



# Oregon 2005 Residential Wood Combustion Emissions Inventory: Revised Interpretation of Wood Burning Survey Data Resulting in Emissions Estimates Reductions

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## Overview

- **1999 NATA: Oregon Residential Wood Combustion (RWC) emissions over-estimated**
- **Review of 2002 RWC methodology**
- **Re-interpretation of survey results**
- **Cordwood density data correction**
- **Activity and emissions estimates reductions for 2005**



## Introduction

- **1999 NATA results (PAH from woodstoves) triggered a review of the Residential Wood Combustion EI method**
- **Finding: Oregon RWC statewide survey results open to interpretation, affecting activity estimates**
- **Specifically: estimated percent of wood burning housing units**

# Department of Environmental Quality



ports on a rare double SPORTS, E1      Portlanders light up LIVING, D1

**STREET FINAL EDITION**

WEDNESDAY  
MAY 22, 2008

PORTLAND, OREGON      VOICE OF THE NORTHWEST SINCE 1850      50c

**Oregon's air third-worst in nation, EPA reports**

**While New York and California top the list, an Oregon official hopes the Legislature will take action on air pollution**

LA TIMES WASHINGTON POST SERVICE

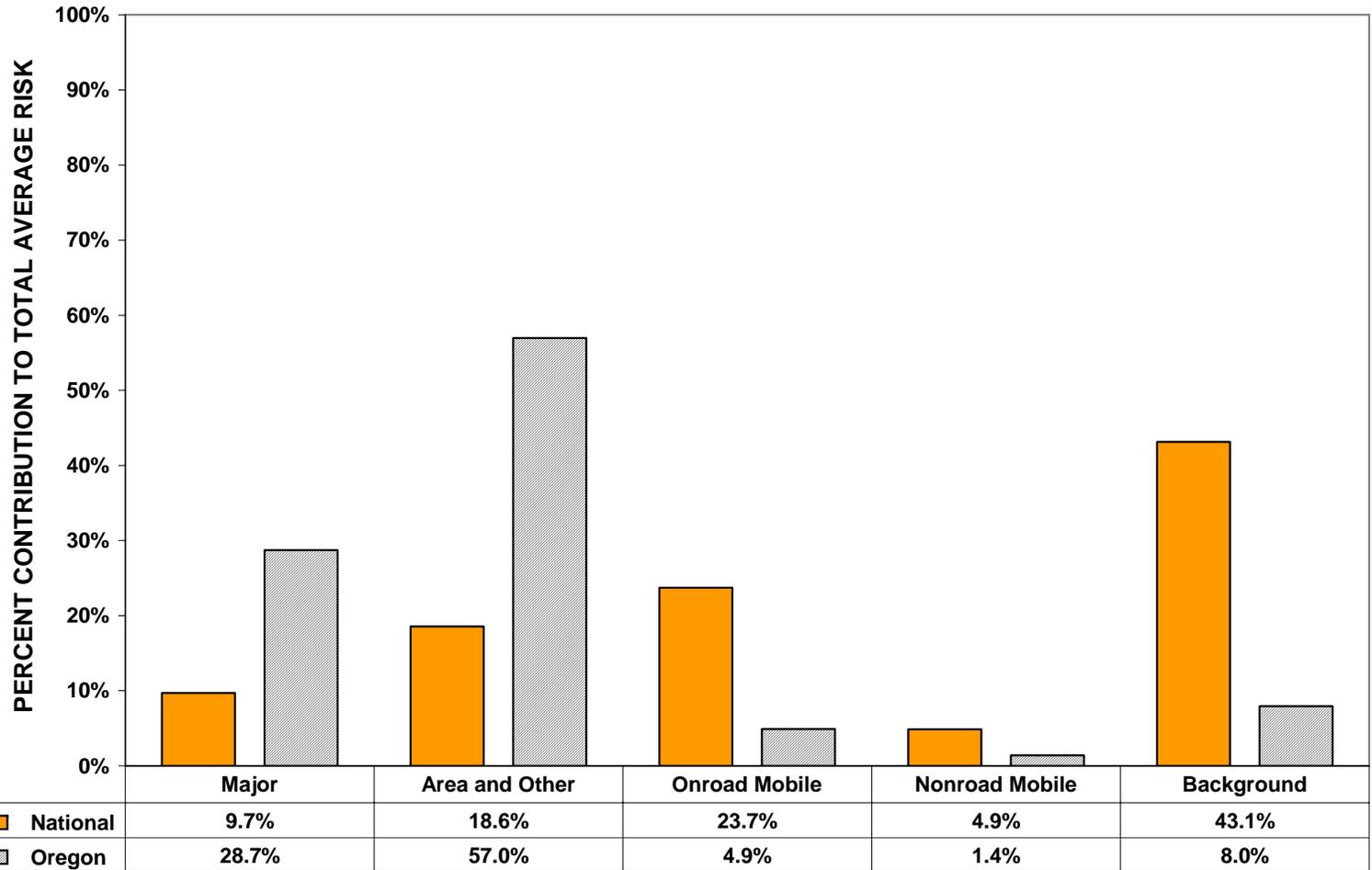
LOS ANGELES — A new federal report says Oregonians shouldn't be so smug about their air quality. The latest Environmental Protection Agency data show Oregon has the third dirtiest air in the country. "We were surprised to see that we ranked third," said Andy Clough, administrator of the Air Quality Division at

**Snowbound survival** | A missing Oregon family turns up safe

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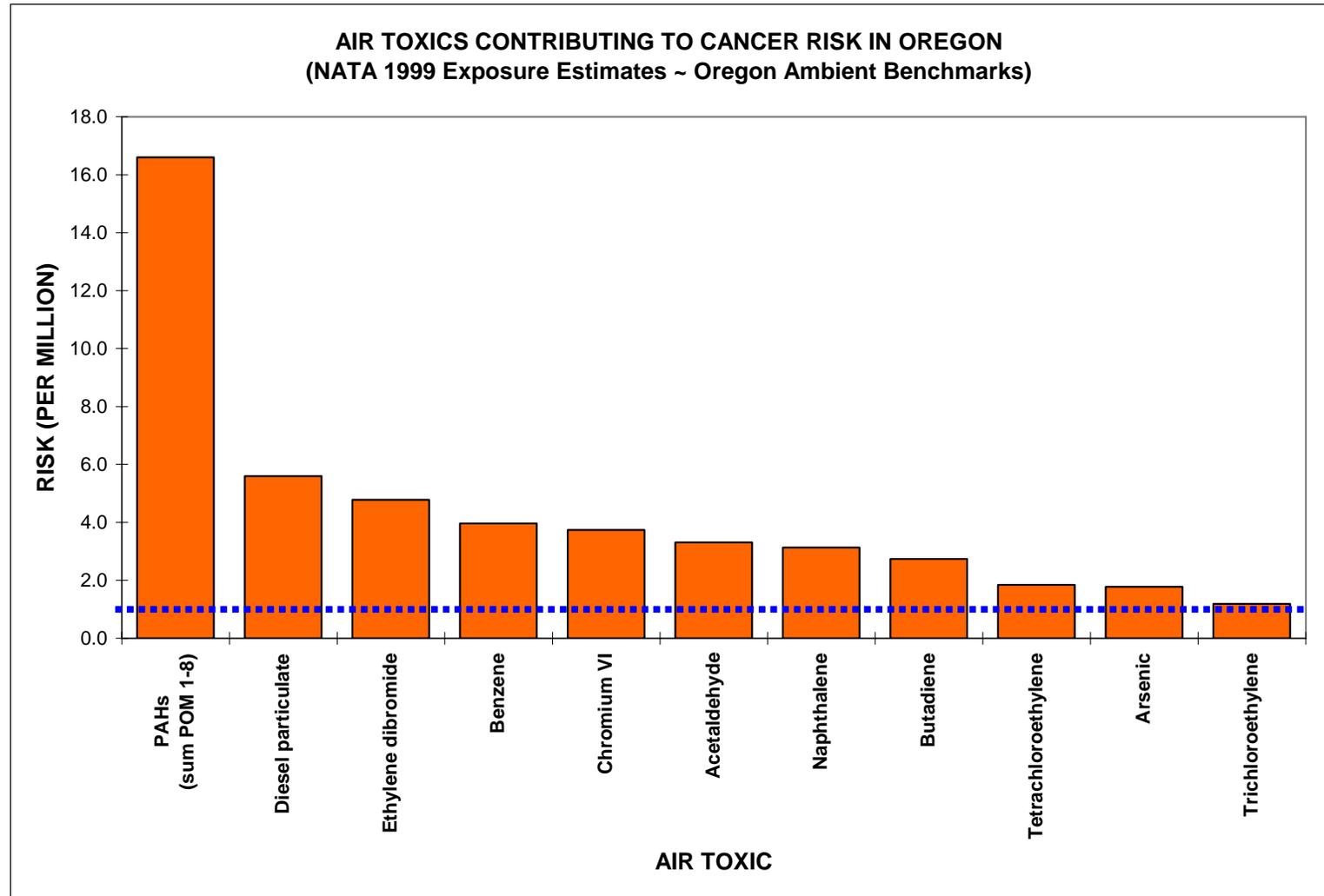
**SOURCES OF CANCER AIR TOXICS (NATA 1999)**



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**AIR TOXICS CONTRIBUTING TO CANCER RISK IN OREGON**  
(NATA 1999 Exposure Estimates ~ Oregon Ambient Benchmarks)





## 2002 Oregon RWC NEI Submittal: Approximately 5X National Avg.

### 2002 NEI Residential Wood Combustion Emissions Estimates <sup>(1)</sup>

	----- tpy -----					
	15-PAH	Benzene	PM25-PRI	CO	VOC	NO <sub>x</sub>
Oregon	312 <sup>(3)</sup>	1,772	38,804	267,289	125,936	3,934
National Avg. <sup>(2)</sup>	72	348	7,236	54,996	26,600	698

Notes:

- (1) [ftp://ftp.epa.gov/EmisInventory/2002finalnei/2002\\_final\\_v3\\_2007\\_summaries/nonpoint/](ftp://ftp.epa.gov/EmisInventory/2002finalnei/2002_final_v3_2007_summaries/nonpoint/)
- (2) National Average is for the NEI excluding OR and WA
- (3) Approximate



## RWC Method: Emissions Formula

**Estimated Emissions = Activity \* Emission Factors**

### Where

- Activity** = tons wood burned  
= estimated using 1993 & 2000 statewide survey results
- Emission Factors** = specific to pollutant and device type  
= taken from EPA, EIIP, and OMNI documentation.



- **Emission Factors considered not open to interpretation**
- **Source of Oregon elevated RWC emissions estimates = ACTIVITY**
- **Activity = estimated from survey data**
- **Survey data open to interpretation**



## DEQ RWC Method: Activity Formula

Tons Wood Burned by County = (a) \* (b) \* (c) \* (d)

Where

a = County 2005 Housing Units (HU), estimated from 2000 US Census Bureau data

b = % Woodburning HU by Region and Device, from 2000 survey data

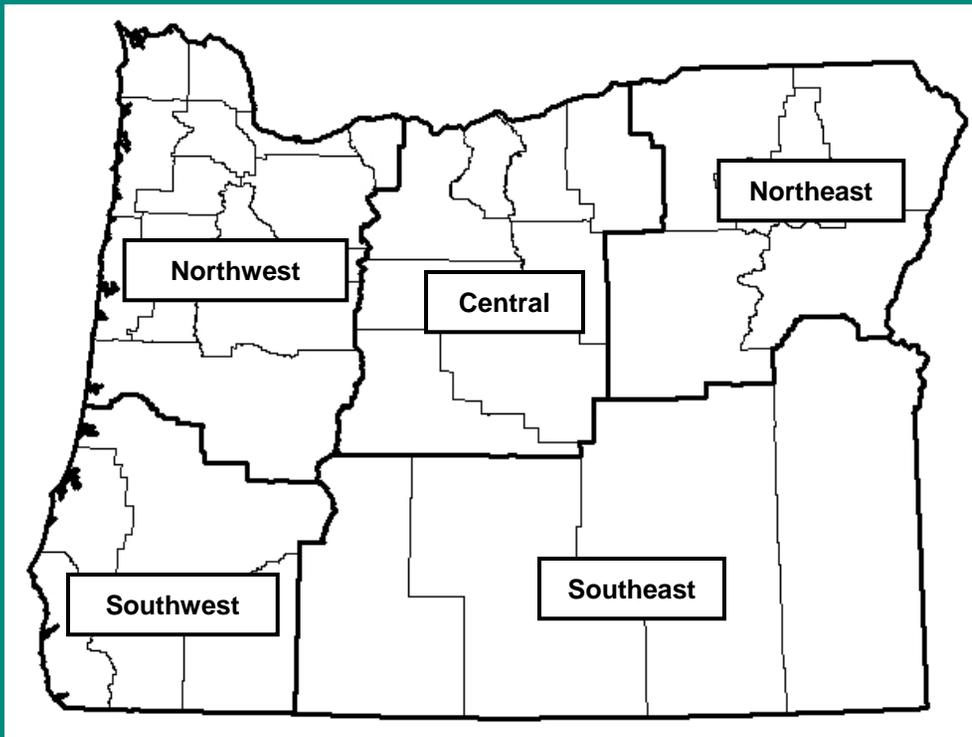
c = Regional Avg. Annual Tons Fuel Combusted per Device, from 1993 and 2000 survey data

d = County 2005/2000 Heating Degree Day ratio, from National Climatic Data Center



## Activity: 1993 and 2000 Statewide Wood Heating Surveys

- 1993 (mail in): wood species data used: cord mass
- 2000 (cold-call): Used for all other activity data
- Survey divided into five regions to accommodate county spatial allocation required by the CERR
- Regions:





## **2000 RWC Survey Results: Re- Interpretation**

- **2002 estimates: Survey fuel burning data was averaged per device and allotted to respondents who reported owning a wood burning device but did not report burning wood fuel in the device**
- **2005 estimates: Survey fuel burning data was not allotted to respondents who reported owning a device but did not report burning wood fuel in the device**



## 2000 RWC Survey Results: Re-Interpretation

“Owners” (own the device) vs. “Burners” (burn wood in the device)

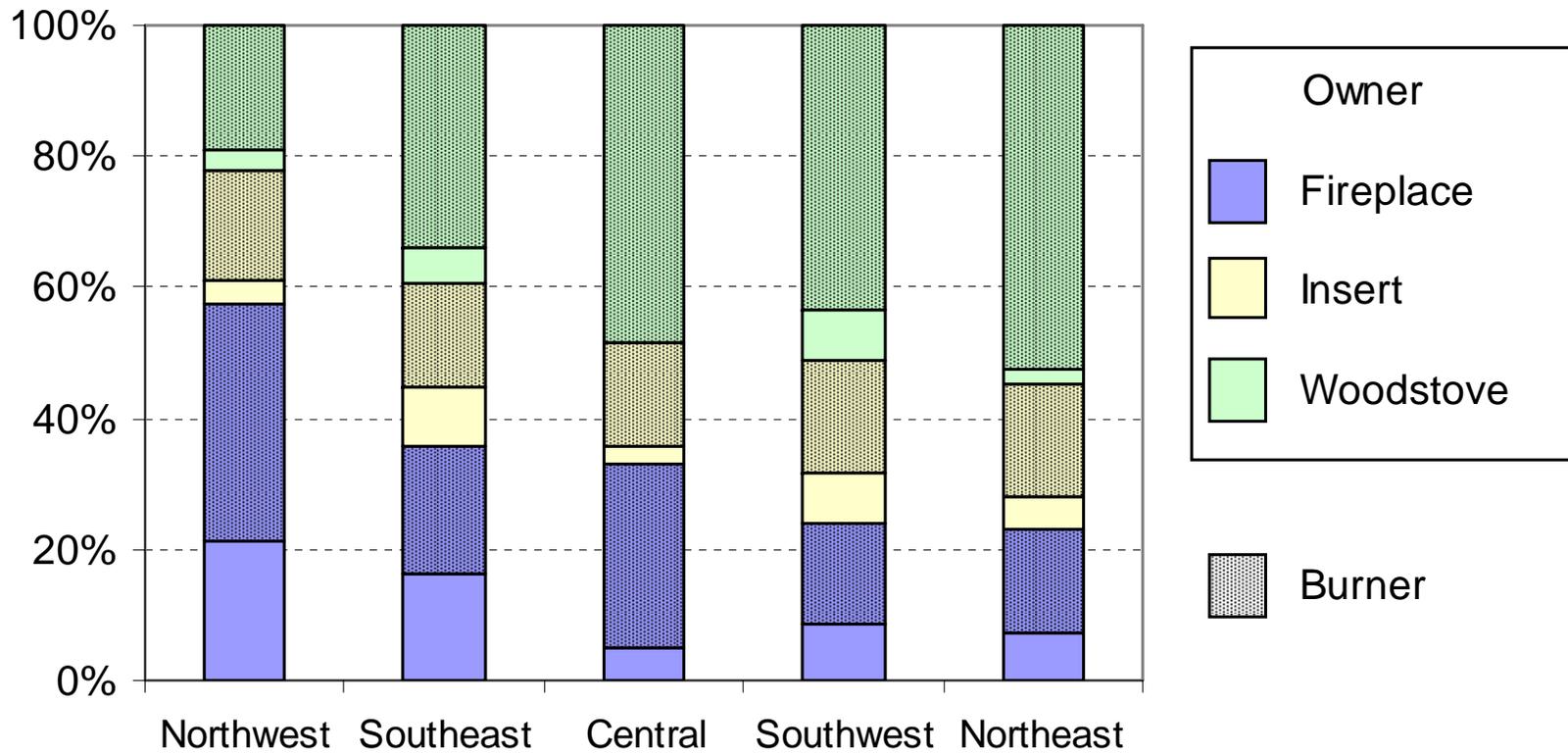
Region	Fireplace		Insert		Woodstove		Pellet Stove		Central Furnace	
	Own	Burn	Own	Burn	Own	Burn	Own	Burn	Own	Burn
Central	17	15	10	8	25	25	9	9	3	3
Northeast	10	7	9	7	23	22	6	6	1	1
Northwest	83	53	30	24	32	28	6	5	2	1
Southeast	20	11	14	9	22	19	4	4	--	--
Southwest	22	14	23	16	47	40	4	3	1	1
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Totals	152	99	85	64	148	133	29	27	6	6

Survey results: Owners = 420/856 completed interviews = 49%

Survey results: Burners = 327/856 completed interviews = 38%

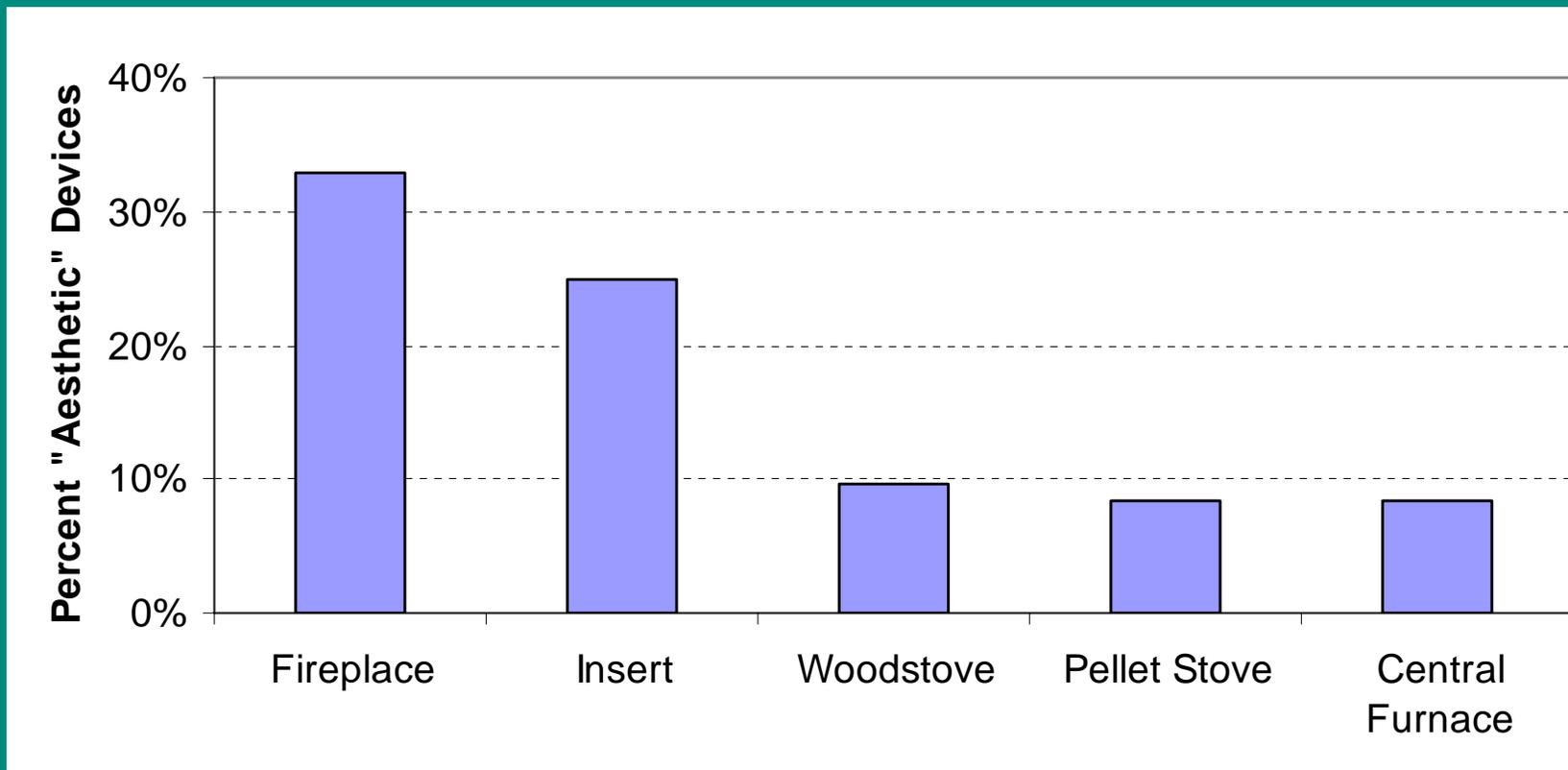


## 2000 RWC Survey Results: Re-Interpretation



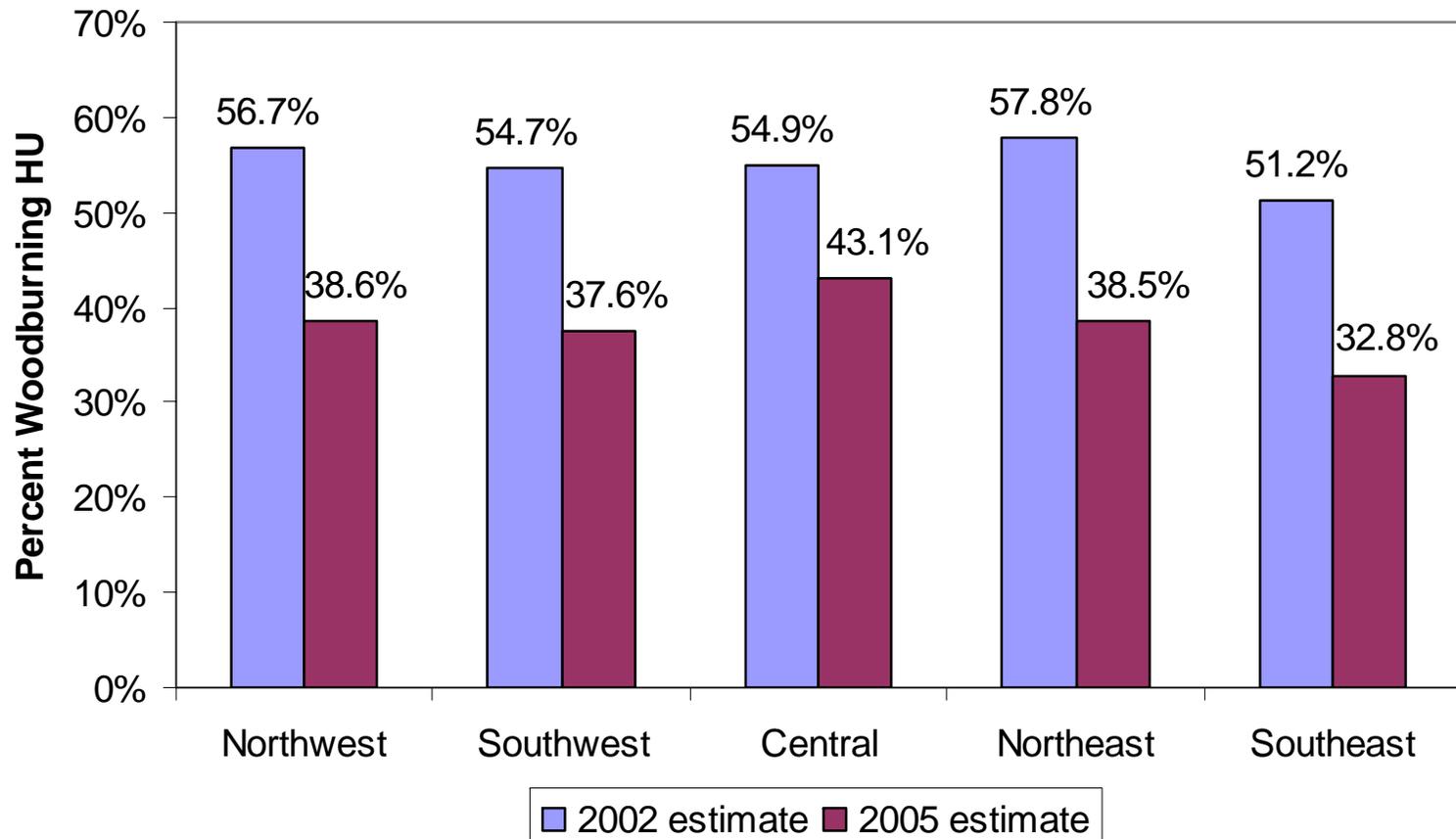


## 2000 RWC Survey Results: Re-Interpretation



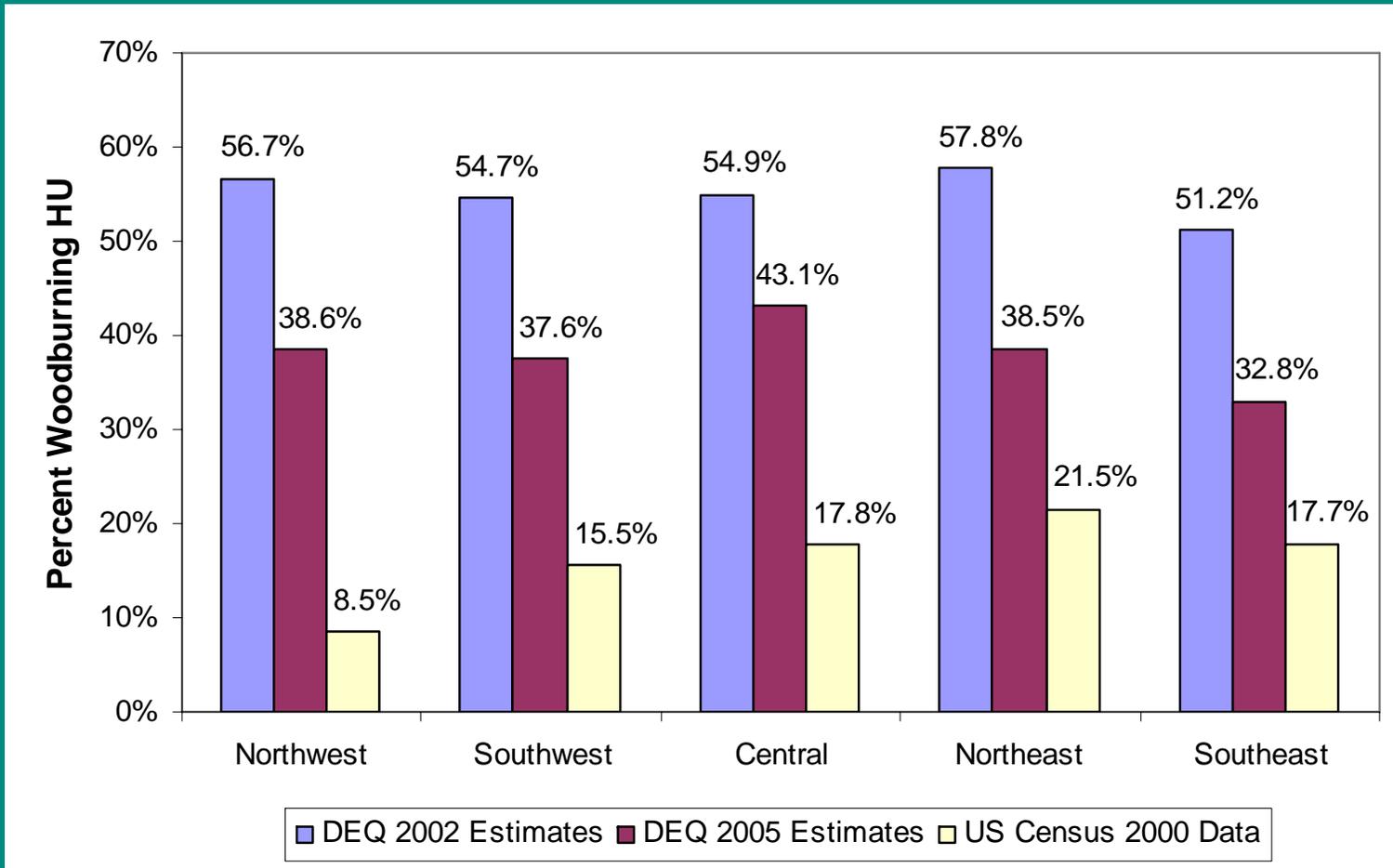


# DEQ Woodburning Housing Unit Estimates





# Woodburning HU: DEQ Estimates vs. 2000 US Census Data: Oregon (H40: House Heating Fuel: Wood = primary fuel)





## **Oregon RWC Activity Method: Wood density error correction to 2005 estimates**

- **Cord consumption by region, from 2000 survey data**
- **“Typical” cord mass estimated from wood species burned (from 1993 survey results)**
- **Incorrect species density value used to estimate typical cord mass for 2002 method**
- **Corrected for 2005: regional average annual tons fuel combusted per device revised downward**

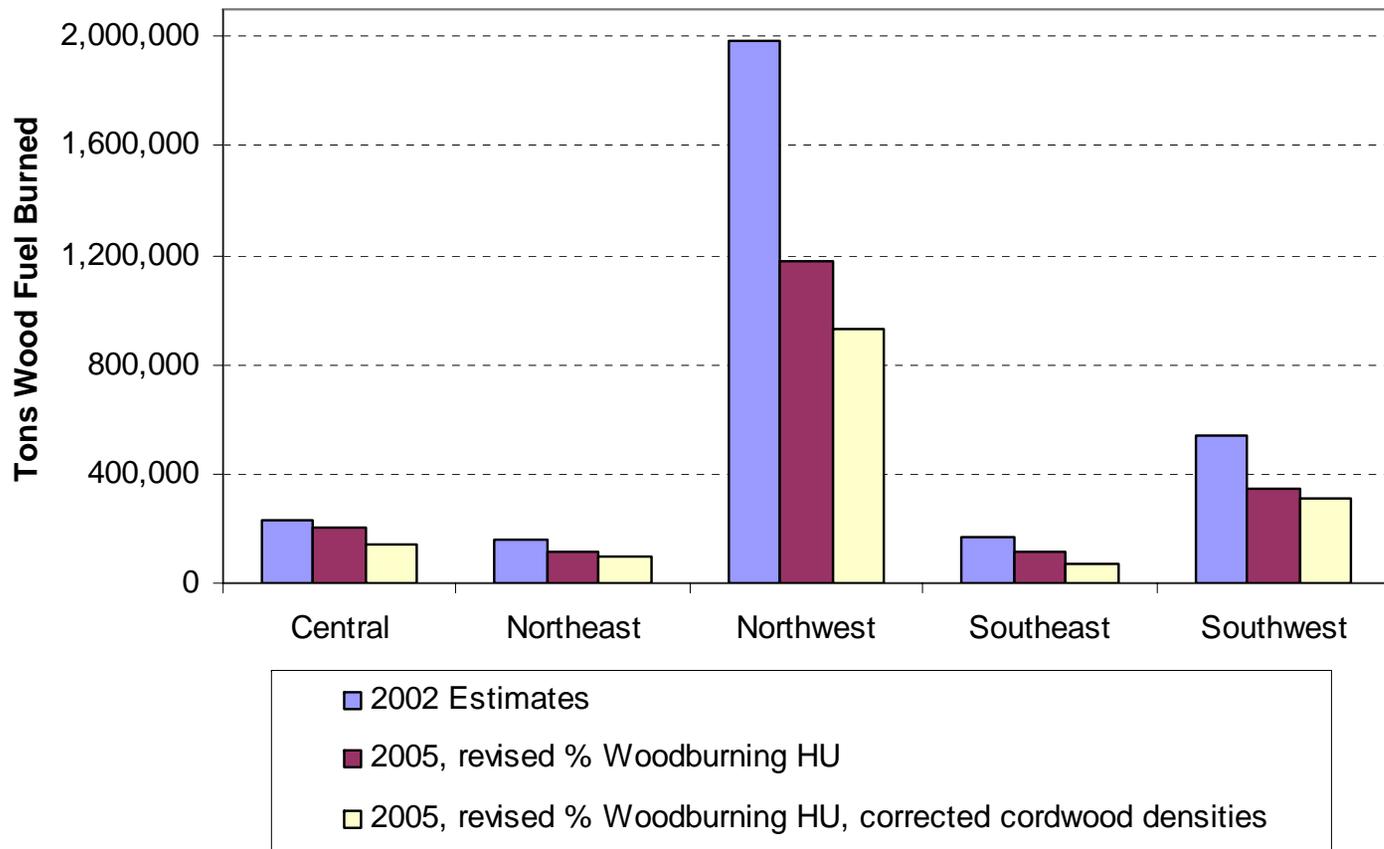


## **DEQ 2005 RWC Activity Reductions From 2002 Estimates**

- **Revised woodburning HU = 37% reduction**
- **Corrected cord density = additional 13% reduction**
- **Total reduction = 50% on average**

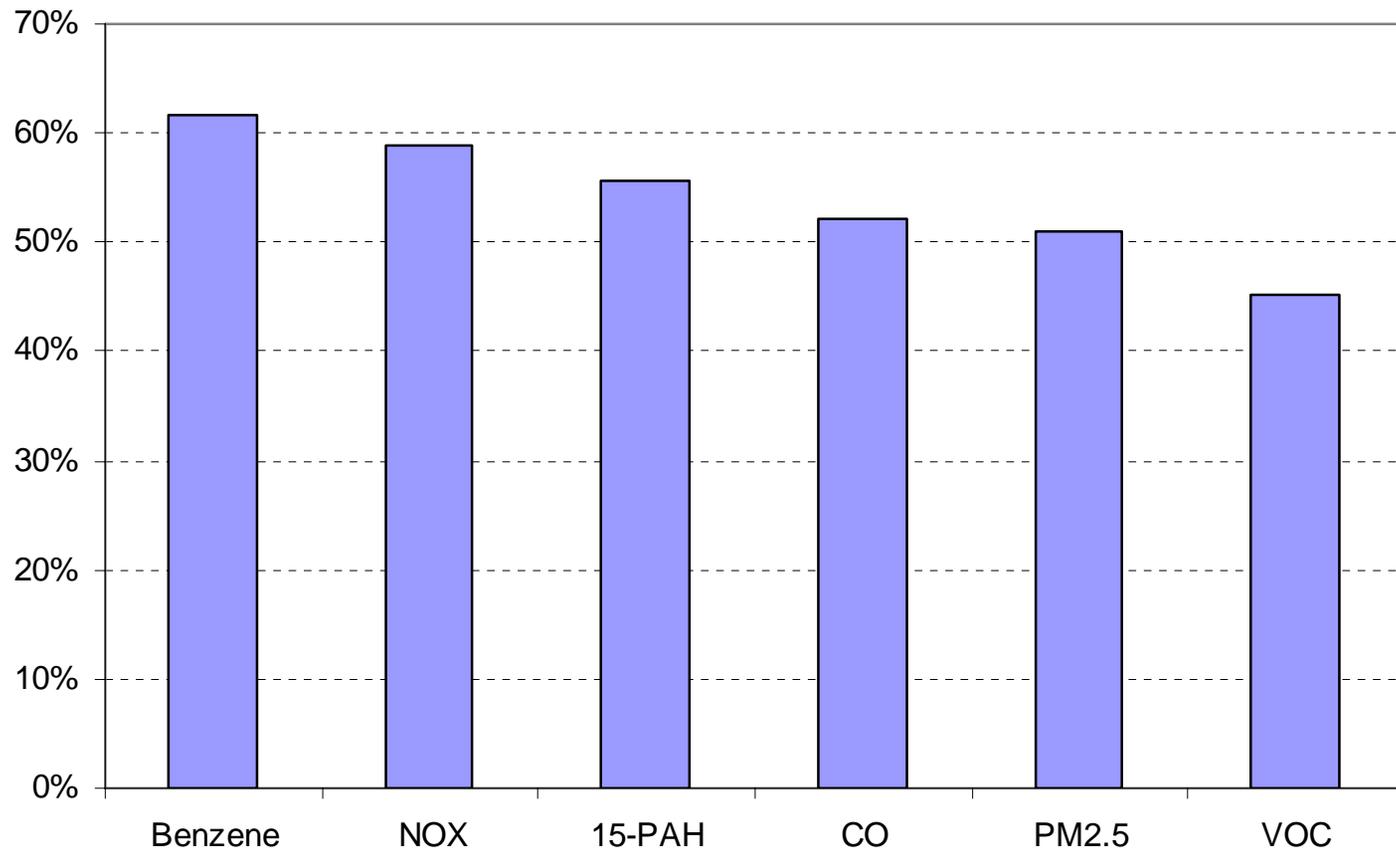


# Estimated Tons Wood Fuel Combusted: 2002 Estimates vs. 2005 Revised Estimates





## Emissions Estimates: percent reduction in emissions estimates between the 2002 and the 2005 DEQ RWC inventories





## Emissions Estimates: 2005 Oregon RWC EI: Approximately 2X 2002 National Avg.

### 2005 Oregon RWC Emissions Estimates Compared to 2002 National Averages

	----- tpy -----					
	15-PAH	Benzene	PM25-PRI	CO	VOC	NOX
Oregon <sup>(1)</sup>	104	797	18,969	127,611	67,126	1,776
National Avg. <sup>(2)</sup>	72	348	7,236	54,996	26,600	698

Notes:

- (1) 2005 Revised estimates
- (2) [ftp://ftp.epa.gov/EmisInventory/2002finalnei/2002\\_final\\_v3\\_2007\\_summaries/nonpoint/](ftp://ftp.epa.gov/EmisInventory/2002finalnei/2002_final_v3_2007_summaries/nonpoint/)  
National Average is for the NEI excluding OR and WA



## **Conclusions / Recommendations: New Survey Needed**

- **Owner vs. burner questions more closely linked**
- **Wood species burned data updated**
- **Primary or secondary fuel questions**
- **Check DEQ estimated activity against US Census data H40 House Heating Fuel (1 in 6 HU get “long form”)**
- **Consider EPA NEI RWC Workgroup recommendations**



## Questions?

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