NOAA's NWS Fire Weather Program

Rhett Milne

WCM/ IMET

National Weather Service Reno, NV

Fire Partners

- **Federal Land Agencies**
  - ***USFS, BLM, NPS, BIA, FWS***
- **State Agencies**
  - ***Parks and Forestry Departments***
- **Local Agencies**
  - ***County, City and Volunteer Fire Departments***

NOAA's NWS Role in Fire

- "…protection of life and property and the enhancement of the national economy. "
- **Fire Weather Forecasts are issued for** ***firefighter and public safety*** **and the** ***protection of homes and businesses.***

Large Fires of the last 5 years

These are all the largest Fires in these states recorded histories

- Rodeo-Chediski Fire (Arizona) 2002
- Biscuit Fire (Oregon) 2002
- Hayman Fire (Colorado) 2002
- Cedar Fire (California) 2003
- Taylor Complex (Alaska) 2004

Rodeo-Chedeski Fire

- Two massive fires merge together
- Chediski Fire started as a signal fire from lost hiker
- 462,614 acres
- 426 structures lost
- $153 million dollars to fight

Hayman Fire Colorado

- Arson Caused (Forest Service Worker)

- 138,000 acres burned
- 132 homes destroyed
- $240 Million to fight
- 3 killed en route to it
- 30 miles SW of Denver

Biscuit Fire

Oregon - July, Aug, Sept, Oct, Nov

- Lightning caused
- 499,965 acres burned
- Burned for 120 days
- 4 homes destroyed
- $123 million to fight

Cedar Fire

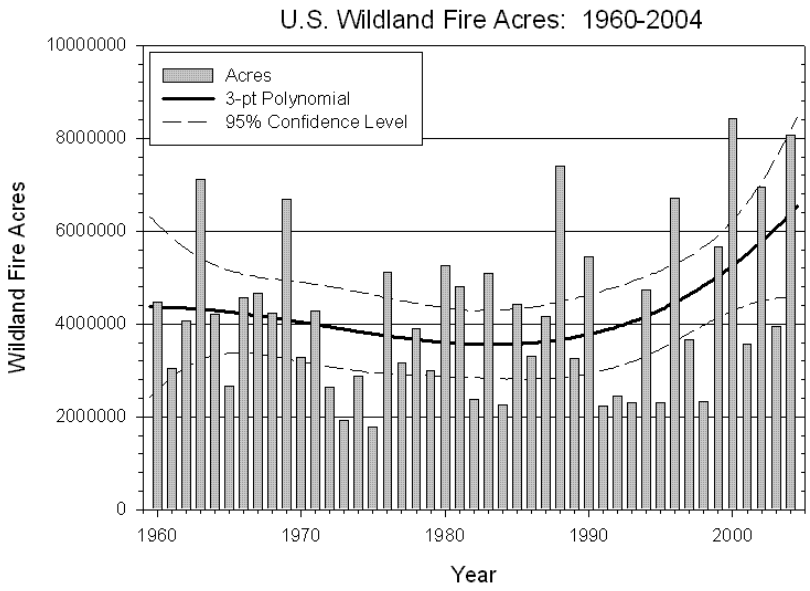
- 280,293 acres
- Lost Hunter lighted a signal fire
- 2,232 homes destroyed
- 14 killed
- ~ $100-200 million

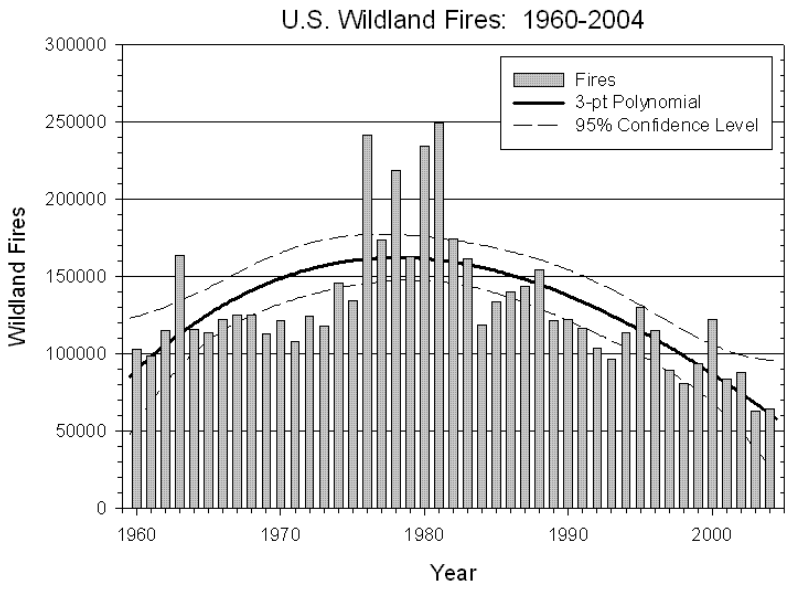
These 4 Fires Combined

- ~ 1.4 million acres (roughly ½ size of Connecticut)
- ~ 3000 homes destroyed
- ~ $600-$700 million to fight (federal budget for annual wildland firefighting is ~ $400-500 million)
- 90,000 fires per year average
- 3 out of 4 were stupid human tricks (arson and lost hikers)

Alaska Large Fires 2004

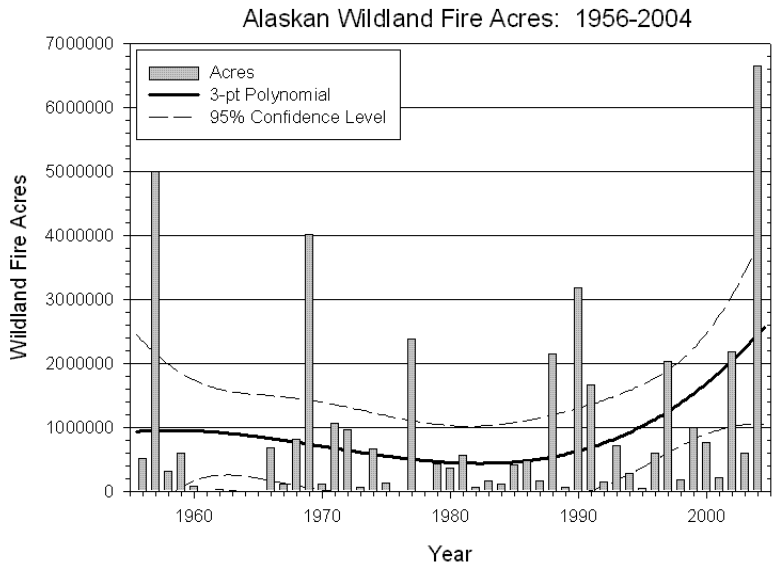
- 1,305,252 acres in just the Taylor Complex

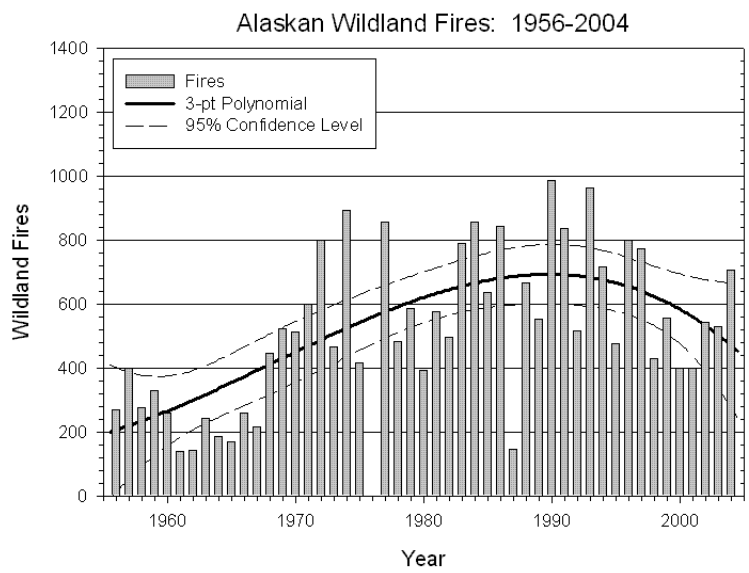




weather

NOAA National Weather Service

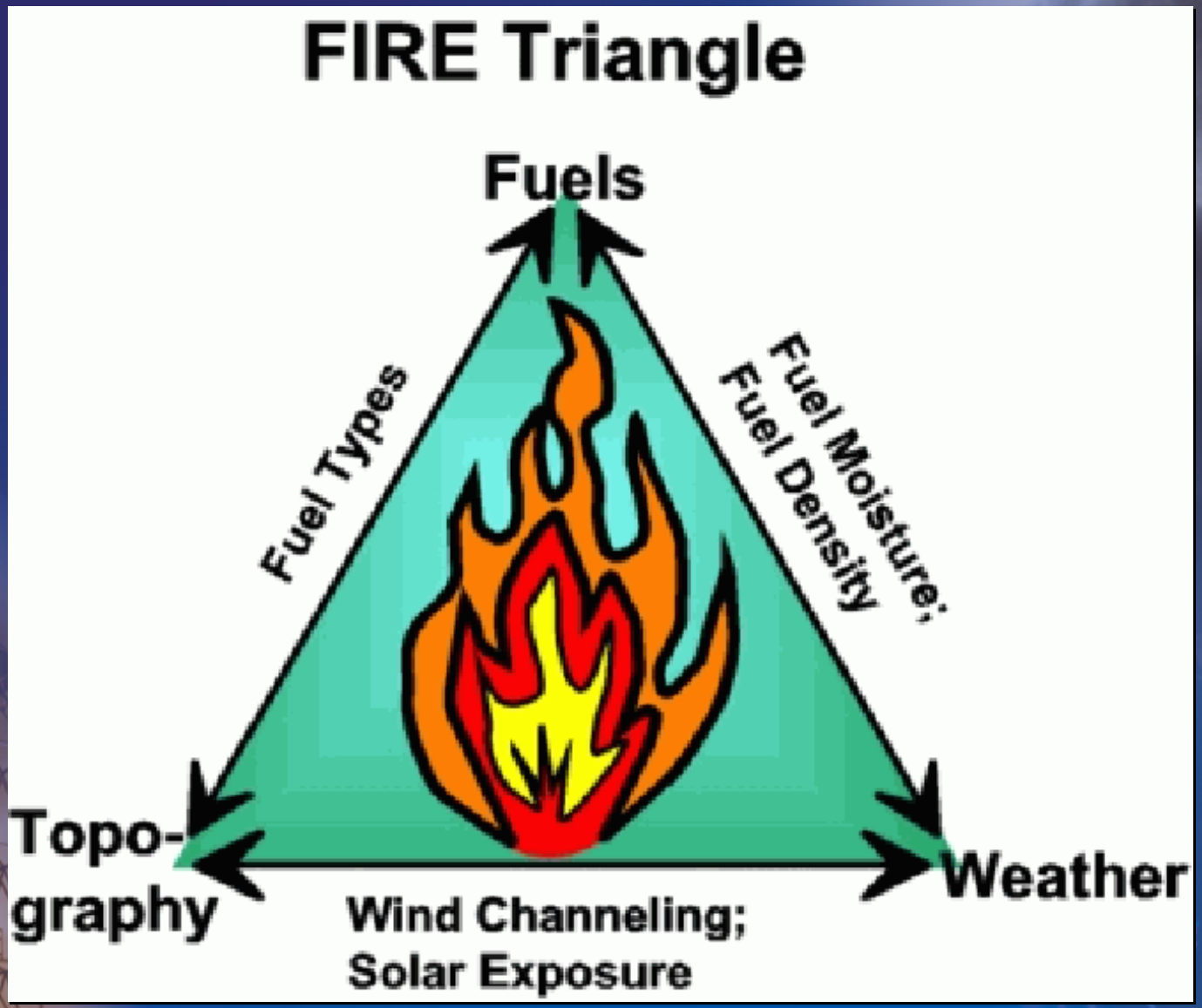

Alaskan Wildland Fire Acres: 1956-2004
Acres
3-pt Polynomial
95% Confidence Level
Wildland Fire Acres
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
1960
1970
1980
1990
2000
Year


Alaskan Wildland Fires: 1956-2004
Fires
3-pt Polynomial
95% Confidence Level
Wildland Fires
1400
1200
1000
800
600
400
200
0
1960
1970
1980
1990
2000
Year

Does Size Matter?

- October 1991
- Oakland Hills Fire (California)
- 25 Killed
- 2,900 Structures Destroyed
- $1.5 Billion in damages
- 1,500 acres!!!

Weather is the most variable!!

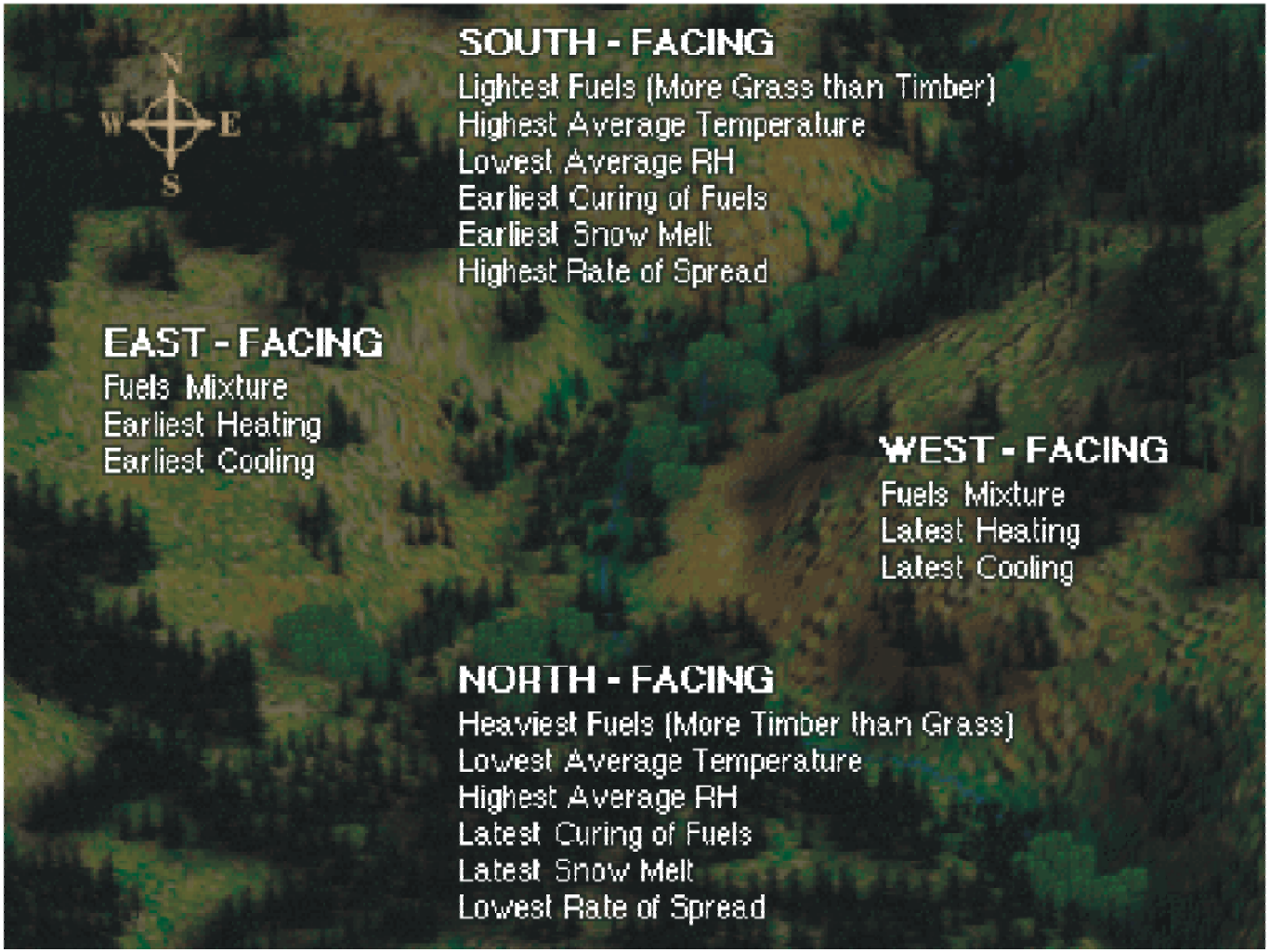


Slope Effects

The COMET Program

Slope Effects

Slope Aspect



The COMET Program

NOAA's NWS Fire Services

- Fire Weather Planning Forecasts (FWF)
- Red Flag Warnings/Fire Weather Watches (RFW)
- Spot Weather Forecasts
  - *Wildfires, Rx Burns, HAZMAT*
- NFDRS Trend Forecasts
  - *National Fire Danger Rating System*
- Incident Meteorologists (IMET)
- Digital Services

Fire Weather Planning Forecasts

- Issued at least 2 times per day during fire season.
  - *7:30 am & 3:30 pm*
- **Headline - Red Flag Warning/Other**
- **Discussion-Clear and Concise: The WHY!!!**
- **Forecast (today, tonight, tomorrow)**

  -Sky/Weather
  -Temps (valley floor and mid-slope)
  -Relative Humidity
  -Wind (valley/slope and ridgetops)
  -Lightning Activity Level (LAL)
  -Haines Index
  -Transport Wind
  -Mixing Height
  -Ventilation Index
  -Chance of Wetting Rain (> 0.10")
  -Extended forecast (days 3-7)
  -Outlook (days 8-14)

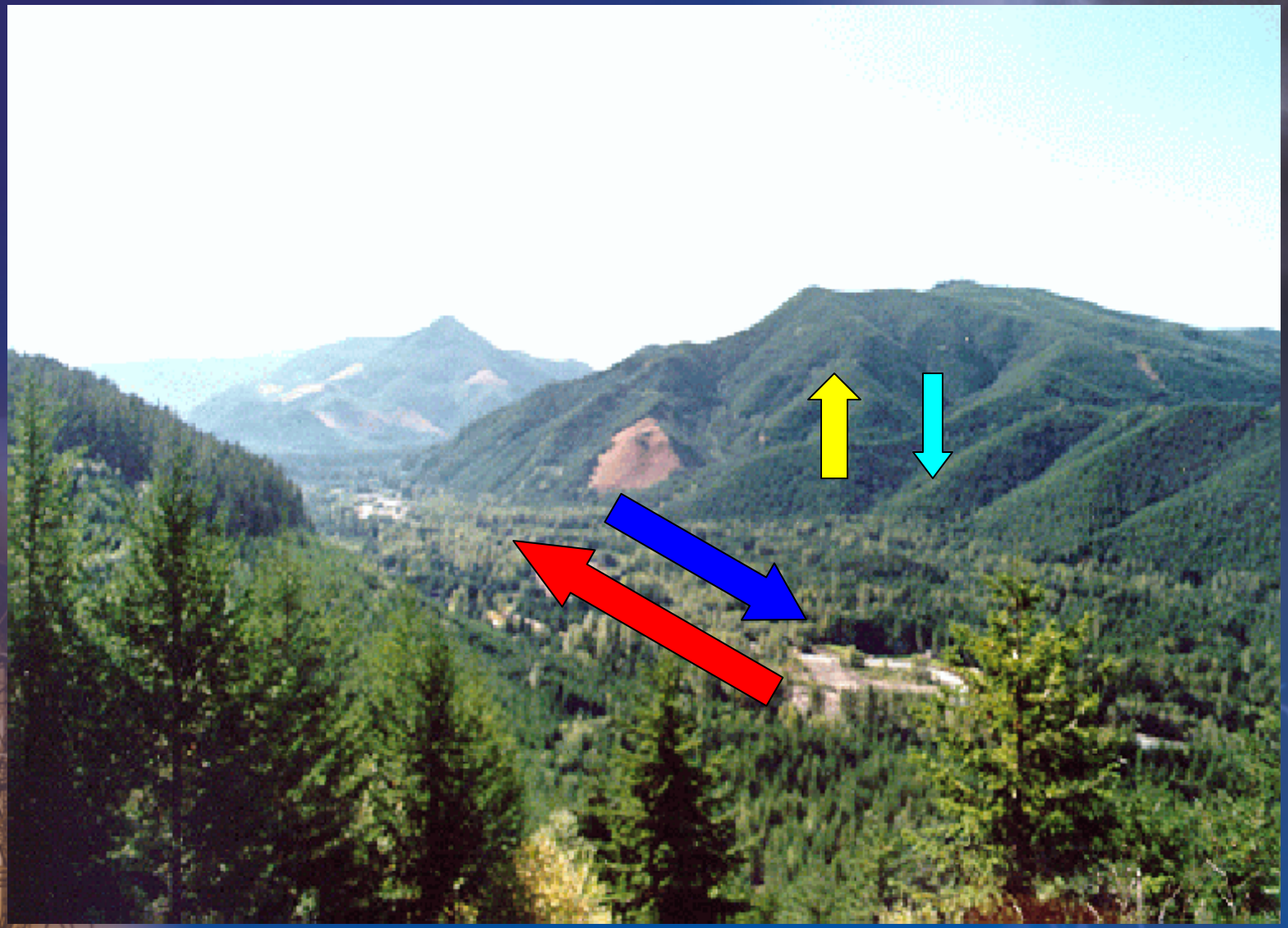
Mixing Height

- MH- the height above the surface through which relatively vigorous mixing will take place due to convection

- - MH = How high will the smoke column rise

Transport Wind

Terrain Winds



Haines Index

- An index to categorize the potential for large fire growth (plume dominated fire)
- Does not take into account wind!!!

- Haines Index = stability term + moisture term

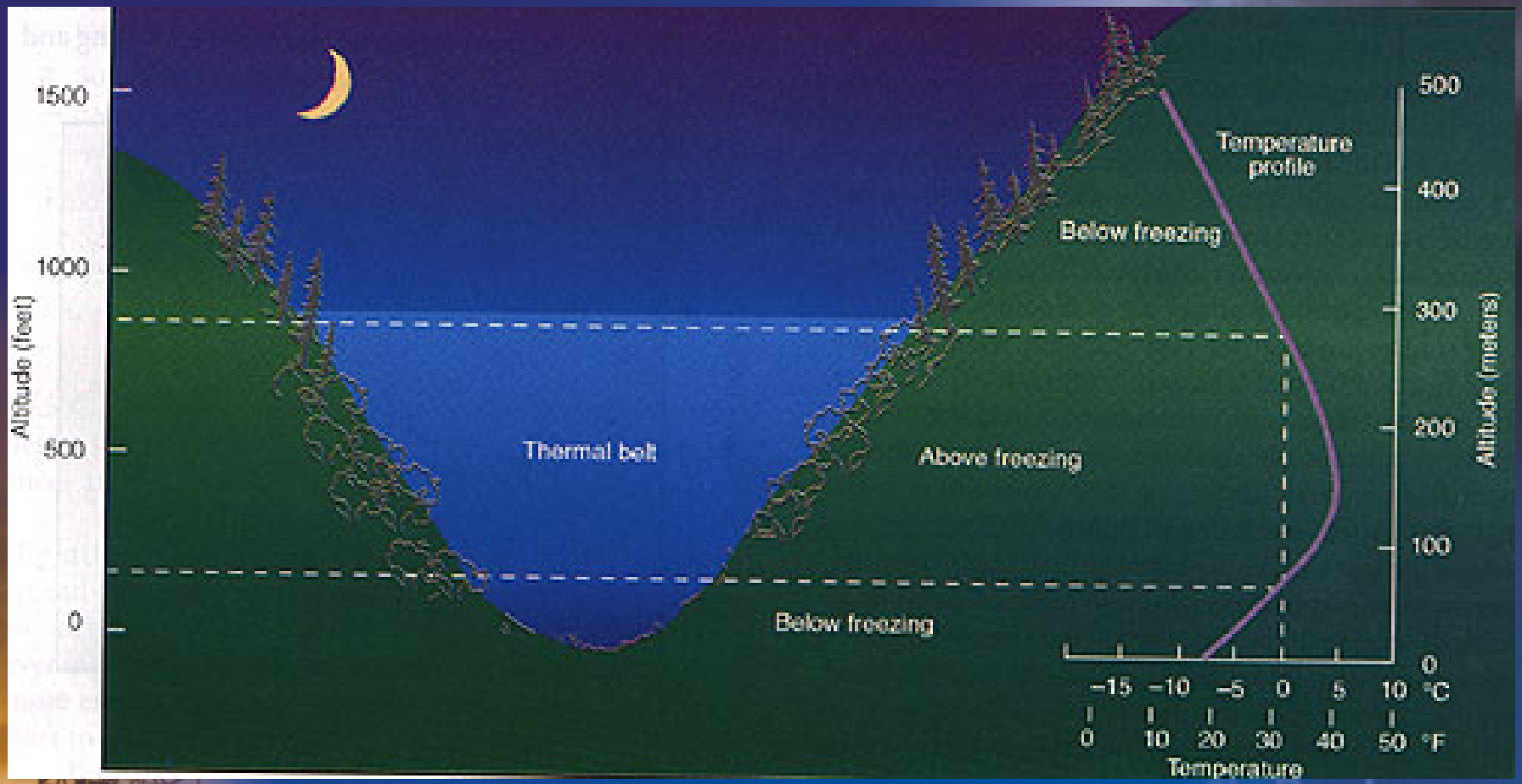
- Haines Index values range from 2 to 6
- High values (5 or 6) indicate dry, unstable air
- Low values (2 or 3) indicate moist, stable air

Fire Weather Planning Forecasts

Narrative Format – Western States

```
.TODAY...
 SKY/WEATHER.........PARTLY CLOUDY WITH ISOLATED THUNDERSTORMS IN THE
                     AFTERNOON.
  MAX TEMPERATURE:
      4000 FEET.......90-100.
      7000 FEET.......75-85.
      24 HR TREND.....DOWN 5 DEGREES
 MIN HUMIDITY:
      4000 FEET.......10-15 PERCENT.
      7000 FEET.......15-20 PERCENT.
      24 HR TREND.....UP 5 PERCENT
 WIND (SLOPE/VALLEY=20 FT, 10 MIN AVG):
      SLOPE/VALLEY....UPSLOPE 3-5 MPH BECOMING SOUTHEAST 15 MPH BY 2 PM
      10000 FT MSL....SOUTH 10 TO 20 MPH.
 CHANCE OF PRECIP....20 PERCENT.
 CWR (>= 0.10 IN)....5 PERCENT.
 LAL.................2.
 HAINES INDEX........6.
 MIXING HEIGHT.......18000 FT AGL.
 TRANSPORT WINDS.....SOUTH 10 TO 15 KNOTS.
 VENTILATION.........EXCELLENT.
```

Thermal Belts



Fire Weather Planning Forecasts

Tabular Format – Central and Eastern States

	TODAY	TONIGHT	TUE
CLOUD COVER	PCLDY	MCLDY	MCLDY
PRECIP TYPE	NONE	NONE	TSTMS
CHANCE PRECIP (%)	0	0	20
TEMP (24H TREND)	70 (-1)	36 (-4)	61
RH % (24H TREND)	22 (-1)	72 (+9)	43
20FTWND-AM(MPH)	W 11		LGT/VAR
20FTWND-PM(MPH)	W 6	LGT/VAR	N 5
MIXING HGT(FT-AGL/MSL)	7409		11580
TRANSPORT WND (KTS)	SW 10		SE 7
HAINES INDEX	VERY LOW	VERY LOW	VERY LOW

Red Flag Conditions

- **A critical weather pattern that could lead to the occurrence of extreme fire behavior or numerous fires starts.**
- **Any weather conditions that pose a danger to firefighter safety.**
- **Requires the combination of receptive fuels and a critical fire weather pattern.**
  - ***Low RH and Gusty Winds***
  - ***Dry Lightning***

Fire Weather Watch

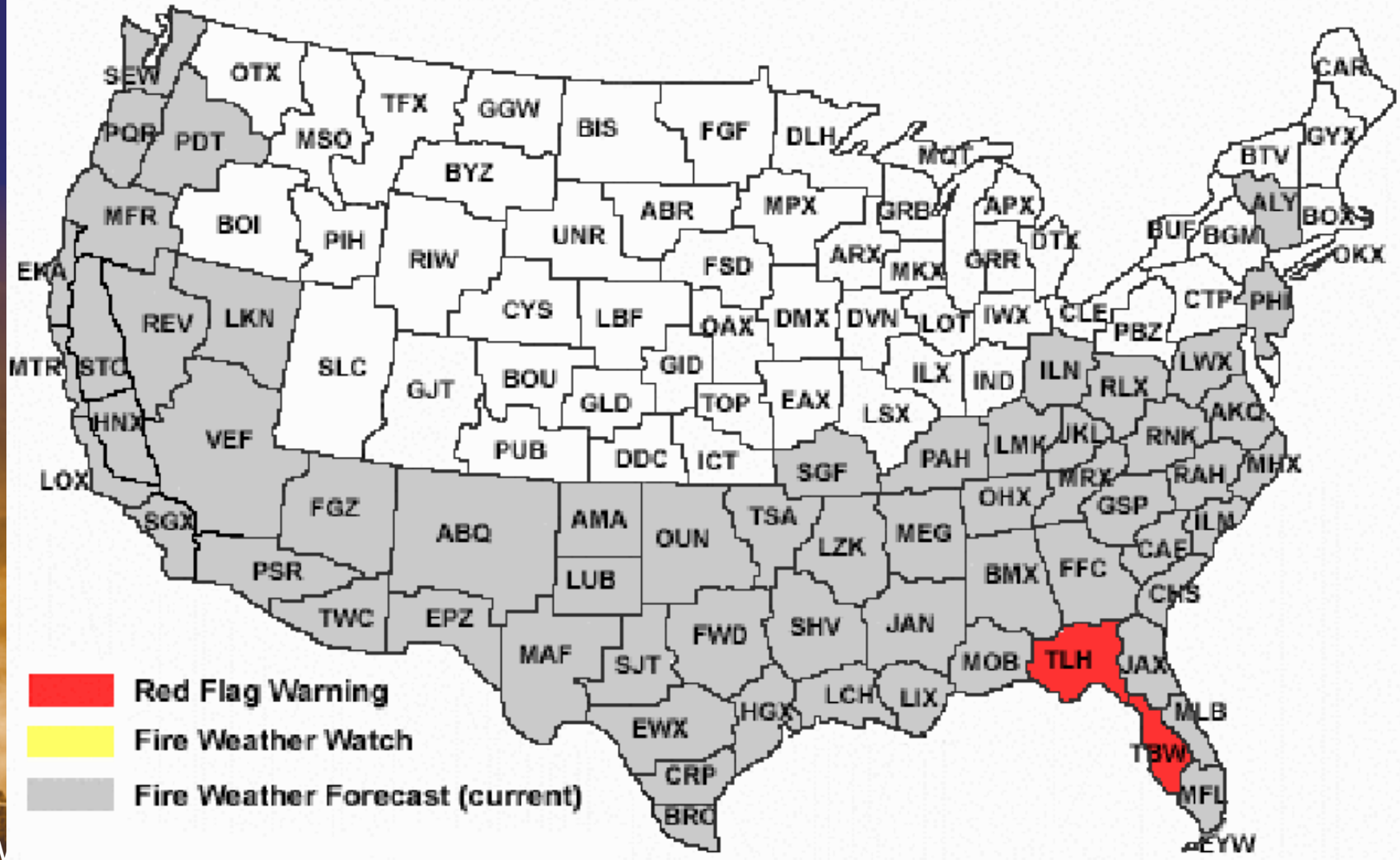
- Used to alert fire management agencies for the possible development of a Red Flag Event.
- Issued when the forecaster has reasonable confidence that the critical weather conditions will develop.
- Watch issued between 24-72 hours in advance of the expected onset of the event.
- Watch may be issued within 12-hours for possible Dry Lightning events only.

RED FLAG WARNING

- Upgrade of a Watch or issued as is.
- Issued when Red Flag conditions are occurring or when there is a high degree of confidence that Red Flag conditions will occur within 24-hours.

Clickable Map for FWF and RFW

http://fire.boi.noaa.gov/



Spot Weather Forecast

- Site specific forecasts requested by user agencies in support of wildfires, prescribed burns, HAZMAT incidents, Homeland Security, or other related emergency response.

- Available 24-hours a day: 365 days a year

Reno Spot Forecasts - Netscape

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop http://spot.nws.noaa.gov/cgi-bin/spot/spotmon?site=rev&date=20041025 Print

Back to Reno Fire Weather Page

RENO SPOT FORECASTS

for

Monday

Oct 25 2004

CALENDAR

Submit a new Spot Request

Pending Question Complete

Name	Ignition Time	Status
Tom Place	10:00 am PDT	COMPLETE
Hot Springs	10:15 am PDT	COMPLETE
Lee Vining	3:30 pm PDT	COMPLETE

start Re: Ne... Reno S... fire Corel P... Grand ... S-290_... FWXPr... Reno S... 2:33 PM

Spot Weather Forecast

...ISOLATED THUNDERSTORMS THIS EVENING CAPABLE OF BRIEF HEAVY RAIN AND WIND GUSTS TO 45 MPH...

DISCUSSION...ENOUGH MOISTURE IS STILL AVAILABLE FOR ISOLATED THUNDERSTORMS IN THE VICINITY OF THE FIRE THIS AFTERNOON. THE THREAT WILL END BY 1800 THIS EVENING. OTHERWISE WEAK LOW PRESSURE WILL MOVE INTO THE PACIFIC NORTHWEST WILL BRING A DRIER WESTERLY FLOW TO THE FIRE FOR SUNDAY.

FOR THIS AFTERNOON
WEATHER.....PARTLY CLOUDY. ISOLATED THUNDERSTORMS UNTIL 1800.
TEMPERATURE.....94-98 LOWER SLOPES TO 80-84 RIDGE
HUMIDITY.....10-13% LOWER SLOPES TO 19-23% RIDGE
WIND...20 FOOT.....WEST 6-12 MPH WITH GUSTS TO 25 MPH

FOR TONIGHT
WEATHER.....MOSTLY CLEAR.
TEMPERATURE.....MIN 59-63
HUMIDITY.....MAX 35-40% LOWER SLOPES TO 50% RIDGE
WIND...20 FOOT.....WEST 6-12 MPH WITH GUSTS TO 25 MPH BECOMING DOWNSLOPE 3-5 MPH AFTER 2200.

OUTLOOK FOR TOMORROW
WEATHER.....MOSTLY SUNNY.
TEMPERATURE.....MAX 92-95
HUMIDITY.....MIN 9-12% LOWER SLOPES TO 17-20% RIDGE
WIND...20 FOOT.....UPSLOPE 4-8 MPH BECOMING 10-15 MPH AFTER 1400 WITH GUSTS TO 27 MPH.

NFDRS- Site Forecast

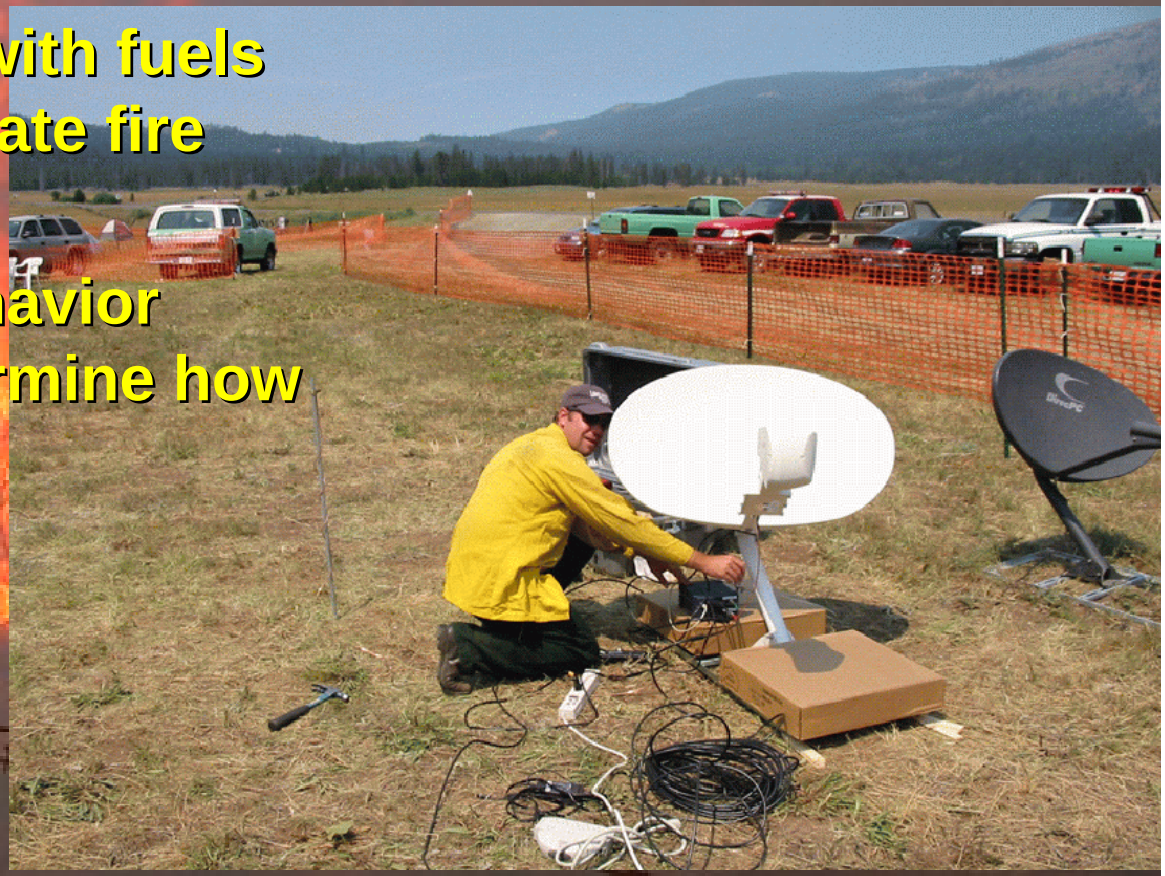
- Forecast of weather elements expected the following day at a specific location (temp, wind, RH, precip, LAL)
- Used by fire agencies to determine potential fire severity....Staffing.
- What types of resources are needed if a fire were to break out. Send ground crews or air attack?
- Helps determine “Smokey Bear” Fire Danger Ratings....Lo
  Medium, High, Extreme

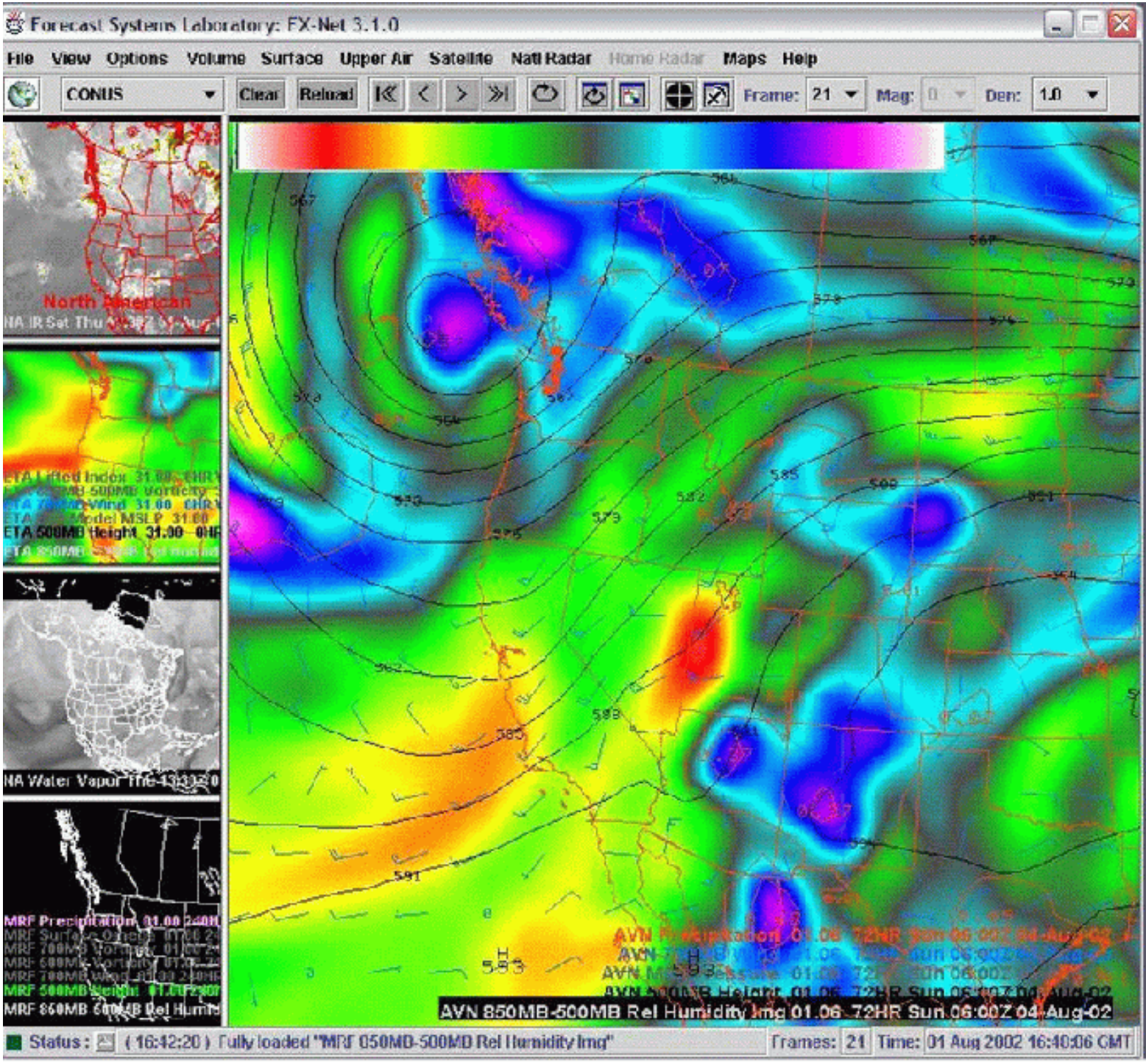
Incident Meteorologist (IMET)

- **On-Site Meteorologists**
  - ***Highly trained***
- **Satellite dishes and laptops that allow them to go anywhere in the country without the need of a phone line**
- **Typically sent to large wildfires to help Fire Behavior Analyst predict what the fire is going to do**

Incident Meteorologist (IMET)

- Works with Fire Behavior Analyst (FBAN)
- Weather combined with fuels and topography dictate fire behavior
- FBAN's run Fire Behavior models to help determine how to best fight the fire




Forecast Systems Laboratory: FX-Net 3.1.0
File View Options Volume Surface Upper Air Satellite Natl Radar Home Radar Maps Help
CONUS
Clear
Reload
Frame: 21
Mag:
Den: 1.0
North American
ETA 500MB Height 31.00 0HR
NA Water Vapor
MRF Precipitation 31.00
MRF 500MB Height
MRF 850MB 500MB Rel Humi
AVN 850MB-500MB Rel Humidity Img 01.06 72HR Sun 06:00Z 04-Aug-02
Status : (16:42:20) Fully loaded "MRF 850MB-500MB Rel Humidity Img"
Frames: 21
Time: 01 Aug 2002 16:40:06 GMT

SIT

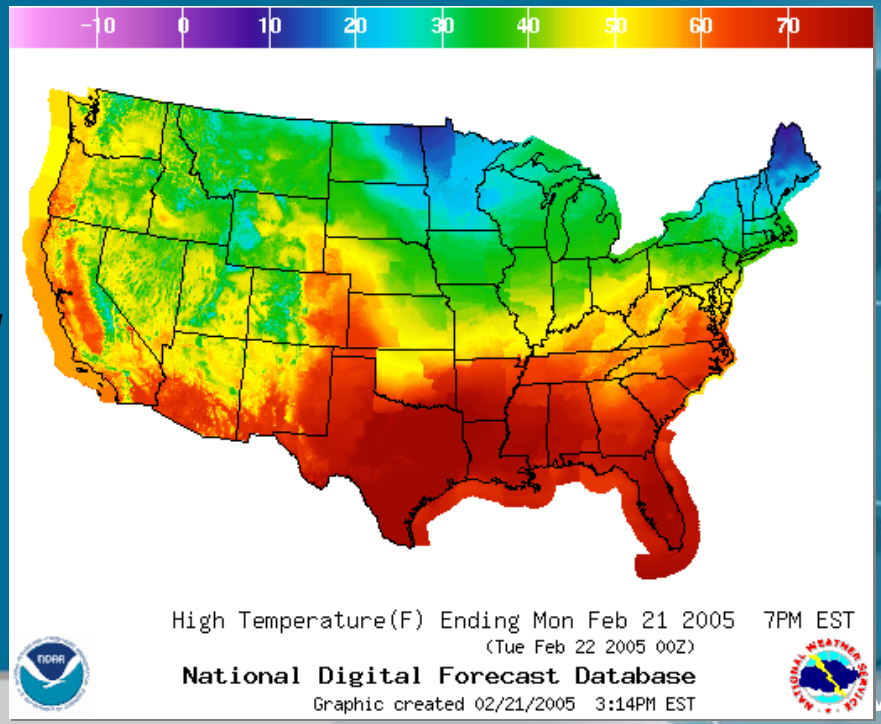
Remote Automated Weather Stations

- RAWS
- Used to monitor conditions in remote locations
- Red Flag Conditions
- Fuel Conditions
- Spot Forecasts
- Rx Burns
- Precipitation

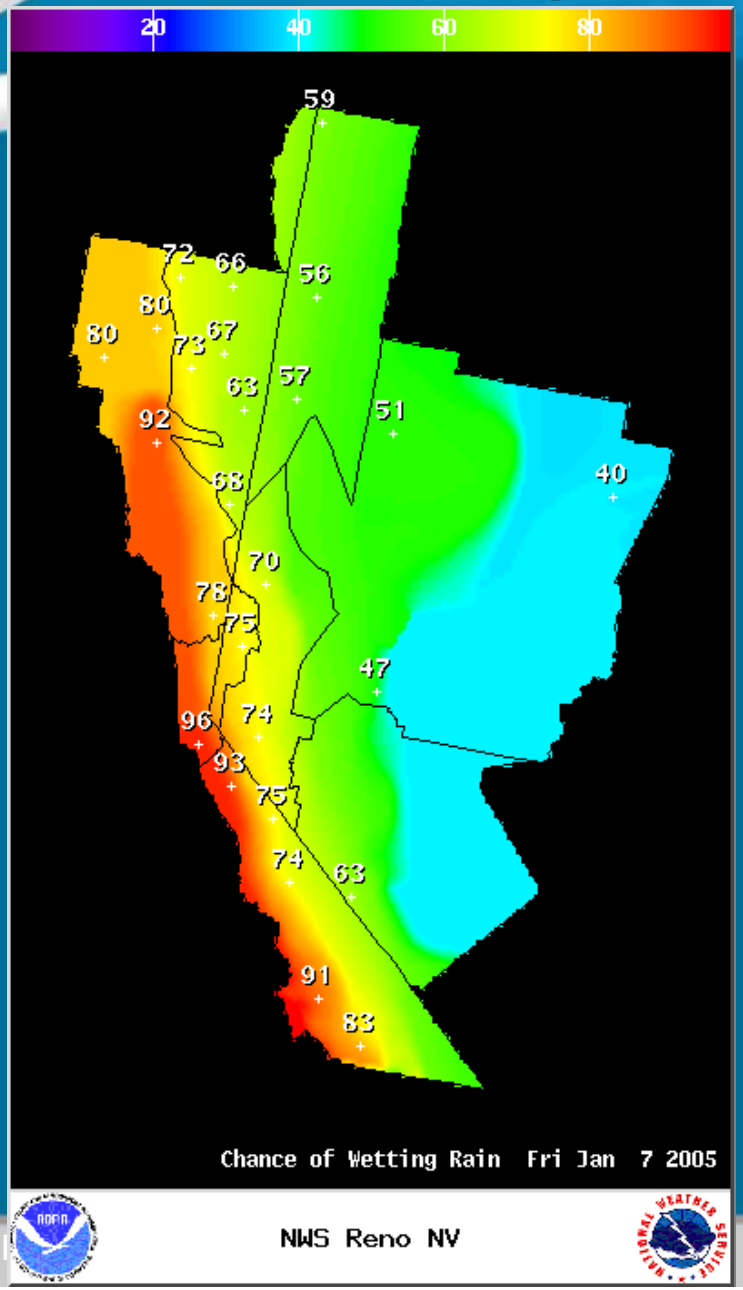
Fire RAWS

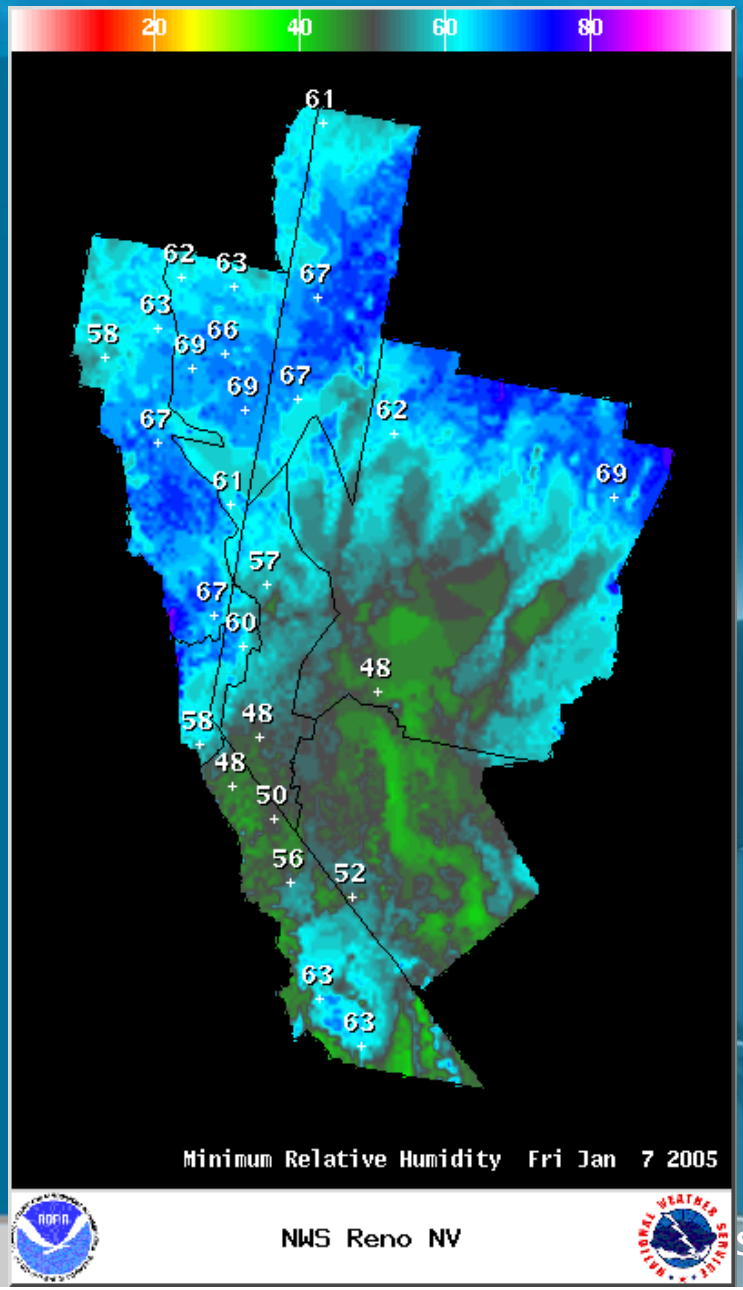
Digital Services

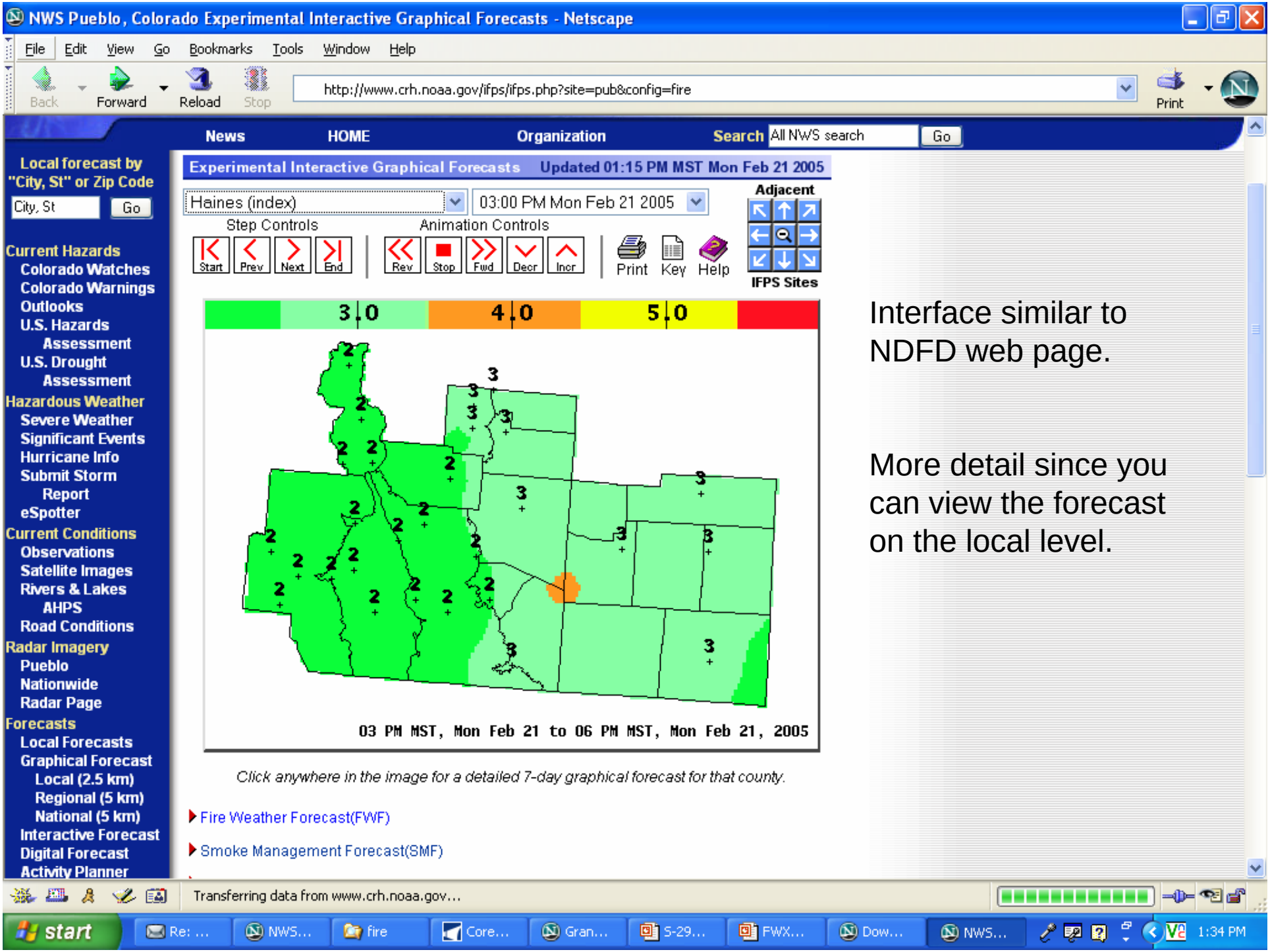
- **National Digital Forecast Database**
  - ***weather.gov/ndfd***
- **Forecast database has more applications than a text forecast.**
  - ***GIS Applications***
  - ***Graphics Software***
  - ***Forecast Images***
  - ***Limitless Computing applications***



Digital Services







Interface similar to NDFD web page.

More detail since you can view the forecast on the local level.

Weather Planner

NWS Boise, Idaho - Weather Planner - Netscape

File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop http://www.wrh.noaa.gov/boi/Wx_Rx_index.php?wfo=rev Print

- Current Hazards
  - Watches/Warnings
  - Storm Reports
  - Flash Flood Potential
  - National Outlooks
- Current Conditions
  - Observations
  - Remote Data
  - Radar Imagery
  - Satellite Imagery
  - River & Lakes AHPS
  - Road Conditions
- Forecasts
  - Local Forecasts
  - Recreation Forecast
  - Tabular Forecasts
  - Discussion
  - with Glossary
  - Aviation
  - Fire Weather
  - Hydrology
  - Soaring
- Experimental
  - Prototype Digital
  - Forecasts
  - National Digital
  - Forecast
  - Database
  - Weather Planner
- Climate
  - Climate
  - Public Information
  - Weather Glossary
- Weather Safety
  - Storm Ready
  - NOAA Wx Radio
  - Lightning Safety
- Other Information
  - Our Mission
  - Office Programs

***** EXPERIMENTAL APPLICATION *****

Interactive Weather Planner

CAUTION: This application generates products from a digital forecast data base. It is intended to allow a user to define and produce a forecast for general planning purposes only. As any weather or hydrologic event evolves, updated forecasts and warnings are issued by the NWS. Customers are urged to obtain the latest official forecast information prior to engaging in any weather sensitive activity, and to monitor forecasts for updates during such activities.

Step 1:

Check the box next to each parameter that is important for your planning purposes. Fill in the blanks with appropriate values. Leaving a value blank means there is no limit for that parameter.

Check Box	Description	Value	Description	Value
☑	Enter Lowest Temperature:	32	Enter Highest Temperature:	65
☐	Enter Lowest Dew Point:		Enter Highest Dew Point:	
☑	Enter Lowest RH:	30	Enter Highest RH:	60
☐	Enter Lowest Chance of Precip:		Enter Highest Chance of Precip:	
☐	Enter Lowest Wind Speed (kt):	1	Enter Highest Wind Speed (Kt):	10
☐	Include Wind Gusts			
☐	Eliminate Wind Direction From:		Clockwise To:	

WFO = REV

Step 2:

Enter the Latitude/Longitude or location of interest.

(Enter decimal degrees (i.e. 42.134) or deg min sec (i.e. 42 23 34))

Enter Latitude: Enter Longitude:

or

start Re: Ne... Meso... fire Corel P... Grand ... S-290_... FWXPr... NWS B... 2:24 PM

Weather Planner

NWS Boise, Idaho - Weather Planner - Netscape

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Back Forward Reload Stop http://www.wrh.noaa.gov/boi/Wx_Rx.php Print

City, St Go

- Current Hazards
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- Climate
  - Climate
  - Public Information
  - Weather Glossary
- Weather Safety
  - Storm Ready
  - NOAA Wx Radio
  - Lightning Safety
- Other Information

***** EXPERIMENTAL APPLICATION *****

Interactive Weather Planner

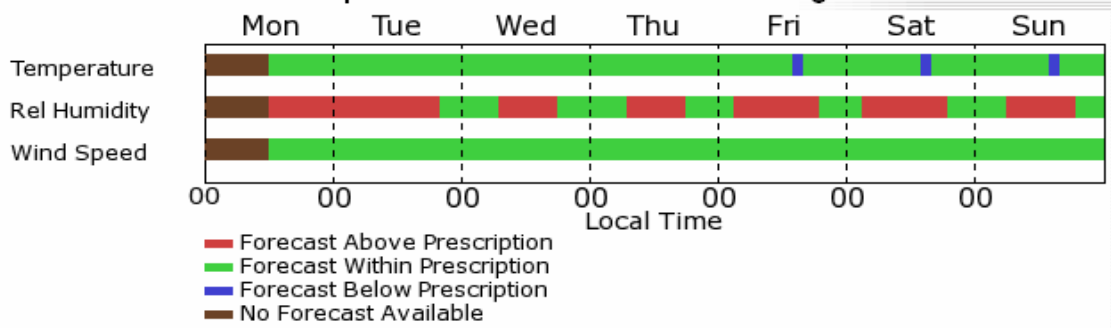
This forecast application is under evaluation as an experimental product.
It is intended for planning and demonstration purposes only.

```
Location = Reno
Latitude =    39.54   Longitude =    119.82
Elevation = 4599 Feet
```

Temperature >= 32 AND <= 65

Relative Humidity >= 30 AND <= 60

Wind Speed >= 1 AND <= 10 Including Gusts



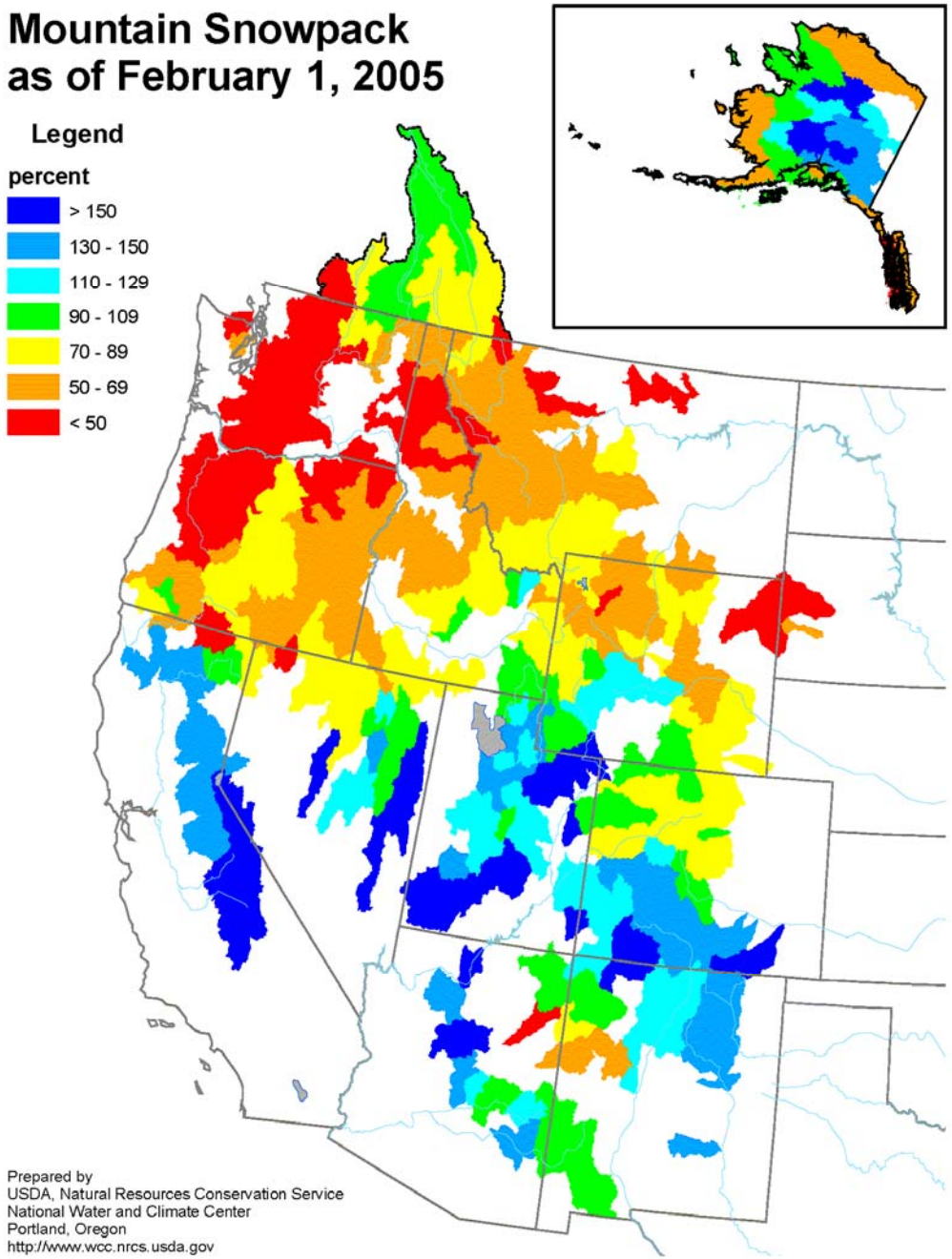
Click on a day on the graph to zoom into a 48 hour window centered on the day you selected.

http://www.wrh.noaa.gov/boi/Wx_Rx.php?day=3&param=T_...0&minw=1&maxwdir=&minwdir=&lat=39.5387&lon=119.8225

start | Re: Ne... | Meso... | fire | Corel P... | Grand ... | S-290_... | FWXPr... | NWS B... | 2:22 PM

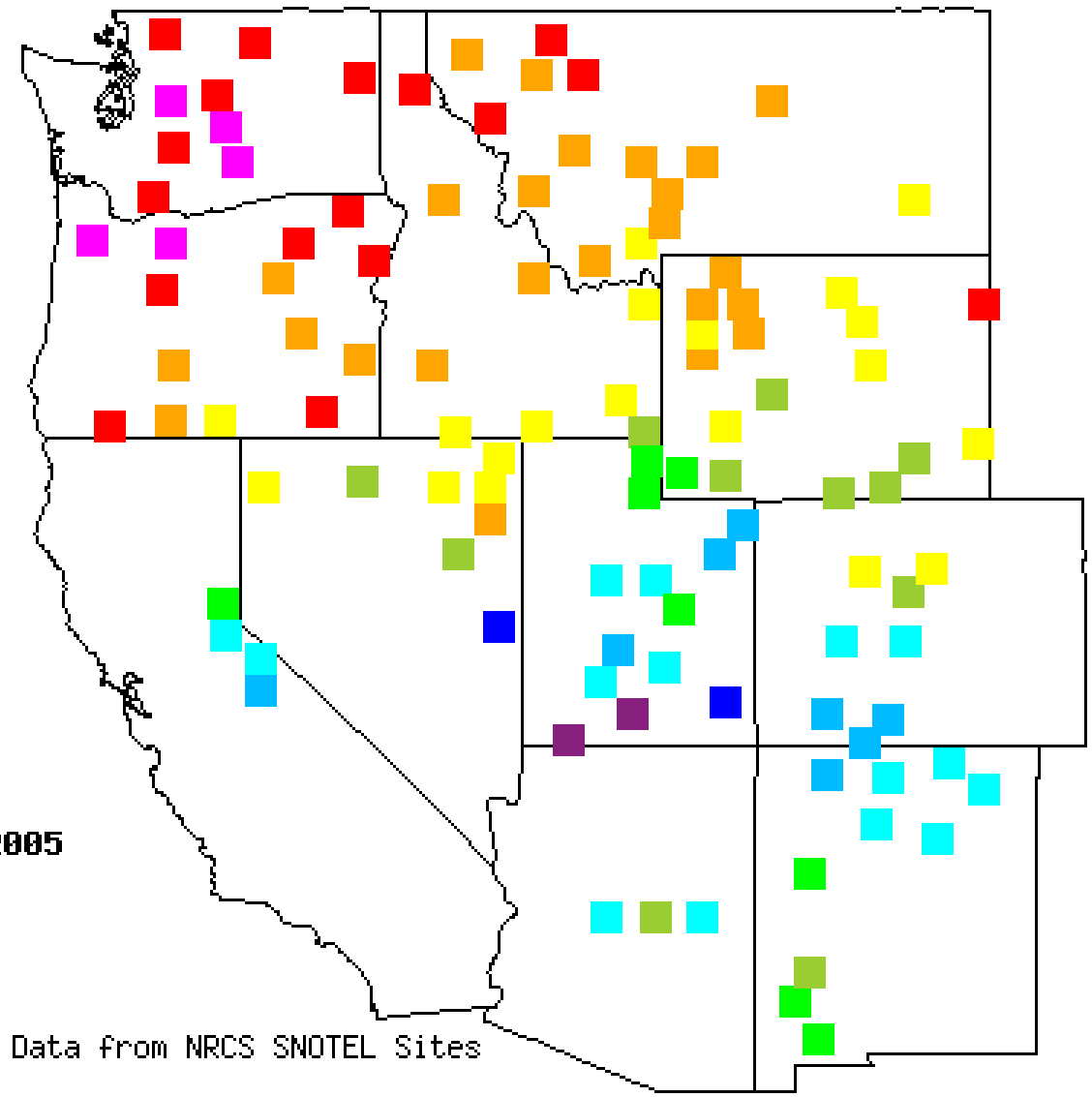
Anticipating Fire Severity

- Help prepare fire agencies for the upcoming season by interpreting and briefing them on:
- Snowpack
- Basin Wide Precipitation
- Snow Water Equivalent
- Annual Climate patterns (El Nino/La Nina)
- Temperature Anomalies
- Past Seasons- Drought


Mountain Snowpack
as of February 1, 2005
Legend
percent
> 150
130 - 150
110 - 129
90 - 109
70 - 89
50 - 69
< 50
Prepared by
USDA, Natural Resources Conservation Service
National Water and Climate Center
Portland, Oregon
http://www.wcc.nrcs.usda.gov

NOAA National Weather Service

Basin Average Snow Water Content. (% of Average.)



Percent of Average

- > 200
- 175 to 200
- 150 to 175
- 125 to 150
- 110 to 125
- 90 to 110
- 75 to 90
- 50 to 75
- 25 to 50
- < 25

Report Date:

FEBRUARY 19 , 2005

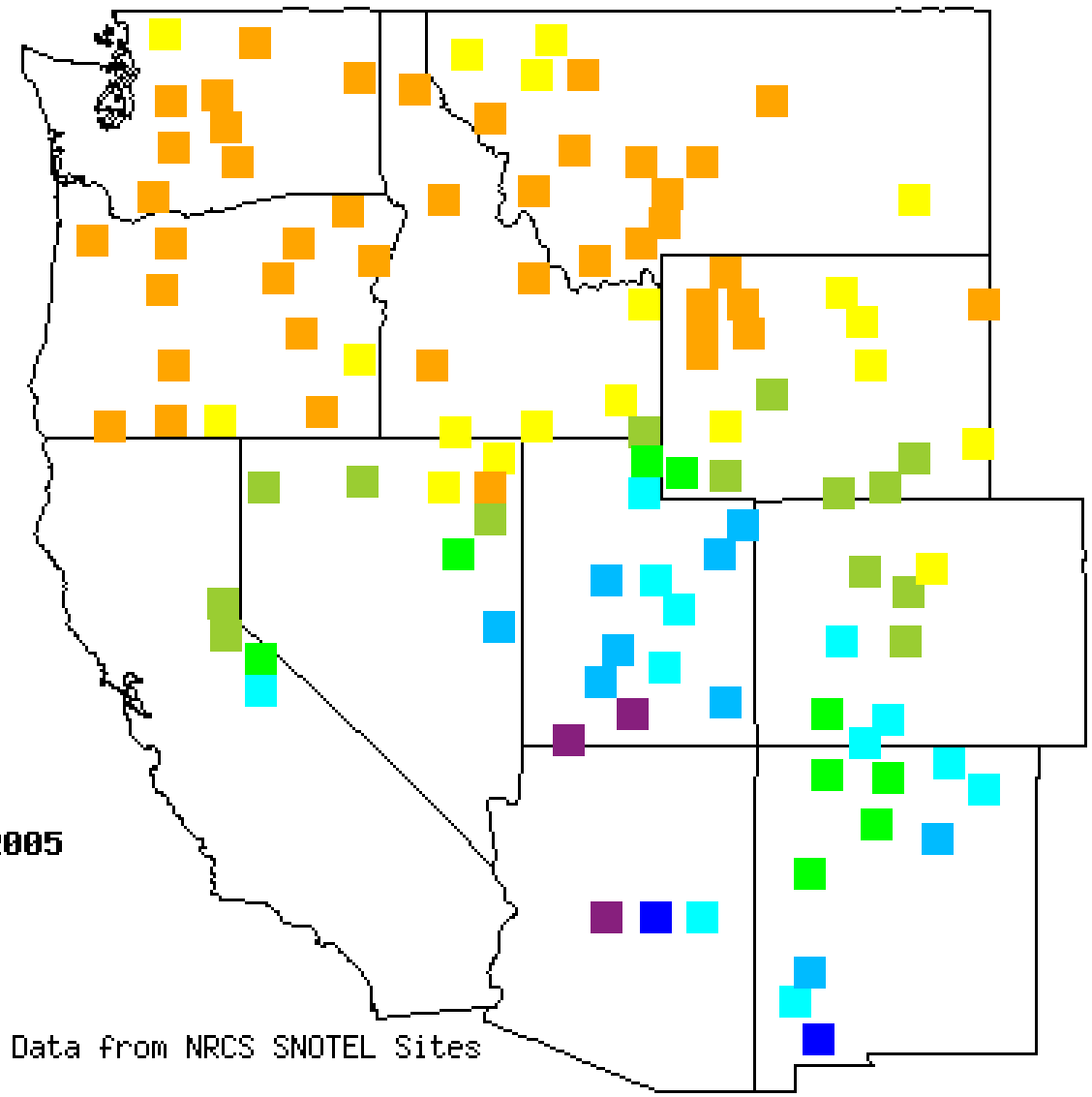
Provisional Data
Based on Mountain Data from NRCS SNOTEL Sites

Data provided by
Water and Climate Center
National Resource Conservation Service
Portland, Oregon

Western Regional Climate Center
Desert Research Institute
Reno, Nevada

Basin Average Precipitation. (% of Average.)

OCTOBER 1 , 2004 thru FEBRUARY 19 , 2005



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Report Date:

FEBRUARY 19 , 2005

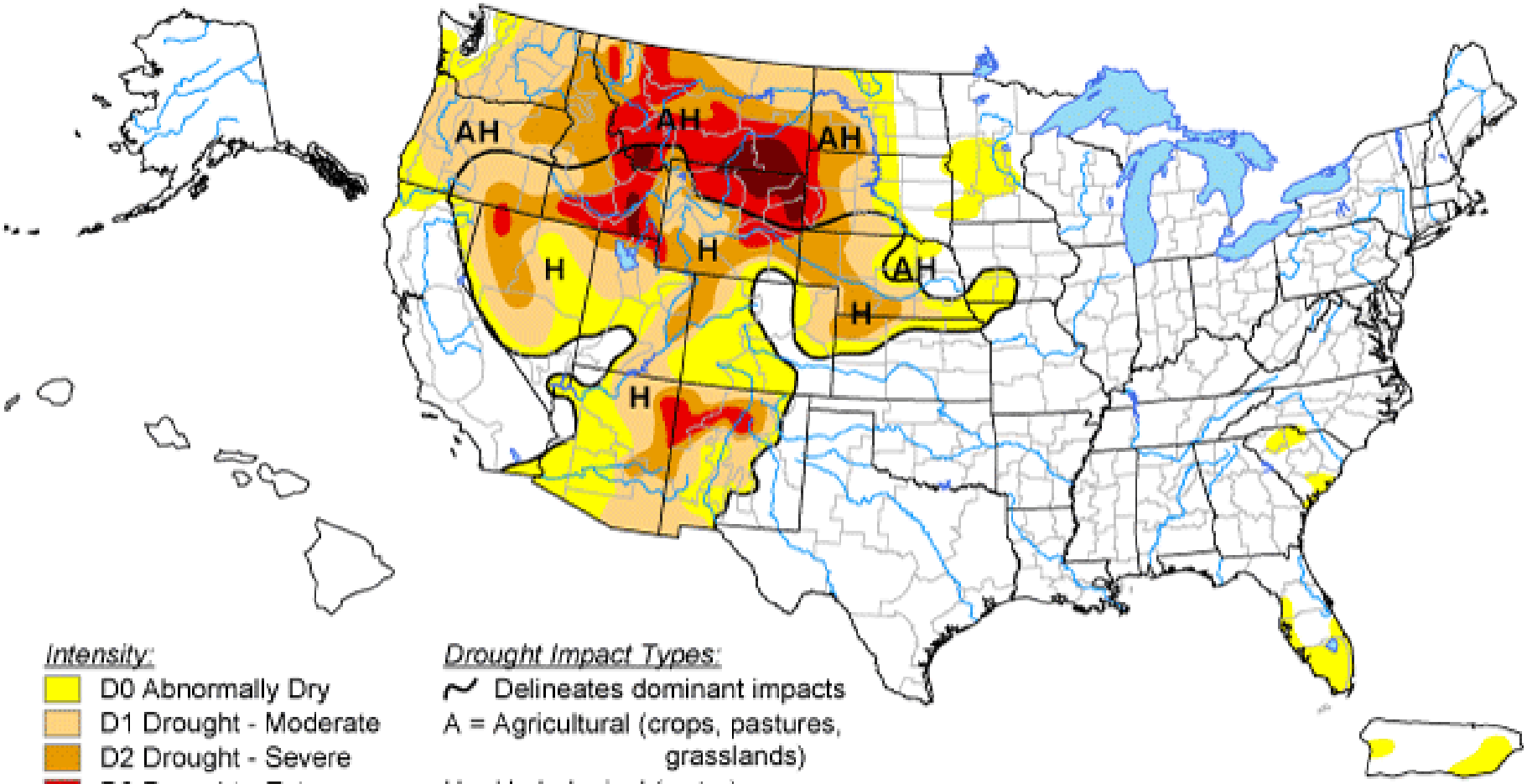
Provisional Data
Based on Mountain Data from NRCS SNOTEL Sites

Data provided by
Water and Climate Center
National Resource Conservation Service
Portland, Oregon

Western Regional Climate Center
Desert Research Institute
Reno, Nevada

U.S. Drought Monitor

February 15, 2005
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
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)

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

http://drought.unl.edu/dm

Released Thursday, February 17, 2005

Author: Rich Tinker, NOAA/Climate Prediction Center

Comments or Questions?

- Rhett.Milne@noaa.gov