

**Residential Wood Combustion Emission Inventory  
South Coast Air Basin and Coachella Valley Portion  
of Salton Sea Air Basin**

**2002 Base Year**

**James E. Houck**

**John Crouch**

**May 18, 2006**



# EI Appliance Categories

---



- **Cordwood Stoves**
- **Pellet Stoves**
- **Cordwood Fireplace Inserts**
- **Pellet Fireplace Inserts**
- **Fireplaces without Inserts Burning Cordwood**
- **Fireplaces without Inserts Burning Wax/Fiber Firelogs**

# Terminology



**Wood Heater = woodstove + fireplace insert**

**Fireplace with Insert = fireplace insert**

**Cordwood Heaters =**

- **Pre-EPA certified cordwood +**
- **EPA certified non-cat. cordwood +**
- **EPA certified cat. cordwood**

**Pellet Wood Heaters = EPA certified + exempt**

# RWC Emission Inventory



**Total Emissions =**

**(Number of Units in Use) x**

**(Mean Mass of Fuel Burned Annually) x**

**(Emission Factor)**

**-Repeated for each appliance category-**



---

**Summation of:**

**Cordwood pre-EPA certification**

**Cordwood EPA-certified non-cat**

**Cordwood EPA-certified cat**

**Pellet Heaters (modern certified and exempt same  
emission factor)**

**Fireplaces without inserts burning cordwood**

**Fireplaces without inserts burning wax/fiber firelogs**

---

**=**

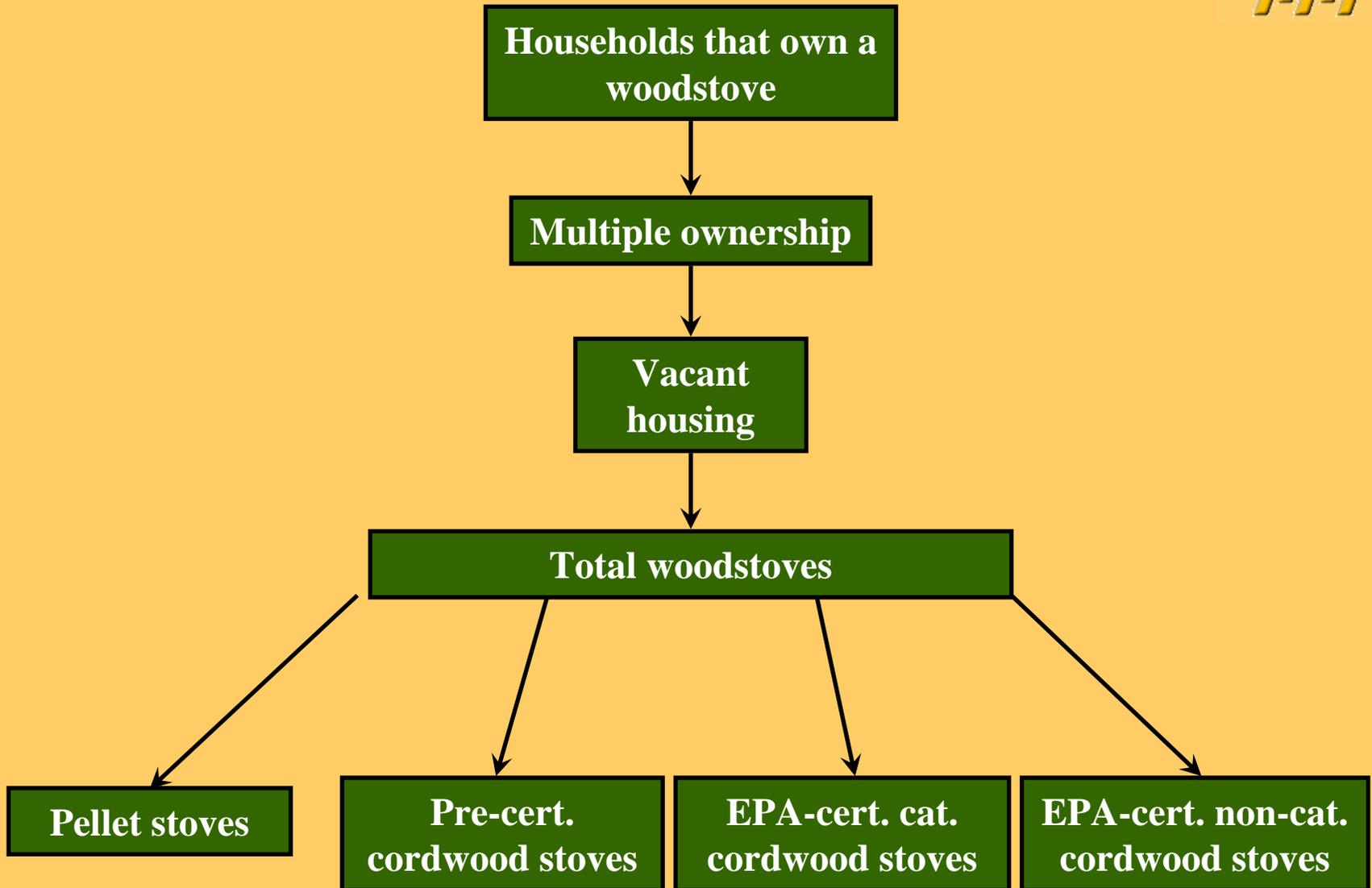
**Total RWC Inventory**

# Miscellaneous Issues



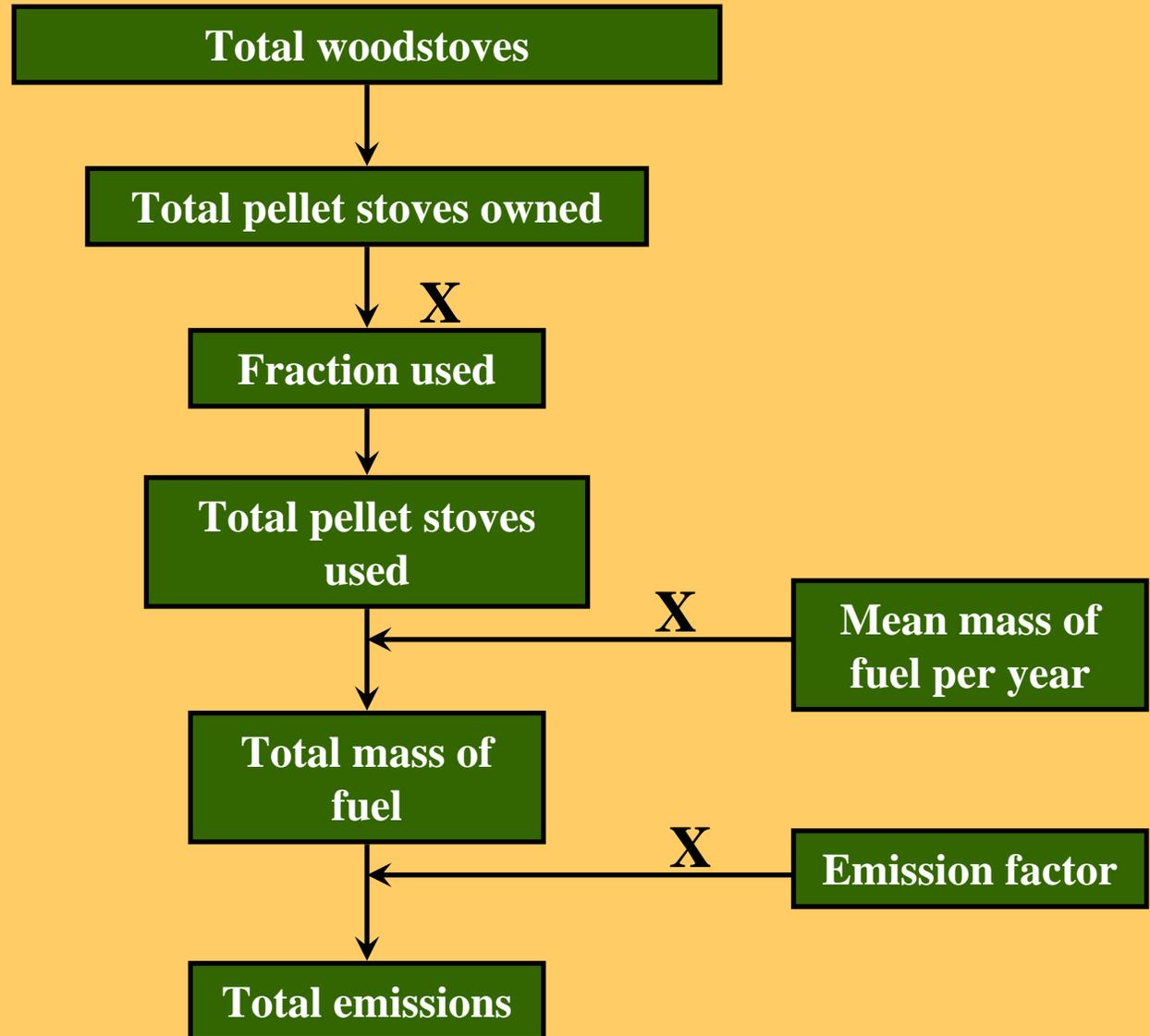
- **Households with multiple units**
- **Used vs. owned**
- **Vacant housing**
- **Tree species – dry cord weight**
- **Gas-fueled fireplaces and fireplace inserts**
- **Coal-fueled stoves**
- **Centralized heating systems (2% to 10% in upper Midwest and East)**
- **Masonry heaters, densified firelogs, and cookstoves (confusing and insignificant)**
- **Efficiency adjustment to fuel use**

# Woodstove Factors (and fireplace inserts)



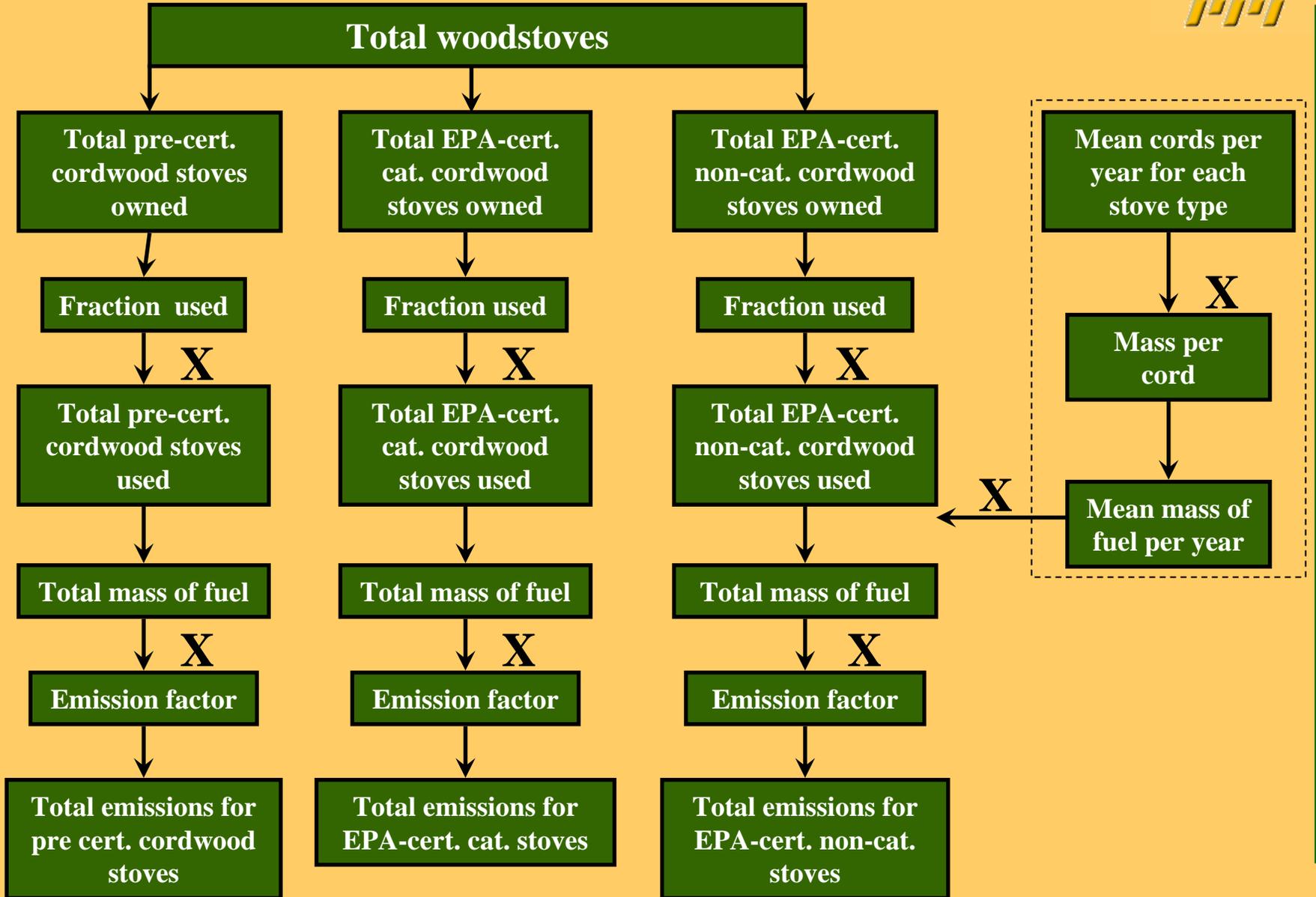
# Woodstove Factors (cont'd)

## Pellet Stoves

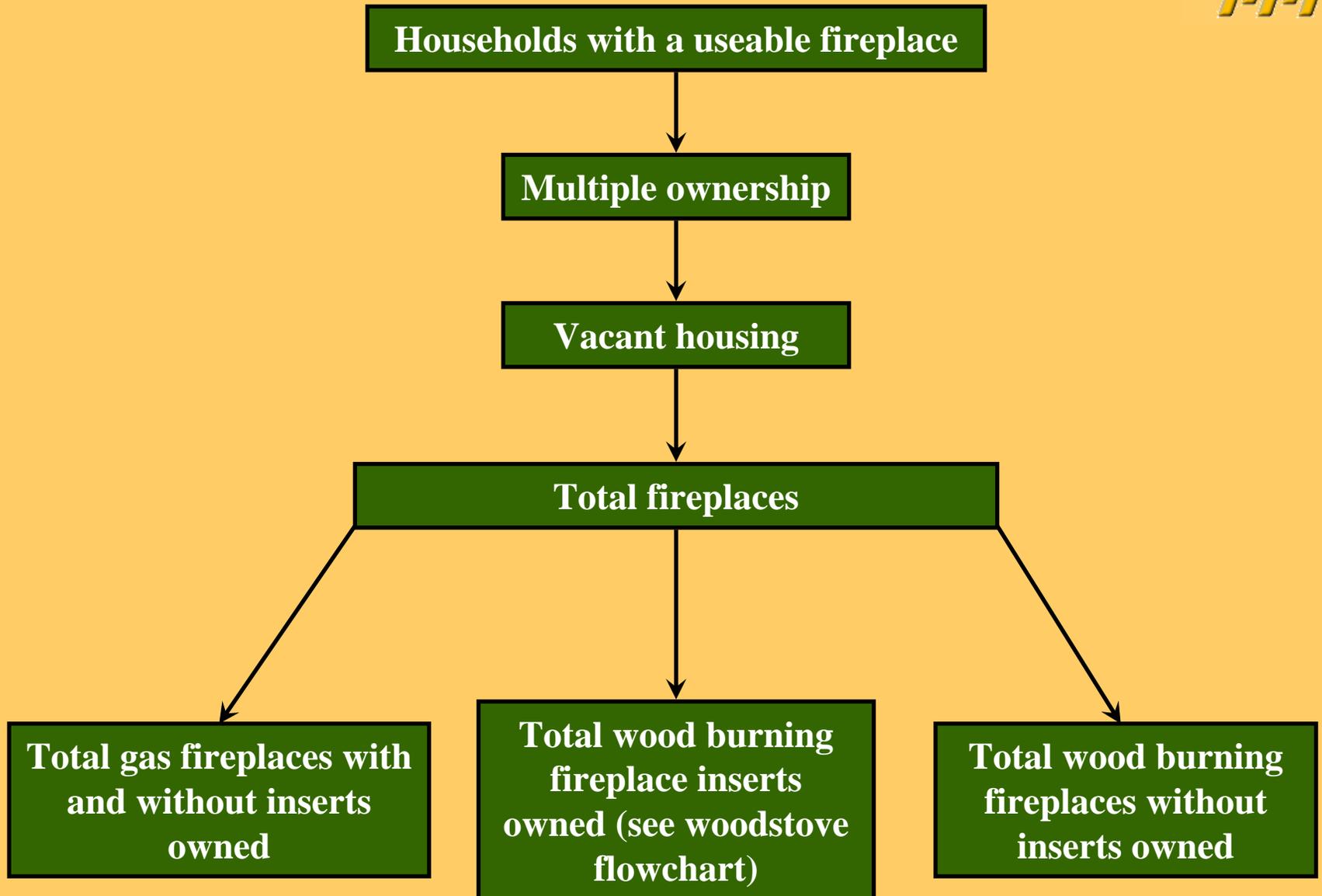


# Woodstove Factors (cont'd)

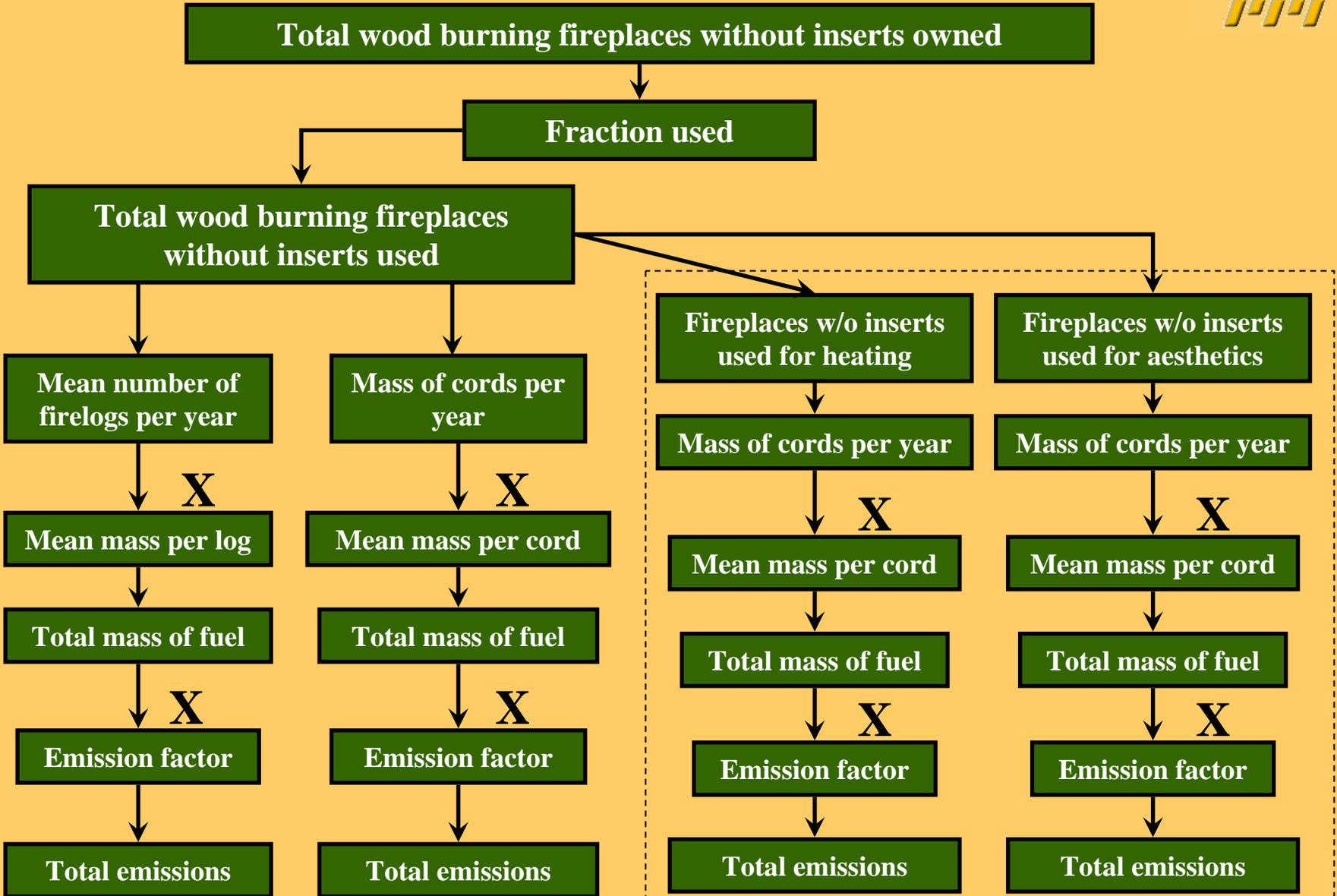
## Pre-Cert., & EPA Cert. Cat./Non-Cat.



# Fireplace Factors



# Fireplace Factors (cont'd)



# Fraction of Cordwood Heaters



Area, Year	Type	Fraction
Minnesota, 2002-2003 (used)	Conventional Pre-EPA Certification	0.76
	Certified Catalytic	0.07
	Certified Non-Catalytic	0.17
U.S. 2003 (owned)	Conventional Pre-EPA Certification	0.79
	Certified Catalytic	0.07
	Certified Non-Catalytic	0.14

# Fraction of Cordwood Stoves and Fireplace Inserts Not in Use



Area, Year	Fraction of stoves not used		Fraction of fireplace inserts not used	
Minnesota, 2002-2003	0.18	conv. 0.22	0.039	conv. 0.044
		cert. cat. 0.057		cert. cat. 0
		cert. non-cat 0.061		cert. non-cat. 0
California, 2002	0.17		0.03	
San Joaquin Valley, 1999	0.14		-	
U.S., 2002	0.15		-	
West/Mountain region, 2004	0.13		-	
Mean	0.15		0.03	

# Fireplace without Insert Usage



Area, Year	Usage category	Fraction by category
San Joaquin Valley, 2002	Almost every day	0.16
	Several times a week	0.20
	Several times a month	0.14
	Rarely	0.28
	<b>Not used</b>	<b>0.22</b>
San Joaquin Valley, 1999	Almost every day	0.12
	Several times a week	0.10
	Several times a month	0.24
	Rarely	0.22
	<b>Not used</b>	<b>0.32</b>
California, 2002	Used last year? Yes	0.77
	<b>Used last year? No</b>	<b>0.23</b>
U.S., 2002	Almost every day	0.15
	1 or 2 times a week	0.23
	1 or 2 times a month	0.24
	1 or 2 times a season	0.17
	<b>Almost never/not used</b>	<b>0.19</b>

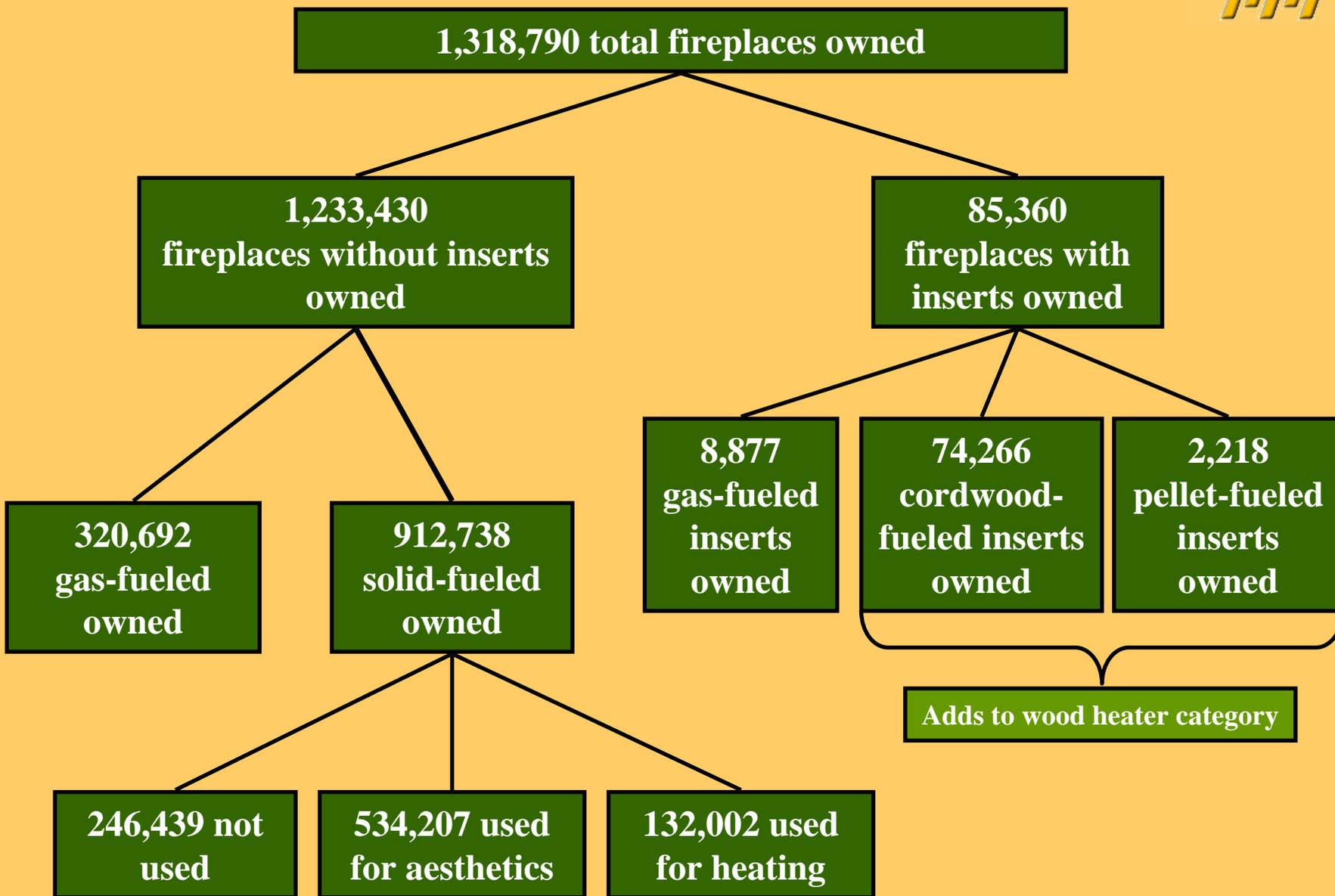
# Fireplace without Insert Usage (cont'd)



Area, Year	Usage category	Fraction by category
U.S. 1994-1995	5-7 times per week	0.11
	3-4 times per week	0.10
	1-2 times per week	0.18
	1-2 times per month	0.13
	1-2 times per season	0.17
	<b>Not used</b>	<b>0.31</b>
West/Mountain, 2004	1-2 times per month +	0.51
	1-2 times per season	0.15
	<b>Almost never/not used</b>	<b>0.34</b>
<b>Mean of almost never/not used</b>		<b>0.27</b>

# Los Angeles – Long Beach, 2002

## Fireplaces



# Emission Factors



<b>Appliance Type</b>	<b>Emission Factor (g/dry kg fuel)</b>	<b>AP-42 (g/dry kg fuel)</b>
<b>Conventional pre-EPA certification wood heaters (freestanding stoves + fireplace inserts)</b>	<b>33.4</b>	<b>15.3</b>
<b>EPA certified non-catalytic wood heaters (freestanding stoves + fireplace inserts)</b>	<b>5.85</b>	<b>7.3</b>
<b>EPA certified catalytic wood heaters (freestanding stoves + fireplace inserts)</b>	<b>7.55</b>	<b>8.1</b>
<b>Pellet heaters (freestanding stoves + fireplace inserts)</b>	<b>1.25 (all)</b>	<b>2.1 certified 4.2 exempt</b>
<b>Fireplaces without inserts</b>	<b>13.0 cordwood 21.2 firelogs</b>	<b>17.3 cordwood -</b>

# Data Summary for SCAB 2002 Base Year



Appliance Type	Number owned	Number used	Mass dry fuel burned (kg)	Mass PM <sub>2.5</sub> emitted (kg)
Conventional pre-EPA certification cordwood heaters	161,260	148,008	1.97 x 10 <sup>8</sup>	6.85 x 10 <sup>6</sup>
EPA certified non-catalytic cordwood heaters	34,341	33,107	3.66 x 10 <sup>7</sup>	2.14 x 10 <sup>5</sup>
EPA certified catalytic cordwood heaters	14,134	13,632	1.40 x 10 <sup>7</sup>	1.06 x 10 <sup>5</sup>
Pellet heaters	9,490	9,278	8.89 x 10 <sup>6</sup>	1.11 x 10 <sup>4</sup>
Solid-fueled fireplaces without inserts	1,673,684	1,222,721	8.90 x 10 <sup>8</sup> cw 1.99 x 10 <sup>7</sup> fl	1.16 x 10 <sup>7</sup> cw 4.22 x 10 <sup>5</sup> fl

**cw = cordwood**

**fl = firelog**