Wildfire Scenario for the Extended Response Exercise

A wildfire has been detected and verified with the following information. The information outlined below will establish direction and guidance for the management of this fire.

Fire Name:	**Preserve Fire**
Geographic Area:	Rocky Mountain
Units Within GACC:	NPS Great Sand Dunes National Park
	NPS Great Sand Dunes National Preserve
	FS Pike and San Isabel National Forests,
	San Carlos Ranger District
Fire Management Unit:	3 separate Fire Management Units
Cause:	Lightning
Latitude/Longitude:	N 37.80639 / W 105.50583
	N 37º 48' 23" / W 105º 30' 21"
GAC Preparedness Level:	4
National Preparedness Level:	4

The Agency Administrator's Intent

This will be a multiple objective fire implementing monitoring, point protection, and modified-suppression strategies. Most of the area allows for resource benefit objectives to be met. I want those objectives to be met as much as possible, but I also want values within the planning area protected. This includes agency structures, infrastructure, cultural sites, private land, private structures, and any other identified values at risk. Take suppression action where necessary to meet any of the incident objectives but only if those actions can be accomplished safely. In other words, do not compromise the safety of the firefighters or the public to meet the incident objectives.

Land Management Objectives: NPS Great Sand Dunes National Park and Preserve*

The information outlined below will establish direction and guidance for the management of this fire.

·   Ensure that 100% of all naturally ignited wildland fires are evaluated and considered for their ecological benefit in designated (approved) areas.

·   Initial actions on human-caused wildfire. These fires will continue to be suppressed in order to minimize negative consequences with respect to firefighter and public safety.

·   To the maximum extent possible, protect important scientific, scenic, historic, and prehistoric cultural resources from the fire.

·   Ensure that all fire personnel are appropriately trained and qualified for the wildland fire assignment they receive.

·   Manage all wildfires in a cost-effective manner with consideration for environmental impacts, while ensuring that firefighter and public safety is the highest priority.

Incident Objectives

Great Sand Dunes National Park and Preserve

·   Plan and implement management actions that fully provide for personnel and public safety.

·   Develop and implement actions that accomplish land management objectives and protect wilderness areas and natural and cultural sites.

·   Allow fire to accomplish resource benefit objectives in the Park and Preserve areas.

·   Keep fire north of Sawmill Canyon.

·   Protect values at risk within Great Sand Dunes National Park and Preserve (visitor facilities) using roads, trails, and natural barriers.

·   Manage incident operations in a cost-effective and efficient manner.

·   Communicate and coordinate with local agencies to create and implement a public information strategy.

_____

* The Pike and San Isabel National Forests have the same land management objectives.

Pike and San Isabel National Forests, San Carlos Ranger District

· Plan and implement management actions that fully provide for fire personnel and public safety.

· Identify and implement actions that ensure the protection of values that may be at risk.

· Increase public understanding of fire objectives and measures being taken to manage the fire.

· Manage incident operations in a cost-effective manner.

Incident Requirements

Great Sand Dunes National Park and Preserve

· Minimize impacts to any threatened and endangered wildlife species.

· Minimize bucking of logs along holding lines and trails. Limb branches flush with bole and leave logs unless they are a holding concern. Logs that are bucked should have cut ends hidden from view of trails and roads.

· Protect all known and discovered cultural resources as directed by Resource Advisor or Archaeologist.

· Plan and implement management actions that fully provide for personnel and public safety.

· Develop and implement actions that accomplish planned land management objectives and protect wilderness areas and natural and cultural sites.

Wilderness Areas Located Within Great Sand Dunes National Park and Preserve

· Use only handtools to construct fireline; chainsaws are permitted. Helicopters are permitted as long as flights are needed to accomplish fire objectives.

· Helicopter landings must have prior approval from the Park Superintendent and/or Forest Supervisor.

· Avoid constructing line in meadows.

· Use minimum impact tactics and other techniques to ensure protection of wilderness values.

· Use natural barriers for holding features to the greatest extent possible.

· Implement resource protection measures at all major spike camp locations, including proper food storage, and wilderness sanitation measures.

- Use heavy equipment only under written permission from the Park Superintendent and/or Forest Supervisor.

- Adhere to retardant avoidance area guidelines in those designated areas. Retardant avoidance areas include any area within 300 feet of any water source.

Risk Assessment Considerations

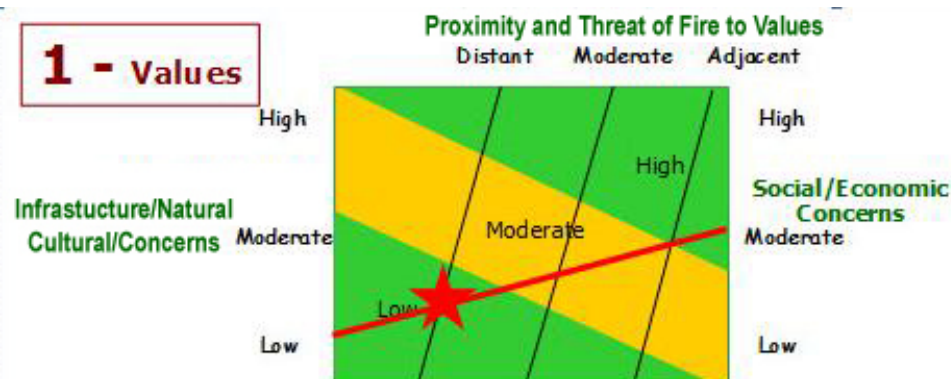Risk assessment considerations for the Preserve Fire include:

- Safety of firefighters and the public.

- Protecting improvements and facilities if the fire escapes outside the planning area.

- Preventing potential adverse effects to private land.

- Limiting effects from off-site smoke.

Initial Relative Risk Assessment

The initial RRA was completed on June 8, 2013 (see chart below).

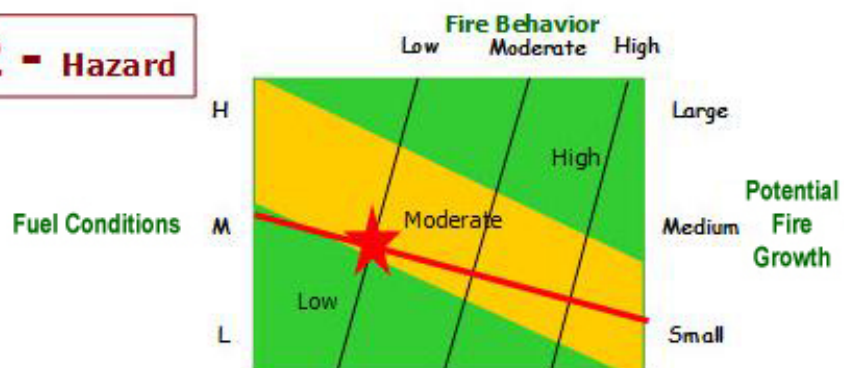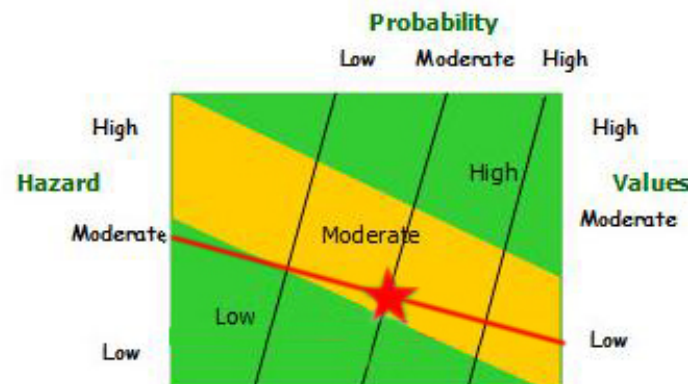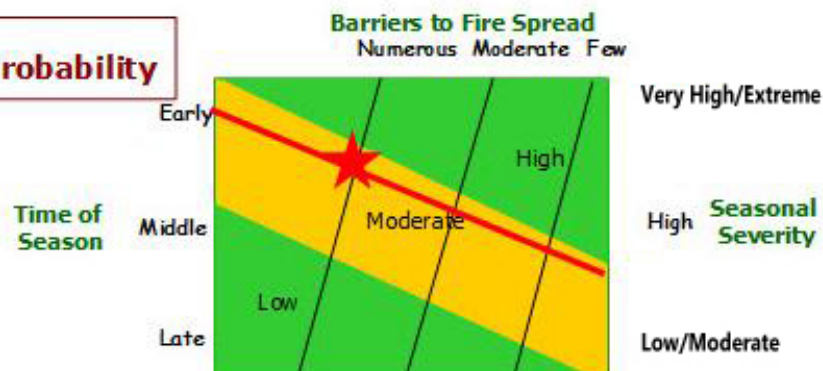# Initial Relative Risk Assessment – Completed 6/8/13

1 - Values

Proximity and Threat of Fire to Values
Distant   Moderate   Adjacent

High   High

High

Infrastucture/Natural
Cultural/Concerns   Moderate   Moderate   Social/Economic
                                              Concerns   Moderate

Low

Low   Low

Relative Risk Assessment

4 - Relative Risk

2 - Hazard

Fire Behavior
Low   Moderate   High

H   Large

High

Fuel Conditions   M   Moderate   Medium   Potential
                                              Fire
                                              Growth
                Low
L   Small

Probability
Low   Moderate   High

High   High

High

Hazard   Moderate   Moderate   Values   Moderate

Low
Low   Low

3 - Probability

Barriers to Fire Spread
Numerous Moderate Few

Early   Very High/Extreme

High

Time of
Season   Middle   Moderate   High   Seasonal
                                          Severity
                Low
Late   Low/Moderate

Complete Steps 1 -3: Connect the left and right elements with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right elements. Take results as inputs to Step 4.

Complete Step 4: Read the relative risk from the background area where the intersection occurs.

Values-at-Risk Table

Name	Description
Pinyon Flats Campground	NPS campground – 88 campsites and 6 structures
Snotel Site	NRCS snowpack telemetry site on Medano Pass
Wellington Cabin	1 structure
American Tower – Red Wing	Communications tower and 2 structures
Medano Cabins	2 NPS structures
Wickiup Site 1	Cultural site
Mosca Pass Trailhead	Interpretive signs
Champion Tree	Record state limber pine
Cultural Sites	Culturally modified trees

Fire Behavior

The Preserve Fire was detected on June 6, 2013, located in the Medano Creek drainage, approximately 19 miles southeast of Crestone, Colorado, NE of the Great Sand Dunes National Park and Preserve Visitor's Center.

The fire is burning on the west side of the Sangre de Cristo Mountain Range at the mouth of Medano Creek approximately 5 miles northwest of Mount Zwischen just northeast of the sand dunes. Timber types in the fire area include open ponderosa pine, piñon-juniper woodlands, mixed conifer, and spruce/fir (Fuel Models TL3 and TU5) with seral aspen stands scattered throughout the higher elevations. Many of these aspen stands, created from stand-replacing fires around 1880, look green from aerial imagery and reconnaissance, especially near Medano Pass. Scattered pockets of dead standing spruce/fir exist in the fire area from past beetle kill, especially on the east slopes of the divide.

Fire activity has been quite variable over the course of the incident to date. There were several days of fire activity and growth. A combination of strong winds, low humidity, steep terrain, and heavy fuel loading led to active fire behavior through June 12. More active fire behavior may be encountered, and increased fire activity may be possible. Otherwise, the fire activity and daily growth have been moderate to low as weather conditions have become less extreme. The piñon-juniper woodlands on the south and southwest aspects have significantly slowed fire behavior, even during times of very strong winds. The Preserve Fire is approximately 267 acres and continues to burn in ponderosa pine and piñon-juniper woodlands at the 8,400-foot elevation.

Observed and Current Fire Behavior

The Preserve Fire was started the afternoon of June 6 by lightning within Great Sand Dunes National Park between Little Medano and Medano Creeks. The fire originated in open ponderosa pine woodland at the 8,400-foot elevation approximately 4 miles north of the Park and Preserve Visitor's Center.

Fire behavior has been significantly influenced by the fuels and topography in alignment with the wind, with fire growth days spreading primarily by surface fire and group torching with short to mid-range spotting. Fire runs have influenced fire growth in areas with heavier surface fuels, and continues to move generally east towards higher elevations with bug-killed trees, and dense stands of mixed conifer, particularly on north aspects. Low relative humidity (RH), high temperatures, and winds have been the most significant weather factors influencing the development of this fire.

Backing fire observed on Preserve Fire, June 12 at 1930.

Lightning ignited the Preserve Fire the afternoon of Sunday, June 6, on a relatively flat area (less than 10% slope). The Sand Dunes RAWS recorded 0.3 inch of precipitation associated with the lightning event. The morning of June 7 the fire was mapped at 0.1 acres in size. Fire spread was primarily creeping through surface litter the first 2 days, growing to 4 acres on June 8. Drier conditions and increased winds led to increased fire behavior and longer burning periods through June 11. Winds were primarily out of the west-southwest and relative humidity bottomed out in the low teens during this period. By June 12 the fire had grown to 267 acres. Following cooler, more moist conditions on June 12 (maximum temperature 59 °F, minimum RH 62%, 0.02 inch of rain at Sand Dunes (RAWS), warm and dry conditions returned to the area.

It is forecasted that winds will continue primarily out of the southwest June 13–16 with RH dropping to a low of 6% by June16. Winds are forecasted to be 10–15 mi/h southwest with gusts to 30 m/hr through June 16. RH is forecasted to be in the single digits though the forecasted period with RH near 5%. Low fine fuel and dead fuel moistures are calculated at 2% exposed and 4% shaded with probability of ignition of 100% exposed and 70% shaded. Continued isolated torching in anticipated with group torching. Crown fire with high flames lengths is possible under forecasted conditions. Major fire growth is anticipated over the next 4 to 5 days as weather conditions become more conducive to large fire growth.

The following table shows the average daily fire spread in chains, estimated fire size by date, and total daily fire growth in acres (* means no data is available).

Date	Average Daily Spread (chains)	Est. Size (acres)	Total Daily Growth (acres)
6/6	*	1.5	1.5
6/7	*	*	*
6/8	*	4	2.5
6/9	*	11	7
6/10	*	50	39
6/11	*	100	50
6/12	20	267	255

Weather and Climatology

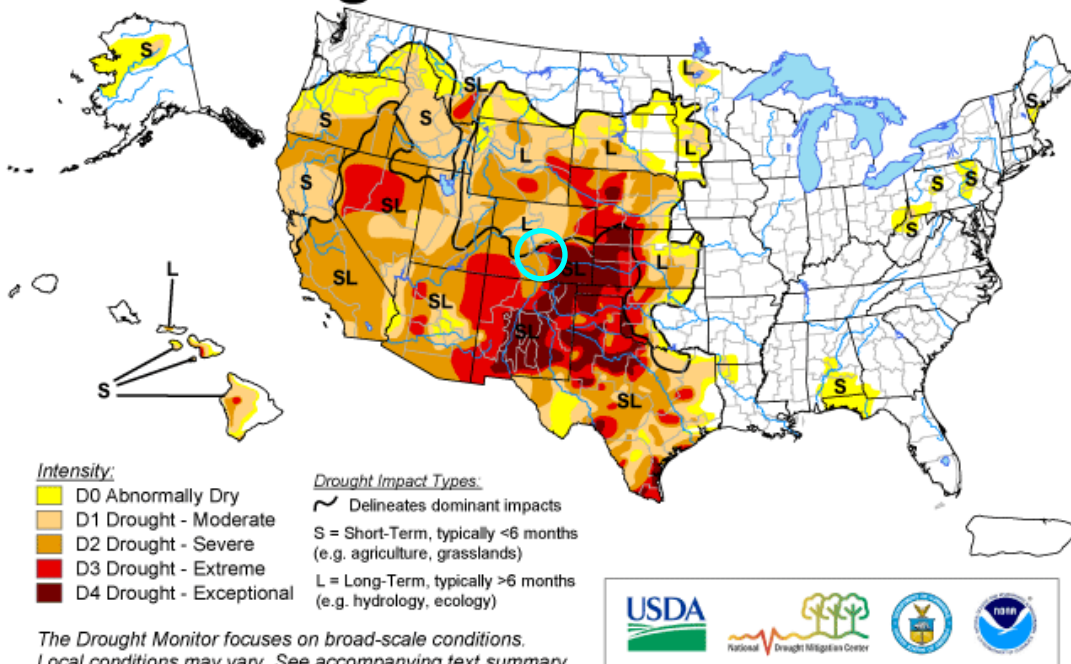Long-Term Weather Trends and Seasonal Severity

Conditions are continuing to dry out in southern Colorado. Energy Release Component (ERC) values are well above the 97th percentile for the Sand Dunes RAWS (see the chart below) and have reached maximum recorded values. The Black Mountain RAWS ERC values are currently above the 90th percentile and the Willis Creek RAWS ERC values are just below the 90th percentile. Calculated 1,000-hour moisture values have exceeded the 97th percentile at Sand Dunes (see the chart below), and conditions have exceeded the 90th percentile at Black Mountain and Willis Creek.

055503-SAND DUNES 2003−2012

055503-SAND DUNES 2003−2012
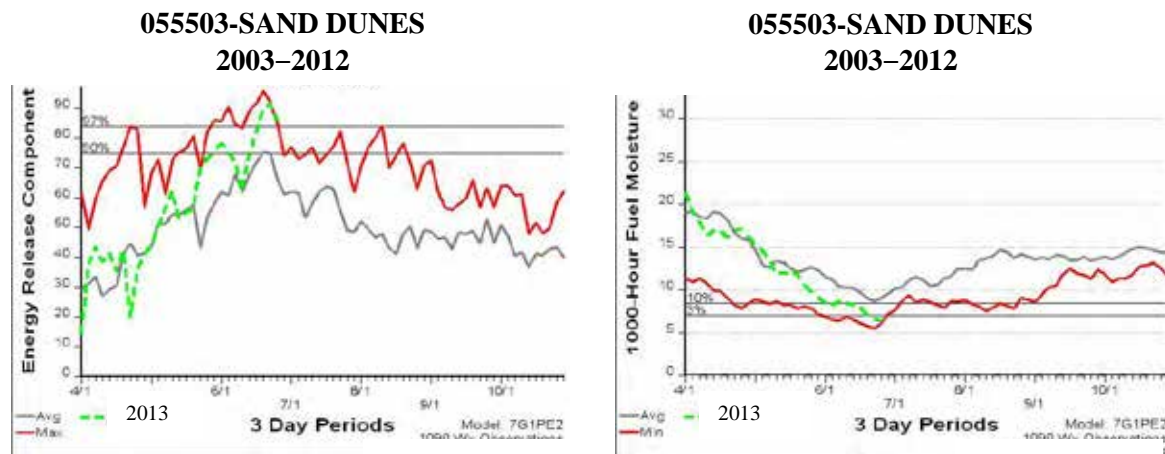
The U.S. Drought Monitor dated June 10 (below) shows that Alamosa County is currently experiencing severe conditions. This is a change over the U.S. Drought Monitor map released in April, which showed abnormally dry conditions for Alamosa County. The increasing drought conditions are also represented by the 12-month Percent of Average Precipitation map through May 2013, which shows Alamosa and Saguache counties (circled in red) as "very dry." The area around the Preserve Fire has received less than 50% of normal precipitation over the last 9 months (circled in blue on the Percent of Average Precipitation map below). The U.S. Seasonal Drought Outlook (below) shows the drought persisting or intensifying in the area where the fire is located. NOAA weather and climatology outlooks are below.
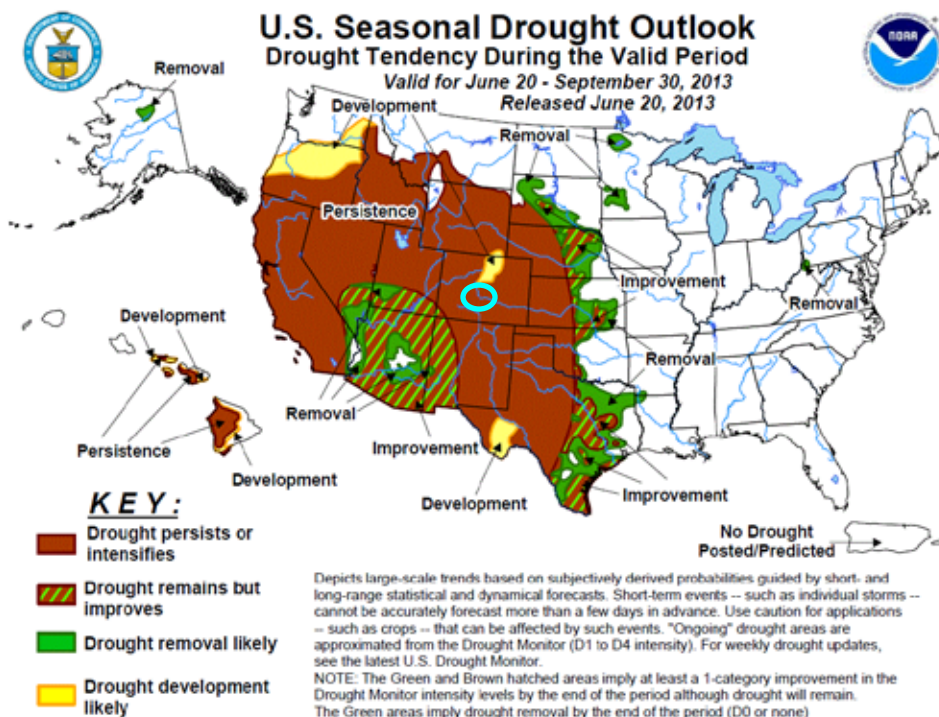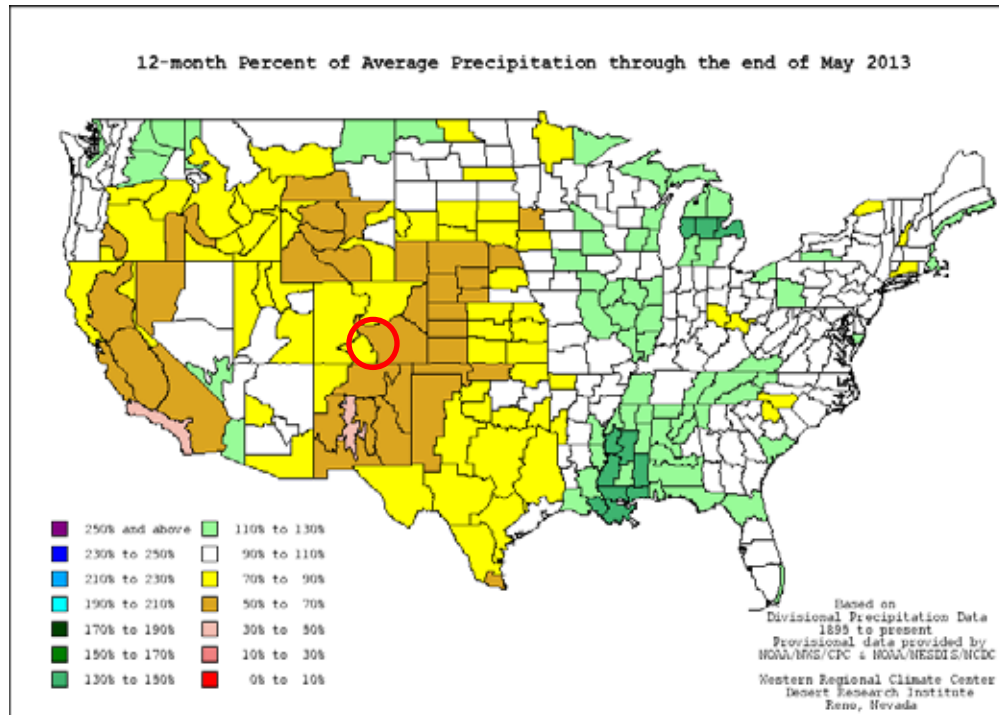
U.S. Drought Monitor

June 10, 2013
Valid 7 a.m. EST

Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

~ Delineates dominant impacts

S = Short-Term, typically <6 months
(e.g. agriculture, grasslands)

L = Long-Term, typically >6 months
(e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions.
Local conditions may vary. See accompanying text summary
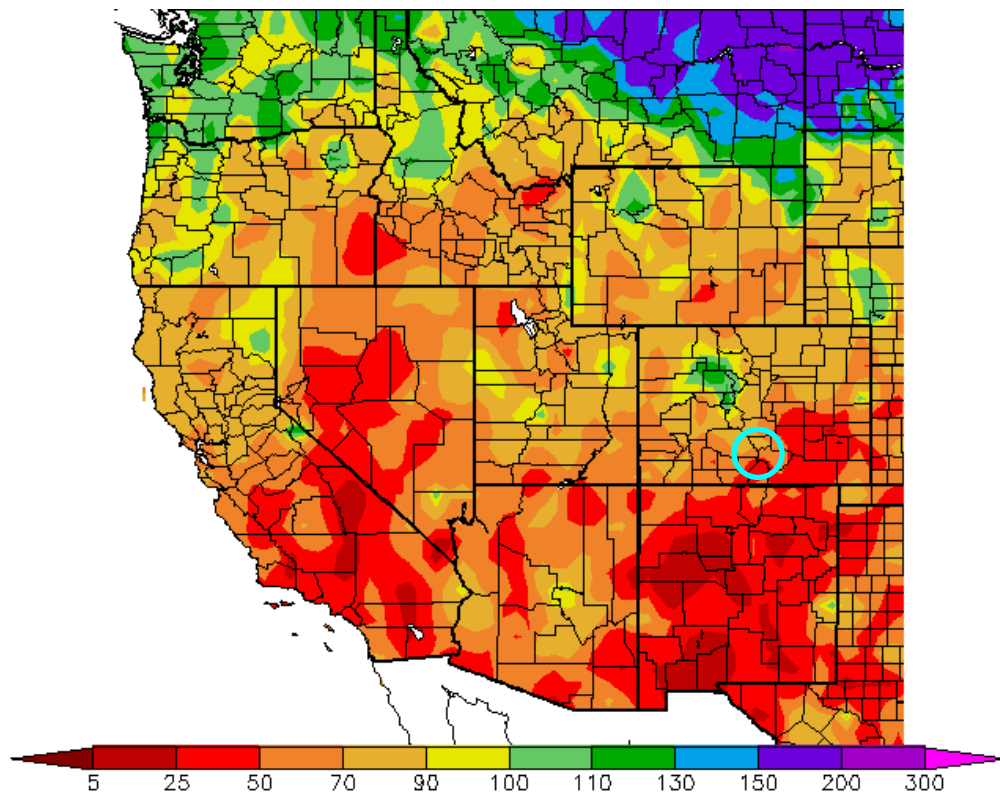for forecast statements.

http://droughtmonitor.unl.edu/

USDA National Drought Mitigation Center

Released Monday, June 10, 2013

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid for June 20 - September 30, 2013
Released June 20, 2013

Removal
Development
Removal
Persistence
Development
Improvement
Removal
Development
Persistence
Removal
Improvement
Development
Improvement
Improvement
No Drought
Posted/Predicted

K E Y :

- Drought persists or intensifies
- Drought remains but improves
- Drought removal likely
- Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and
long-range statistical and dynamical forecasts. Short-term events -- such as individual storms --
cannot be accurately forecast more than a few days in advance. Use caution for applications
-- such as crops -- that can be affected by such events. "Ongoing" drought areas are
approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates,
see the latest U.S. Drought Monitor.
NOTE: The Green and Brown hatched areas imply at least a 1-category improvement in the
Drought Monitor intensity levels by the end of the period although drought will remain.
The Green areas imply drought removal by the end of the period (D0 or none).

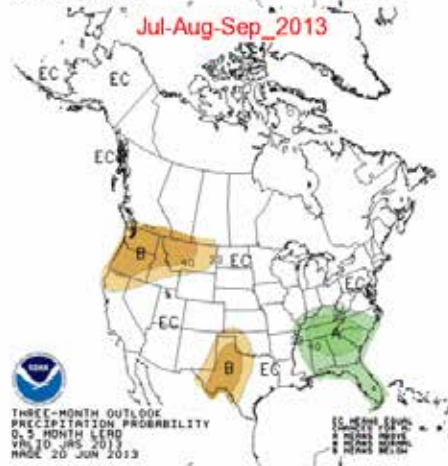12-month Percent of Average Precipitation through the end of May 2013
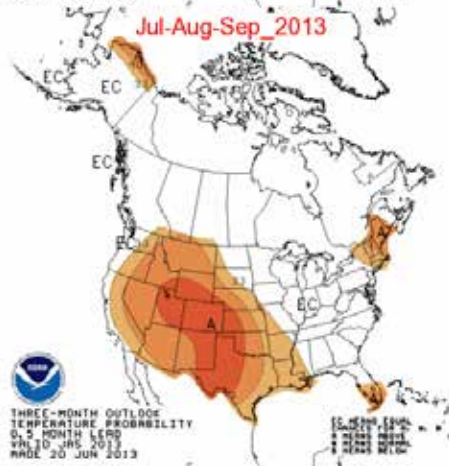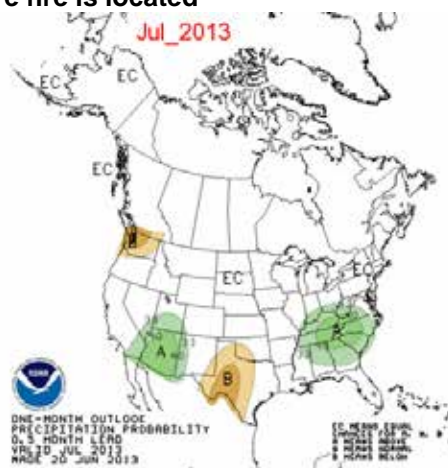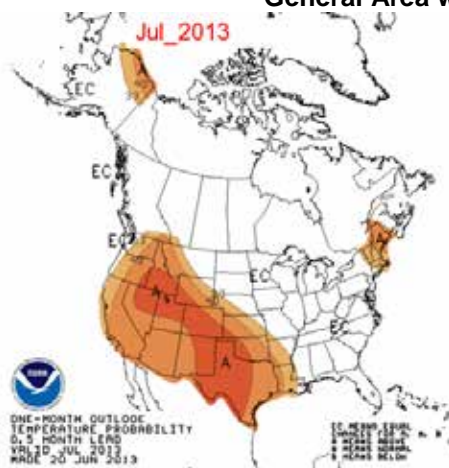
Percent of Average Precipitation (%)
10/1/12 – 6/11/2013

Generated 6/10/2013 at HPRCC using provisional data.

8-14 day outlook – Temp Probability – Valid thru 6/24/13

8-14 day outlook – Precip Probability – Valid thru 6/24/13

General Area where fire is located

Fuel Moisture Data

Live fuel moistures sampled on June 10 at the Sand Dunes RAWS (8,324 feet, Great Sand Dunes National Park) are as follows:

- Perennial grass (*Hesperostipa comata*): 104%
- Rubber rabbitbrush (*Ericameria nauseosa*): 190%
- Piñon pine (*Pinus edulis*): 115%

1,000-hour dead fuel moisture is 7%.

Live fuel moistures sampled on June 6 at the Black Mountain RAWS (8,982 feet, Pike-San Isabel National Forest) are as follows:

- Rocky Mountain juniper (*Juniperus scopulorum*): 92%
- Ponderosa pine (*Pinus ponderosa*): 87%
- Piñon pine: 92%

1,000-hour dead fuel moisture is 7%; duff moisture content is 11%.

Long-Term Weather Outlook

2-DAY OUTLOOK... Monday, June13, through Tuesday, June 14
The high-pressure ridge will linger in the area with a gradual transition to a drier flow on Wednesday and Thursday. Temperatures will begin to rebound with highs in the mid-70s (°F) and winds becoming south to southwest.

3- TO 5-DAY OUTLOOK…Wednesday, June 15, through Sunday, June 19
A much drier southwest wind flow pattern will develop as the fire area will be in between high pressure to the southeast and low pressure over the Great Basin. Afternoon temperatures will reach 80 °F with a slight chance of thunderstorms each afternoon. The next chance of measurable precipitation will be dependent upon where Tropical Depression Alex makes landfall, which is uncertain at best.

6- TO 14-DAY OUTLOOK… Monday, June 20, through Monday, June 27
Normal temperatures are expected. Due to the forecast of an active hurricane season in the Gulf of Mexico, there is also an increasing likelihood of above-median precipitation in monsoon flow, but a slightly delayed onset in the southerly flow that will provide that source. One thing to watch will be the influence of the persistent pattern of deep low-pressure troughs into the Pacific Northwest and Great Basin as these have suppressed the high pressure ridge and associated premonsoon flow further to the southeast.

30-DAY OUTLOOK…Month of July
According to the Climate Prediction Center, "La Nina-like conditions have recently appeared and the current El Nino Southern Oscillation state is best classified as Neutral. An official classification of La Nina requires at least three consecutive months of La Nina conditions." The outlook calls for above-normal temperatures and near-normal precipitation.

SEASONAL OUTLOOK… August through September
Predictions from the Climate Prediction Center's Consolidation forecast indicate a 70% chance of La Nina continuing to intensify through the period.

The climate data for Willis Creek RAWS (WLCC2) 28 miles east-northeast of the fire source is:

Month	Mean High Temperature (°F)	Mean Low Temperature (°F)	Mean Precipitation (inches)
July	74.5	48.3	3.44
August	72.3	47.3	4.02
September	67.5	40.9	1.76

The National Weather Service's Climate Prediction Center predicts above-average temperatures and below-average precipitation throughout most of Colorado through the month of June. Predictions through the end of September are for above-average temperatures and near-average precipitation in the fire area. Eastern Colorado is predicted to receive below average precipitation over the next 3 months.

Wind Analysis

An analysis of winds was conducted using historical weather data from the Sand Dunes and Black Mountain RAWS to determine the most likely direction of fire spread. Historical data analysis indicates that wind direction at the Sand Dunes RAWS during the burn period is typically from the east through northwest (clockwise). East through southeast winds tend to occur primarily in the evening hours. The Black Mountain RAWS experiences a strong southwest wind throughout the majority of the burn period, although east-southeast to southeast winds are not uncommon. Note that RAWS stations have limitations when predicting winds at the localized level. The wind roses below were analyzed for 1200-2359 time periods for the 2-week period between June 10 and July 1.
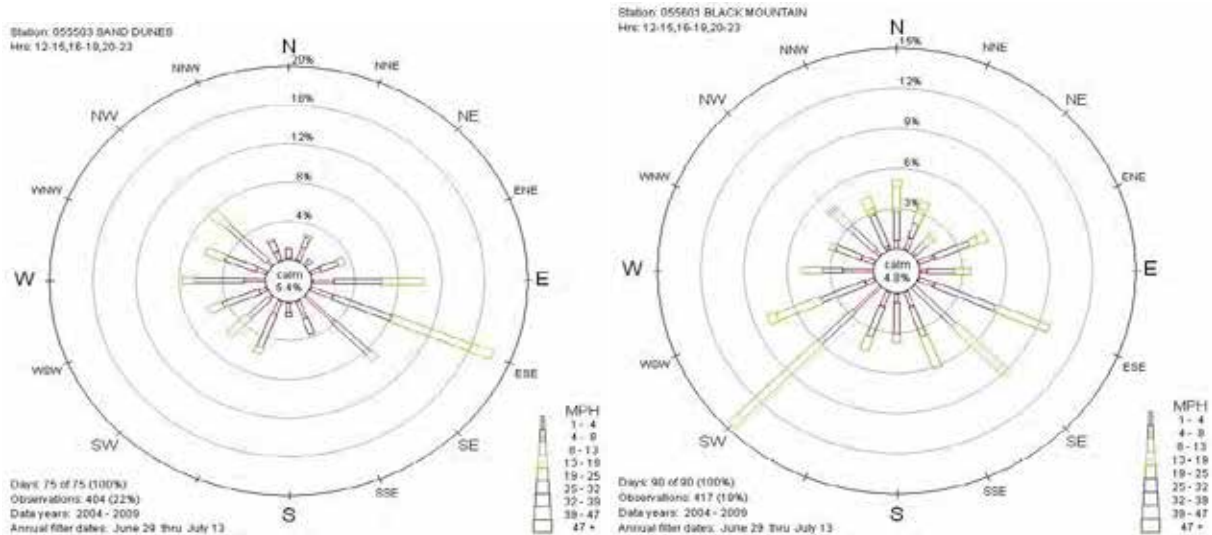
 "Rare event" fire spread would likely be associated with gusty winds associated with either a cold frontal passage or thunderstorms. Northerly winds would be considered a rare event that could push the fire down drainage towards the values at risk, particularly on the west side of the Sangre de Cristo range.

Probability of Fire-Slowing Event

There is a possibility of fire-slowing precipitation events before the end of fire season. Precipitation of at least 0.75 inch over a 3-day period might be expected to at least slow the fire spread for 2 to 3 days. Data from the Sand Dunes RAWS were analyzed to determine the likelihood of the fire area receiving fire-slowing precipitation. Based on historical weather records, it is most common to receive precipitation events between early July and early August (associated with the summer monsoon). Number of rain events exceeding 0.75 inch over 3 days (1999–2012):

June 16–30:   4
July 1–15:   13
July 16–31:   12
August 1–15:   12
August 16–31:   5
September 1–15:   3
September 16–30:   4
October 1–15:   5
October 16–31:   2

Probability of Season-Ending Event

If no significant precipitation is received, fire movement should be expected until season end. To determine the probability of a season-ending event, Energy Release Component was used. Reviewing the seasons for the Sand Dunes RAWS, when the ERC drops below 40 (60th percentile) and stays below that level, it seems to represent the end of the threat for large fires. Although the area does often experience a secondary rise in ERC values during late September through October following the end of the summer monsoons, no large fires occurred outside the "early" ERC peak in this analysis (1996–2009).

The data from Sand Dunes RAWS shows the following probabilities of a season-ending event:

50% probability by July 30
75% probability by August 16
90% probability by August 31
99% probability by September 27

Local Fire History

Park and Forest Service lands in the Preserve fire area have experienced 11 fires larger than 10 acres in the last 14 years (current analysis includes Great Sand Dunes National Park and Preserve; Pike and San Isabel National Forests, San Carlos Ranger District; and Rio Grande National Forest, Saguache and Conejos Peak Ranger Districts).

Sixty percent of the fires in the area occur during the months of June and July. Eighty-two percent of area fires occur within the period of June through August. Fire Family Plus was used to summarize fire history data for the area. The graphs below summarize the information.

Great Sand Dunes National Monument
03 Conejos Peak RD
06 Saguache RD
03 San Carlos RD
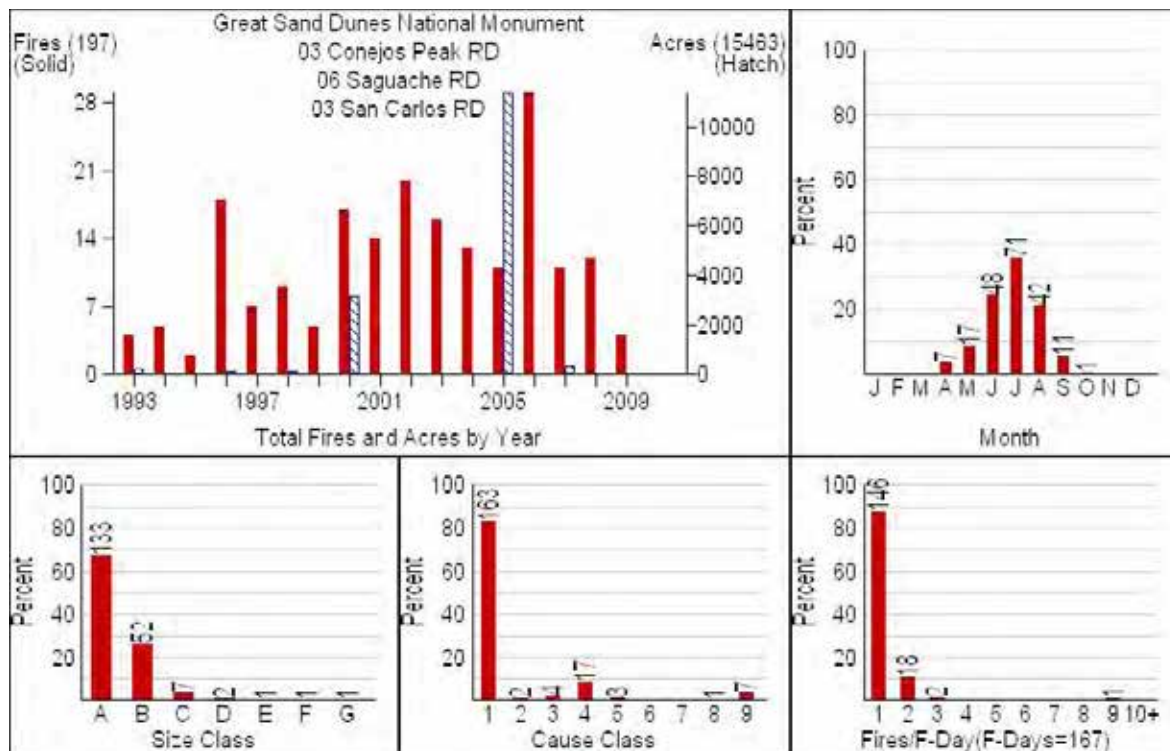
Most recent large fire history in the vicinity of the Preserve Fire and in similar fuel types includes the Mato Vega Fire, 14,000 acres in 2006 along the Sangre de Cristo Range 15 miles south near La Veta Pass. One other recent large fire to note is the Sand Fire 3,125 acres in 2000 in the lowlands south of the Sand Dunes which ran up to the woodland foothills above the Park Visitor Center just southwest of the Preserve Fire.

Fire Spread Probability (FSPro) Results

The FSPro output (below) was run on June 12, for the time period of June 13 through June 27 (14-day run, one without barriers). The Sand Dunes RAWS was used for fuel moistures and wind. This run was based on the calibration runs; further adjustments were made as necessary. The forecasted weather was used for the first 7 days. Beyond 7 days, historical data was used. This output is only valid through June 27, 2013, at which time it should be determined if future analyses are needed.

Preserve Fire – June 12, 2013
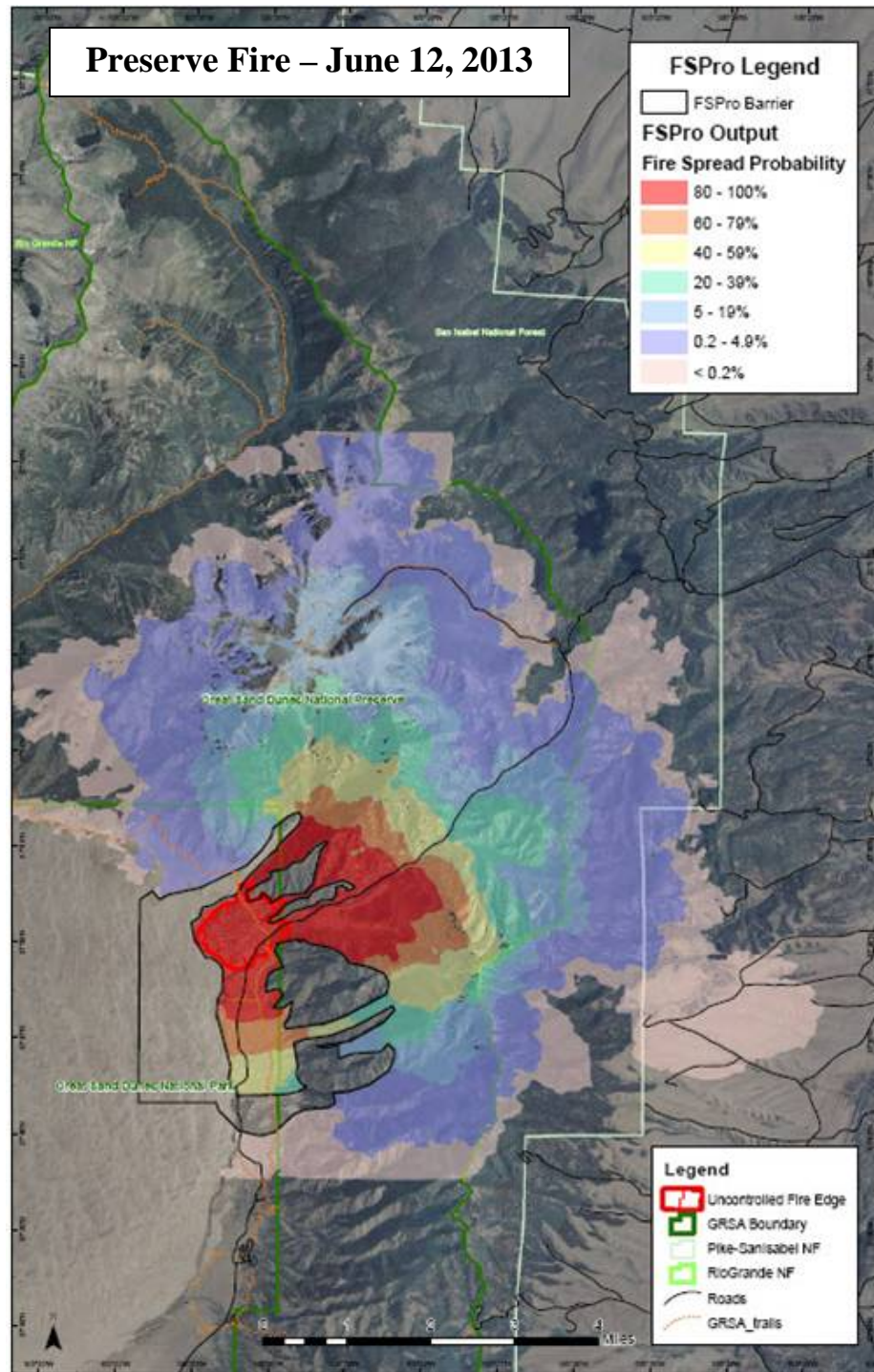
Fuel Model Descriptions

LANDFIRE National Fuel Model (092909) data were used with adjustments for fuel model and canopy characteristics. The table below describes the four predominant fuel models (>10%) found in the analysis area.

LANDFIRE Fuel Model	Scott and Burgan (2005) Fuel Model	Representative Vegetation Type	This model was used to:
165 – Very high load, dry climate timber-shrub	TU5	Timber/shrub mix	Predict spread probability in timber stands dominated by mixed conifer with heavy surface fuel loadings.
161 – Low load, dry climate timber-shrub-grass	TU1	Timber/shrub/grass mix	This model was used to predict spread probability in aspen stands.
183 – Moderate load, conifer litter	TL3	Timber/litter	This model was used to predict the spread probability in mixed conifer stands with moderate surface fuel loadings.
122 – Moderate load, dry climate grass-shrub	GS2	Grass/shrub mix	This model was used to predict spread probability in the shrub/grass communities.

Calibration of FSPro

The FSPro model was calibrated to better simulate actual ground conditions. The calibrations were based on the fire run that occurred on June 12. The ERC's were at the 79th percentile for that day. The following attributes were adjusted for calibration:

· Burn period
· Wind speed
· Spotting probability
· Canopy cover
· Canopy base height
· Canopy bulk density
· Live fuel moistures

Further adjustments were made to the model, only when necessary, as follows:

·   Southwest to east slope LANDFIRE data were modified to better represent fuel models and canopy characteristics.

Limitations and Assumptions of FSPro

·   FSPro uses the same underlying fire models as BehavePlus, FARSITE, and FlamMap. The assumptions and limitations of those models are also inherent in FSPro (e.g., uniform fuels, etc.).

·   The model probability spread assumes no suppression action has been taken on any portion of the fire. FSPro operator may manually input barriers to simulate line construction, natural barriers, etc.

·   The extremely rare event may or may not be represented by the simulation.

·   Limited fine-scale temporal variability in weather. This means that the weather is constant for the entire day (1 ERC value and related fuel moistures, 1 wind speed and wind direction).

·   The peak burning period is assumed because the ERC, fuel moisture, and wind are obtained at that time.

·   There is no correction of fuel moisture for elevation or aspect (forthcoming).

·   Winds and fuel moistures are independent.

·   No climate change prediction is available (assumes historic climate).

·   The extremely rare event may or may not be represented by the simulation.

·   The resulting burn probability maps are easily misinterpreted as a fire progression, such as in FARSITE. (**FSPro results show probability contours, NOT daily progression perimeters!**)

·   Model should not be used for tactical decisionmaking.

·   Model output is contingent upon model input and modeler expertise. FSPro can only be as accurate as the data used as inputs to the model. The following two data sources should be and were critiqued:

    -   **Landscape:** Needs to be up to date (often the landscape will need to be edited to provide realistic modeling results); use of the landscape editor might be needed. On the Preserve Fire, the landscape files were edited during calibration to better represent actual field conditions.

    -   **RAWS:** One or two can be selected and need to be representative of the analysis area for both ERC values, as well as wind values. On the Preserve Fire, several weather stations were analyzed with two being selected as most representative. Willow Creek RAWS was used to represent fuel moisture conditions on the Preserve Fire. Live fuel moistures were adjusted to better reflect actual fuel conditions on the incident. Various tools were used to determine live fuel moistures, including local sampling that occurred at Sand Dunes and Black Mountain RAWS.