FSPro Calibration on the Shantatilik Creek Fire (Kenai Peninsula)

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Purpose

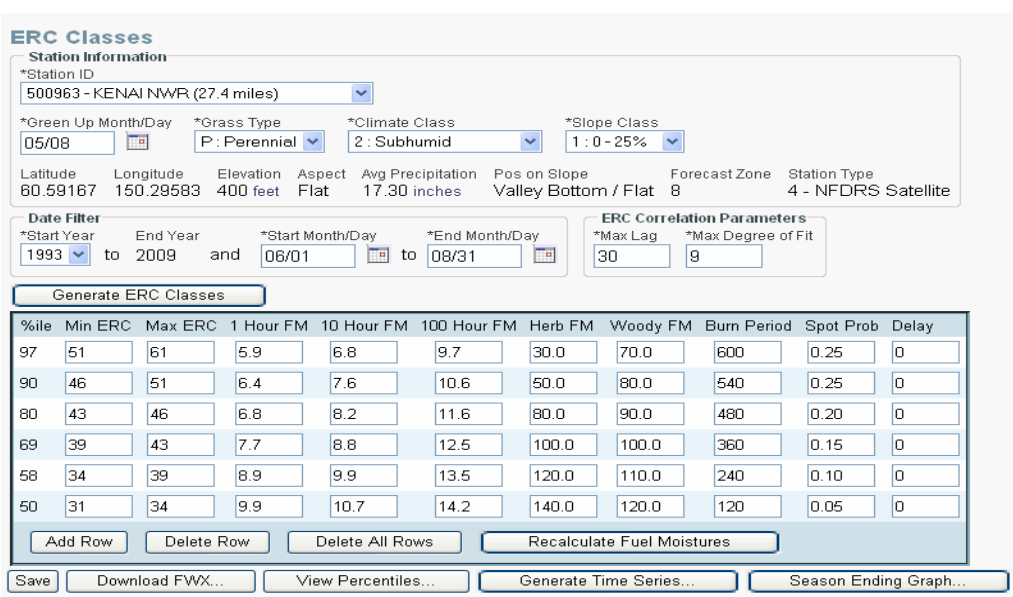
The purpose of this paper is to document the calibration process on the Shanta Creek Fire (#348) so that future analysts can benefit from this procedure and findings.

Background

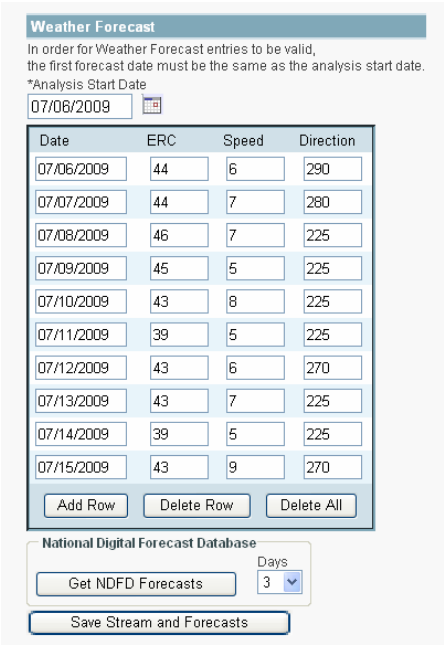
The Shanta Creek Fire started by a lightning strike on June 30th on the Kenai National Wildlife Refuge. The ignition was located approximately 11 miles southeast of Soldotna, AK. Upland areas of beetle-killed spruce contributed significantly to the spread of the fire. Significant fire movement occurred in an ERC range between the 70th and 85th percentile.

Calibration - Inputs

- The July 6th a.m. **perimeter** was selected as the start with the 15th p.m. perimeter as the validation perimeter.
- The WFDSS Alaska 2009 **fuels** data was initially used (created from LANDFIRE vegetation and cross-walked to the 40 fuel models). Beetle-killed areas were not captured adequately, so significant fuel modifications were made (discussed below).
- The Kenai NWR **RAWS** (500963) was used for weather and Swanson River RAWS (500924) was used for winds.
- An extra bin was added to capture moderate conditions (50th percentile). This often a good idea when doing modeling in early or late in the fire season.
- NFDRS calculated dead **fuel moisture**s were adequate, but live herbaceous and woody fuel moisture were altered. Herbaceous fuels were increased considerably. Woody fuel moisture was increased moderately.
- **Burn period** was increased from the default to account for the longer burn period.
- **Spotting** probability was increased from the default settings.



- The **weather forecast** contained 10 days and populated with the *previously observed weather* obtained from WFDSS (ERC) [ERC Classes > "View Percentiles…" button]) and MesoWest via Roman (wind speed and direction) (http://raws.wrh.noaa.gov/roman/). Remember, with a typical FSPro run you would provide a forecast of a couple days. However, we are calibrating the model to know weather, hence the "forced" weather for the *entire* simulation period.



SWANSON RIVER SWNA2

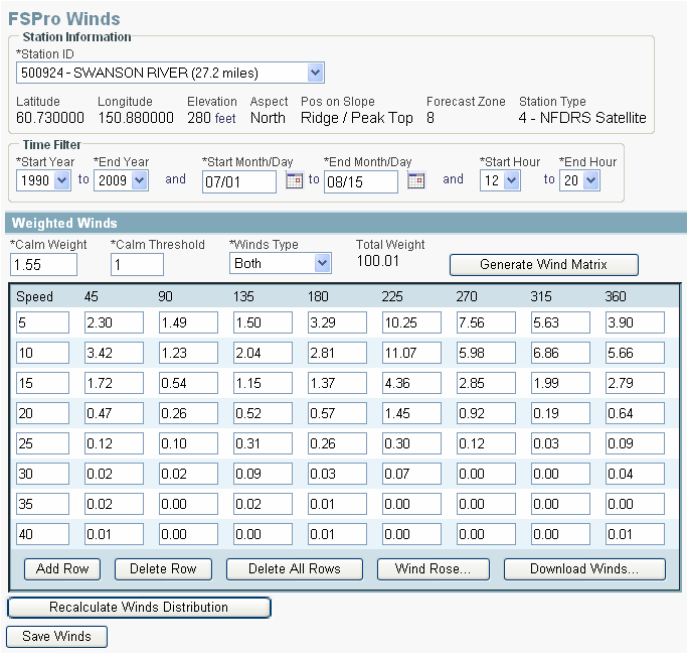
Wind Speed in mph & Wind Direction for 14 days // Jul 6, 2009 - Jul 20, 2009

Local Hour of Day	Jul 06	Jul 07	Jul 08	Jul 09	Jul 10	Jul 11	Jul 12	Jul 13	Jul 14	Jul 15	Jul 16	Jul 17	Jul 18	Jul 19	Jul 20
00	-	1 /SW	1 /SW	1 /S	1 /SW	1 /S	1 /SW	1 /S	2 /S	0	-	1 /S	1 /SW	3 /SE	3 /NE
01	-	1 /SW	0	1 /S	0	1 /S	1 /S	1 /S	3 /S	1 /S	-	1 /SW	1 /S	1 /E	4 /NE
02	-	1 /S	0	2 /N	0	0	0	1 /SW	3 /SE	1 /S	-	1 /SW	1 /S	0	3 /NE
03	-	1 /S	1 /SW	0	1 /SW	1 /SW	0	1 /SW	1 /SE	2 /S	-	0	0	2 /NE	1 /NW
04	-	0	1 /S	1 /NE	0	1 /SW	1 /SW	-	2 /SE	1 /SE	-	1 /SW	0	2 /N	2 /N
05	-	2 /SW	0	0	0	1 /SW	1 /SW	-	1 /S	1 /S	-	0	0	2 /N	4 /N
06	-	0	0	1 /N	1 /S	1 /SW	0	0	0	1 /S	-	0	0	2 /NW	3 /NE
07	-	0	1 /SW	1 /NE	0	2 /SW	0	1 /S	1 /SW	1 /SW	-	0	1 /NE	3 /N	5 /NE
08	-	0	0	0	1 /SW	1 /SW	0	1 /SW	2 /SW	1 /S	-	0	1 /N	2 /N	5 /NE
09	-	0	0	1 /SW	0	1 /SW	0	2 /SW	2 /SW	1 /SW	-	0	1 /NE	3 /N	4 /NE
10	-	0	0	0	0	2 /SW	0	2 /S	2 /SW	1 /W	-	1 /SW	2 /N	6 /NE	4 /NE
11	-	1 /SW	1 /SW	2 /SW	1 /NW	1 /SW	0	2 /SW	2 /SW	1 /W	-	1 /W	2 /E	6 /N	5 /NE
12	0	1 /NW	1 /S	2 /SW	1 /W	1 /SW	1 /W	2 /SW	2 /SW	1 /W	-	1 /W	3 /E	6 /N	-
13	1 /NW	1 /W	2 /SW	2 /SW	1 /SW	1 /SW	1 /W	3 /S	2 /SW	1 /W	-	2 /W	4 /SE	6 /N	-
14	1 /SW	1 /W	3 /SW	2 /SW	2 /S	1 /W	1 /W	2 /SW	2 /S	2 /SW	-	2 /NW	4 /SE	5 /N	-
15	1 /W	1 /W	4 /SW	2 /SW	3 /SW	2 /SW	1 /W	3 /SW	2 /S	1 /W	4 /SW	3 /N	5 /SE	4 /N	-
16	2 /NW	1 /W	3 /SW	3 /SW	3 /SW	2 /SW	1 /W	3 /SW	1 /SW	-	4 /SW	1 /W	4 /SE	5 /N	-
17	1 /NW	1 /W	3 /SW	3 /SW	3 /SW	2 /SW	1 /W	4 /SW	3 /SW	-	4 /SW	2 /W	3 /SE	3 /N	-
18	1 /W	1 /NW	4 /SW	2 /SW	3 /SW	3 /SW	1 /W	2 /SW	3 /SW	-	4 /SW	1 /NW	3 /E	3 /N	-
19	1 /W	1 /W	3 /SW	3 /SW	3 /SW	3 /SW	1 /W	3 /SW	3 /SW	-	4 /SW	3 /NW	4 /SE	1 /N	-
20	1 /W	3 /SW	3 /SW	3 /SW	5 /SW	3 /SW	2 /SW	3 /SW	3 /SW	-	3 /SW	3 /N	2 /SE	2 /N	-
21	2 /SW	2 /SW	2 /SW	2 /SW	2 /SW	2 /SW	2 /SW	3 /SW	2 /SW	-	3 /SW	1 /N	2 /SE	0	-
22	1 /SW	1 /SW	2 /SW	2 /SW	3 /SW	2 /SW	2 /SW	2 /SW	3 /SW	-	2 /SW	1 /SW	2 /SE	3 /N	-
23	2 /SW	1 /SW	1 /S	2 /SW	2 /SW	2 /SW	1 /S	1 /S	2 /SW	-	2 /SW	1 /SW	3 /SE	2 /NW	-

University of Utah MesoWest

For Questions or Comments about this page or MesoWest contact atmos-mesowest@lists.utah.edu

- **Winds** were filtered by July 1 – Aug. 15 for 1200 to 2000. 10-minute winds and gusts were used by selecting "both". In mild years, use the 10-minute average, otherwise use "both." Because the wind speeds are so high when selecting "gusts," this option is not recommend except under the most extreme conditions. If you are unsure which wind to select, run two separate scenarios, one with the 10-minute average and one with the gusts.



FSPro Winds

Station Information

*Station ID: 500924 - SWANSON RIVER (27.2 miles)

Latitude	Longitude	Elevation	Aspect	Pos on Slope	Forecast Zone	Station Type
60.730000	150.880000	280 feet	North	Ridge / Peak Top	8	4 - NFDRS Satellite

Time Filter

*Start Year: 1990 to *End Year: 2009 and *Start Month/Day: 07/01 to *End Month/Day: 08/15 and *Start Hour: 12 to *End Hour: 20

Weighted Winds

*Calm Weight: 1.55 *Calm Threshold: 1 *Winds Type: Both Total Weight: 100.01 Generate Wind Matrix

Speed	45	90	135	180	225	270	315	360
5	2.30	1.49	1.50	3.29	10.25	7.56	5.63	3.90
10	3.42	1.23	2.04	2.81	11.07	5.98	6.86	5.66
15	1.72	0.54	1.15	1.37	4.36	2.85	1.99	2.79
20	0.47	0.26	0.52	0.57	1.45	0.92	0.19	0.64
25	0.12	0.10	0.31	0.26	0.30	0.12	0.03	0.09
30	0.02	0.02	0.09	0.03	0.07	0.00	0.00	0.04
35	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.00
40	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.01

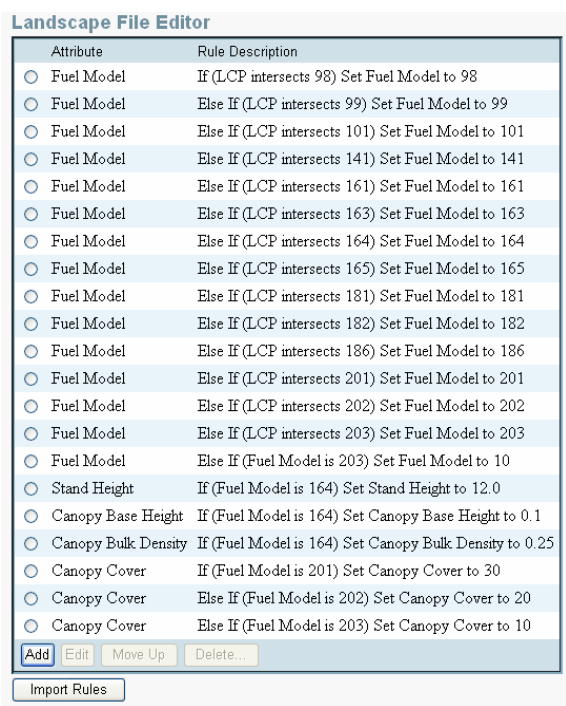
Add Row | Delete Row | Delete All Rows | Wind Rose... | Download Winds...

Recalculate Winds Distribution

Save Winds

- Several changes were made to the **landscape** using the WFDSS landscape editor. Vegetation mapping by Wade Wahrenbrock (http://www.borough.kenai.ak.us/sbb/pages/who.html) was incorporated in the fire area to more accurately account for beetle-killed black spruce. Other changes were made based on Wade's mapping and proved much more reliable than the LANDFIRE derived vegetation on the Kenai Peninsula.

  Stand height in black spruce (fuel model 164) was increased (12 m), CBH was decreased (0.1 m), CBD was increased (0.25 kg m^{-3}), and canopy cover was decreased in beetle-killed areas proportionate to the level of mortality. The changes were "fused" into the existing WFDSS fuel model layer.

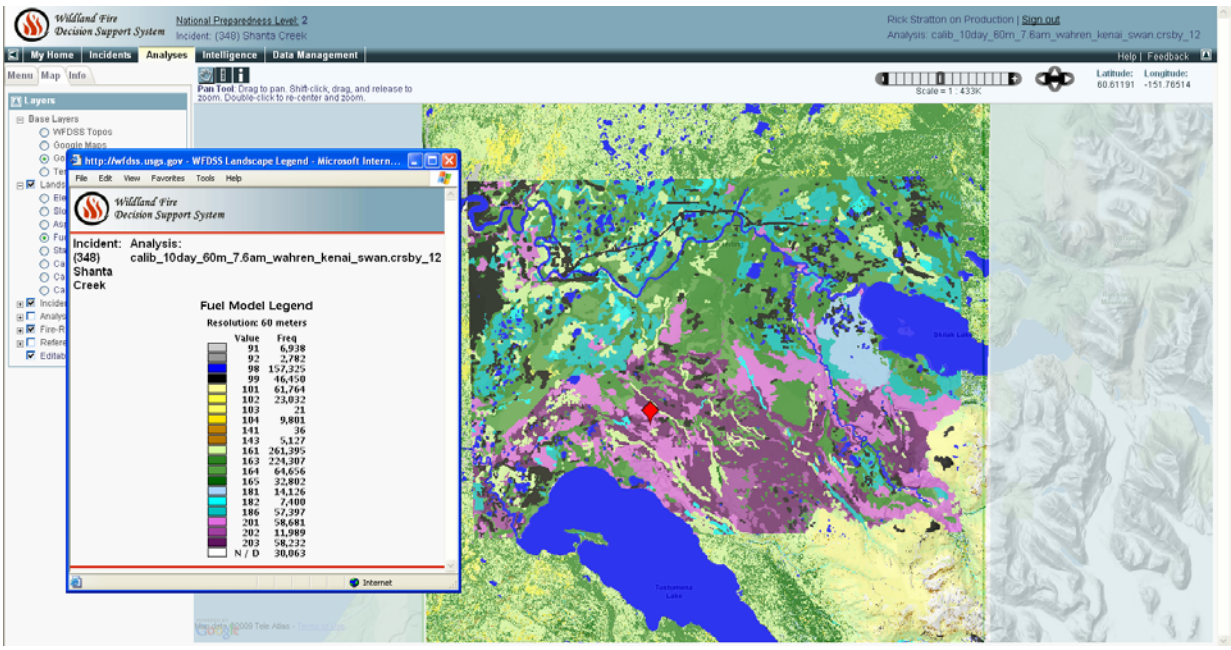


Landscape File Editor

Attribute	Rule Description
Fuel Model	If (LCP intersects 98) Set Fuel Model to 98
Fuel Model	Else If (LCP intersects 99) Set Fuel Model to 99
Fuel Model	Else If (LCP intersects 101) Set Fuel Model to 101
Fuel Model	Else If (LCP intersects 141) Set Fuel Model to 141
Fuel Model	Else If (LCP intersects 161) Set Fuel Model to 161
Fuel Model	Else If (LCP intersects 163) Set Fuel Model to 163
Fuel Model	Else If (LCP intersects 164) Set Fuel Model to 164
Fuel Model	Else If (LCP intersects 165) Set Fuel Model to 165
Fuel Model	Else If (LCP intersects 181) Set Fuel Model to 181
Fuel Model	Else If (LCP intersects 182) Set Fuel Model to 182
Fuel Model	Else If (LCP intersects 186) Set Fuel Model to 186
Fuel Model	Else If (LCP intersects 201) Set Fuel Model to 201
Fuel Model	Else If (LCP intersects 202) Set Fuel Model to 202
Fuel Model	Else If (LCP intersects 203) Set Fuel Model to 203
Fuel Model	Else If (Fuel Model is 203) Set Fuel Model to 10
Stand Height	If (Fuel Model is 164) Set Stand Height to 12.0
Canopy Base Height	If (Fuel Model is 164) Set Canopy Base Height to 0.1
Canopy Bulk Density	If (Fuel Model is 164) Set Canopy Bulk Density to 0.25
Canopy Cover	If (Fuel Model is 201) Set Canopy Cover to 30
Canopy Cover	Else If (Fuel Model is 202) Set Canopy Cover to 20
Canopy Cover	Else If (Fuel Model is 203) Set Canopy Cover to 10

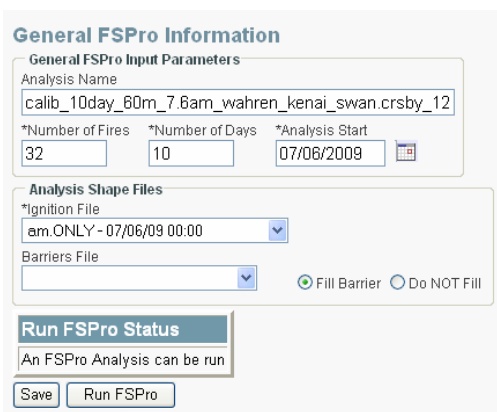
Add | Edit | Move Up | Delete...

Import Rules



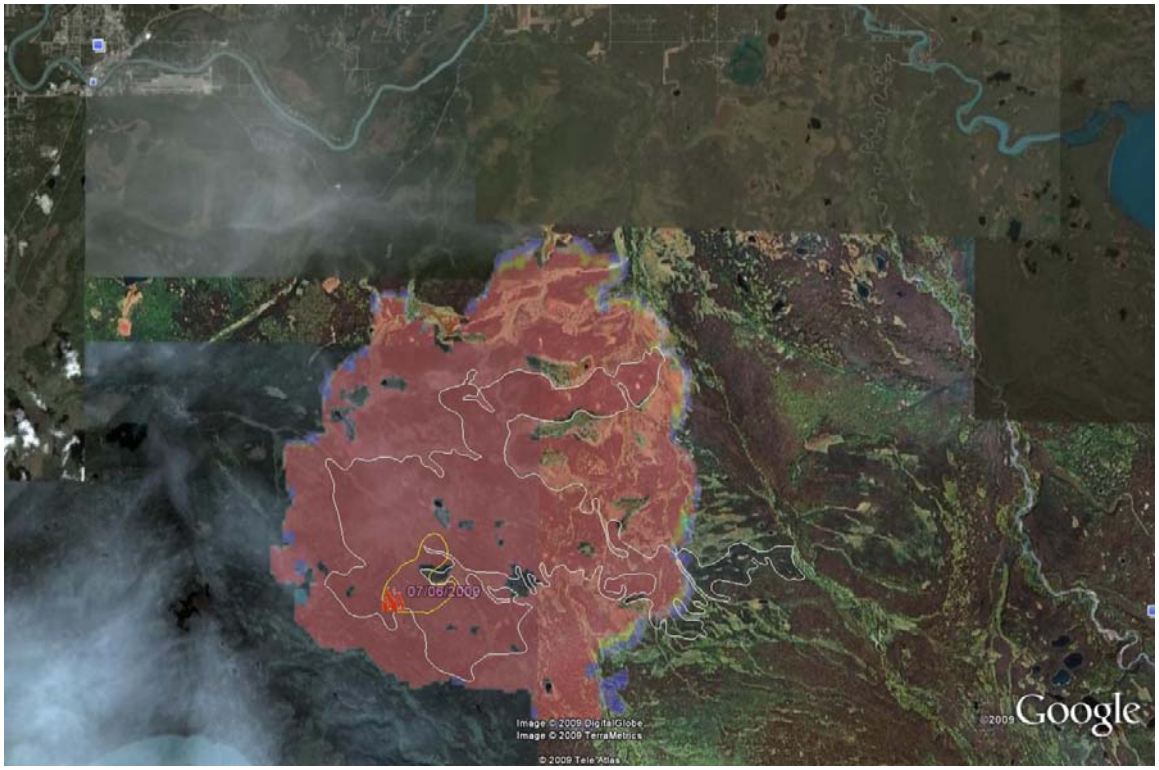
Calibration – Parameters & Process

- Set the **number of fires** to 1. Because a 32-processor machine at EROS does the calculations, this number will be converted to 32.
- Set the **number of days** based on the starting and ending perimeters used (10-days in this case). Set the **analysis start** date to the 1st burn period. Import the ignition file. Remember all shape files imported into WFDSS must be zipped and contain all the necessary files. When all the inputs are entered, the Run FSPro Status will state: "An FSPro Analysis can be run." Click "Run FSPro."



Calibration – Process

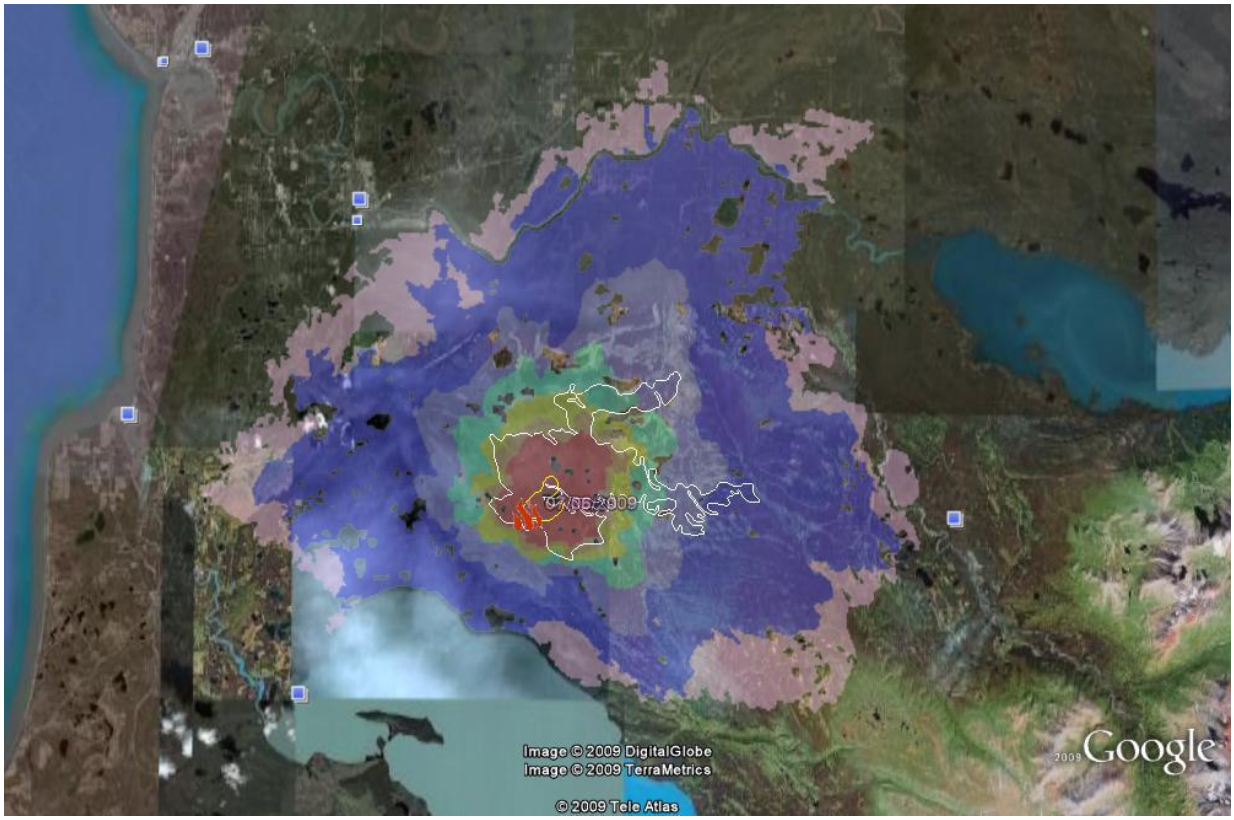
- The output will be mostly red dueto the selection of only 32 fires. Essentially, you are viewing a MTT run where spotting was included (the only way to do this currently). The yellow perimeter is the 6th and the white perimeter is the 15th. Remember, the red area is a probability of 80 to 100%, so try and capture much of the perimeter. However, understand that there was a 20% probability that it *would not* burn the areas in red. *So this is a very crude and quick technique with subjective degrees of acceptability.*



- Continue the calibration process till you achieve an adequate fit. Do not expect perfection. Remember it is just a model—an approximation of reality. Make sure your fuel moistures and weather and wind stations are representative of the fire area. Spend a lot of time viewing and querying and if necessary modifying the fuel with the WFDSS landscape editor. Change the burn period and spotting probability. For more information on calibration and making changes to an LCP refer to my guidebook on LANDFIRE fuels data manipulation (http://www.treesearch.fs.fed.us/pubs/31921).

Post-calibration Runs

- Once your model is calibrated you will have more confidence in the output going forward. The initial days of an incident are the trickiest modeling due to unfamiliarity with the data, fire, terrain, and fire behavior. Simulations nearing a term event are also challenging. Incident FBANs, FMOs, fuel specialist, foresters, etc. need to be your eyes. Ask question and rely on them. With time, you will get to know the area, fire, and the data. The end result will be FSPro output that will lead to more informed decision making. Below is the "finished product"—a 10-day run with the starting and ending perimeters overlaid.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