

Residential Wood Combustion in Minnesota

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Midwest and Central States
Air Quality Workshop



**Minnesota Pollution
Control Agency**

Overview

- Survey Background
- 2011-2012 Survey Highlights
- Emissions Information
- Upcoming Efforts

Residential Wood Use Survey

- Survey has been conducted since 1960 (historically, by MDNR and USFS)
 - Manage forests, inform policy/science, support hearth/fireplace industries
- MPCA conducted survey in 2012
 - Gather additional information about 2011-2012 wood combustion practices
 - Support agency's efforts to investigate/address fine particle pollution

Survey Objectives

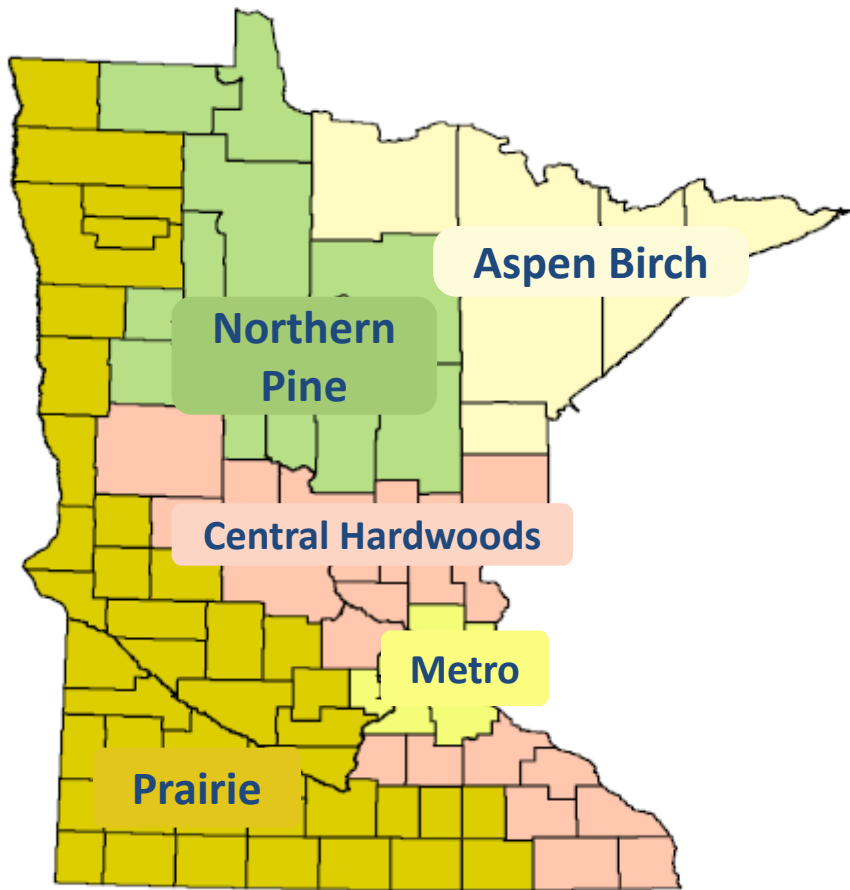
1. Estimate the total volume and species of wood harvested and consumed between July 1, 2011-June 30, 2012
2. Determine the geographic distribution of households burning wood by: type of usage (e.g., primary heating source, secondary heating source, and pleasure), type of wood, and type of wood-burning appliance used
3. Identify wood burning trends
4. Determine the temporal allocation of wood burning over a year
5. Understand the reason(s) wood is burned in order to inform air pollution reduction strategies
6. Estimate the volume of wood burned from the following wood supply categories: live and/or dead trees, logging residue, land clearing, yard/boulevard trees, mill residues, lumber scraps, salvage of wood pallets, and commercial fuel products such as wood and paper pellets and manufactured fireplace logs
7. Estimate the volume of fuel wood harvested from land owned by different entities (state, federal, county, forest industry, and private lands)

2012 Survey Information

- Survey: 10 page multiple choice and fill in the blank questionnaire
- Redesigned 2012 survey to increase overall response rate and increase confidence in Metro area results
 - Simplify survey format, increase Metro area sample size, online completion option, informational graphics included
- Response rate of 35% higher than previous years
 - Sent out nearly 7,000 surveys, received nearly 2,400 responses
- State divided into 5 regions for data collection/analysis purposes
- Distinguished between 7 types of wood burning, based on equipment used

MN Residential Wood Use Survey

(Five Minnesota Survey Regions)









USDA-Forest Service, Forest Inventory and Analysis survey units for Minnesota forests



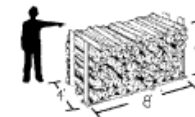
USFS Forest / Nonforest Map of Minnesota

Minnesota's 2011/2012 Residential Fuelwood Use Survey

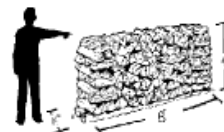
Equipment type	
	Conventional Fireplace
	Fireplace insert
	Wood stove
	Wood or corn pellet stove
	Wood-burning boiler or furnace
	Outdoor fire ring, chimenea, fire pit, etc.

Estimating how much firewood you use

A full cord is a large amount of wood. It measures 4 feet high by 4 feet wide by eight feet long (4' x 4' x 8') and has a volume of 128 cubic feet.



A face cord of wood is four feet high by eight feet long and is as wide as the individual firewood pieces, but averages 16 inches wide. A 16-inch wide face cord (sometimes called a fireplace cord) is equal to one-third of a full cord.

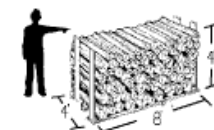


Face cord (16")

X
times

3
three

=
equals



One full cord

Two full-size pick-up truck loads (8 foot box) equals one full cord, whether the wood is stacked carefully so it is about level with the truck box sides, or is thrown into the truck box with the top of the pile about as high as the cab.

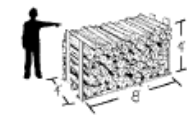


Full-size pick-up truck (8')

X
times

2
two

=
equals



One full cord

Four compact pick-up truckloads (6 foot box) equals one full cord of wood, whether the wood is stacked carefully and about level with the truck box sides or thrown into the truck box with the top of the pile about as high as the cab.

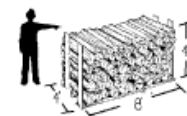


Compact pick-up truck (6')

X
times

4
four

=
equals



One full cord

64 bags/bundles of firewood that measure about one foot by one foot by two feet (1' x 1' x 2') equals one full cord.

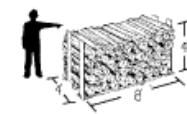


Bag or bundle (1' x 1' x 2')

X
times

64
sixty four

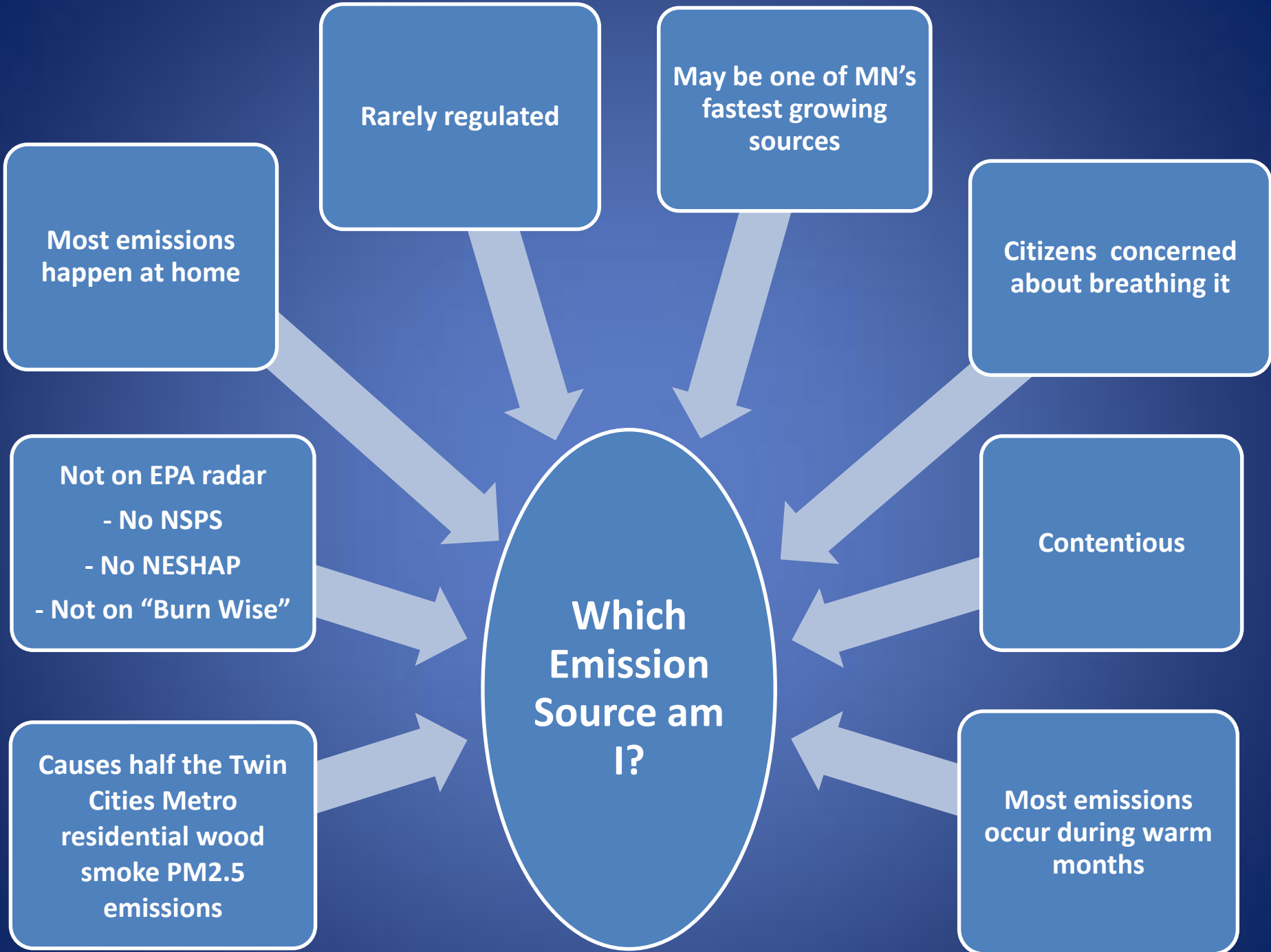
=
equals



One full cord

Residential Wood Burning Equipment





The answer is:



**Outdoor
Residential
Recreational
Burning**

Where there's smoke, there's ire

Keep backyard campfires and chimeneas from smoking you and your neighbors out. The smoke is not just a nuisance—it can be toxic and harmful to people.

- Limit backyard fires in the city.
- Never start backyard fires during an air pollution alert.
- In the Twin Cities it's illegal to burn any waste in a fire.



Minnesota Pollution
Control Agency

Learn more at
www.livinggreen.org/fire

2011-2012 Survey Highlights

Million Cords of Wood Burned per Year by Minnesota Residents over Five Decades

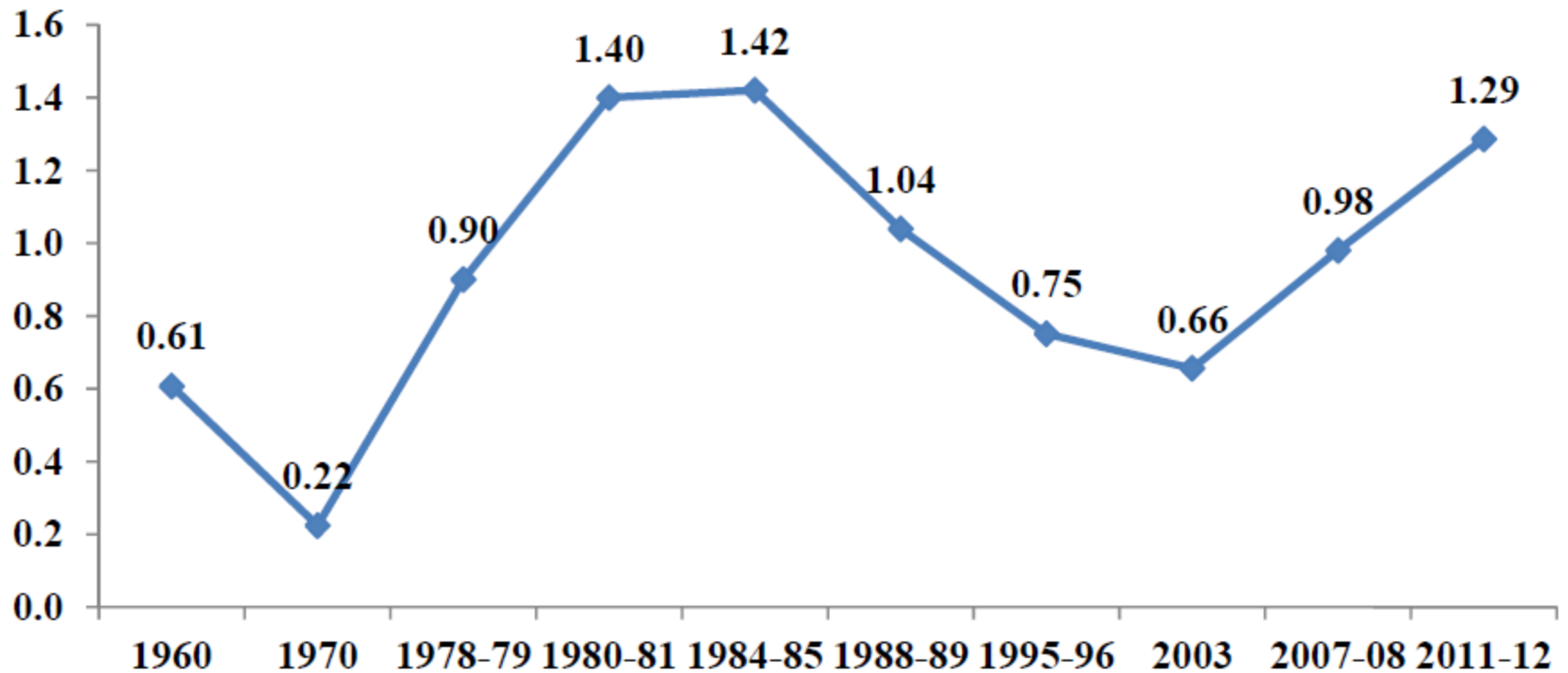
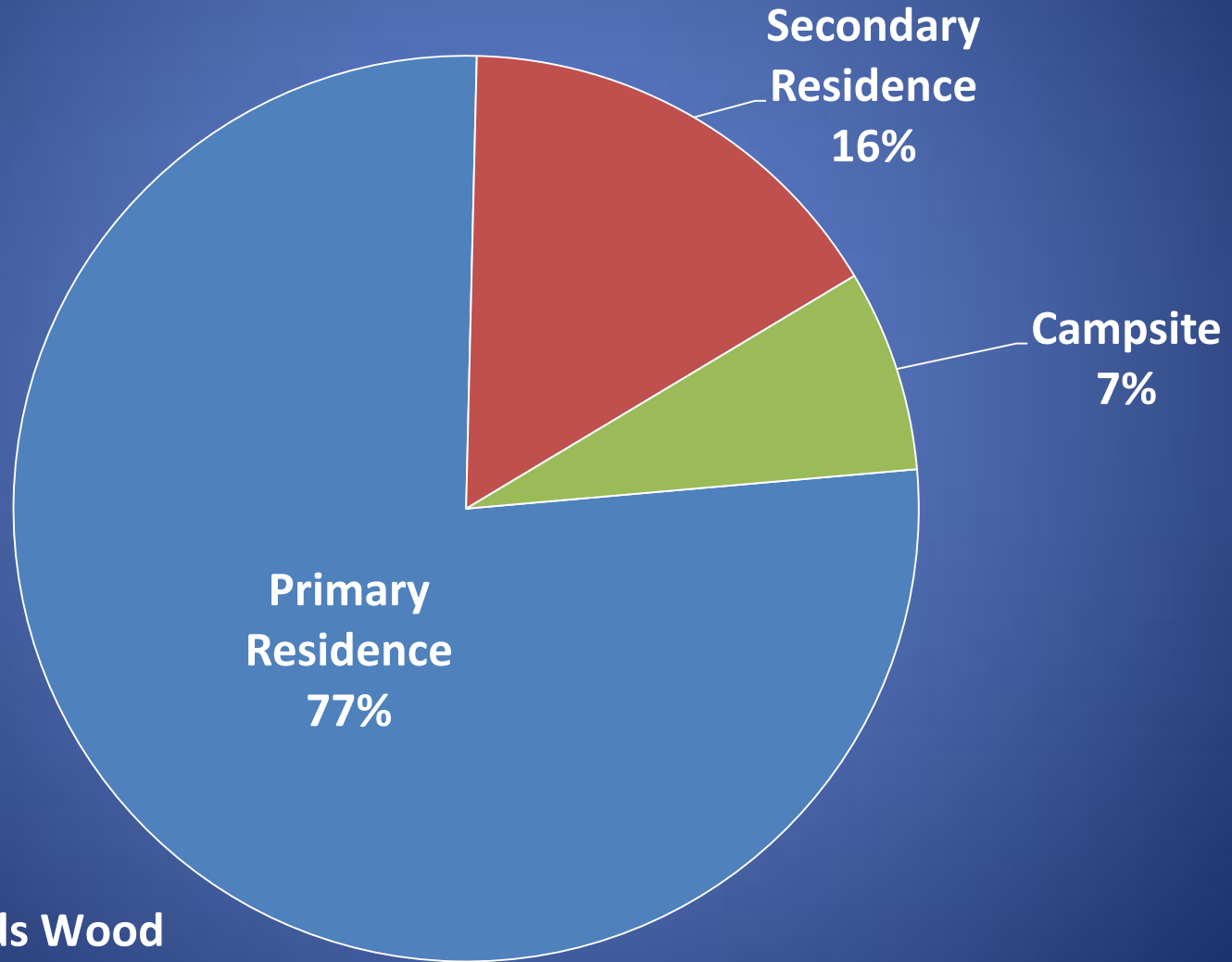


Figure 2. Wood fuel consumption in Minnesota by survey year (Millions of Cords)

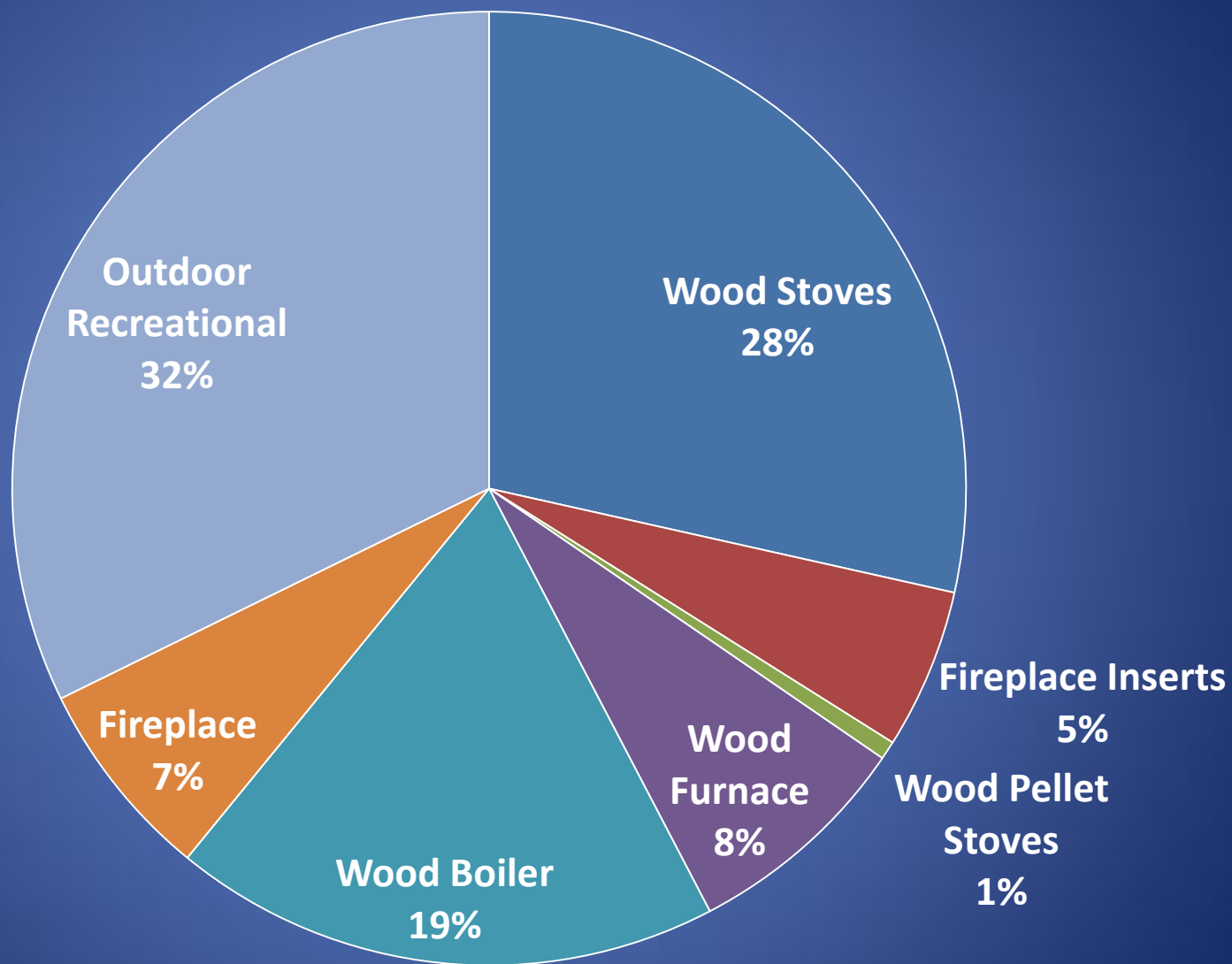
Most Wood is Burned at Home



**~ 1.3 Million Cords Wood
Burned by Residents**

2011/2012 survey

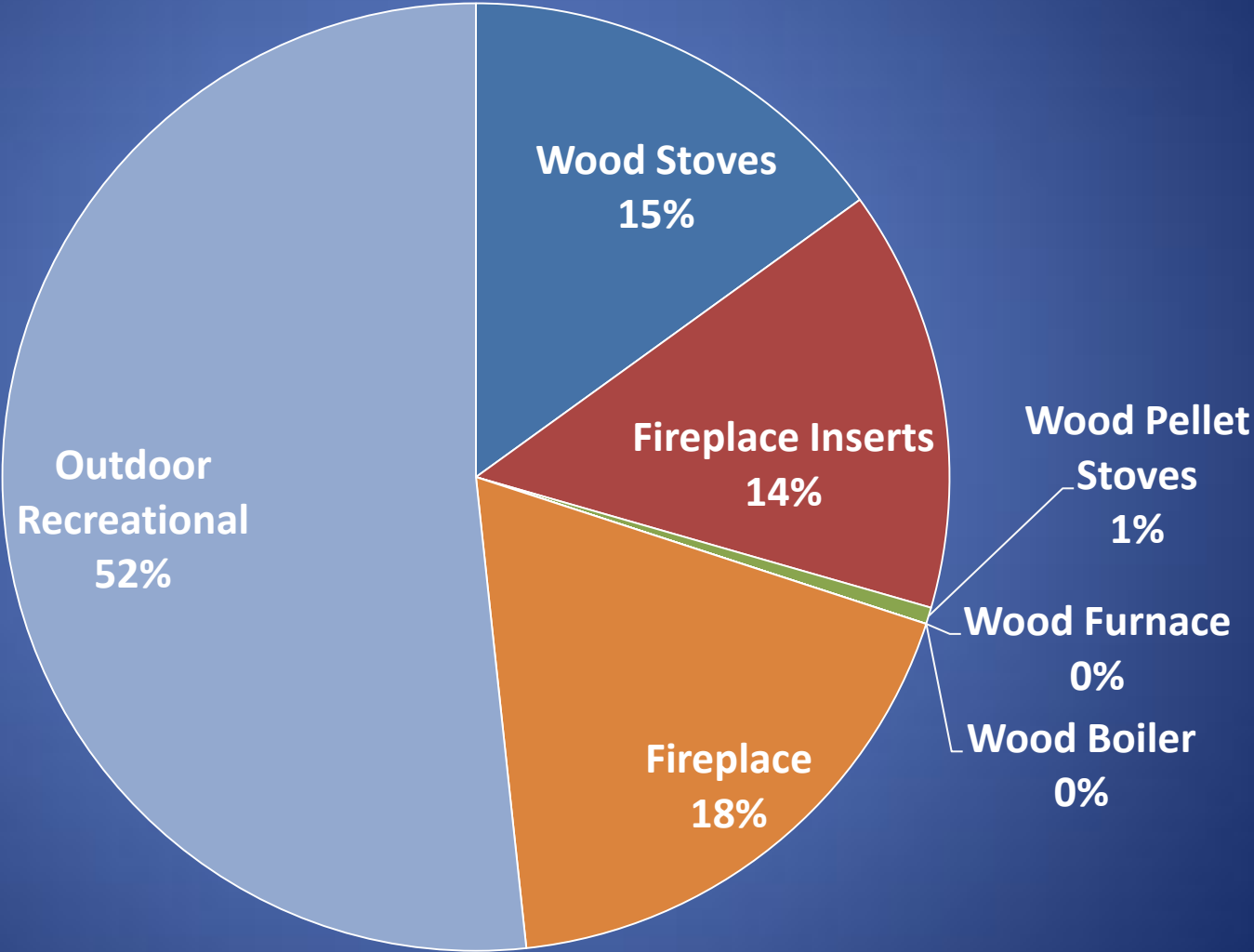
Residential Cords of Wood Burned Statewide



~ 1.3 Million Cords
Wood Burned by
Residents in Minnesota

2011/2012 Survey

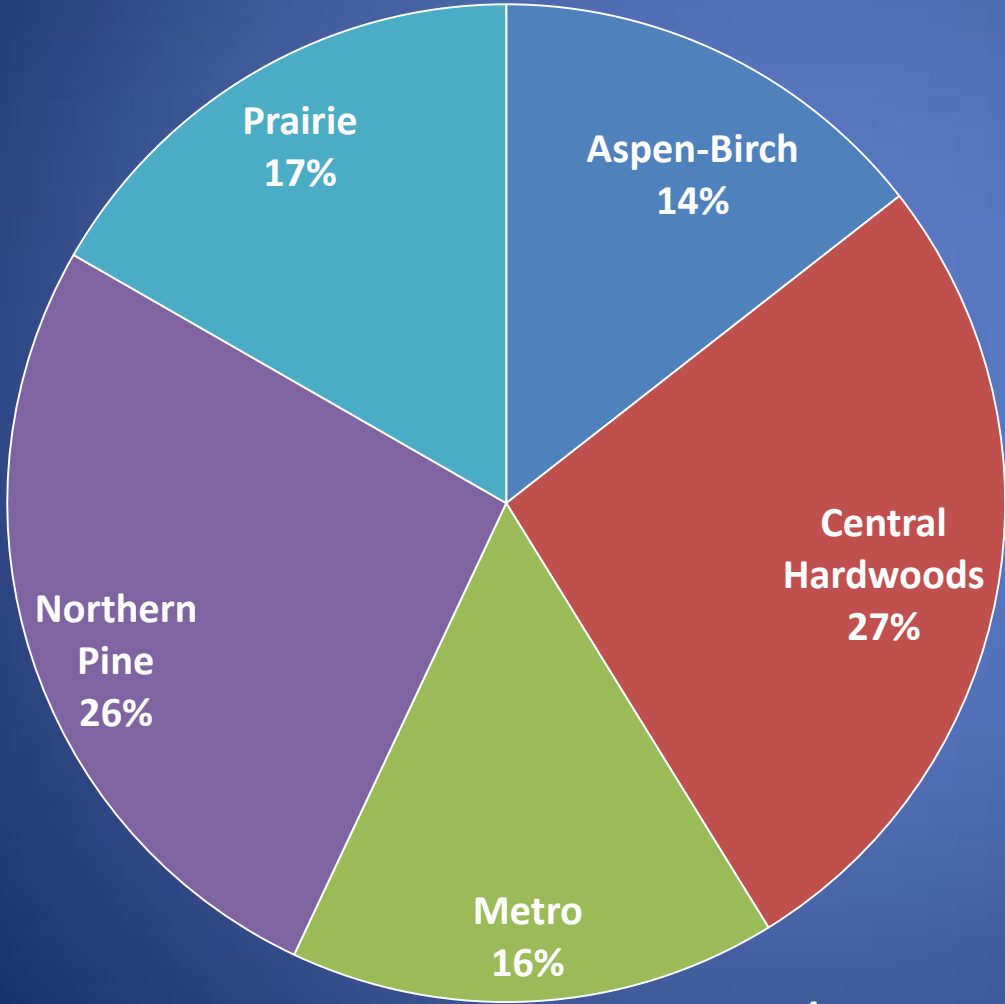
Residential Cords Wood Burned in Metro



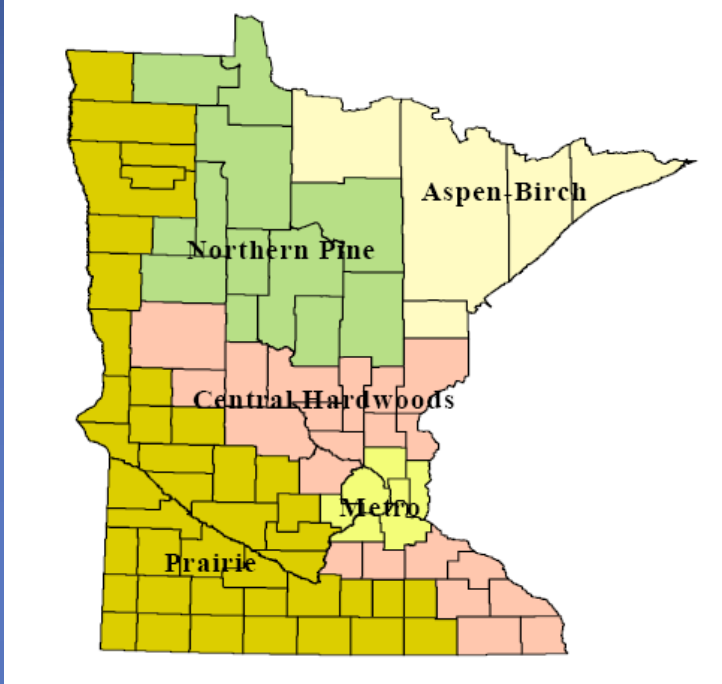
~200,000 Cords of Wood Burned in the Metro Region

2011/2012 Survey

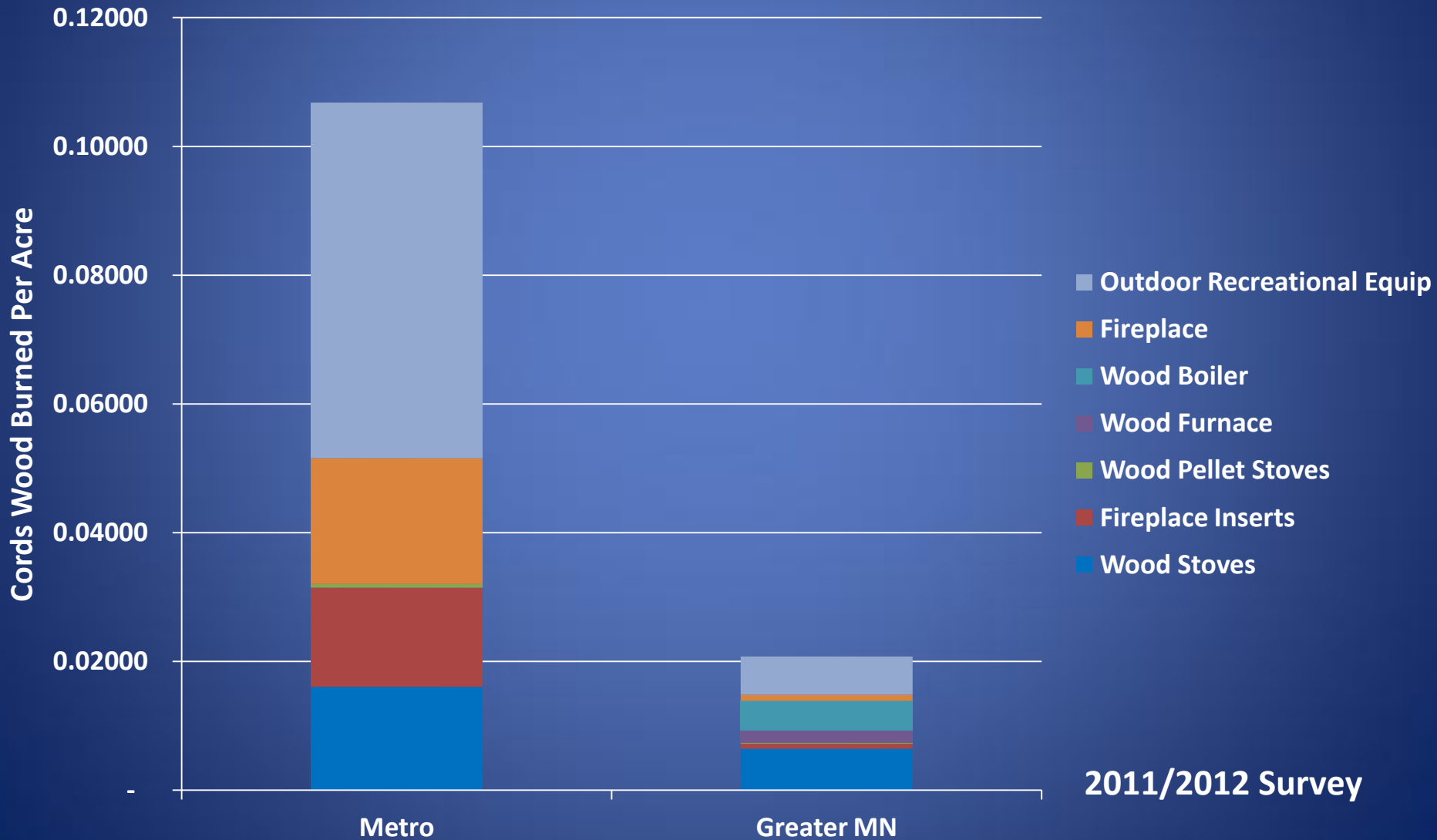
Similar Amounts of Wood Burned in 5 MN Regions



2011/2012 Survey

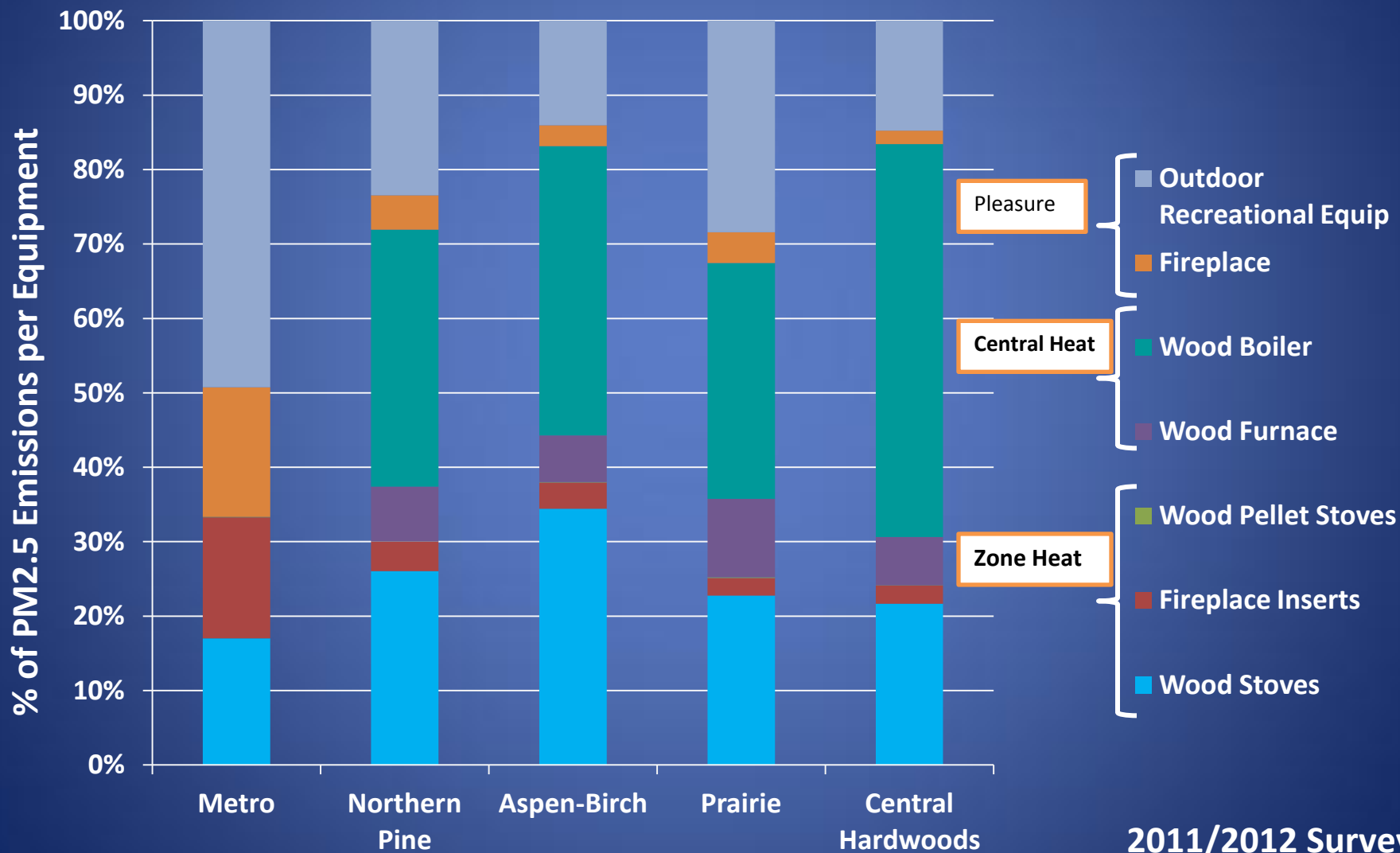


Metro Region Burned the Most Wood per Acre



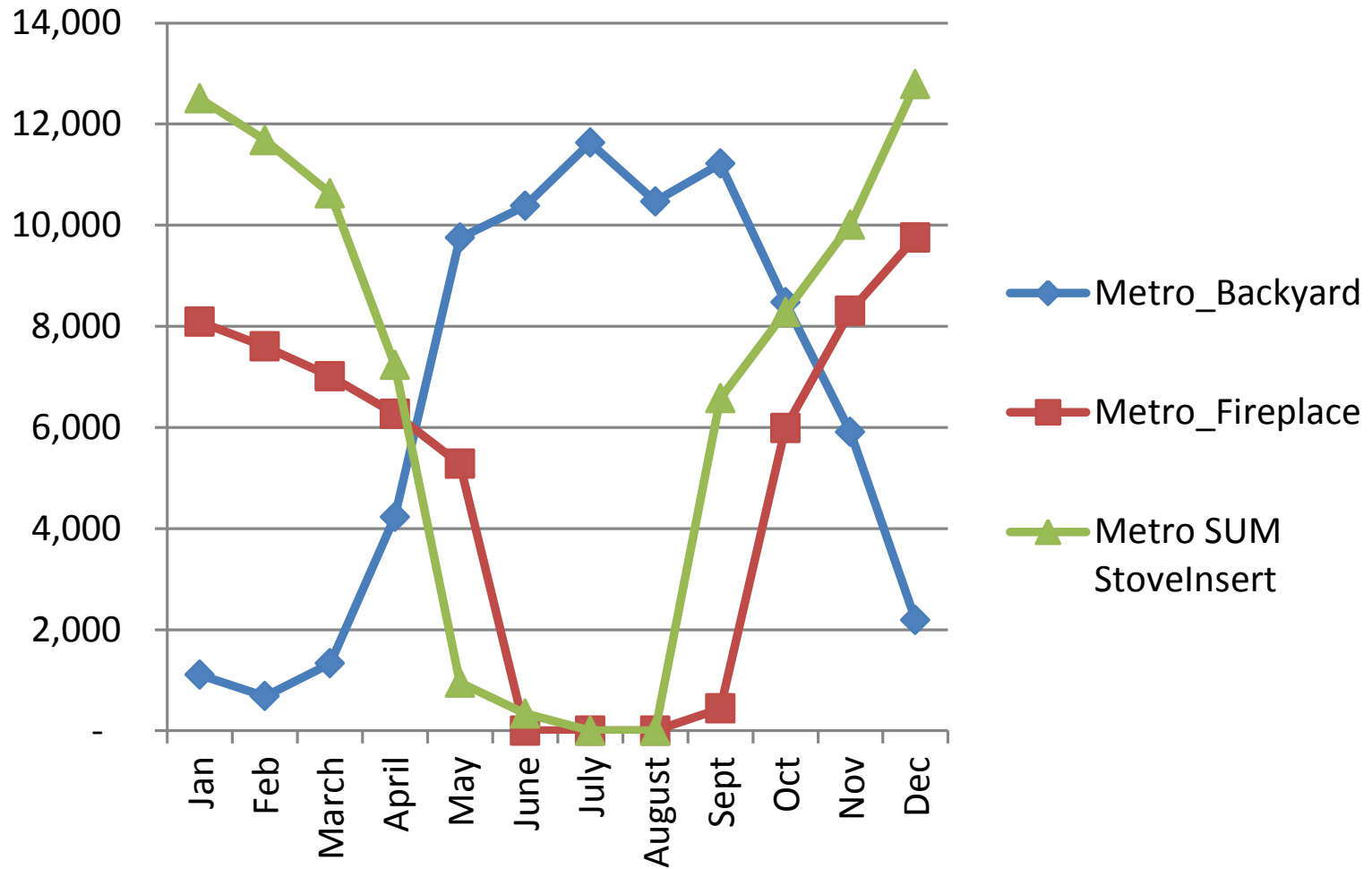
Most Metro Burning Emissions are for Pleasure, Most Rural Burning Emissions are for Heat

Residential Wood Burning Sources of PM2.5 Emissions - by MN Region



2011/2012 Survey

Metro Cords Wood Burned by Month



Statewide Residential Wood Burned

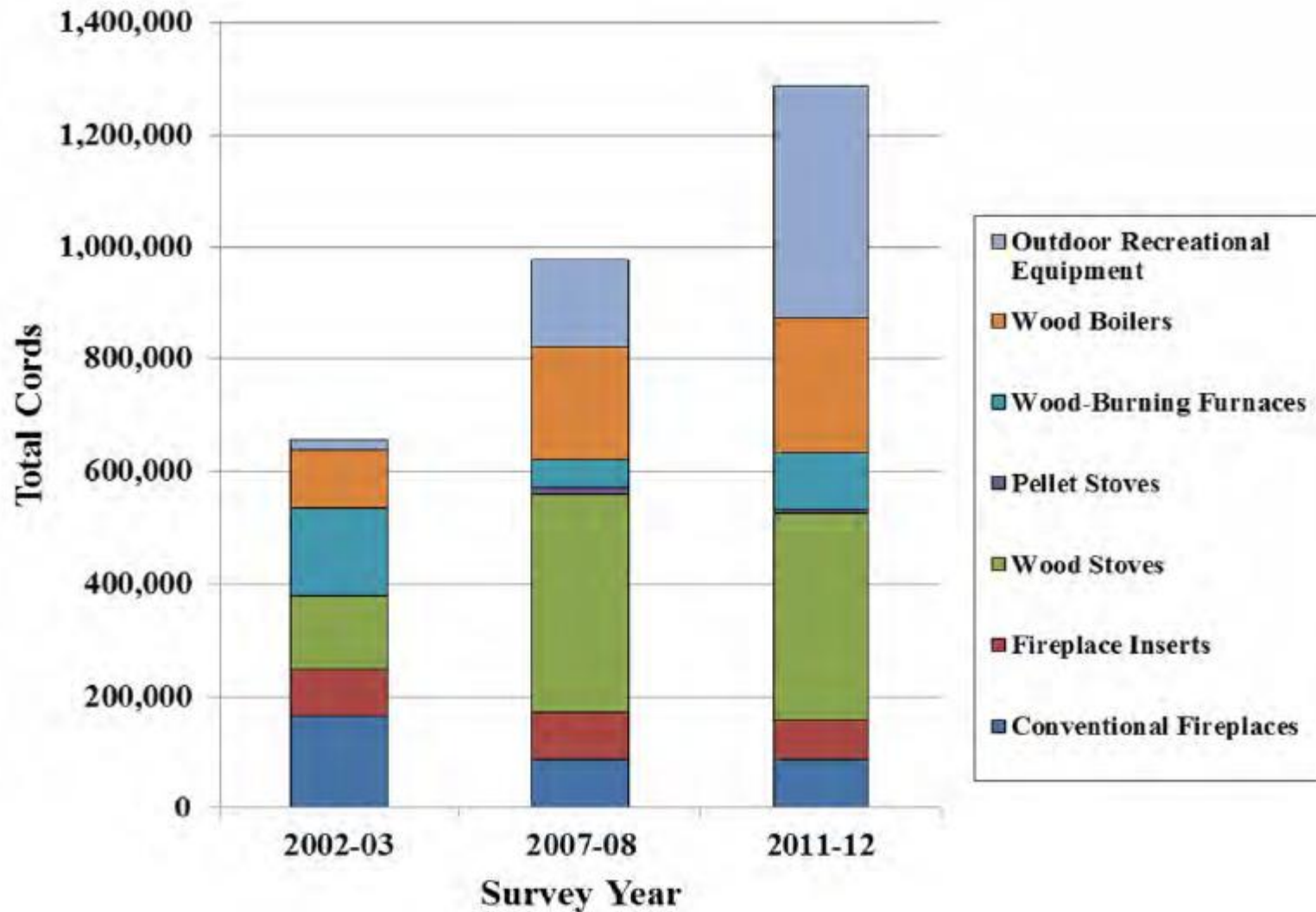
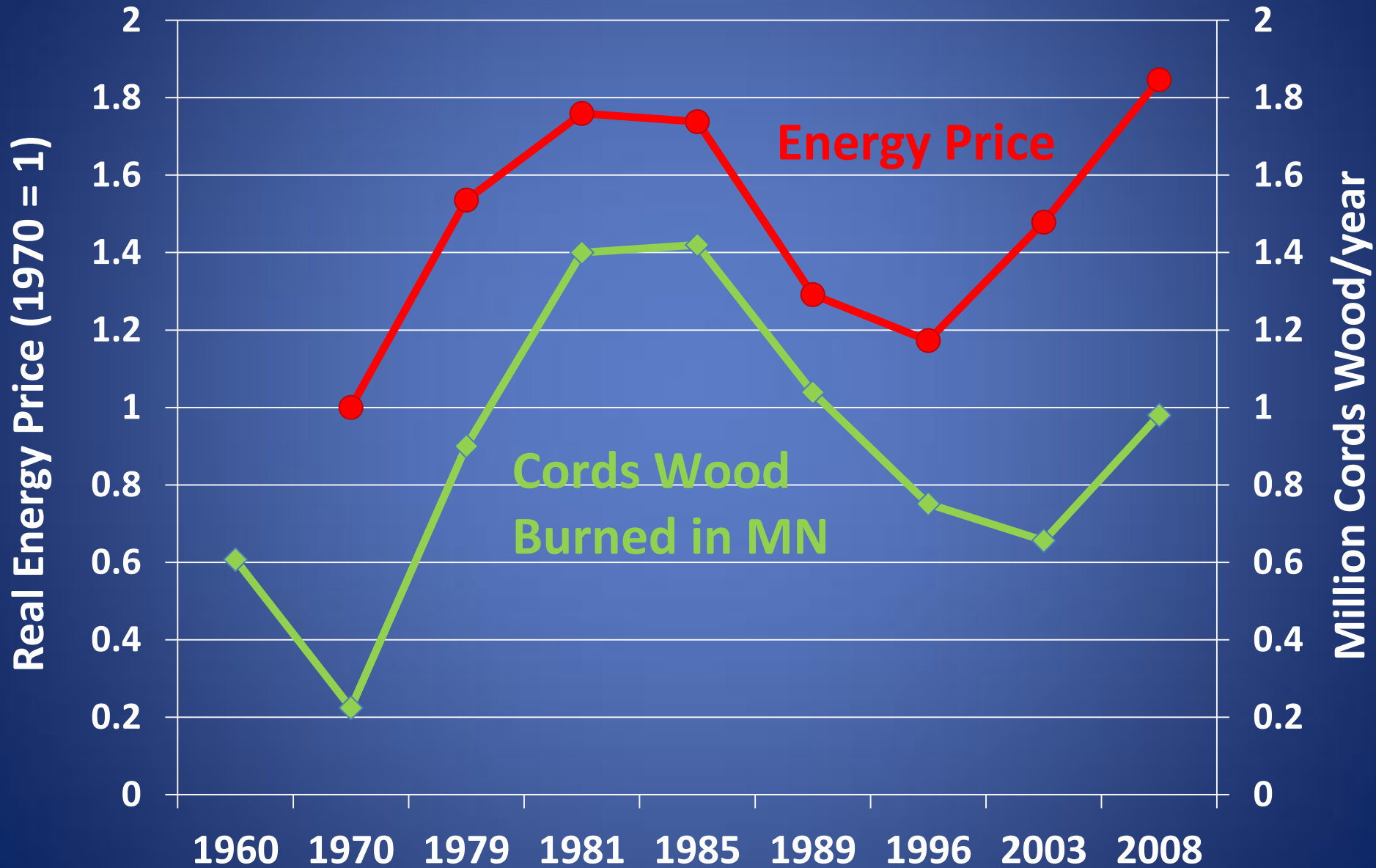
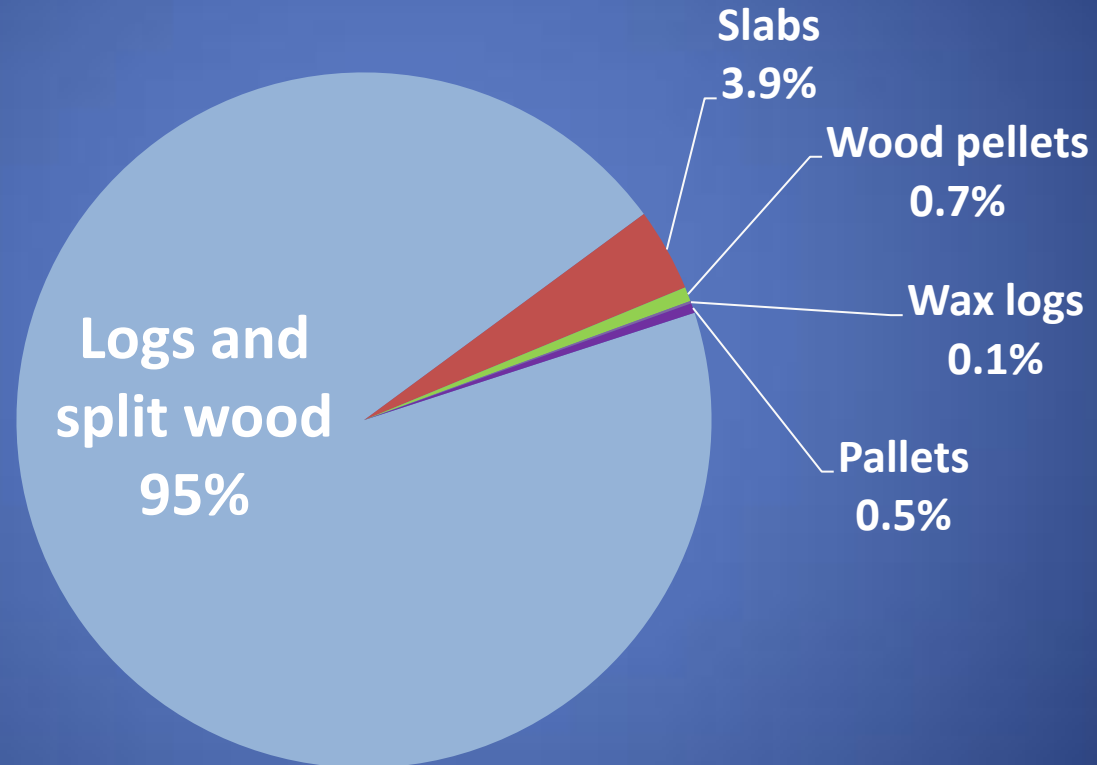


Figure 5. Total wood burned by type of wood burning equipment and year of survey

Residential Wood Use vs. Real Energy Price



Fuel Types Burned by Minnesota Residents



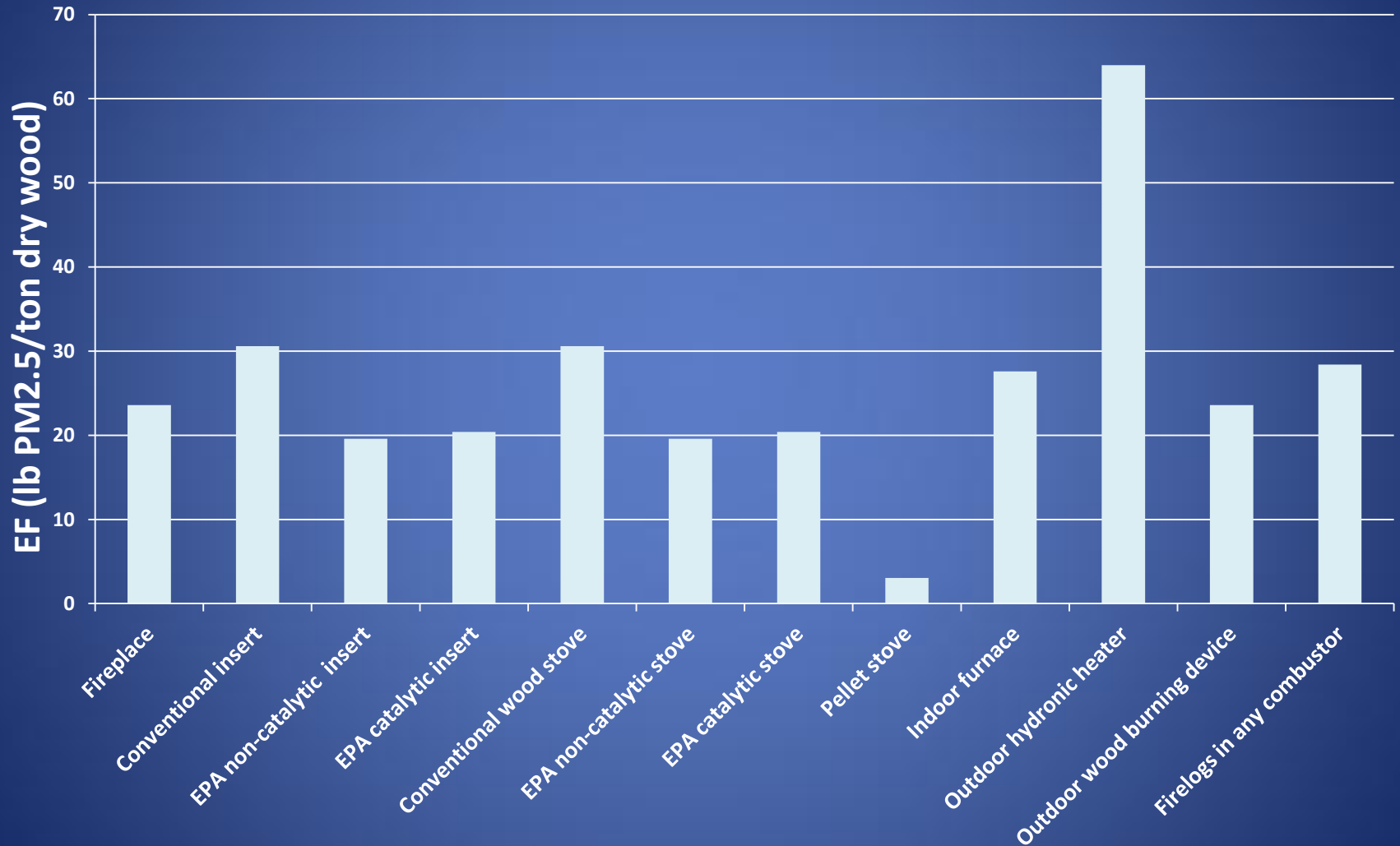
Highlights of Minnesota's Residential Wood Burning Surveys

- Most Metro wood burning is for pleasure and aesthetics
 - backyard recreational burning (warmer months)
 - fireplaces and wood stoves (colder months)
- Most wood burned in Greater Minnesota is for heat
 - hydronic heaters (“wood boilers”), forced air furnaces, wood stoves and fireplace inserts (most in colder months)
- Metro has 5 times more wood burned per acre than the 4 more rural regions of Greater Minnesota
- Wood burning apparently doubled in the past decade
 - Due to more heating and more recreational burning

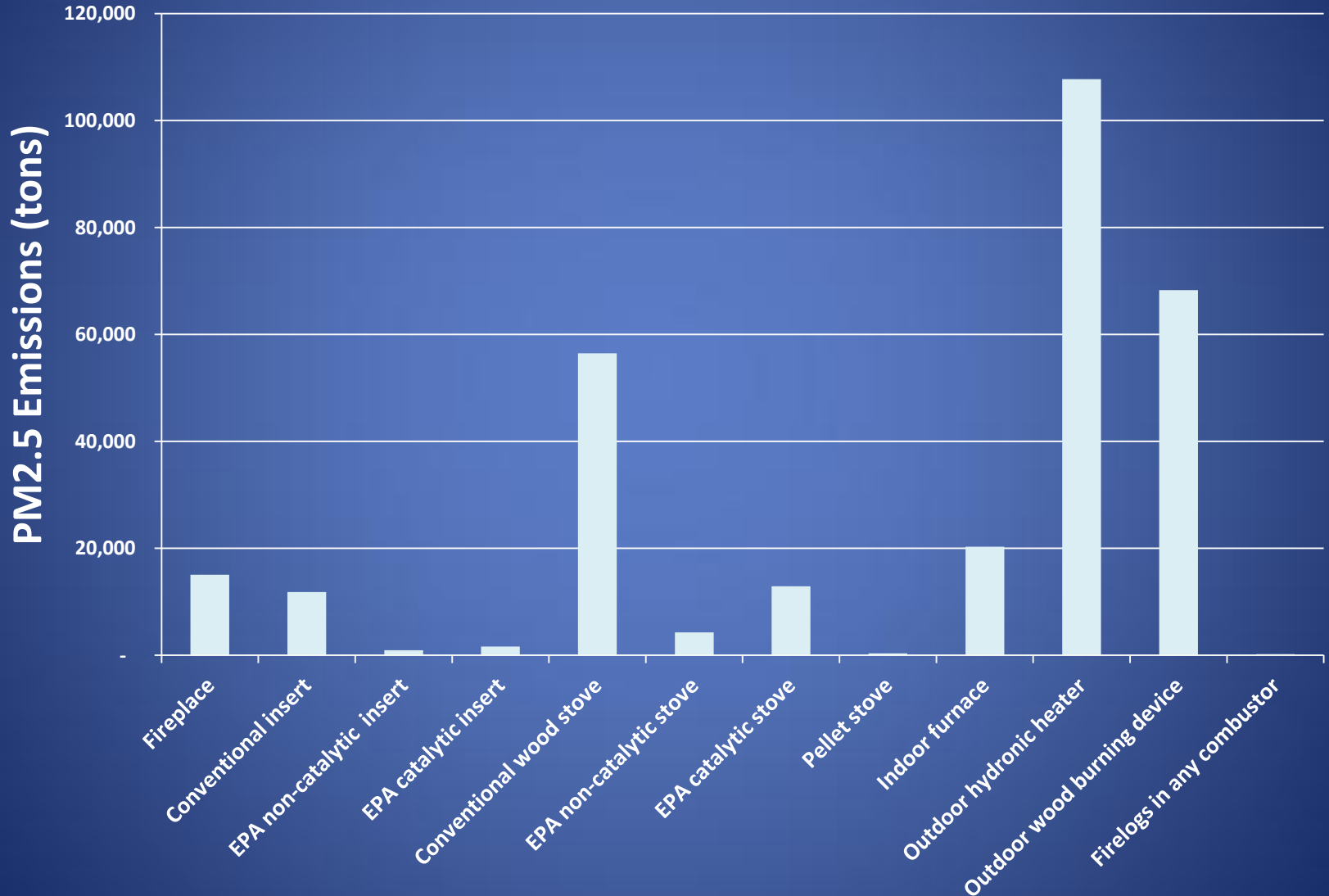
Calculation of Statewide PM_{2.5} Emissions (Tons)

- Total Cords of Wood Burned -> Tons Wood
 - Based on density of mixture of species burned
 - Cords -> Tons
- Tons Wood x Pollutant Emission Factor (s)
 - lb pollutants/tons wood
 - Tons PM_{2.5} statewide

PM2.5 Emission Factor (2011 NEI)



MN Residential Wood Combustion (2011)



Emissions Information

Major contributors to primary PM_{2.5} emissions in the 2011 emission inventory for Minnesota.

Source Sector	Contribution to State Total (%)
Agriculture - Crops & Livestock Dust	24.8
Fires – Wildfires	23.7
Fuel Comb - Residential - Wood	13.7
Fires - Agricultural Field Burning	7.7
Fires - Prescribed Fires	7.5
Fuel Comb - Industrial Boilers, ICEs - Biomass	2.8
Industrial Processes - Ferrous Metals	2.4
Dust - Paved Road Dust	2.2
Other Sectors	15.2

RWC Upcoming Efforts

What MPCA is doing:

- Used RWC Survey results to inform Clean Air Minnesota voluntary efforts
- Additional data analyses to better understand the survey results
- Finalize/improve RWC database
- Present at AWMA Conference
- Considering a future survey -hope to conduct another in the future

Partners are working toward voluntary efforts including:

- Developing wood burning equipment change-out incentive programs
- Wood smoke outreach team workgroup

MPCA and/or partners are working on:

- MPCA established a Residential wood smoke coordinator outreach position (Mike Nelson)
 - Includes coordinating with other agencies related to biomass burning
- Backyard recreational burning (in Metro residential neighborhoods)
- Developing a model ordinance for hydronic heaters (aka outdoor wood boilers)
- Investigating brush management practices

New Developments

- Recent propane cost increases have led homeowners to switch to wood heating

Questions?

- For additional information, please contact:
 - Lisa Herschberger, 651-757-2432,
lisa.herschberger@state.mn.us
 - Mike Nelson, 651-757-2122,
michael.nelson@state.mn.us
- Minnesota's Residential Wood Combustion Survey Report (MPCA, August 2013)
- Residential Fuelwood Assessment, State of Minnesota (2007-2008 Heating Season)