Data Needed to Run Most Models

- Fuel Loads
- Receptor Distances
- Ventilation Adjectives
- Visibility Threshold

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# Uncertainty in Fuel Loads



#### Non-Solution: Estimate load from fuel type

Fuel type is independent of fuel load - and PM



2005 proposed max. daily acres, grouped by reported fuel model. Top of scale truncated. Fuel types are ordered by total NFDRS load, except that mixed fuels varies.

- Fuel Loads
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# Miles to Closest Receptor

□ 10(+) ■ 7-9.9 19% **Broadcast 5-6.9** Permits, 15% ■ 3-4.9 9% 2-2.9 15% ■ 1-1.9 8% 11% 0.5-0.9 9% 0-0.4 14%

2005

- Fuel Loads
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# **Ventilation Adjectives**

<u>Strategy</u>: Sample spot weather forecasts.
Categorize by the day's best adjective.
For each category, extract typical number of hours in each adjective class.

Results are applicable more generally.

# Spot Forecast Sample

- 7/1/04 6/30/05
- One forecast per day
- Selection within a day: Boulder, Pueblo, GJ
- Preference: rx fire, wildfire, then other.
- Random numbers then used if needed.

# Spot Forecast Sample

- 300 days have any forecast.
- 34 'poor' days have limited analytic use.
- Completeness varies. For most graphs, 100 - 150 usable days.
- Represents burn days better than all days.

#### How often can I burn?

#### Portion of Days by Best Adjective, Day 2 'Day 2' is the second day of the forecast, less biased against poor. N=249 100% 75% excellent very good 50% good 🗖 fair 🗖 poor 25% 0% 3 2 4 5 6 7 8 9 10 12 11 1 month 'Poor' is 22% overall. 'Fair' is infrequent.

#### Portion of Days by Month's Dominant Activity, Day 2



#### **Daylight Hours of Morning Poor**



#### **First Hour Better than Poor**



## When does 'poor' break?



Little pattern; Factor out sunrise & even seasonal effect fades. First Hour Better than Poor DAY 2



# When does 'poor' break?

Day 2 Comparison

**First Hour Better than Poor** 



## How long from 'poor' to best dispersion?

## Morning

	overall	fair	good	very good	excellent
mean	1.7	(0)	1.4	2.3	2.7
median	2	(0)	1	2	2 2
sample size	149	28	45	30	46

## How long from 'poor' to best dispersion?

## Morning – Day 2 Comparison

	overall	fair	good	very good	excellent	
mean	1.7/1.8	(0)	1.4/1.6	2.3/2.3	2.7/ <mark>2.3</mark>	
median	2/2	(0)	1/2	2/2	2/2	
sample size	149/136	28/16	45/44	30/38	46/38	
				very c	lose ma	tch

## and later, how long from best dispersion to 'poor'?

## Afternoon

	overall	fair	good	very good	excellent
mean	1.7	(0)	1.3	2.9	2.4
median	1	(0)	0	3 2	.5 2
sample size	95	20	23	17	35

## How alike are morning and afternoon transitions?



#### **Time Best Adjective Starts**



Time Best Adjective Starts DAY 2



## When does the day's best dispersion begin? Day 2 Comparison

similar

# When does the day's best dispersion end?

#### End Time of Day's Best Adjective



How long does smoke disperse best?

#### **Hours Duration of Best Adjective**

	overall	fair	good	very good	excellent
mean	6.2	4.9	5.7	6.1	7.2
median	6	4	5	6	8
sample size	93	18	23	16	36

#### How long does smoke disperse best?



#### When does 'poor' resume?



relative to sunset

#### Which graph works better for same data?



Start of Evening Poor

#### Start of Evening 'Poor'

#### Start of Evening 'Poor'



Fair: 16:00 and 1(+) hr before sunset Others: 19:00 or later, after sunset

# When does 'poor' resume?



# Summary, a.k.a Gross Generalities

- Season does not drive diurnal timing.
- Season does drive frequency of adjectives.
- 'Fair' is different, while other adjectives resemble each other.

# Summary, a.k.a Gross Generalities

	a.m. transition hrs	peak	p.m. transition hrs
fair	n/a	noon – 16:00	n/a
good	1	noon – 17:00	0
very good	2	noon – 18:00	2.5
excellent	2	noon – 20:00	2.5

# How do the results apply?

- How representative is this one year?
- Season not key for models (phew!)
- How does late start of 'poor' apply to shutdown times?
- Does dissimilarity of fair compared to better adjectives matter?

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# Visibility

- Colorado's goal = 32 mile visibility.
- Surveys of disparate groups chose very consistent 'acceptable' air quality.
- Intent: a PM limit that protects visibility
- Model Input needed: PM concentration that equals visual extinction at 32 miles



# Visibility -

**Run SASEM Equations Backward** 

### Visual Range = 3.9 / (.00001 + b \* PM conc.) Rayleigh coefficient of clean air

b = backscatter ratio: 5.0 for Kosh 2.0 for P&V

Why different? "The particles... undoubtedly [?] had traveled long enough to grow due to... hygroscopic water."

# 32-mile Visibility Estimates

$$Kosh = \underline{13} \ \mu/m^{3}$$
APCD uses SASEM's Kosh only  
for receptors closer than 20 miles.  
$$P&V = \underline{33} \ \mu/m^{3}$$
Are these estimates  
any more credible??  
An unknown portion of the 33µ  
may be hygroscopic water.