

**The Problem of the Dirty Ridge:
Do you feel lucky?**

Burn Ban Forecasting for the New PM_{2.5} Standard

Robert Elleman

EPA Region 10

The Problem

- **New PM2.5 standard poses problems for traditional burn ban policies**

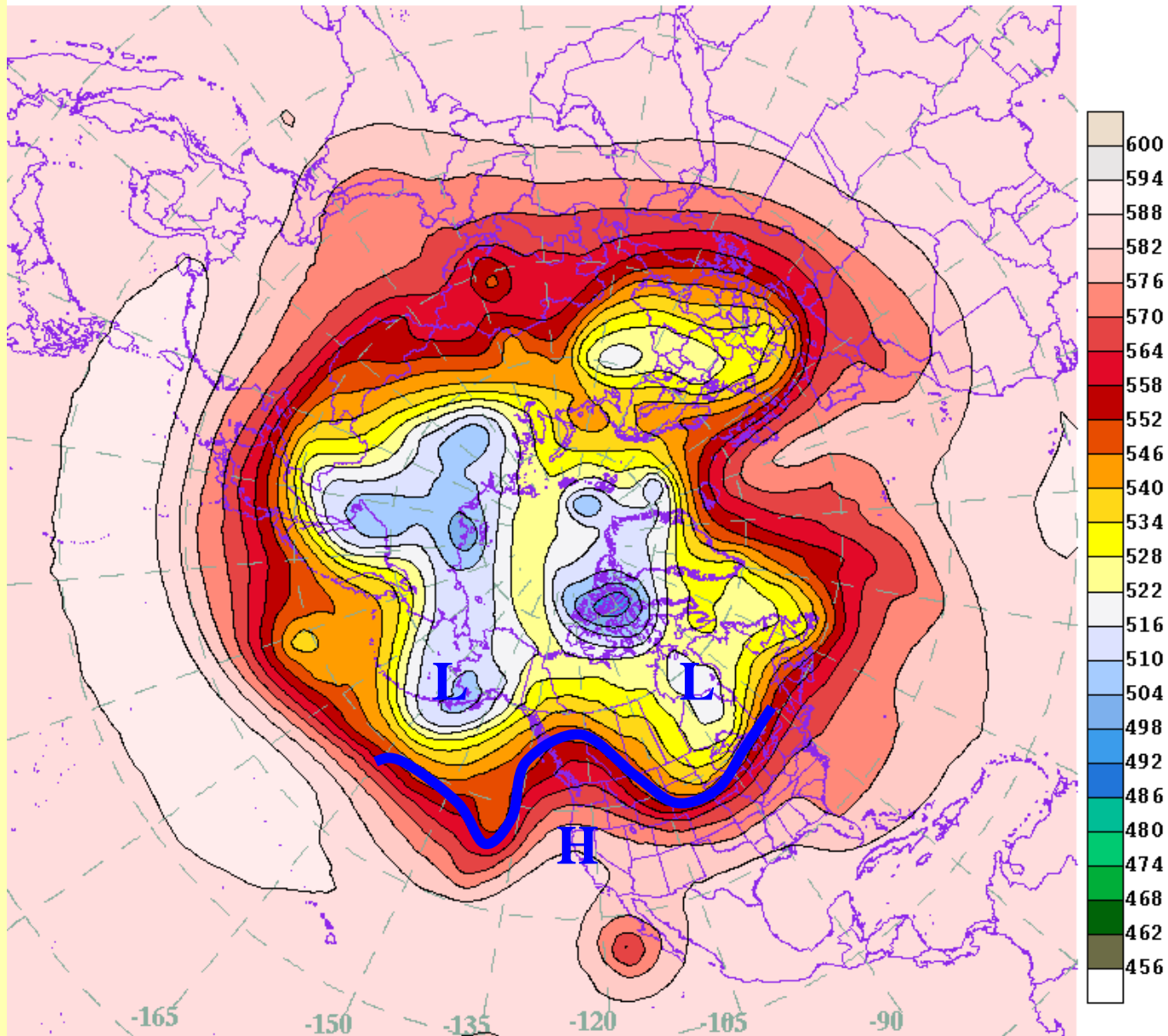
| Potential Exceedances since 10/1 in WA,OR,ID | | | | |
|--|---------------------------------|---------------------------------|----|----|
| standard | 65 ($\mu\text{g}/\text{m}^3$) | 35 ($\mu\text{g}/\text{m}^3$) | | |
| potential exceedances | 0 | 58 | | |
| | | ID | OR | WA |
| | | 10 | 30 | 18 |

All Data Based
on AirNow

- **The issues**
 1. **Burn bans are (and will be) more frequent**
 2. **Burn bans will be called for more marginal meteorological conditions**
 3. **Less margin for error**
- **Results: More Busted Burn Ban Forecasts**
More Ineffective Burn Bans

Classic Ridge

024 Hr Fcst 500 MB Heights (dekameters) valid 12Z Wed 14 Nov 2007
(initialized 12Z Tue 13 Nov 2007)

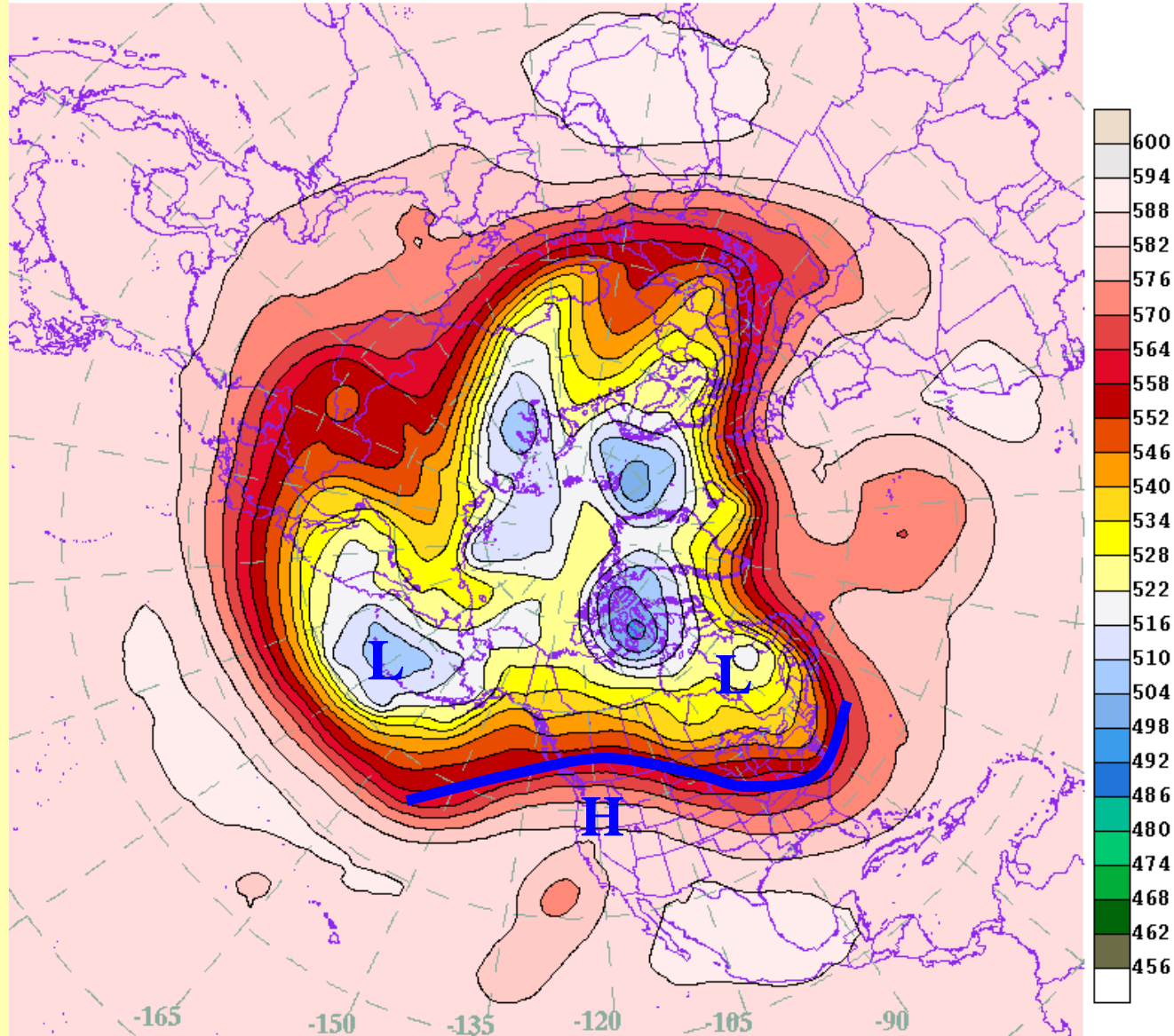


The Old Way

- **Only get PM_{2.5} > 65 $\mu\text{g}/\text{m}^3$ or Ozone > 80 ppb during stationary high pressure ridges**
 - **Light winds**
 - **Little dilution vertically b/c of inversion**
 - **Builds up to exceedance over several days**
- **Easy to forecast approach, duration, and end**

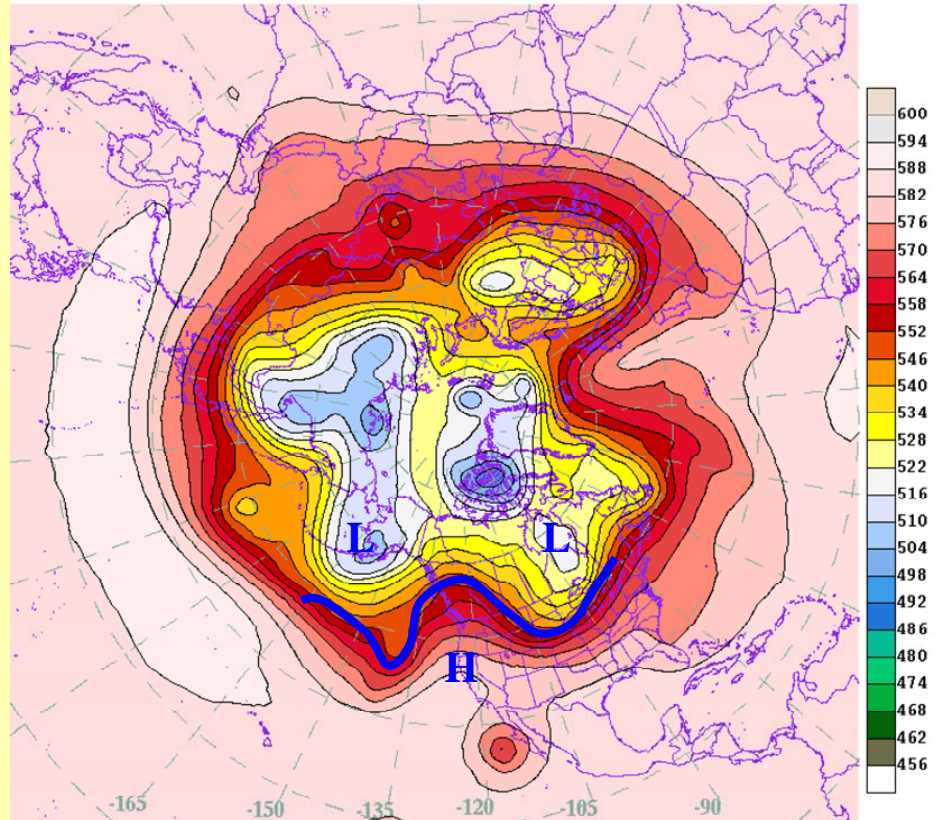
Dirty or Flat Ridge

000 Hr Fcst 500 MB Heights (dekameters) valid 18Z Wed 07 Nov 2007
(initialized 18Z Wed 07 Nov 2007)



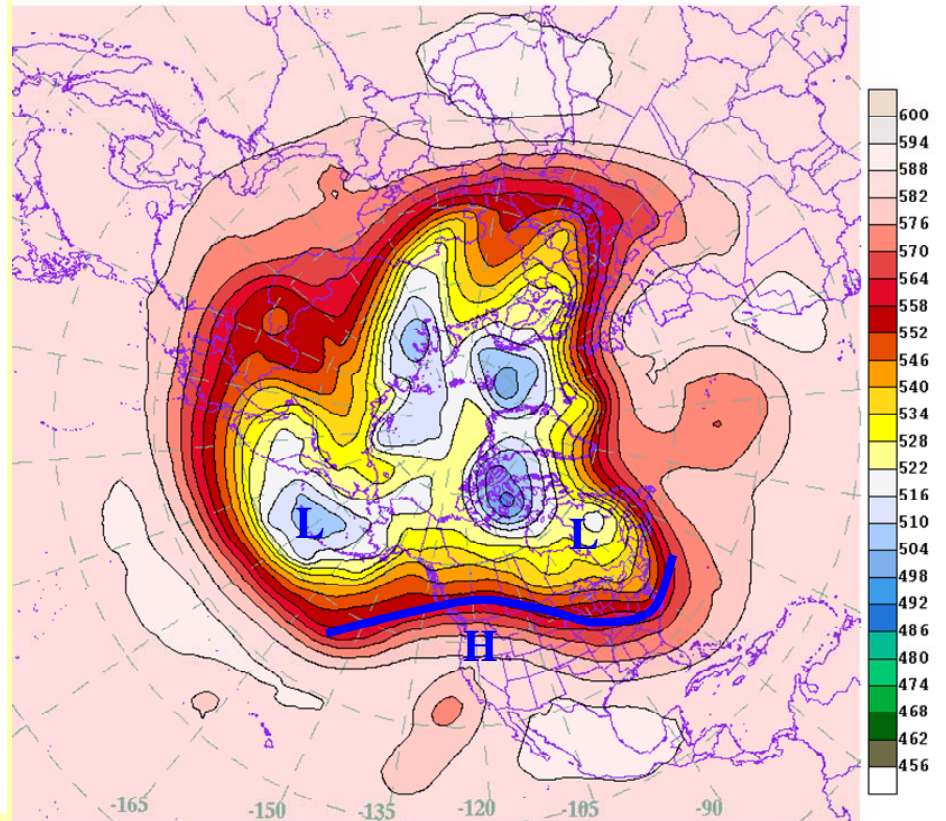
Classic Ridge

024 Hr Fcst 500 MB Heights (dekameters) valid 12Z Wed 14 Nov 2007
(initialized 12Z Tue 13 Nov 2007)



Dirty or Flat Ridge

000 Hr Fcst 500 MB Heights (dekameters) valid 18Z Wed 07 Nov 2007
(initialized 18Z Wed 07 Nov 2007)



Dirty or Flat Ridge *[10/14-11/9, 2007]*

- **Ridge with weather systems every 2-3 days**
- **Weather systems sometimes clean out valleys, sometimes not**
- **Weather systems sometimes graze farther south, sometimes not**

Dirty or Flat Ridge

| | | |
|---------------------------------------|------------|------|
| Hillsboro - Hare Field | 10/14/2007 | 35.5 |
| Pinehurst | 10/15/2007 | 47.2 |
| Pinehurst | 10/16/2007 | 41.8 |
| Pendleton - McKay Creek | 10/26/2007 | 61.5 |
| Oakridge - Willamette Activity Center | 10/27/2007 | 42.8 |
| Pendleton - McKay Creek | 10/27/2007 | 36 |
| Pinehurst | 10/27/2007 | 37 |
| Klamath Falls - Peterson School | 10/28/2007 | 45.8 |
| Oakridge - Willamette Activity Center | 10/28/2007 | 36.3 |
| Pinehurst | 10/28/2007 | 48.2 |
| Seattle Duwamish | 10/28/2007 | 36.5 |
| Eugene - Amazon Park | 10/29/2007 | 37.1 |
| Pinehurst | 10/29/2007 | 45 |
| Salem - State Hospital | 10/29/2007 | 35.6 |
| Seattle Duwamish | 10/31/2007 | 35.5 |
| Klamath Falls - Peterson School | 11/1/2007 | 51.6 |
| Pinehurst | 11/3/2007 | 50.5 |
| Portland - SE Lafayette | 11/3/2007 | 43.3 |
| Klamath Falls - Peterson School | 11/4/2007 | 41.3 |
| Pinehurst | 11/4/2007 | 43 |
| Klamath Falls - Peterson School | 11/6/2007 | 35.7 |
| Lacey | 11/6/2007 | 70 |
| Seattle Duwamish | 11/6/2007 | 35.7 |
| Tacoma Port Area | 11/6/2007 | 35 |
| Tacoma South L St | 11/6/2007 | 39.1 |
| Klamath Falls - Peterson School | 11/7/2007 | 39.5 |
| Seattle Duwamish | 11/7/2007 | 40.1 |
| Seattle South Park | 11/7/2007 | 35.7 |
| Tacoma Port Area | 11/7/2007 | 37.8 |
| Burns - Madison Street | 11/8/2007 | 38.3 |
| Kent | 11/8/2007 | 35.3 |
| Klamath Falls - Peterson School | 11/8/2007 | 38.6 |
| Oakridge - Willamette Activity Center | 11/8/2007 | 36 |
| Seattle Duwamish | 11/8/2007 | 36.9 |
| Tacoma Port Area | 11/8/2007 | 44.8 |
| Yakima-4th Ave | 11/8/2007 | 36.7 |
| Yakima-4th Ave | 11/9/2007 | 37.7 |

10/14 – 11/9, 2007

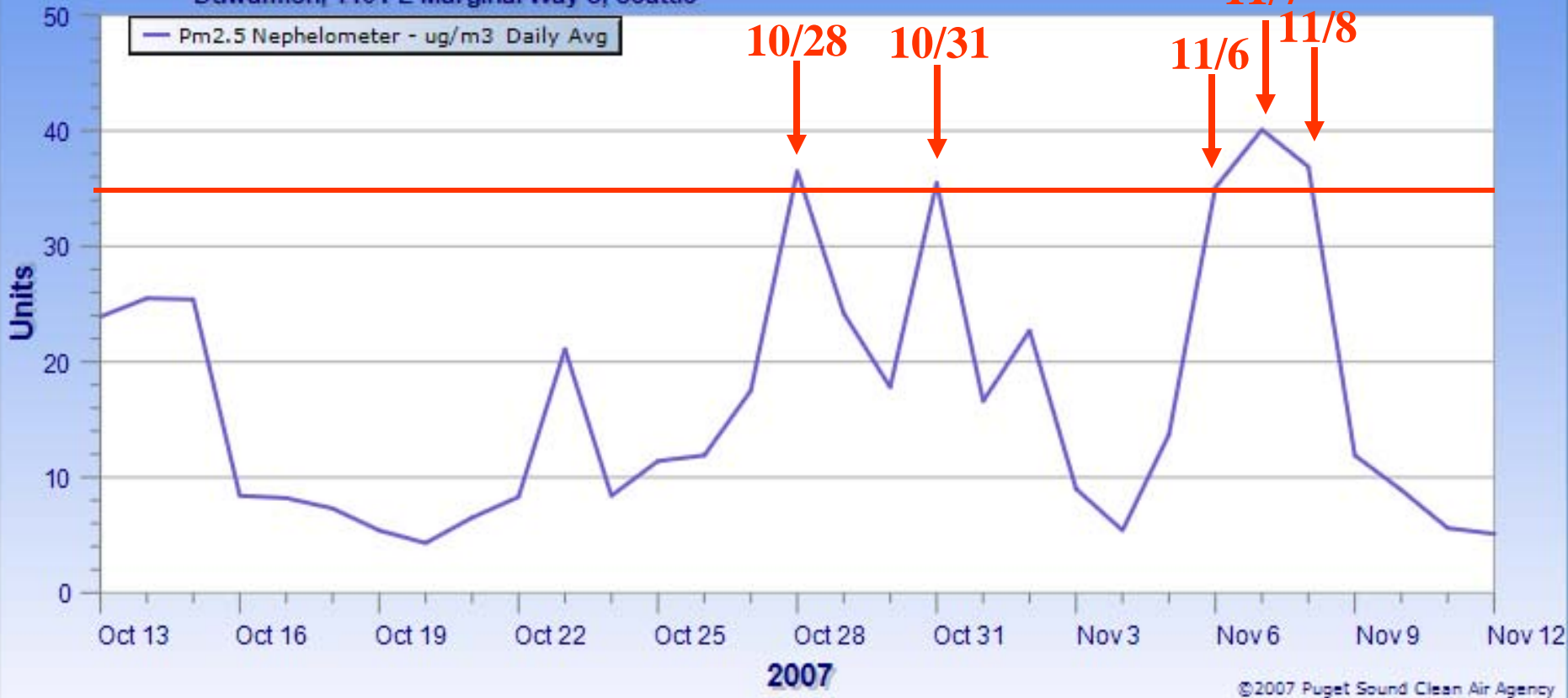
| site | # Exceedances |
|---------------------------------------|---------------|
| Pinehurst | 7 |
| Klamath Falls - Peterson School | 5 |
| Seattle Duwamish | 5 |
| Oakridge - Willamette Activity Center | 3 |
| Tacoma Port Area | 3 |
| Pendleton - McKay Creek | 2 |
| Yakima-4th Ave | 2 |
| Burns - Madison Street | 1 |
| Eugene - Amazon Park | 1 |
| Hillsboro - Hare Field | 1 |
| Kent | 1 |
| Portland - SE Lafayette | 1 |
| Salem - State Hospital | 1 |
| Seattle South Park | 1 |
| Tacoma South L St | 1 |

35 Potential Exceedances

Dirty or Flat Ridge

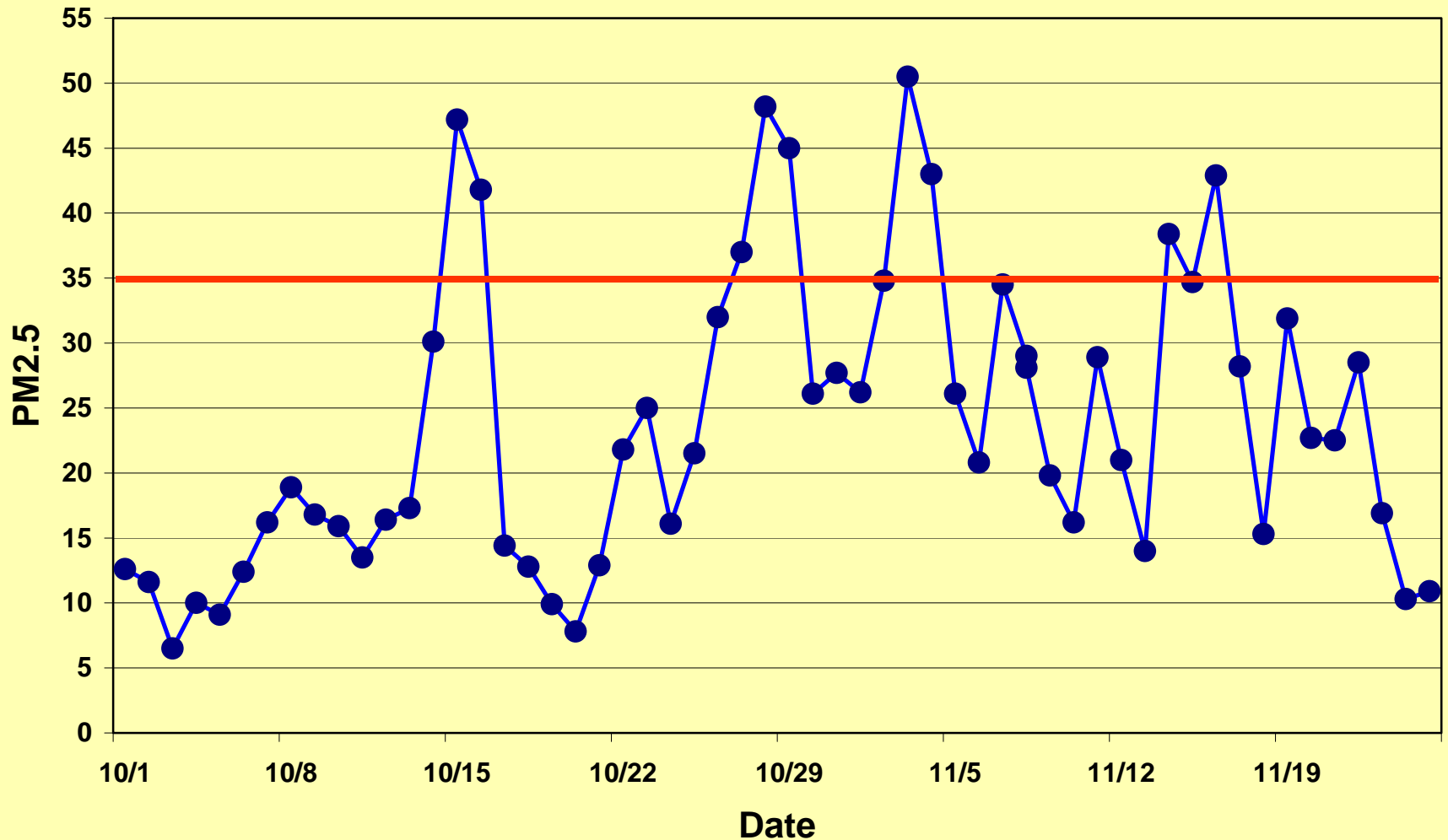
Seattle Duwamish Valley

Duwamish, 4401 E Marginal Way S, Seattle



Dirty or Flat Ridge

Pinehurst PM2.5



Progressive Ridge [11/14-11/16, 2007]

- Ridge passes through the Northwest in 2-3 days

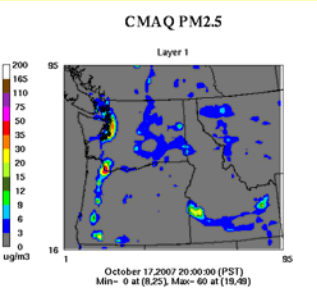
| Site Name | Date | 24-hr Avg PM2.5 | site | # Exceedances |
|---------------------------------|----------|-----------------|---------------------------------|---------------|
| Pinehurst | 11/14/07 | 38.4 | Pinehurst | 2 |
| Klamath Falls - Peterson School | 11/14/07 | 37.4 | Klamath Falls - Peterson School | 1 |
| Sandpoint USFS | 11/15/07 | 41.4 | Sandpoint USFS | 1 |
| Shady Cove - Shady Cove School | 11/15/07 | 40.2 | Shady Cove - Shady Cove School | 1 |
| Pinehurst | 11/16/07 | 42.9 | | |

5 Potential Exceedances

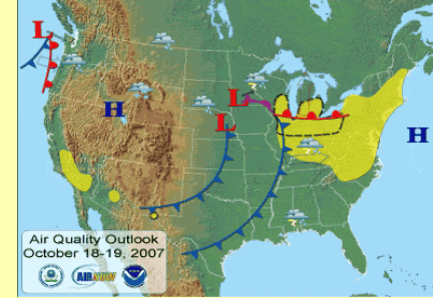
Off-Shore Ridge [11/22-11/25, 2007]

| | | | site | # Exceedances |
|----------------------------------|----------|------|----------------------------------|---------------|
| Eugene - Amazon Park | 11/22/07 | 37.3 | Klamath Falls - Peterson School | 3 |
| Klamath Falls - Peterson School | 11/23/07 | 47.8 | Eugene - Amazon Park | 3 |
| Eugene - Amazon Park | 11/23/07 | 39.3 | Tacoma South L St | 2 |
| Tacoma South L St | 11/23/07 | 38.6 | Hillsboro - Hare Field | 2 |
| Albany - Calapooia School | 11/23/07 | 36.7 | Albany - Calapooia School | 2 |
| Klamath Falls - Peterson School | 11/24/07 | 53.5 | Salem - State Hospital | 1 |
| Eugene - Amazon Park | 11/24/07 | 51 | Lynnwood | 1 |
| Hillsboro - Hare Field | 11/24/07 | 46.9 | Darrington | 1 |
| Salem - State Hospital | 11/24/07 | 38 | Corvallis - Circle Blvd. | 1 |
| Darrington | 11/24/07 | 37.4 | Bremerton | 1 |
| Bremerton | 11/24/07 | 36.2 | Beaverton - Highland Park School | 1 |
| Tacoma South L St | 11/24/07 | 36.2 | | |
| Beaverton - Highland Park School | 11/24/07 | 36.1 | | |
| Albany - Calapooia School | 11/24/07 | 35.7 | | |
| Hillsboro - Hare Field | 11/25/07 | 63.8 | | |
| Klamath Falls - Peterson School | 11/25/07 | 41.9 | | |
| Lynnwood | 11/25/07 | 36.5 | | |
| Corvallis - Circle Blvd. | 11/25/07 | 35.7 | | |

18 Potential Exceedances

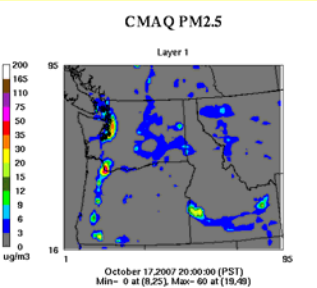


Burn Ban Issues with New Standard

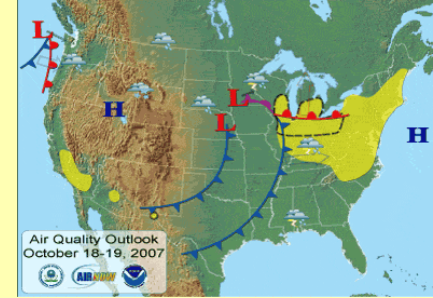


- 1. Conditions not obvious meteorologically**
- 2. Less margin for error**
- 3. Short notice**
- 4. Short duration**
- 5. See-saw burning bans**
- 6. Bans will include clean periods, too**
- 7. Longer burn ban season**

**Issues depend on agency because burn ban policies vary greatly
across Idaho, Oregon, and Washington**



Conclusion



- **Burn bans alone cannot be [counted on](#) as a viable control strategy**

