

# **EPA's Wood Smoke Program**

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## Presentation Overview

- Why care about wood smoke
- Cleaner burning & more energy efficient appliances
- Benefits of upgrading appliances
  - Energy efficiency, safety and health
- Building partnerships
- Practical tips for burning more efficiently

# **EPA's Residential Wood Smoke Focus**

- Wood Heater New Source Performance Standard
- **Woodstove Changeouts**
- Voluntary Fireplace Program
- Voluntary Hydronic Heater Program
- **Burn Wise Education Campaign**

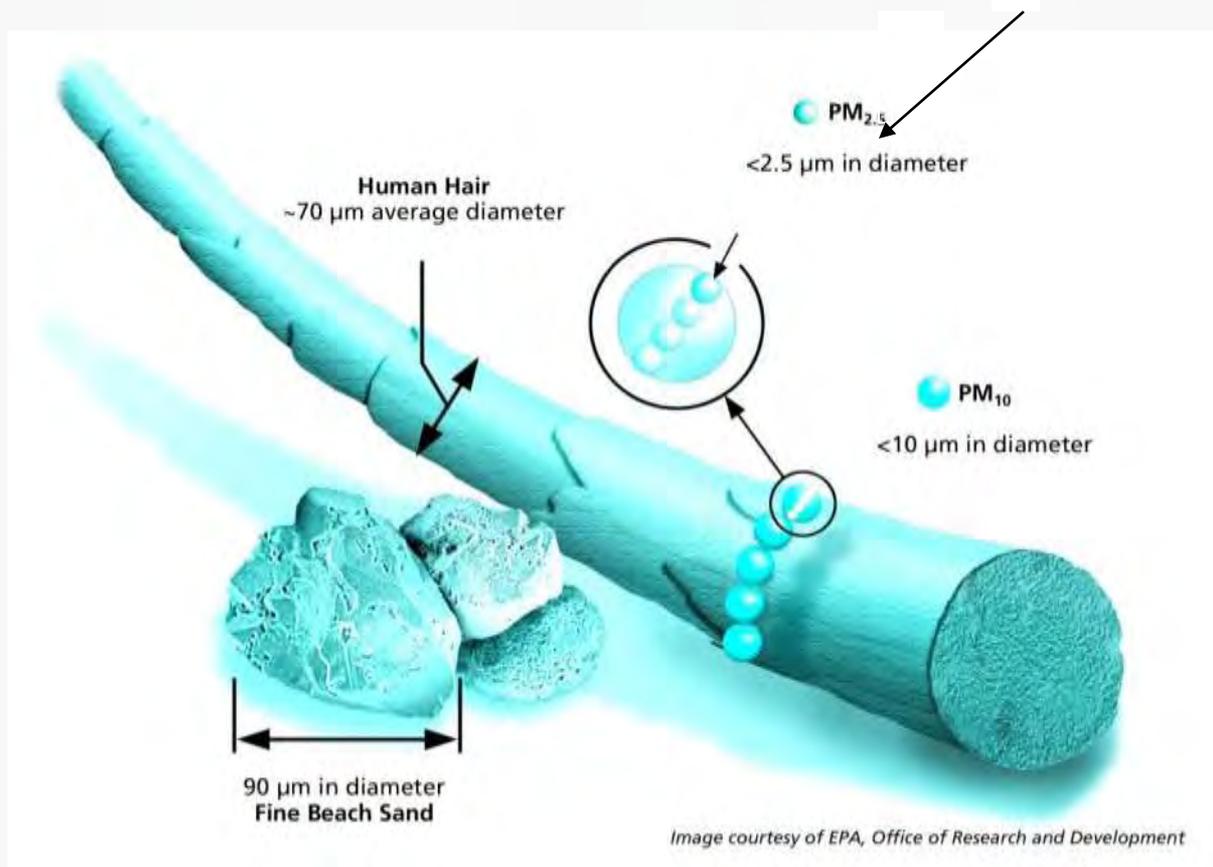
# Why is Wood Smoke a Concern?

Wood smoke can be harmful to health and the environment

- A primary source of exposure to fine particle pollution (PM<sub>2.5</sub>)
- Contains other toxic (and some cancer-causing) compounds:
  - carbon monoxide
  - polycyclic aromatic hydrocarbons
  - benzene
  - formaldehyde
- Reduces visibility

# Particulate Matter: What is It?

**A complex mixture of extremely small particles and liquid droplets**



## Particulate Matter

- Larger particles ( $> PM_{10}$ ) deposit in the upper respiratory tract
- Smaller, inhalable particles ( $\leq PM_{10}$ ) penetrate deep into the lungs



Model of interior human lung

## PM2.5 Can be Harmful to Your Health

- Decreases lung function;
- Aggravates asthma;
- May lead to:
  - Chronic bronchitis;
  - Irregular heartbeat;
  - Nonfatal heart attacks; and
  - Premature death in people with heart or lung disease.

### Most Vulnerable:

- Children under 18
- Older adults/elders
- People with diabetes, heart disease, asthma and other lung diseases

- Low stacks
- Poor dispersion



Photo: Makah Tribe

# Federal Wood Heater Regulations

Requires manufacturers of new residential wood heaters (e.g. wood stoves) to design heaters to:

- Meet particulate emission limits;
- Have model lines tested by EPA-accredited labs; and
- Attach hang tags and labels after EPA approval
- Originally promulgated in 1988

## Upcoming Revisions to the Wood Heater Rule:

- Looking at wood heating devices beyond wood stoves:
  - Pellet stoves
  - Wood boilers
  - Masonry heaters
- Emission limits not yet determined, but will likely be more stringent
- Stoves will include energy efficiency rating
- Proposal in December 2011. Final in December 2012.

# What's a Wood Stove Changeout Campaign?

- Voluntary, education and incentive-based (cash rebates) effort to encourage owners of old, inefficient woodstoves to replace or “changeout” their stove with a cleaner burning appliance like:
  - Gas stoves
  - Wood pellet or corn stoves
  - EPA-Certified wood stoves
- Partnership with hearth industry and others to market and support program, e.g., additional discounts

## Identifying an EPA-Certified Appliance



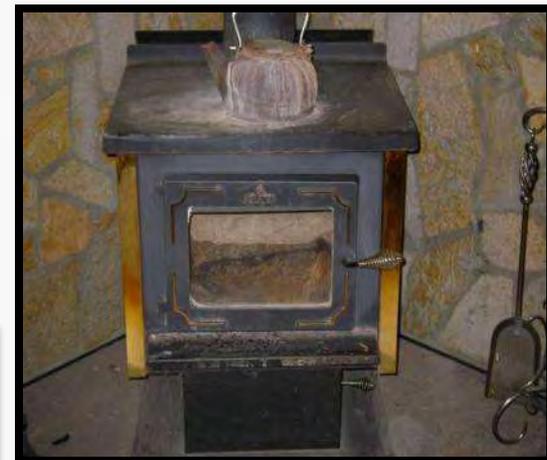
Old „conventional“  
stoves built  
before 1990



## Identifying an EPA-Certified Appliance



Old „conventional“  
stoves built  
before 1990



## Identifying an EPA-Certified Appliance

„Un-conventional“ stoves



## Coal Stoves



# Masonry and Manufactured Fireplaces are not efficient heaters



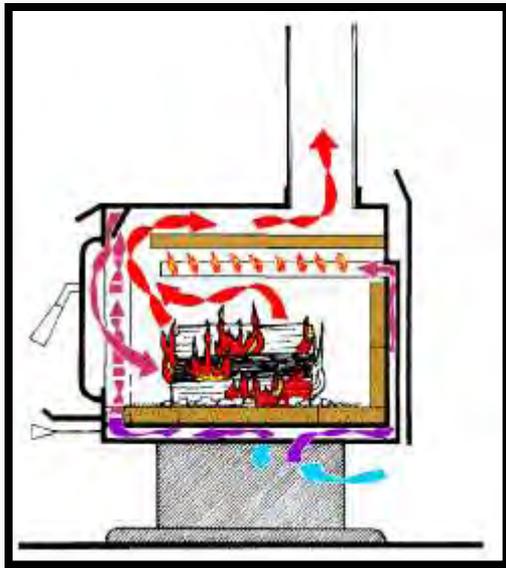
## Identifying an EPA-Certified Appliance



New certified stoves

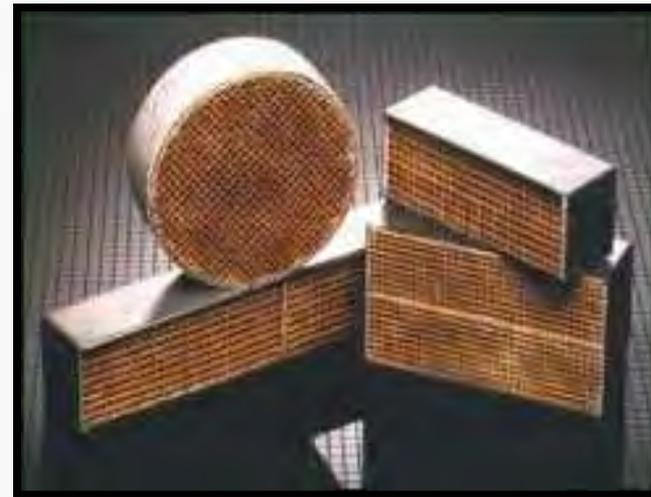
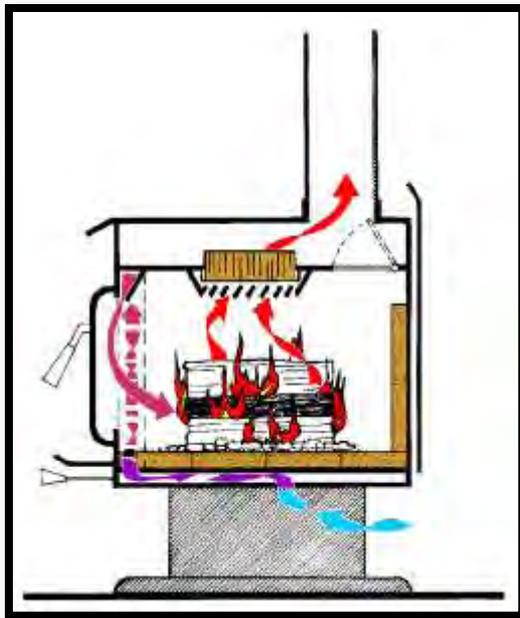


## Inside a „Non-Cat“ Wood Stove



1. Firebox insulation
2. A large baffle
3. Preheated combustion air

# Inside a Catalytic Wood Stove



**Smoke passes through a catalytic honeycomb that  
Lowers smoke ignition temperature**

## Identifying an EPA-Certified Appliance

Look for the EPA tag on the back of the wood stove



## Wood Pellet Stove



# Benefits of Wood Stove Changeouts

New, cleaner burning technologies offer:

- Health benefits
- Environmental benefits
- Safety benefits
- Economic benefits

Before



Old stove

After



EPA-certified stove

# Pilot Project and Success Story

- Libby, Montana

- Was not meeting federal PM<sub>2.5</sub> annual standard
- 82% of PM<sub>2.5</sub> came from wood smoke
- Changed out 1,100 wood stoves

Results:

- Approx. 30% reduction in PM<sub>2.5</sub> winter time emissions
- In process of being redesignated from “non-attainment” to attainment for PM 2.5 annual standard
- Helped keep Libby from violating the PM<sub>2.5</sub> 24 hour standard
- 70% reduction of indoor PM<sub>2.5</sub>

## Indoor Air Quality Findings (University of Montana)

Monitored PM<sub>2.5</sub> before & after changeouts

- Within 21 homes

Average: 26.5  $\mu\text{g}/\text{m}^3$  \* (EPA Annual health standard: 15  $\mu\text{g}/\text{m}^3$ )

PM<sub>2.5</sub> Spikes (average was 205  $\mu\text{g}/\text{m}^3$  \*).

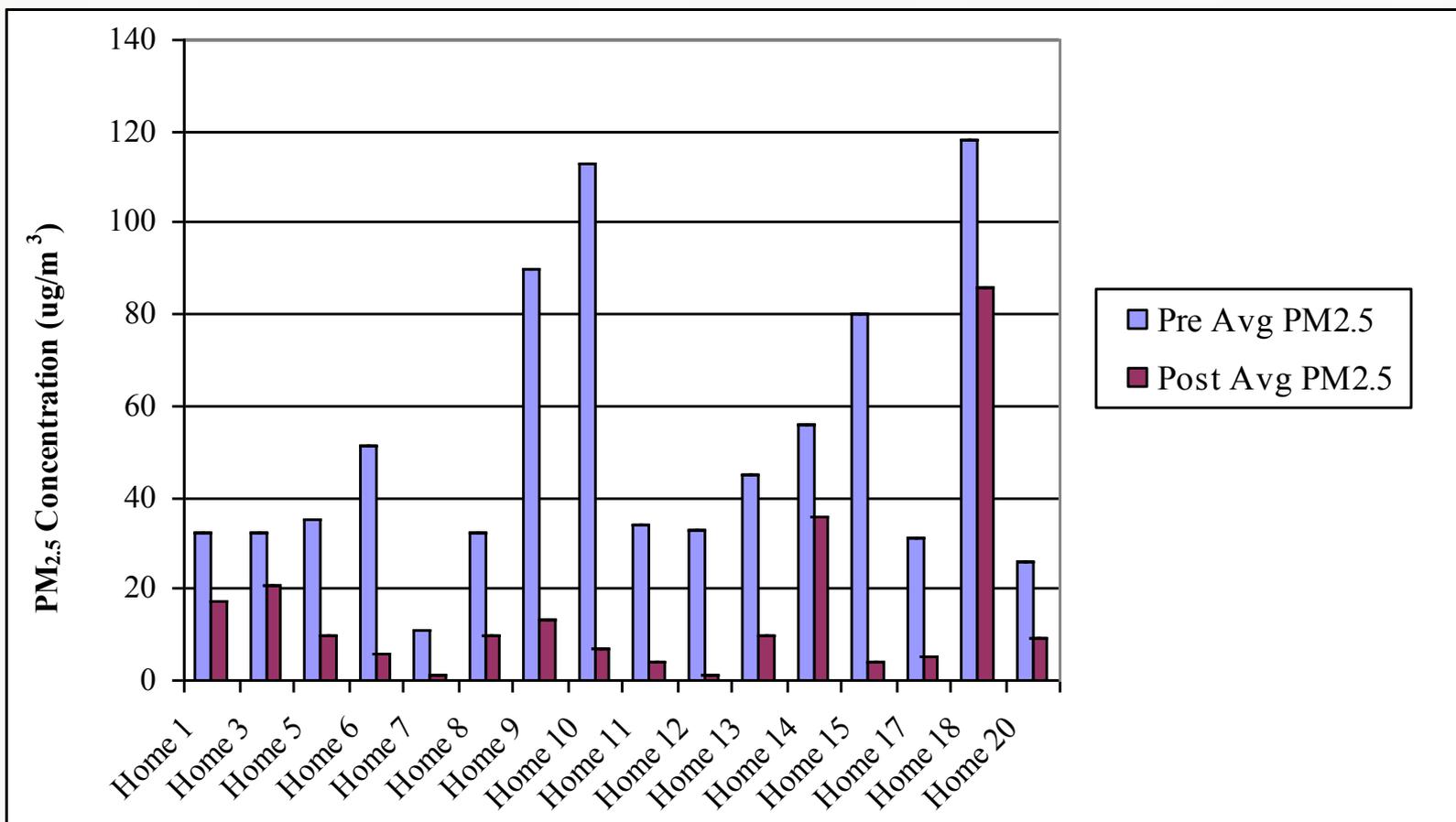
Post changeout average. = 7.5  $\mu\text{g}/\text{m}^3$  \*

- Ave. reduction indoor PM<sub>2.5</sub> within 16 homes: ~ 70%  
(Incomplete data for 5 homes)

\*Number based on U. MT correction factor

## Libby, MT

# PM<sub>2.5</sub> Mass Results – Pre and Post Stove Changeout



# Nez Perce Tribe, ID Indoor Air Quality Results

## Monitored PM 2.5 before & after changeouts

- Within 16 homes

Average: 20  $\mu\text{g}/\text{m}^3$  \*

Post changeout average. = 9.5  $\text{ug}/\text{m}^3$ \*

- Ave. reduction indoor PM<sub>2.5</sub> within 15 homes: 52%  
(Incomplete data for 1 home)

- Educating home wood burners was key to better burning

\*Number based on U. MT correction factor.

## Outreach and Education: Lessons Learned

- New stove learning curve: need training
- Less is information is more
- Be specific. Step by step directions



Photo: Nez Perce Tribe

## Safety Benefits

- Newer stoves produce less smoke and less creosote build up
- 70% of home fires are caused by chimney fires
- Incomplete burning creates carbon monoxide in the home



## Economic Benefits

- Newer stoves burn wood 1/3 less wood and are up to 50% more efficient
- Newer wood stoves use less fuel for the same amount of heat than older models
- Time = \$  
less cutting, splitting, stacking and hauling of wood

# Potential Sources of Funding

- Federal Funds
  - HUD: Block Grant
  - HHS: Low income Home Energy Assistance Program
  - DOE: Low-income weatherization, ARRA
  - EPA: EJ, Indoor Air, Community Grants
- Supplemental Environmental Projects
  - Salt River Project, Navajo and Apache Counties
  - Swinomish Tribe, Lummi Tribe
- Hearth Industry Rebates/Discounts/Efforts
- Tax Credits
  - State and Federal

# Examples of Past Projects: Tribal Woodstove Changeouts

- Swinomish Tribal Indian Community (WA)
  - Indoor air driving force, changed out all stoves
- Makah Tribe (WA)
  - Case example for tribes
- Oneida Indian Nation (Wisconsin)
  - Used EPA indoor air grant funds to changeout stoves
- Passamaquoddy Tribe (Maine)
  - Ongoing

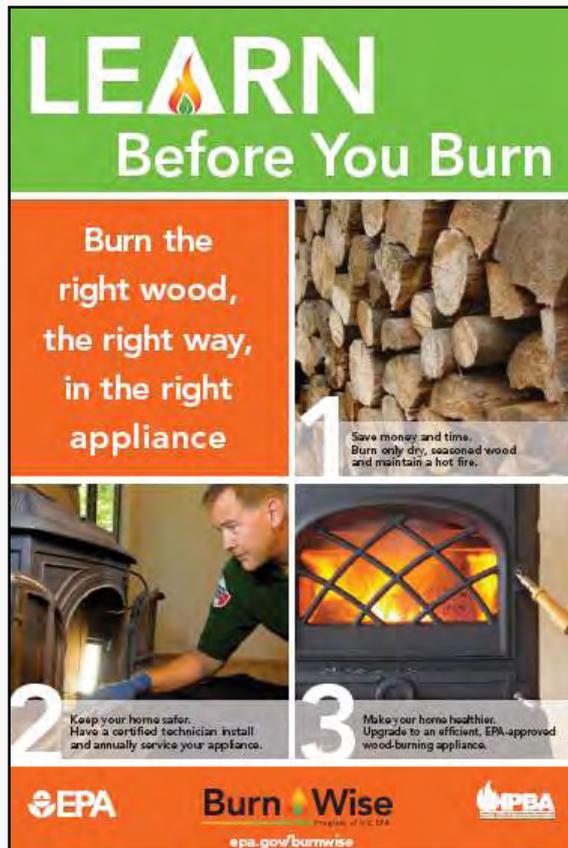
## Educating the Wood Stove Owner

- Despite success of wood stove changeouts, we still see wood smoke issues
- Changeouts and voluntary programs were only one part of the puzzle
- How people burn wood is just as important (if not more important) as what they use to burn wood

## How are People Burning?

- Burning wet wood – biggest problem!
- Burning trash
- Using older technology
- Not performing annual maintenance
- Improper operation and installation

## Burn Wise Message



**LEARN**  
Before You Burn

**1** Burn the right wood, the right way, in the right appliance

**2** Keep your home safer. Have a certified technician install and annually service your appliance.

**3** Make your home healthier. Upgrade to an efficient, EPA-approved wood-burning appliance.

EPA Burn  Wise  
Program of U.S. EPA  
epa.gov/burnwise

**Burn the right wood.** Save money and time. Burn only dry, seasoned wood and maintain a hot fire.

**The right way.** Keep your home safer. Have a certified technician install and annually service your appliance.

**In the right appliance.** Make your home healthier. Upgrade to an efficient, EPA-approved wood-burning appliance.

## What Not to Burn

**Never Burn** the following items. These can release harmful chemicals.

- Household garbage or cardboard
- Coated, painted, or pressure-treated wood
- Ocean driftwood, plywood, particle board, or any wood with glue on or in it
- Wet, rotted, diseased, or moldy wood

# Wood Moisture

- Green wood contains roughly 50% water depending on the species and the season it's cut.
- A 34 lb load of green wood may contain roughly 17 lbs (about 2 gallons) of water.
- Dried to 25% moisture this same load of wood weighs roughly 23 lbs and contains about 5.7 lbs of water.

## Wood Moisture

43 lbs of green sugar maple at ~40% moisture



## Wood Moisture

43 lbs of green sugar maple with approx. water content



## Same wood – different readings



Before splitting

After splitting

**WET WOOD IS A WASTE**  
 BURN DRY FIREWOOD TO SAVE MONEY AND HEALTH

**Four Easy Steps to Dry Firewood**

**STEP 1 SPLIT** **STEP 2 STACK**

**STEP 3 COVER** **STEP 4 STORE**

**Burn  Wise**  
 Program of U.S. EPA

EPA 614-F-10-003

## FOUR EASY STEPS TO DRY WOOD

**STEP 1 SPLIT**



- Start with the right sized wood
- Split wood dries much faster
- Split the wood in a range of sizes to fit your stove, but no larger than 6 inches in diameter
- Split small pieces for kindling

**STEP 2 STACK**



- Stack wood to allow air to circulate
- Build the stack away from buildings
- Keep wood off the ground. Stack it on rails
- Stack wood in a single row with the split side down

**STEP 3 COVER**



- Cover the top of the stack to protect it from rain or snow
- Make sure there is space between the cover and the stacked wood - don't let the cover rest directly on top
- Keep the sides open so air can circulate through the stack

**STEP 4 STORE**



- Allow enough time to dry
- Softwoods take about 6 months
- Hardwoods take about 12 months
- Cracked ends on the wood typically means it is dry enough to burn

**Is your wood dry? Take the moisture meter test.**

Wet wood can create excessive smoke which is wasted fuel. Moisture meters that allow you to test the moisture level in wood are available in all sizes and can cost as little as \$20. Properly dried wood should have a reading of 20% or less. Dry wood creates a hotter fire. Moisture meters save wood - ultimately saving you time and money.

[www.epa.gov/burnwise](http://www.epa.gov/burnwise)

## Split, Stack, Cover & Store

### Split Wood

- Start with the right sized wood
- Split wood dries much faster
- Split the wood in a range of sizes to fit your stove, but no larger than 6 inches in diameter
- Split small pieces for kindling



## Split, Stack, Cover & Store

### Store Wood

- Allow enough time to dry
- Softwoods take about 6 months
- Hardwoods take around 12 months
- Look for cracked ends



## Tools You Can Use

[www.epa.gov/burnwise](http://www.epa.gov/burnwise)

## Tip Sheet

### Burn Wise

Program of U.S. EPA

BURN THE RIGHT WOOD, THE RIGHT WAY, IN THE RIGHT APPLIANCE

**D**id you know that by changing the way you burn wood you can save money, reduce air pollution and protect your health?

Here are a few simple tips to make your fire burn hotter, keep your wallet fatter and keep your local air cleaner and healthier.

- Season all firewood.** All firewood should be split, securely covered or stored, and aged for at least six months. Seasoned wood burns hotter, cuts fuel consumption and reduces the amount of smoke your appliance produces.
- Choose the right firewood.** Hardwoods are the best. Never burn trash or treated wood which can emit toxic air pollutants.
- Start it right.** Use only clean newspaper or dry kindling to start a fire. Never use gasoline, kerosene, charcoal starter, or a propane torch.
- Don't let the fire smolder.** Many people think they should let a fire smolder overnight. But reducing the air supply does little for heating and can increase air pollution.
- Clean ashes from your wood-burning appliance.** Excess ashes can clog the air intake vents reducing efficiency. Be sure to dispose of ashes in a metal container away from the house or any flammable material to reduce the risk of fire.
- Keep your chimney clean.** A clean chimney provides good draft for your wood-burning appliance and reduces the risk of a chimney fire. Have a certified chimney sweep inspect your chimney once a year.
- Be a good neighbor.** Follow best practices for burning wood and always remember to comply with state and local codes.
- Follow instructions.** Operate your wood-burning appliance according to the manufacturer's instructions and follow all maintenance procedures specified by the manufacturer.
- Upgrade to cleaner equipment.** EPA-certified and qualified wood stoves, fireplaces, and wood boilers burn cleaner and burn wood more efficiently emitting less particle pollution than older equipment.
- Size matters.** Choose the right sized appliance for your needs. If your wood-burning appliance is too big for your room or house, the fuel will smolder and create more air pollution.



For more information about burning cleaner, go to [www.epa.gov/burnwise](http://www.epa.gov/burnwise)

## Tear Pad

- Developed with for Chimney Sweeps
- Pads of 50 measuring 8-1/2" x 3-1/2"
- Provides quick tips to review with homeowners
- Include in billing statements
- Use at local expos



**Burn  Wise**

**Burn the right wood, the right way, in the right appliance.**

- 1 Save money and time.**  
Burn only dry, fully seasoned wood and maintain a hot fire.
- 2 Keep your home safer.**  
Have a certified technician install and annually inspect your appliance and chimney.
- 3 Make your home healthier.**  
Upgrade to an efficient, EPA-approved wood-burning appliance and proper chimney.

Learn before you burn.  
Go to [www.epa.gov/burnwise](http://www.epa.gov/burnwise)

  United States Environmental Protection Agency 

EPA-456X-09-001

## Additional Materials

- Dirty Little Secrets Brochures and Posters
- PSAs (15, 30 and 60-second)
- Widgets



## Social Media

- Subscribe to RSS content
- Join us on Facebook
- Follow us on Twitter



## Summary/Next Steps:

- Work with your housing, energy and environmental colleagues to:
  - Up Grade Appliances and Educate Wood Burners
- Benefits Include:
  - Improved Energy Efficiency
  - Saves time, energy, money and resources
  - Improve safety in homes
  - Improves health of children and elders

## Want More Information?

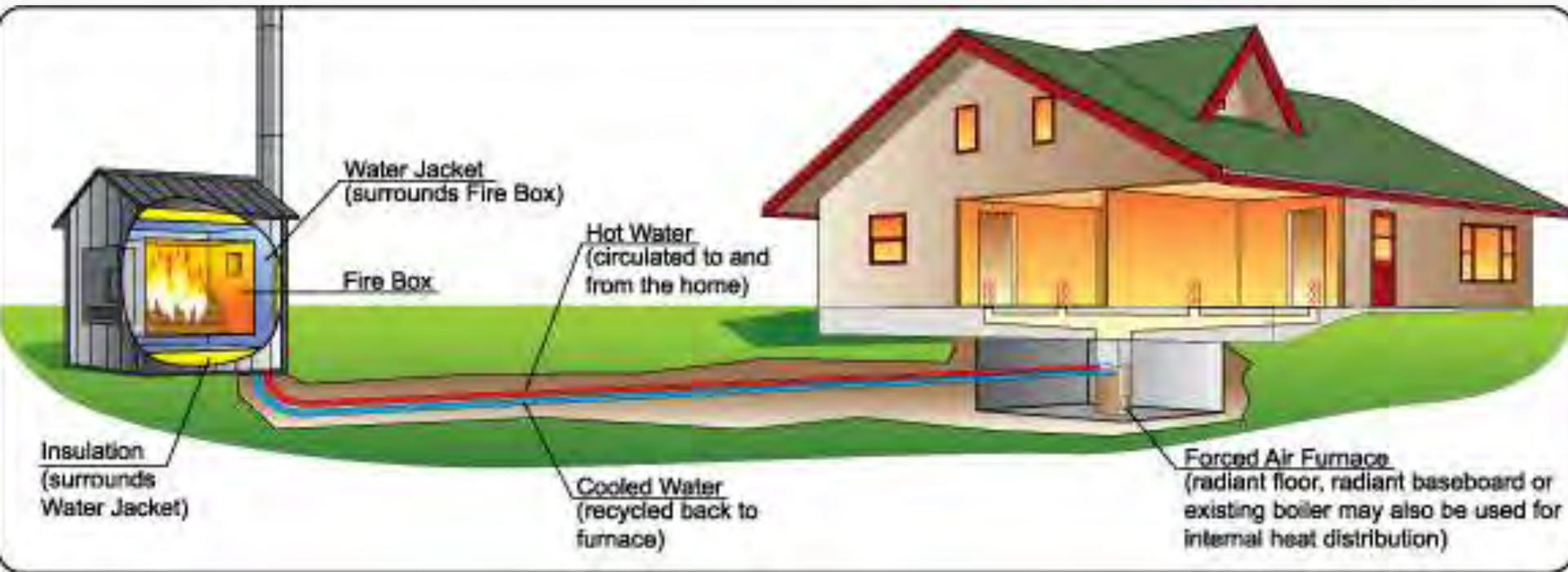
brockman.larry@epa.gov or 919-541-5398

herrington.leigh@epa.gov or 919-541-0882

**[www.epa.gov/burnwise](http://www.epa.gov/burnwise)**

# Additional Reference Slides Follow

## Hydronic Heater/Outdoor Wood Boiler How It Works









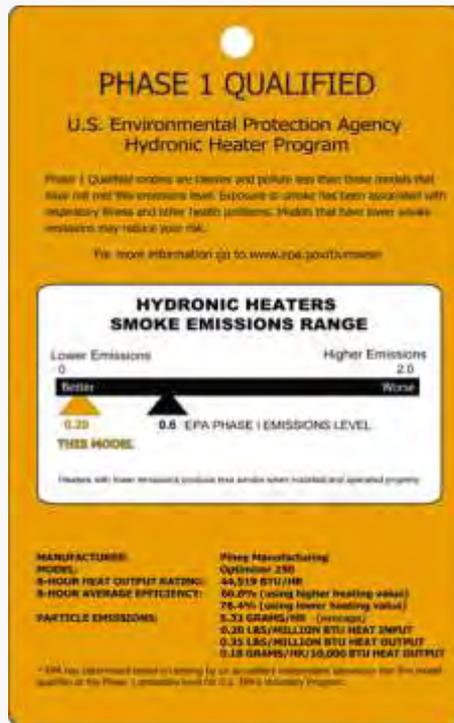
# Wood Boiler Voluntary Program

- First launched in 2007, providing criteria for units to be 70 percent cleaner than unqualified models. (Phase 1)
- The goal is to achieve emission reductions and protect public health sooner than a federal rule.
- Today the program has evolved to Phase 2, and EPA-qualified units are up to 90 percent cleaner than older unqualified units.
- Models must be tested by an EPA-accredited laboratory to verify that they meet established emission levels.

# Wood Boiler Manufacturer Participation

- Sign a Partnership Agreement with EPA to bring cleaner wood boiler models to the market.
- Use a descriptive hang tag that provides information on smoke emissions.
- Display information about the voluntary program in sales areas.
- Include text in each qualifying owner's manual on proper operation and maintenance of the wood boiler including how and what to burn.
- Submit sales and test data on improved wood boilers.

## Wood Boiler Hang Tags



**70% Cleaner**  
Phase 1 - Good



**90% Cleaner**  
Phase 2 - Better

# Fireplace Voluntary Program

Similar to wood boiler voluntary program:

- Encourages the development and sale of a new generation of lower-emitting fireplaces that burn cord wood.
- Expected to reduce air pollution emissions from new wood-burning fireplaces sooner than could be achieved by federal regulation.
- Covers new masonry and prefabricated (low-mass) fireplaces. It does not currently cover retrofit devices for existing fireplaces.

# Fireplace Manufacturer Participation

- Sign a Partnership Agreement with EPA to bring cleaner fireplaces to the market.
- Use a descriptive hang tag that provides information on smoke emissions.
- Display information about the voluntary program in sales areas.
- Include text in each qualifying owner's manual on proper operation and maintenance of the fireplace including how and what to burn.
- Submit sales and test data on improved fireplaces.

## Fireplace Tags



◀ **57% Cleaner**  
Phase 1 - Good



◀ **70% Cleaner**  
Phase 2 - Better

**Models with doors must include a visible tag on the inside of the unit**

**OPERATE WITH DOORS CLOSED**  
Closing doors reduces smoke and the wood burns better.

## Fireplace Retrofits

Currently not part of the voluntary program, however we are exploring the possibility of folding it into the existing voluntary program for fireplaces.



## Learn Before You Burn Video PSA



[www.epa.gov/burnwise/contest.html](http://www.epa.gov/burnwise/contest.html)

## Particulate Matter

- Larger particles ( $> PM_{10}$ ) deposit in the upper respiratory tract
- Smaller, inhalable particles ( $\leq PM_{10}$ ) penetrate deep into the lungs



Model of interior human lung