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The Steamboat Springs Smoke-out: The Evolution of Impact-Based Decision Support

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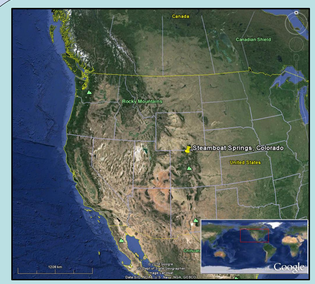


Figure 1. Map of Western United States

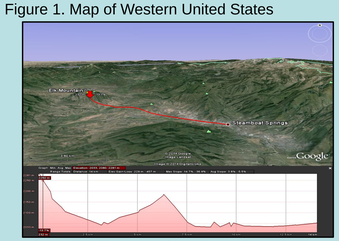


Figure 2. Elk Mountain to Steamboat Springs

Introduction

➢ A controlled burn was conducted on Elk Mountain about 15 km northwest of Steamboat Springs Colorado on 15 April 2010.

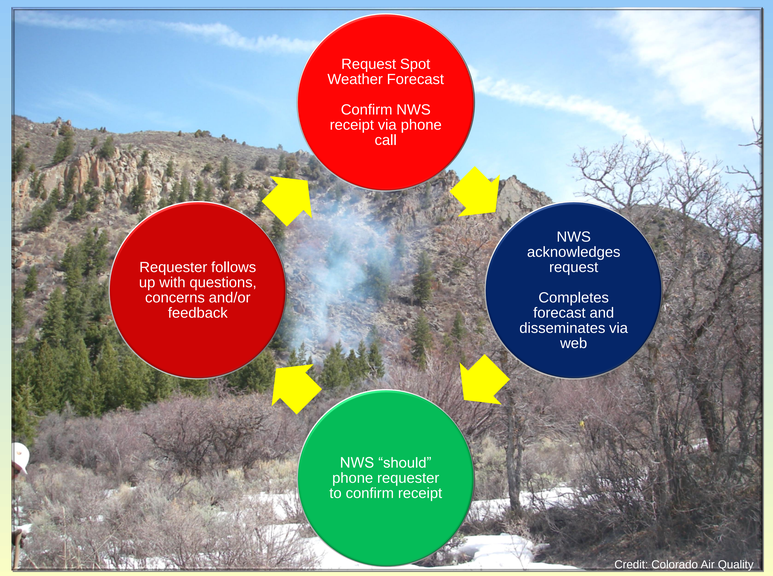
➢ The requesting agency submitted a spot weather forecast through normal National Weather Service (NWS) channels.

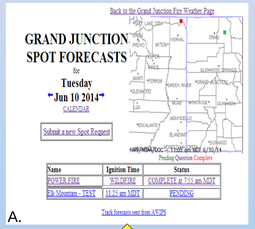
➢ NWS Forecasters completed request in timely fashion with only a brief phone conversation with the requesting dispatch center.

➢ Requesting agency had concerns about smoke getting into the Steamboat Springs Valley but failed to provide this critical piece of information to NWS forecasters.

➢ This study will look at how the decision support process has evolved and improved since this breakdown in communication occurred.

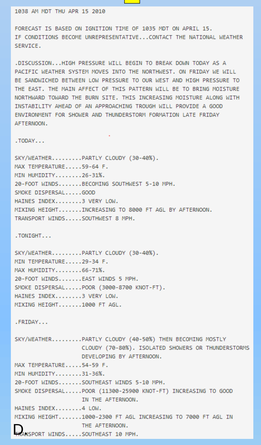
Process to Obtain Spot Weather





A.

B.



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1038 AM MDT THU APR 15 2010

FORECAST IS BASED ON IGNITION TIME OF 1035 MDT ON APRIL 15.
IF CONDITIONS BECOME UNREPRESENTATIVE...CONTACT THE NATIONAL WEATHER
SERVICE.

.DISCUSSION...HIGH PRESSURE WILL BEGIN TO BREAK DOWN TODAY AS A
PACIFIC WEATHER SYSTEM MOVES INTO THE NORTHWEST. ON FRIDAY WE WILL
BE SANDWICHED BETWEEN LOW PRESSURE TO OUR WEST AND HIGH PRESSURE TO
THE EAST. THE MAIN AFFECT OF THIS PATTERN WILL BE TO BRING MOISTURE
NORTHWARD TOWARD THE BURN SITE. THIS INCREASING MOISTURE ALONG WITH
INSTABILITY AHEAD OF AN APPROACHING TROUGH WILL PROVIDE A GOOD
ENVIRONMENT FOR SHOWER AND THUNDERSTORM FORMATION LATE FRIDAY
AFTERNOON.

.TODAY...

SKY/WEATHER.........PARTLY CLOUDY (30-40%).
MAX TEMPERATURE....59-64 F.
MIN HUMIDITY.......26-31%.
20-FOOT WINDS......BECOMING SOUTHWEST 5-10 MPH.
SMOKE DISPERSAL....GOOD
HAINES INDEX.......3 VERY LOW.
MIXING HEIGHT.....INCREASING TO 8000 FT AGL BY AFTERNOON.
TRANSPORT WINDS....SOUTHWEST 8 MPH.

.TONIGHT...

SKY/WEATHER.........PARTLY CLOUDY (30-40%).
MIN TEMPERATURE....29-34 F.
MAX HUMIDITY.......66-71%.
20-FOOT WINDS......EAST WINDS 5 MPH.
SMOKE DISPERSAL....POOR (3000-8700 KNOT-FT).
HAINES INDEX.......3 VERY LOW.
MIXING HEIGHT.....1000 FT AGL.

.FRIDAY...

SKY/WEATHER.........PARTLY CLOUDY (40-50%) THEN BECOMING MOSTLY
                    CLOUDY (70-80%). ISOLATED SHOWERS OR THUNDERSTORMS
                    DEVELOPING BY AFTERNOON.
MAX TEMPERATURE....54-59 F.
MIN HUMIDITY.......31-36%.
20-FOOT WINDS......SOUTHEAST WINDS 5-10 MPH.
SMOKE DISPERSAL....POOR (11300-25900 KNOT-FT) INCREASING TO GOOD
                    IN THE AFTERNOON.
HAINES INDEX.......4 LOW.
MIXING HEIGHT.....1000-2300 FT AGL INCREASING TO 7000 FT AGL IN
                    THE AFTERNOON.
TRANSPORT WINDS....SOUTHEAST 10 MPH.
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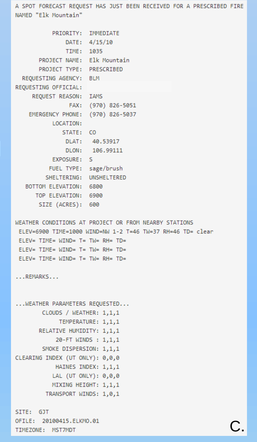
D.



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A SPOT FORECAST REQUEST HAS JUST BEEN RECEIVED FOR A PRESCRIBED FIRE
NAMED "Elk Mountain"

          PRIORITY:  IMMEDIATE
              DATE:  4/15/10
              TIME:  1035
       PROJECT NAME:  Elk Mountain
       PROJECT TYPE:  PRESCRIBED
 REQUESTING AGENCY:  BLM
REQUESTING OFFICIAL:
    REQUEST REASON:  IAWS
               FAX:  (970) 826-5051
 EMERGENCY PHONE:  (970) 826-5037
          LOCATION:
             STATE:  CO
              DLAT:   40.53917
              DLON:   106.99111
         EXPOSURE:  S
         FUEL TYPE:  sage/brush
        SHELTERING:  UNSHELTERED
 BOTTOM ELEVATION:  6000
    TOP ELEVATION:  6900
     SIZE (ACRES):  600

WEATHER CONDITIONS AT PROJECT OR FROM NEARBY STATIONS
 ELEV=6900 TIME=1000 WIND=NW 1-2 T=46 TW=37 RH=46 TD= clear
 ELEV= TIME= WIND= T= TW= RH= TD=
 ELEV= TIME= WIND= T= TW= RH= TD=
 ELEV= TIME= WIND= T= TW= RH= TD=

...REMARKS...


...WEATHER PARAMETERS REQUESTED...
        CLOUDS / WEATHER:  1,1,1
             TEMPERATURE:  1,1,1
        RELATIVE HUMIDITY:  1,1,1
              20-FT WINDS :  1,1,1
         SMOKE DISPERSION:  1,1,1
CLEARING INDEX (UT ONLY):  0,0,0
            HAINES INDEX:  1,1,1
             LAL (UT ONLY):  0,0,0
            MIXING HEIGHT:  1,1,1
        TRANSPORT WINDS:  1,0,1

SITE:  GJT
OFILE:  20100415.ELKMO.01
TIMEZONE:  MST7MDT
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C.

Images A-D (Top left clockwise to bottom left). A. Sample of spot request page for NWS Grand Junction. B. Form to submit request for formal spot weather forecast. C. Information submitted to forecasters (note: No comments in remarks regarding critical nature of spot). D. Forecast submitted back to web. Follow up call made to ensure receipt and ask for questions on the forecast.

15 April 2010 Case

➢ Spot Weather request received by NWS Grand Junction at 1614 UTC.

➢ Concern of smoke moving into Steamboat Springs was not relayed to the forecasters.

➢ Forecaster completed forecast based on latest model information, submitted to web site, and contacted fire dispatch to notify them that the spot was ready.

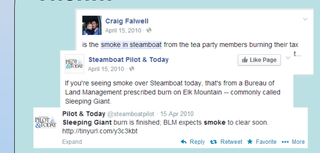
➢ No other communication made between the requester and the NWS office.

➢ Colorado Air Quality contacted NWS Grand Junction late in the afternoon to notify them that Steamboat Springs had been "smoked-in".

➢ Colorado Air Quality suggested an after action review to discuss ideas with the NWS on how to improve communication so this would not happen again.

Could Social Media Enhance a Forecast?

Then…



- Social Media from sources such as Twitter and Facebook were virtually non-existent to NWS forecasters in 2010.
- By 2014, reports on most weather phenomena are being generated by the dozens and in real-time.
- This new source of information will allow adjustments to be made "on-the-fly" and will improve communication.

…and Now

Conclusions

➢ Requesting agency operations and fire crews were "surprised" by the heavy smoke that descended upon the town of Steamboat Springs, CO.

➢ NWS Forecasters worked up forecast based on information given to them at the time of the request.

➢ Requesting agency failed to request follow-up forecasts or ask questions, even after it became evident that the smoke was not dispersing as forecast.

➢ After event action items included increased discussion between the requesting agency and the NWS forecasters.

➢ More frequent phone and face-to-face communication with concerns from all parties involved expressed prior to any ignition.

➢ Better sharing of critical concerns, especially near mountain communities.

➢ New forecasting tools and improved modeling are further enhancing forecasts in complex terrain.

➢ Social media influence on information sharing continues to grow and is offering a new tool for all parties.