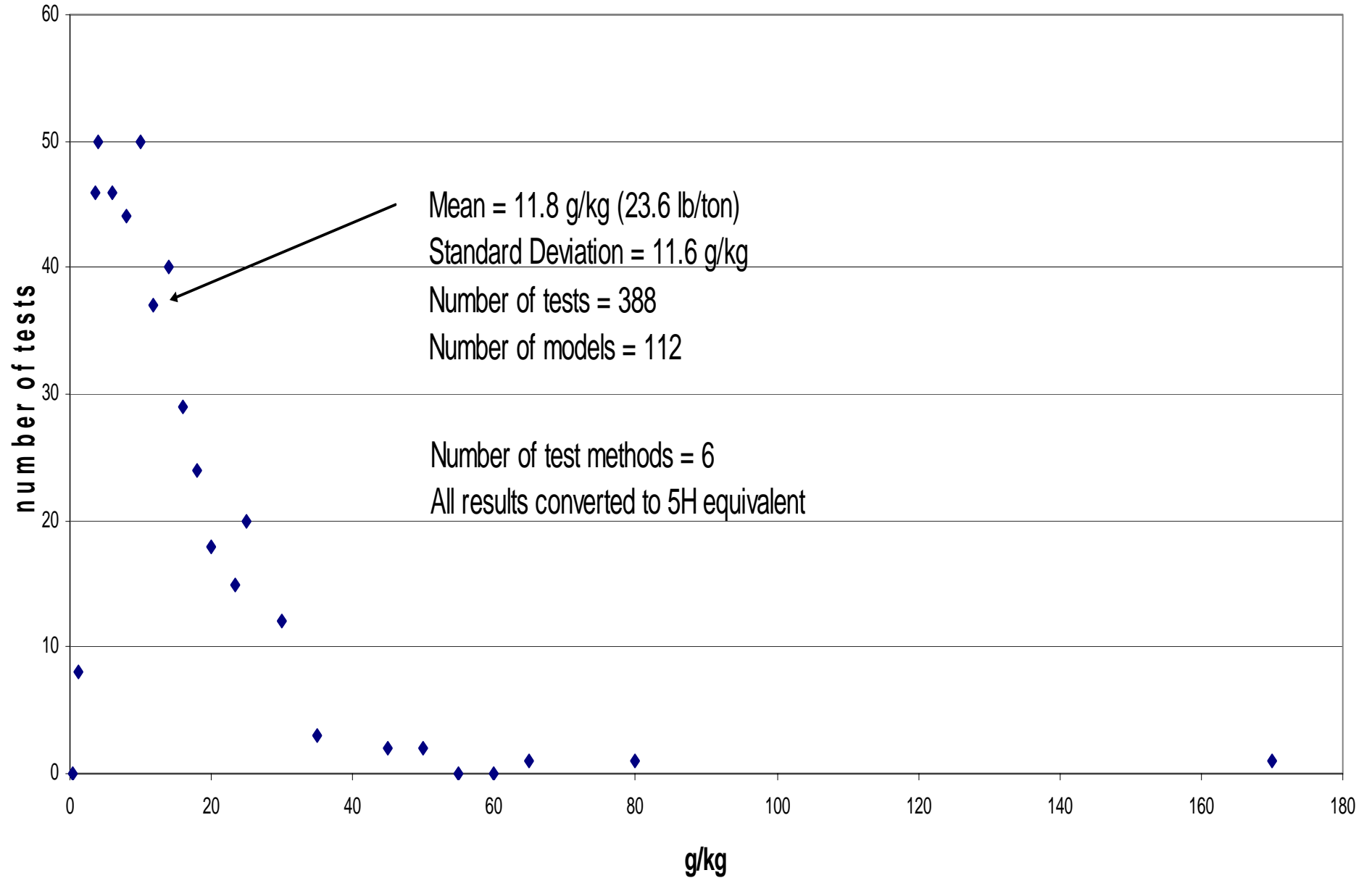

Residential Wood Combustion Regional Haze SIP day

Roy Huntley, US EPA
Emission Inventory and Analysis Group
Huntley.Roy@EPA.gov
919 541-1060

Topics

- RWC Emission Factors
 - RWC Inventory Method – Today & Tomorrow
 - NEI redesign, RWC task force
 - Woodstove change-out calculator
-

Histogram of Fireplace PM Emission Data (g/kg)



Fireplace Emission Factors

	Pechan	NEI	OMNI	AP42
PM	34.6	23.6	30.5	34.6
VOC	229	229	18.9	229
CO	252	128	149	252
NO _x	2.6	2.6	2.9	2.6
SO ₂	0.4	0.4	0.4	0.4

Conventional WS Emission Factors

	Pechan	NEI	OMNI	AP42
PM	30.6	30.6	30.5	34.6
VOC	53.0	53.0	36.8	53.0
CO	231	231	157	231
NO _x	2.8	2.8	0.3	2.8
SO ₂	0.4	0.4	0.2	0.4

Certified Catalytic WS EF's

	Pechan	NEI	OMNI	AP42
PM	15.4*	20.4	16.8	20.4
VOC	13.5*	15.0	17.2	15.0
CO	124*	104	107	104
NOx	2.0*	2.0	2.0	2.0
SO2	0.4*	0.4	0.4	0.4

Certified Non-Catalytic WS EF's

	Pechan	NEI	OMNI	AP42
PM	15.4	19.6	15	19.6
VOC	13.5	12	20.2	15.0
CO	124	141	140	141
NOx	2.0	2.0	2.2	None
SO2	0.4	0.4	0.4	0.4

A	B	C	D	E	F	G
Parameters for Calculation of WS Changeout						
Benefit	Inputs	Input Description				
Cords of Wood Burned per Woodstove =	3	Assumed				
Conversion of tons to cords =	1.162	EIA/DOE				
Number of stoves changed out =	1					
Woodstove % efficiency for conventional WS =	54	AP42				
Woodstove % efficiency for certified WS =	68	AP42				
Fraction of Changeout stoves to be new certified WS =	0.8	80% assumed go to new Cert WS, 20% to gas appliances				
		Emission factors (lb/ton)	Conv WS	Certified WS	Reference	
		CO	230.8	107	AP42 - Section 1.10	
		SO2	0.4	0.4	AP42 - Section 1.10	
		Nox	2.8	2	AP42 - Section 1.10	
		VOC	53	15	AP42 - Section 1.10	
		PAH, total	0.73	0.414	AP42 - Section 1.10	
		PM2.5-PRI	30.6	12	Conv Factor = AP-42; Certified EF = EF	
		Emission Avoided (tons)				
		Pollutant	Total Emissions Avoided		EPA technical report referenced is Residential Wood Combustion Technol EPA-600/R-98-174a Dec-98	
		CO	0.28			
		SO2	0.00			
		NOX	0.00			
		VOC	0.08			
		PAH, total	0.00			
		PM2.5-PRI	0.04			

NEI Method; Fireplaces

- Start with Total Wood Burned in Residential Sector (DOE)
 - Determine FP consumption by counting fireplaces and assuming activity
 - Determine the # of homes w/fp (DOC)
 - Some homes have more than 1 fp (multiply by 1.17)
 - Some people burn gas (74% burn wood, 26% burn gas)
-

NEI Method; Fireplaces

- Some fp not used (42% not used)
 - Subtract out fp with inserts (DOC)
 - Fp with inserts treated like woodstoves
 - Divide into 2 categories; fp used for heating, fp used for aesthetics
-

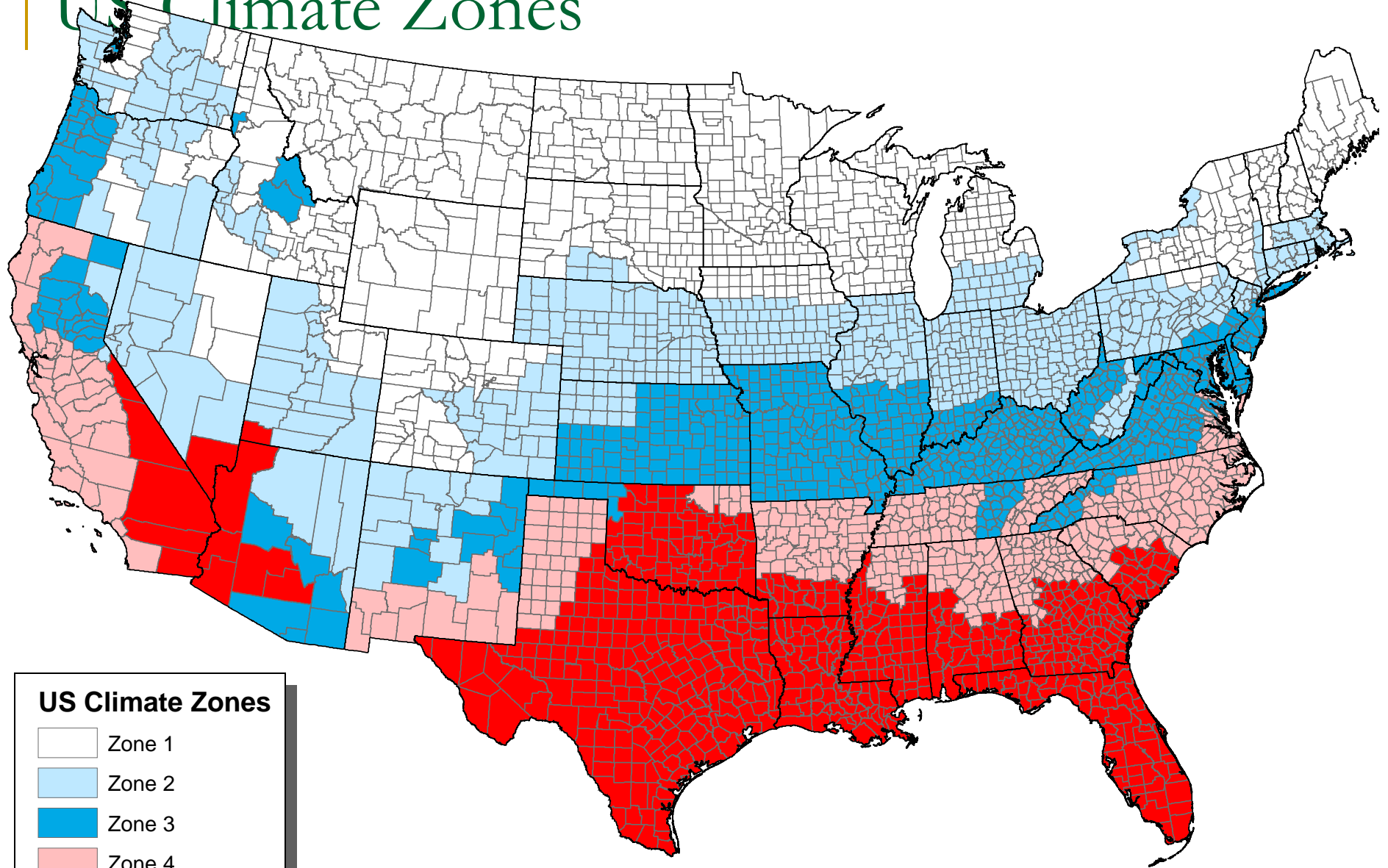
NEI Method; Fireplaces

- Determine wood consumption for each fireplace type
 - Assume wood consumption rates
 - 0.656 cords/unit/year for heating
 - 0.069 cords/unit/year for aesthetics
 - Allocate wood consumption to climate zone and then to county
-

Climate Zone Definition Criteria

Climate Zone Number	Heating Degree Days	Cooling Degrees Days
1	>7000	
2	5500-7000	
3	4000-5499	
4	<4000	<2000
5	<4000	>2000

US Climate Zones



US Climate Zones

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5

Allocating Wood Consumption to Climate Zones

Climate Zone	Wood Burned (EIA/DOE Residential Energy Consumption Database)
1	36%
2	19%
3	21%
4	15%
5	9%

NEI Method; Fireplaces

- Adjust urban and rural wood consumption to match DOC data (73% of wood burned in fireplaces is burned in urban counties)
 - Use iterative procedure until urban/rural split is 68/32.
-

NEI Method; Woodstoves and Fireplaces with Inserts

- Start with total wood burned and subtract out wood burned in fireplaces
 - Allocate wood consumption to climate zones
 - Use # of single family detached homes as surrogate
-

NEI Method; Woodstoves and Fireplaces with Inserts

- Sum the wood consumption in each zone and compare to the urban/rural split
 - For WS, 65% rural, 35 urban
 - For inserts, 43% rural, 57% urban
 - Adjust until split matches
-

NEI Method; Woodstoves and Fireplaces with Inserts

- Now have cordwood consumption
 - Conversion; 1 cord = 1.163 tons wood
 - Woodstove Population (Hearth Products Association Data)
 - 92% conventional ws
 - 5.7% non-catalytic ws, EPA-certified
 - 2.3% catalytic ws, EPA-certified
 - Use emission factors to determine emissions
-

Woodstove SCC's

- 2104008010-WS, general
 - 2104008030-WS, catalytic
 - 2104008050-WS, non-cat, EPA certified
 - 2104008051-WS, non-cat, non-certified
 - 2104008052-WS, non-cat, Low Emitting
 - 2104008053-WS, non-cat, Pellet Fired
 - 2104008070-Outdoor Wood Burning Equipment (hydronic heaters)
-