Fire Ending Event Workshop
January 29th – 31st 2008
Fairbanks, Alaska,

Version 2 - draft

Attendees, associated agency and AWFCG committee affiliation:

Sharon Alden, NPS, Weather
Tami Defries, AFS, Fuels
Jake Dollard, AFS, Fuels
Marsha Henderson, DNR,
James Higgins, AFS, Fuels
Kato Howard, AFS,Fuels, Fire Behavior
Mary Lynch, AFS, Fire Planning
Chase Marshall, FWS Fuels
Jan Passek, FWS, Weather,GIS
Robert Schmoll, DNR, FMO
Brian Sorbel, NPS, GIS, FPA
Skip Theisen, BLM, Fire behavior
Steve Theisen, AFS, FMO
Larry Weddle, NPS, Weather

Goals for the meeting and process:

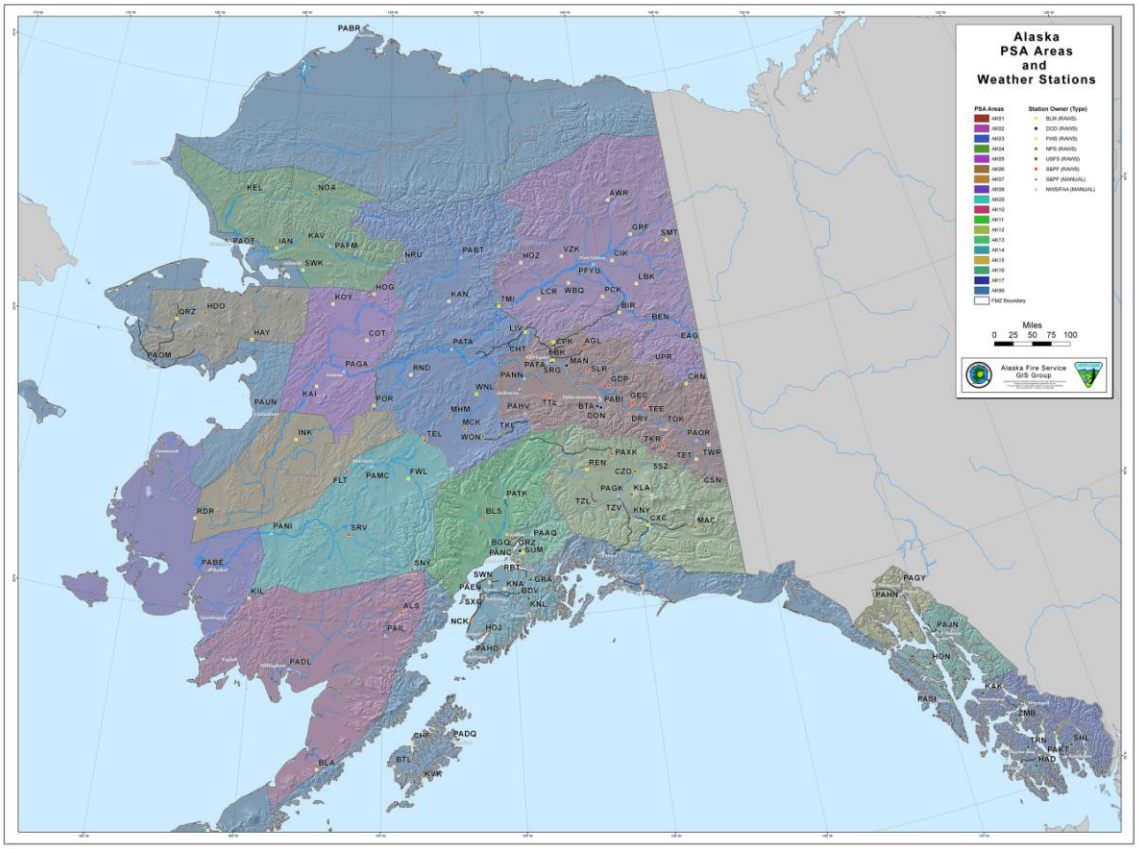
1) Using the available statewide fire weather data and combining stations to develop long data sets for fire slowing/ending events probabilities (we will not be doing SE Alaska)
2) Develop prescriptions statewide (except SE) that constitutes a fire slowing event - and/or a turning point value, when looking at large duration fires and large fire spread.
3) Document assumptions and process as we proceed (so we can improve upon the product)
4) Use information in 2008 fire season to refine values to assist managers in Stage 2 & 3 WFIP's
5) Refine prescriptions - assumptions in the fall 2008 after summer validation.

Process:

Defining Geographic locations:

Using the Predicative Service Areas (PSA's) as a base map, we combined the PSA's into 6 geographic areas in which we called Zones based on fuels and similar fire behavior to begin our validation process. The assumption was made that the PSA's had already divided the state into like climate areas. The base map included the location of all the fire weather stations by ownership across the state for easy reference.

For each Zone created, we selected representative weather stations for testing. Representative stations were selected by location (trying to capture the variation across the Zone) as well as knowledge of the stations data quality. Once the Zones and fire weather stations were selected we began the process of developing a fire ending event scenario. We started with an interior zone with a very active fire history that the group was familiar with to help validate our assumption.



Map 1. Predictive Service Areas.

Creating Season Event Scenario's:

In developing an end of season event scenario to determine a Term date for the Rare Event Risk Assessment Process (RERAP), we looked at the following Long Term Fire Assessments: Kenai Lake, 2001, Black Hills Complex 2003, Eagle Complex 2004 to see recommendations and processes used.

There was much discussion on the differences between a fire slowing event and a fire season ending event as well as a fire ending event. For the purposes of this exercise we defined the fire slowing event as a weather event that slowed the fire growth but there was enough of the fire season left for fuels to dry and continue to burn large acres. Using local experience and historical weather data in Firefamily Plus version 4b we concluded that if the event took place prior to July 10th it had a high probably of being a fire slowing event. . We looked at the Duff Moisture Code (DMC) as the representative index to follow the trend throughout the season. If an event happened prior to July 10th and the DMC never went above average for the rest of the season then that was a fire ending event. If the DMC recovered and continued to climb above average it was a fire slowing event. The duration of fire slowing event was not defined – generally it would be a few days of dampened fire behavior until the indices begin the climb to the pre-event level. It was agreed that the normal daily diurnal pattern event was not the fire slowing event. If the event occurred after July 10th the probability increased that it was a fire ending event.

A good example of the variation from year to year can be seen in Figure 1. In 1994 an event happen around June, 18th and the DMC never recovered above the average for the rest of the season. For 1994 we would declare June 18th as the fire ending event date. In 2000 you can see dips where weather events might have caused a fire slowing event but it was not until August 11th that we meet the criteria for a fire ending event. The term date for 2000 would be August 11th.

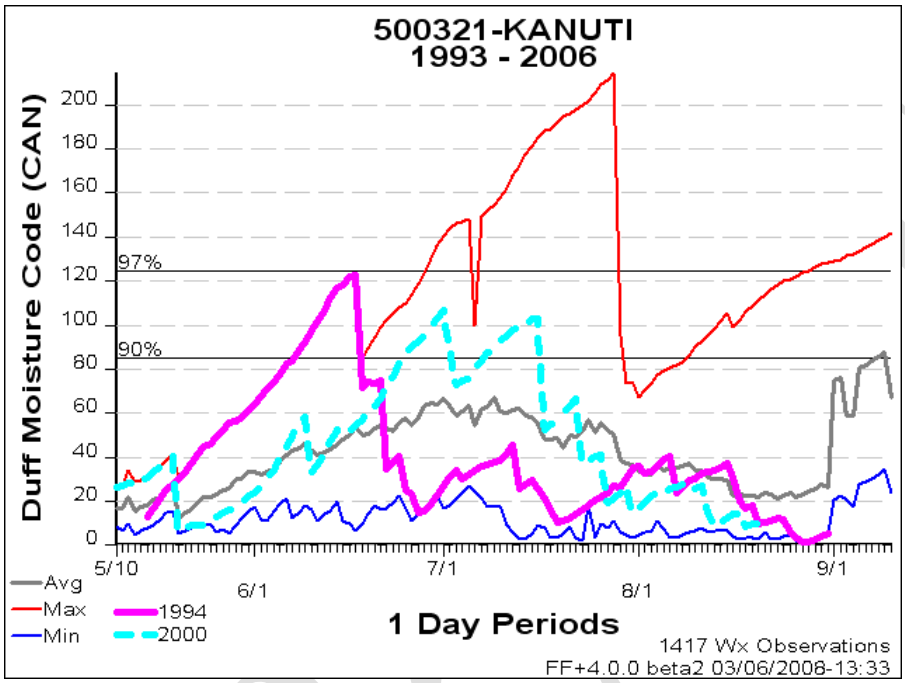


Figure 1.

It needs to be clear that for our purposes a fire ending event is not necessarily the same as a fire season event- although some years they could be the same. Due to the size of Alaska and variance from one end of the state to the next and the composition of our fuels (deep duff) – we did not feel comfortable defining the fire ending event as a fire season ending event to be extrapolated to an entire zone or to make staffing decision (ie – mobilize resources to lower 48 because). There are other tools for managers to use to assist with those decisions. This process is for individual fires and not tested to cover an entire dispatch zone. There was also agreement for the purposes of this exercise we could have a fire ending event without a fire.

It was felt that rain alone did not constitute a fire ending/slowing event – i.e. one day of rain for .50". This event would slow fire activity – however it could be quick to recover and become active again - this could qualify as a fire slowing event. Fire ending events should be more in line with weather pattern changes. We defined our event happening over a 5 day period, where there was 0.50 inches of rain **and** precipitation duration of 25 hours **and** the average mean RH was over 50%. This multi day event helped to better define a large weather pattern shift rather than local convective activity.

At first we created Special Interest Groups (SIG's) in Fire Family Plus to create longer data sets and soon realized it reduced the number of events we had as all stations in that SIG had to meet the criteria. Therefore we used each station individually to determine the event dates.

We continued this process for all zones. As we moved into the coastal area's there was a significant increase in the amount of precipitation per rain event. We modified the fire ending event scenario to reduce the duration of precipitation from 25 hours to 20 hours in the coastal areas.

Developing of Term Files.

The Term Module in Rare Event Risk Assessment Process (RERAP)allows you to easily calculate the Weibull waiting-time distribution for a season-ending or fire-stopping event.

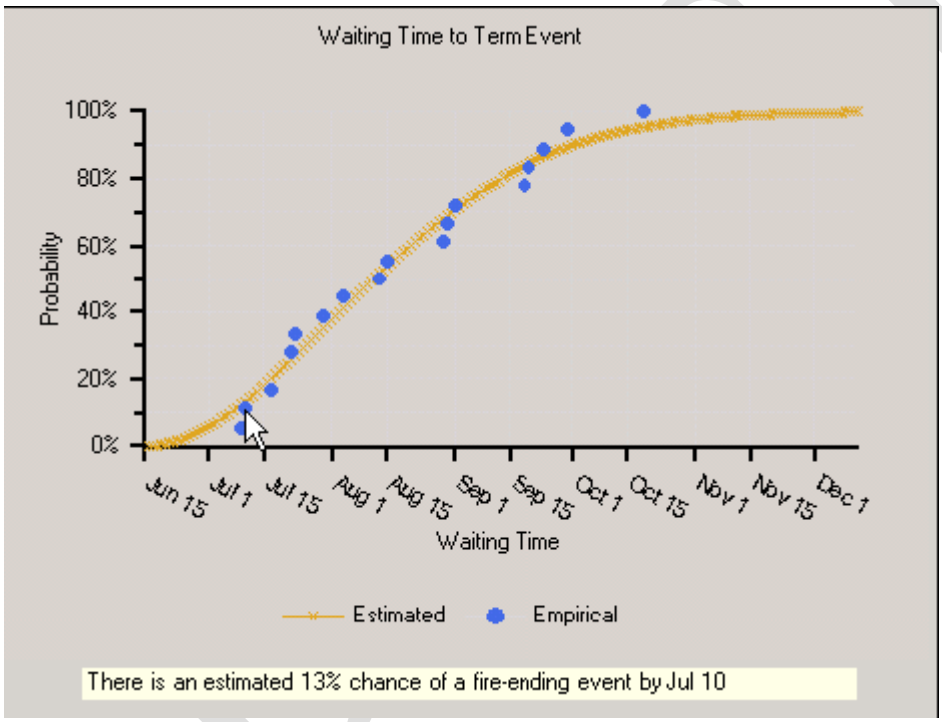


Figure 2. Graph created by using RERAP's Term Module.

The following is an excerpt from the RERAP User's Guide version 7.01, June 12, 2006.

….Defining the criteria for the term events

Use local knowledge and your expertise to define the criteria for the term events you wish to include. To reduce the uncertainty of predicting the term events, use more than one indicator and compare the outcomes. Remember, fire-stopping and season-ending criteria will be different. Options include:

• Term events can be defined by reviewing a time series of precipitation amount and duration.
• Fire behavior is highly correlated with Energy Release Component (ERC). Term events can be defined when the ERC reaches and remains below a defined threshold.
• Fire occurrence data is also useful for determining season-ending events. Lack of large or multi-fire days often indicate the end of the critical fire season.

Your local fire weather meteorologist can also provide valuable insight to current weather trends and conditions. If one inch of rain over one or more days occurs, you can perform a 5-day search in FireFamily Plus to identify the 3 or 4 days prior to the event.

Review historical data obtained from weather records or output from FireFamily Plus to determine fire-stopping event dates. If possible, use at least twenty years of data, and more importantly, use good and reliable data.
Season-ending events typically occur over large geographic areas, allowing you to use weather records from non-fire weather stations, such as the National Weather Service (NWS) and state and local weather bureaus, when available. Using a combination of weather events, NFDRS indices, and historical fire occurrence data is the best approach for determining season-ending event dates.

You can establish only one season-ending event date per year.

Validation:

Modis was used to validate the last days of fire spread on a fire to see if the Term date was valid. We were able to look at a fire in a particular year – and look for large fire growth after the calculated Term event date. Our prescription for development of a fire ending event was verified by lack of fire growth shown on Modis. This process was also used in years in which the event filter did not show an occurrence to meet our criteria for a fire ending event. We then looked at where the DMC did not go above the station's average and Modis did not show any fire growth. We looked more closely at the daily weather observations before and after the event to see if there was a shift in the overall weather pattern verses an isolated episode (thunderstorm). We looked at the same dates at nearby weather stations to help validate that it was a wide spread event. We also screened the historical weather data looking for unusual gaps in data as well as typo's that could skew the data, i.e., 30 inch of rain in one day. Another factor was that for manual stations there is no mean RH calculated, so we could not find a qualifying event for those years at the manual station.

A query of the Alaska Fire Service's database for large fires accruing after our term date was made to determine if large fire growth of new fires occurred. This quick scan of the fires verified our prescription for the term event. Currently there is no easy way to determine large fire growth against our term dates without going through the individual hard copy fire reports.

Eight interior weather stations were selected to validate and test our assumptions:

Kanuti (500321)– best fit

Chalkyitski (500421) – bad data, station was not used
Koyukuk (500319)
Hodzana (500417
Kelly River (500934)
Ben Creek (500414)
Tok (500720)
Wein Lake (500715)
McCarthy (500519)

Applicability and validation of the criteria for fire ending event will not occur until it is used on actual fires. Our validation in this paper only applies to defining the event criteria. Testing on fires will be done during the 2008 fire season.

Assumptions:

- PSA's already divided the state into similar climate zones.
- Events that happen on or prior to July 10th – a fire slowing event
- Events that happening after July 10th – could be considered as a fire ending event.
- Cross over – prior to July 10th – 40% that it would be fire ending event and 60% that it is a fire slowing event - after July 10th 60% fire ending event and 40% slowing event.
- The output of the models is not stand alone information and need an expert to interpret (model limitations and quality of data). If it is too easy to get an answer than could mean nothing and give managers a false sense of security.
- We developed this objectively with a few subjective assumptions but should be used subjectively
- Coastal area fuels were different – shorter depth of tundra, fewer holdovers fires – shorter duration of rain was needed for fire ending event. Compared 20 hours and 25 hours of precipitation needed side by side and saw that for zone 2 (Coastal) the amount of precipitation was greater with each rainfall event than in Zone . So we refined the event needed accordingly.
- This is not a stand alone process there are other tools available that are a compliment to the season ending date: For example the charts developed by AFS is to look at DMC and BUI charts. Can fire indices recover back to moderate levels?
- Originally the intent for this process was to be used on stage 2 and 3 WFIP's , and fires in limited areas – we recommend it can be used on any fire. Users must have haTo be used with an understanding of the models and limitations to interpret data.

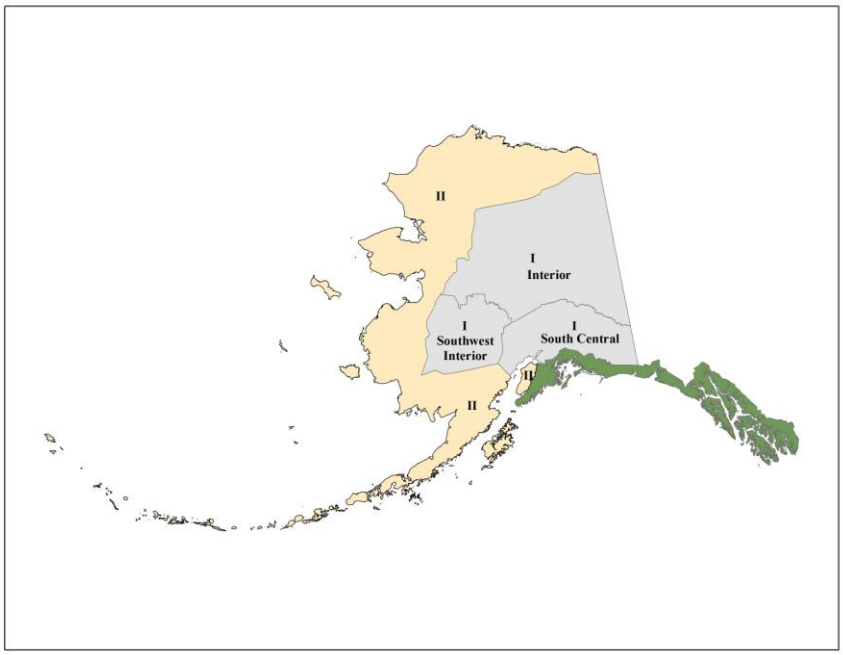
Recommendations:

Utilize the 2008 fire season to test the following events for development of term files in Alaska:

Event 1:

Over a 5 day period: 0.50 inches of rain **and** 25 hours of duration **and** the average mean RH over 50% . (interior weather systems-area I on map 2.)

Event 2:
Over a 5 day period: 0 .50 inches of rain **and** 20 hours of duration **and** the average mean RH over 50% (coastal weather systems- area II on map 2.).



Map 2. Location of area I & II to apply season ending event scenarios.

A master warehouse of data be kept and updated annually so there is one stop shopping for any analysis. For 2008 this will be done with the network developed by this workshop and will be refined as needed.

Issue
It there are missing weather observations during a rain event the program will skip that event meeting the criteria. This could mislead or skew the data to have a later than normal event.

Suggestion:
Managers of the weather data need commit to review the daily weather observation in WIMS during the season to see that it is maintained and to enter missing data prior to Nov. 20th each year. This will ensure a complete weather set will be in the National Archive.

Include a responsibilities and accountability of fire weather data in the RAWS weather paper in development through AWFCG weather committee.

Show examples of how valuable the data is the consequences of missing data. Target the folks who enter the data into the system and their supervisors..

Develop system to check for missing data throughout the fire season to keep it up to date.

Suggestion: Search weather archives to find missing weather observations, update the weather observations in Fire Family – share that data with colleges so they don't waste time duplicating work. Leave the National archive system alone.

Issue:
Length of data collected for stations. Weather observations were stopped at end of August so there is no data to look at a late fire season.

Suggestions:
Weather committee should develop operating procedures for WIMS input to include start up and ending protocols. (Weather committee has already begun to develop paper on RAWS stations) A recommendation is that collection begins as soon as the station is snow free and ends at hard freeze or a set date in the fall i.e Oct.15th.

The Future for 2008 season.

Agency representatives who are interested in testing the logic above will begin to look at individual weather stations in their areas of concern and develop Term files using the criteria above. Any TERM files created or modifications to the weather database will be shared with the group to help duplicate efforts. There will be a data call on or about May 1st to consolidate the files. A cd will be made with the updated Alaska weather files and all the term events created to share as needed with technical experts.

Get word out to AWFCG committees/and IM Teams, agency staff of this process for input and testing.

In fall of 2008 meet with those individuals who tested this process in an group back after Action review to capture recommendations for the 2009 season.

Glossary:

Fire-stopping or fire-slowing event. Occurs when there is a sufficient change in the environmental conditions to cause fire spread to temporarily stop. This could be caused by rainfall events or by an increase in relative humidity that temporarily inhibits fuel availability.

Diurnal. Pertains to daily cycles of temperature, relative humidity, and wind.

Duff moisture code (DMC): a numerical rating of the average moisture content of loosely compacted organic layers of moderate depth in the Canadian fire danger rating system. This code gives an indication of duff consumption in moderate duff layers and medium size woody material.

Fire Beans: An Alaska Interagency Coordination Center data base created capture information and data on fires to populate state wide reporting systems such as the "Daily Situation Report, Fire reports, used by State of Alaska DND and AFS.

Precipitation. Any or all the forms of atmospheric water, liquid, or solid that reach the ground, usually measured to the nearest one-hundredth of an inch.

Precipitation duration. The time, in hours and fraction of hours, that a precipitation event lasts. More precisely, for fire danger rating purposes, it is the length of time that fuels are subjected to liquid water during the day.

Remote Automatic Weather System (RAWS). AWIMS satellite station that automatically tracks and stores weather information.

Season-ending event. Occurs when one or more weather events change a wildland fire environment so that it no longer supports fire spread. After this particular weather event, fuel moistures inhibit fuel availability so that fire growth is no longer of concern to wildland fire managers for the remainder of the fire season. A season-ending event usually consists of a fire-stopping event followed by a continual combination of environmental factors that end the fire season.

Special Interest Group (SIG): is a collection of weather station catalogs that users group together to analyze fire danger climatology.

Term file: The Term file is used to easily calculate the Weibull waiting-time distribution for a season ending or fire stopping event. It consists of one entry per year of the date the fire season event happed.