone	Cumulative
80-100%	330	330
60-79%	817	1,147
40-59%	1,639	2,786
20-39%	3,909	6,695
5-19%	17,616	24,311
0.2-4.9%	49,076	73,387
< 0.2%	16,583	89,970

Fire Size (acres)

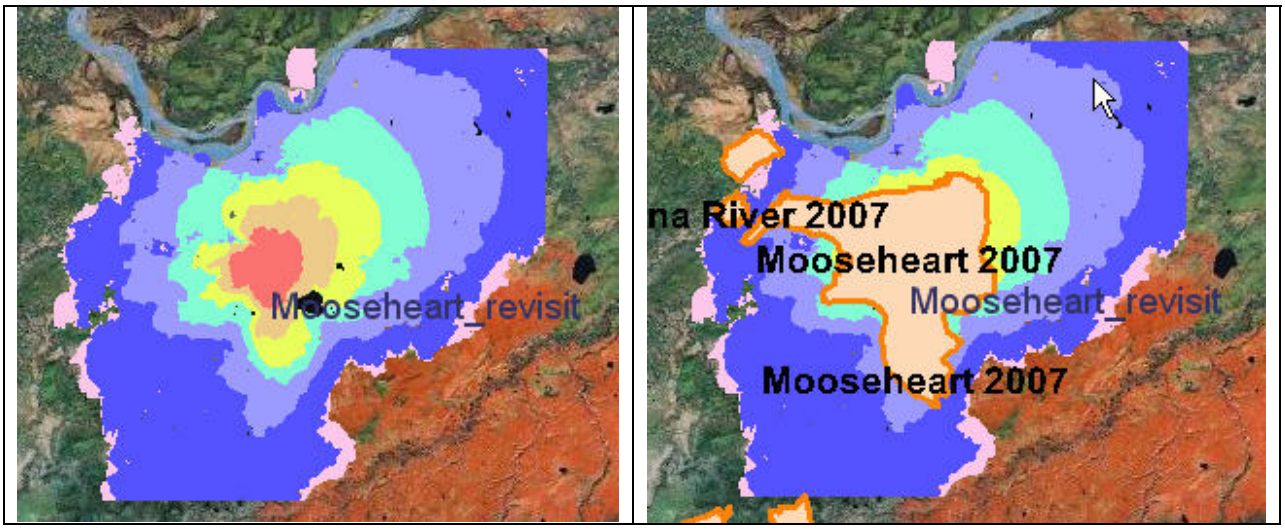
Average Size:	5,352
90th Percentile:	14,536
70th Percentile:	5,133
50th Percentile:	2,521
30th Percentile:	1,024
10th Percentile:	175
Largest Fire:	54,376



The histogram shows the number of fire simulations in each size group, with approximately 2/3 of the fire simulations resulting in less than 5,000 acres.

The actual fire actually exceeded the outer contour when it made its run to the west on June 6th.

These factors indicate that this run may have underestimated probability.



This simulation utilized TU4 for the Conifer Forest. Actual fire spread was largely limited to the conifer forest based on the final fire perimeter.

Actual final fire size was 21,508.3 ac with last significant spread event on the 14th day.

Average modeled size was 28,765 ac and the median modeled size was 21,381 ac.

Wildland Fire Decision Support System

FSPro Analysis Information

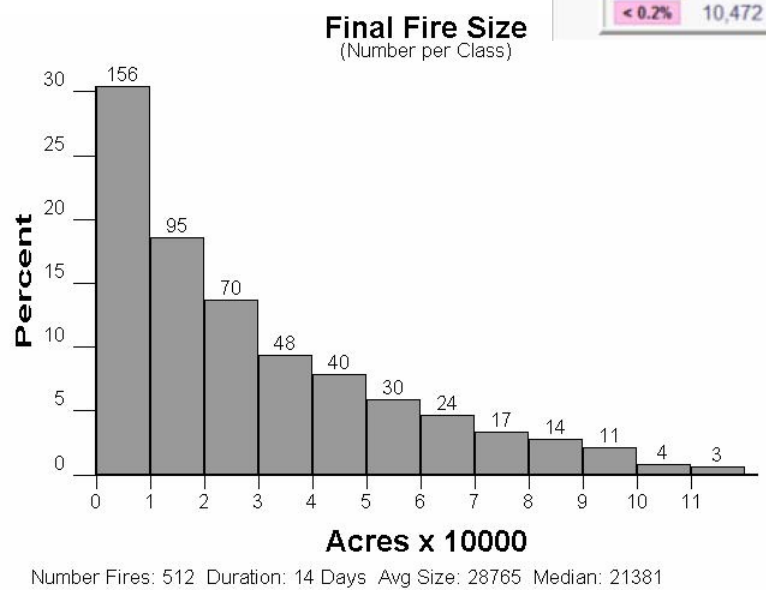
Incident:	Mooseheart_revisit	**Analysis:**	FM SH5 (145)
Author:	Ziel, Robert	**Analyst:**	Ziel, Robert
Requested:	06/12/2008 12:50	**Completed:**	06/12/2008 15:11
Latitude:	64.7833	**Longitude:**	151.2667
Geographic Area:	Alaska		
Burn Start:	5/23/07	**Duration:**	14 days
Resolution:	90 meters	**Simulations:**	512 fires
ERC Station:	500715 - WIEN LAKE	**Wind Station:**	500715 - WIEN LAKE

Probability Detail (acres)

Zone	In Zone	Cumulative
80-100%	4,712	4,712
60-79%	7,628	12,340
40-59%	13,252	25,592
20-39%	23,142	48,734
5-19%	43,790	92,524
0.2-4.9%	68,229	160,753
< 0.2%	10,472	171,225

Fire Size (acres)

Average Size:	28,765
90th Percentile:	68,151
70th Percentile:	37,209
50th Percentile:	21,448
30th Percentile:	9,757
10th Percentile:	2,499
Largest Fire:	119,676



The histogram shows the number of fire simulations in each size group, with a wider distribution of fires and the largest modeled fire approximately twice the size of the analysis above.

The fact that the median modeled size is very close to the actual final fire size may be coincidence. However, the analysis period (14 days) equals the period of active growth and the actual number of days of active spread is similar to the ERC modeled percentage.

RECOMMENDATIONS

This is a very limited evaluation, based specifically on one fire that occurred in 2007. One point on a continuum of drought conditions, insect and disease damage, and normal seasonality should be viewed very skeptically. Additional analyses should be considered with each new ignition in the project area. In the absence of that, other fires that occurred under different circumstances, such as in 2004, should be similarly evaluated. In either case, here are some recommendations to consider.

1. Fire behavior in Alaskan Black Spruce is not particularly difficult or complex to model. It transitions relatively quickly to torching and active crown fire under dry summer conditions. Analysts need only to determine whether the summer drying threshold has been reached and model accordingly. Local expertise recognizes the value of the Duff Moisture Code (DMC), the Drought Code (DC), and the Buildup Index (BUI) from the CFFDRS Fire Weather Index System in evaluations of crown fire potential.

2. Considerable work has been done recently in fuels classification, resulting in the document “Fuel Model Guide to Alaska Vegetation”. This guide identifies a variety of vegetation or cover types and suggests fuel models/types from the CFBPS, the original 13 US Fire Behavior Fuel Models, and the 40 new US Fire Behavior Fuel Models to represent each of them. In many cases, the fire behaviors produced by the three corresponding selections vary widely. It is important to consider this document as a draft, reviewing the selections with each fire analysis done to refine those selections. Typical canopy characteristics should also be considered for inclusion in the classification guide.

3. The landscape used in this project is very coarse, with only 6 significant fuel variations. This may be adequate for long term probability assessments. However, more detailed evaluations may find that it produces both significant over- and underestimates of fire spread over shorter forecast periods.

4. Though suggested by some, analysts should be uncomfortable with the fuel model selections for the other types in the landscape. TL6, TU2, and SH2 all produce very little spread and intensity. Under many circumstances they may serve as barriers. However, it is likely that under dryer scenarios that they will burn more actively. The CFBPS equivalents are included as a frame of reference if other models need to be selected.

5. FSPro will not automatically consider fire spread to the end of the season or attempt to identify when a fire ending event will occur. Work to determine the frequency of significant rain events and the length of periods between them. Evaluation of the distribution of possible season ending dates should continue. That information can meaningfully inform the selection of duration for any FSPro analyses conducted.

ACKNOWLEDGEMENTS

Frank Cole, AICC contributed numerous case studies of fire behavior in Black Spruce. He shared his substantial library and personal knowledge of fires and fire seasons over a number of years.

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Sean Triplett, AICC, for supporting my GIS needs.

REFERENCES

1. Cella, Brad, et.al.; Fuel Model Guide to Alaska Vegetation, March 2008, 62p.

2. Camp, Ann E., et.al.; Refinement and Development of Fire Management Decision Support Models Through Field Assessment of Relationships Among Stand Characteristics, Fire Behavior, and Burn Severity; Aug 2007; 62p.

3. Taylor, S.W., et.al.; Field Guide to the Canadian Forest Fire Behavior Prediction System; Special Report 11; 1997; 59p.

4. Alaska Fire Service; Handy-Dandy Fire Suppression Field Guide; May 2006; 141p.