

Land Clearing Burning



Management Handbook

*Burning Techniques for
Good Smoke Management*



Burning Can be a Smoky Business

Fire is a natural, valuable tool in land clearing management. But open burning produces smoke, which – if not carefully managed – creates a nuisance for neighbors and may impact public health and safety. Smoke may reduce visibility on adjacent roadways, creating a potential for deadly traffic accidents.

This handbook provides information for small, private landowners and contractors burning forest and other land clearing de-

bris. Your local air quality agency, Olympic Region Clean Air Agency (ORCAA) asks those participating in these types of burns to help the agency reduce air pollution. This handbook explains the pollution found in smoke, the laws relating to outdoor burning, and alternatives to outdoor burning.

By better understanding how to burn your forest and land clearing debris with less smoke, you can make a difference!



What is Smoke? Air Pollution!

Smoke contains carbon dioxide, water vapor, and a stew of compounds and small particles of material that result from incomplete combustion. Those small particles account for some of the most serious of the ‘pollution’ in smoke. Bits of particulate matter smaller than 2.5 microns in diameter present a serious health risk to humans. This fine particulate matter (PM_{2.5}), when inhaled, penetrates deep in the lungs, causing irritation, difficulty breathing, and potentially serious respiratory disease. Because these fine particles may be trapped in the lungs for years, they have been linked to chronic lung diseases and cancer.

Some of the compounds formed by the burn-

ing also present concerns for human health. Opening burning emits Carbon Monoxide (CO), a known toxic gas. Fortunately, CO blends with the ambient air around the fire to quickly dilute it, thus reducing its health hazard beyond the immediate burn pile location. Other pollutant gases and compounds, however, may be of greater concern. Those include nitrogen dioxide (NO₂) and volatile organic compounds (VOCs).

VOCs emitted by the burning of woody debris may include toxic carcinogenic substances such as benzene, formaldehyde and benzo-a-pyrene.

Why reduce air pollution?

Air pollution affects millions of Washington residents every day. It damages our health, our crops, our property, and our environment. Vehicles and industry produce much of the air pollution in cities, but the majority of air pollution in most rural areas comes from vehicles and motorized equipment, residential wood burning for home heat, and outdoor burning.

Land clearing and forest management burning contribute

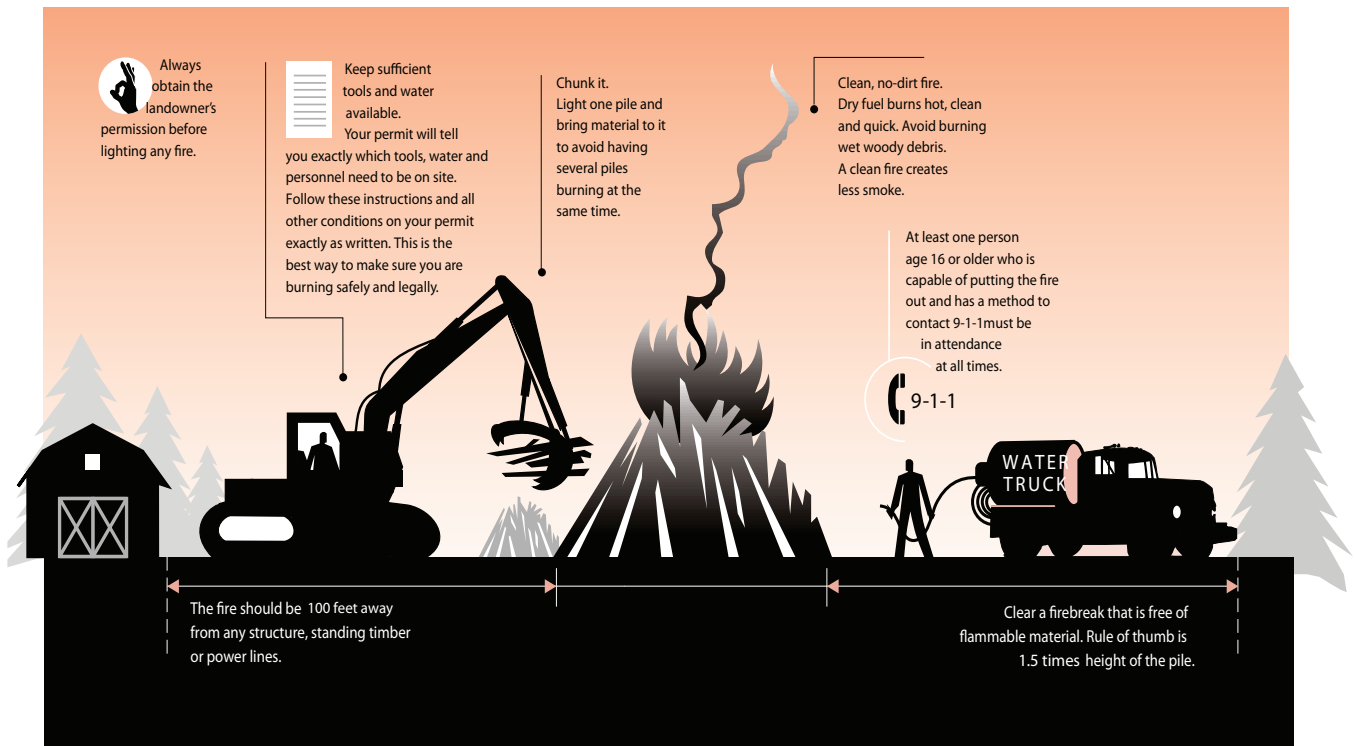
In most cases, land clearing and forest management burning, when properly conducted, contribute to air quality problems, but are not the primary source of the problem. At times, however, that contribution significantly impacts the regions overall ambient air quality.

Complaints

The odor and reduced visibility resulting from outdoor burnings account for most complaints people have about air pollution in general. Smoke from outdoor burns fits both complaint types, and when the smoke enters populated areas, it also generates health concerns and breathing problems for people.

Smoke IS air pollution

Local air quality agencies such as ORCAA enforce local and state rules and laws for outdoor burning designed to minimize the smoke produced and thus limit the fires impact on air quality.



You need a permit (or two) to burn

ORCAA and the local fire agencies within ORCAA's jurisdiction require the following:

- You **MUST** know the air pollution and fire safety rules before your burn;
- You **MUST** control your burn and manage your smoke carefully;
- The fire you ignite could become a significant air pollution nuisance and/or a wildfire unless you follow the rules **AND** use good common sense.

Know when its smart to burn

Meteorology helps determine when weather conditions will allow the smoke to rise up and disperse. Air stagnation, inversions and/or foggy conditions in your local area may prevent smoke from readily dispersing.

The actions of others also influence the issue of whether you should burn. For instance, other property owners may have burning projects already underway in your area, thus impairing air quality significantly before your burn can take place.

The danger of wildfire must also be considered in your decision-making. The local fire agencies or the state Department of Natural Resources (DNR) may declare 'fire safety' burn bans due to conditions that result in high wildfire risks. Likewise, ORCAA may declare air quality burn bans when meteorological conditions result in elevated levels of air pollution.

Land clearing permits – issued by ORCAA, local fire districts or county agencies (permitting authority varies depending on where you plan to conduct a burn) – may specify hours to start a burn or when to stop adding fuel to an existing fire. Always check with your permitting agency about limitations on your permit. Appropriate contact information will be listed on the permit.

Know your burning requirements

ORCAA and the state have adopted rules about outdoor burning to help you minimize smoke from your burn. A hot, dry fire ensures more complete combustion of all materials, and the heated plume from such a fire carries what pollutants do exist high into the air where they more readily disperse.

To achieve a hot, clean-burning fire, the material to be burned should be:

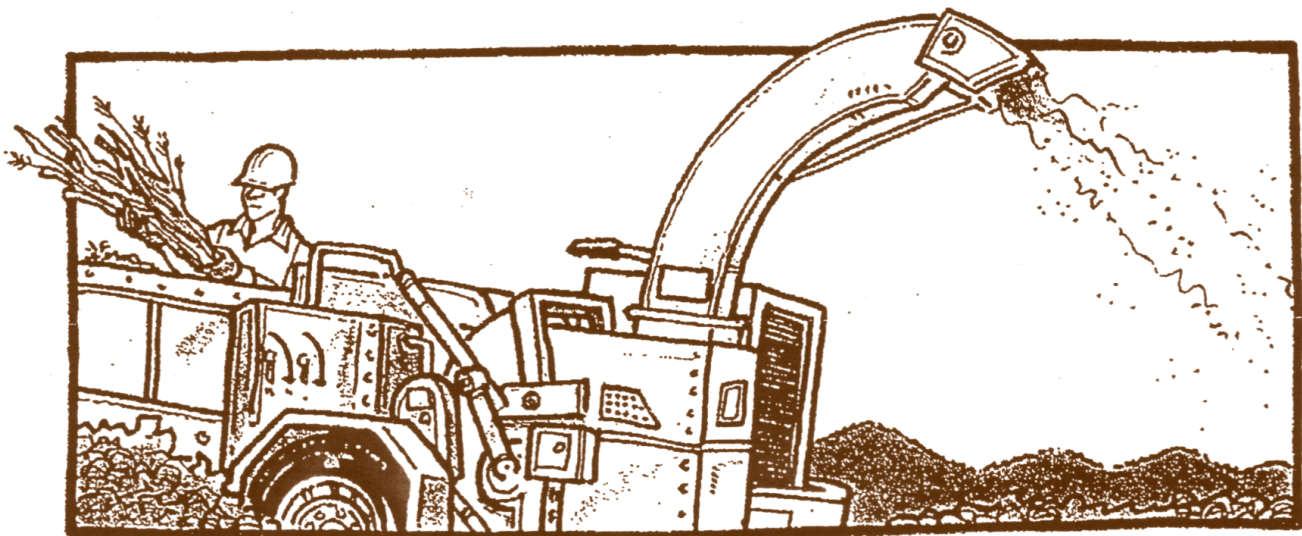
- Only natural vegetation and free of prohibited materials. No tar paper, demolition debris, petroleum wastes, tires, tar, metal, plastics, treated wood, trash, or household garbage;
- Arranged so as to allow air to circulate freely. Stack your burn pile loosely so oxygen can move throughout. The use of portable fans can also aid in creating an oxygen-rich (and therefore hot) fire.
- Free of dirt or excess surface moisture. Dirt won't burn. In fact, it hinders burning. It hinders drying and keeps air away from the fuel. Likewise, surface moisture on the fuel must be boiled off before the fuel can heat up enough for clean, complete combustion.
- Dried for at least the minimum drying periods. If your fuel is too green, you waste time and effort to get it to burn. Your fire will waste energy boiling moisture out of the green wood rather than fully consuming it. That means excessive smoke.

Smoke Management Strategies

Smoke management means burning land clearing debris using best practices. Those ‘best practices’ include ensuring fuel moisture is low enough to achieve a complete burn and pacing ignition to minimize smoke production and create an efficient fire. These all work together to make sure smoke accumulation doesn’t exceed acceptable limits.

While these practices may seem time consuming and expensive, **smoke management must be considered one of basic costs of doing business** if burning is part of your business plan. Good smoke management plans will include these key elements of pollution reduction and efficient burning:

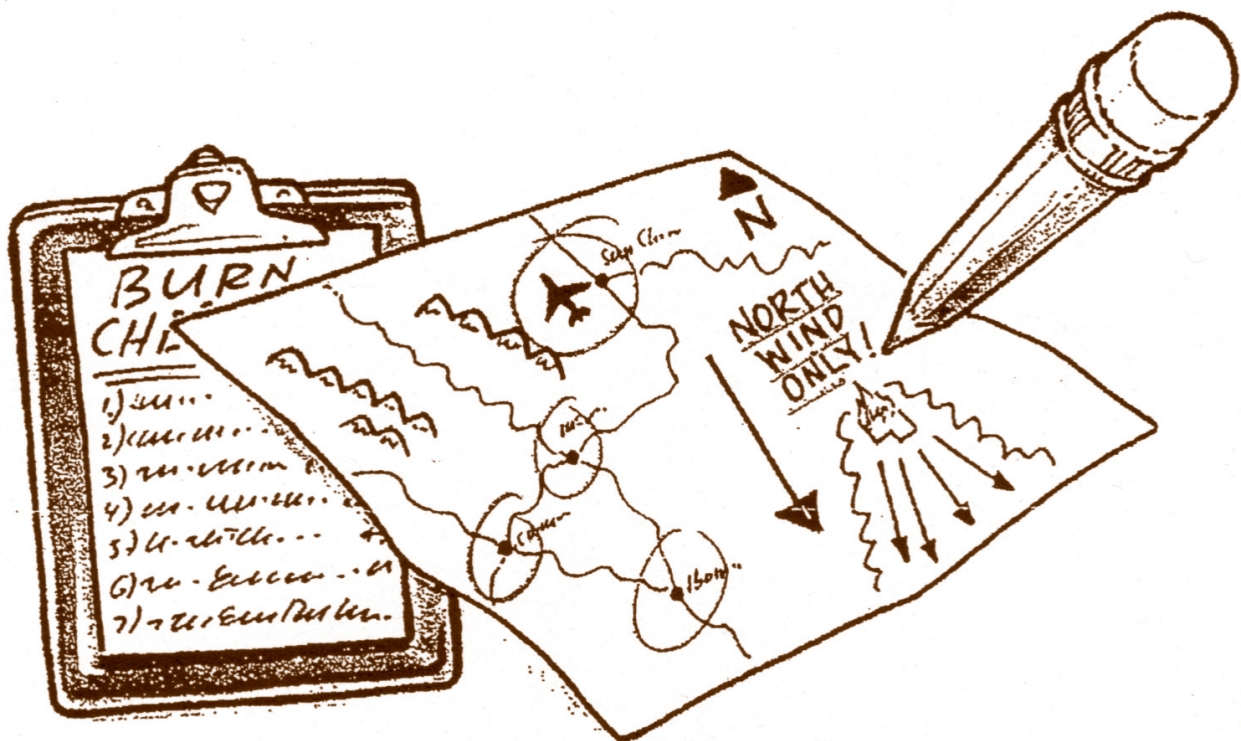
- ◆ **Avoidance.** Don’t burn when smoke will not disperse well or will be carried toward smoke-sensitive areas such as populated neighborhoods, airports, roads and highways or any place smoke could affect visibility and/or public health and safety.
- ◆ **Dilution.** Reduce smoke concentration by staggering ignitions and/or burning when there is good air dispersion and vertical movement (thermic lift). Burn some areas at different times of the year, in addition to those burn seasons traditionally chosen. Cover piles when they are dry so they can be kept ready to burn when the surrounding area is wet and fire-safe.
- ◆ **Emission Reduction.** Reduce the amount of pollution emitted by burning only when there are no other alternatives. When you do burn, burn only the parts of the site needing it or by reducing the fuel loading (burn smaller piles separately). Use alternatives to burning such as chipping and composting and whole-tree logging, especially near urban cores.
- ◆ **Schedule Restrictions.** Honor periods of no burning such as overnight, weekends and especially holidays. In some areas, protecting good visibility may be an important public relations goal during certain times of the year.



Chipping woody debris is a great alternative to burning. Chips can be used in landscaping, dust-control, and composting.

Planning your Burn

- ◆ Prepare a formal burn plan, including:
 - Specific objectives of the burn
 - Location and size of the burn site
 - Size of fuel to be consumed
 - Fuel load per acre
 - Type and arrangement of fuel
 - Length of fuel drying time
 - Ideal fuel moisture level and weather to burn
 - Direction and distance to smoke-sensitive areas
 - Estimated length of burn from ignition to mop-up
 - Provisions to minimize residual smoke production
 - Who to notify before burning and when
 - Contingency plan for escaped fire
- ◆ Share your burn plan with air agencies and fire departments
- ◆ Obtain all necessary permits and prepare to comply with all permit conditions.
- ◆ Take preliminary measurements of variables such as temperature, relative humidity, and fuel moisture content. Keep track of the days since rain.
- ◆ Determine the best weather that will allow you to burn with good smoke management.



- ◆ Prepare to share your plans with all those interested, including public agencies, adjacent land owners, neighbors, and nearby smoke-sensitive institutions such as schools, hospitals, nursing facilities, and daycare centers. This is common courtesy as well as a requirement in many areas. All those concerned will then know that your burn is not a wildfire.
- ◆ Use approved ignition devices which do not produce black smoke. These include butane or propane torches.
- ◆ DO NOT burn tires or pour fuel oil or diesel on a pile.
- ◆ Before ignition, light a test fire away from roads and other ‘edges’ to assess winds aloft. Watch how well the test fire burns and where/how the smoke moves. Postpone your burn if the tests show the smoke would move toward sensitive areas.

Pile Ignition Techniques

- Pile fuels loosely and allow ample air spaces
- Ignite many spots around the base of the pile
- Avoid pushing dirt into the pile if using heavy equipment
- Don’t make the pile too large
- Don’t leave your fire unattended. EVER! It may escape or smolder and emit more smoke once the finer fuels burn and the fire temperature drops. Reform the pile to promote flaming when burning is partially completed.

Weather and terrain effects on wind

Accurately predicting wind behavior may take years of study and field experience. Be sure you learn about the local, small-scale daily wind patterns in your area, their relation to surface features, and how various weather fronts can affect them.

Surface winds are strongly affected by the shape of the ground and features above ground such as tree lines, buildings, and fences. Daily time temperature variances (cool at night, warmest mid-day) also influence wind behaviors, especially near slopes and open fields.

Sloping ground, especially near higher hills and mountains, may have dramatic changes in wind direction during the day. Cold air tends to rush downslope (catabatic winds) during the night and morning hours. As the ground warms and the air temperature rises, the winds shift to moving up-slope (adiabatic) usually in midday through late afternoon. As evening comes, catabatic winds may return.

POOR Smoke Dispersion Conditions



Poor air (smoke) dispersion conditions frequently can be found when skies are clear, or layered with low, flat clouds and little or no wind.

GOOD Smoke Dispersion Conditions



Good dispersion rates occur when there are tall and/or puffy cumular clouds (these result from strong vertical air movement) and strong winds.

Avoid burning after dark

Air temperature normally decreases with height above ground, allowing heated air and smoke to rise. A temperature inversion is an increase in air temperature with height. This inhibits vertical air movement and mixing. Unfortunately, inversions frequently occur in the natural basins and valleys within ORCAA's jurisdiction.

Overnight inversions will form in sheltered valleys, given little wind and clear night skies. The ground cools first at night, cooling the air in contact with it, while the air aloft may remain near daytime temperatures. The cooled surface air (with any smoke in it) gets dense and flows downslope as it cools further (catabatic wind). That results in shallow cold air layers on the slopes and deep, cold (and smoky) air trapped near the ground surface on the valley floor.

By late afternoon any residual smoke coming from your burn will stay at ground level, cool and being to drain downhill. Time your burn early enough in the day so that it won't still be smoldering as night falls.

Don't be a public nuisance

If your burn emits enough smoke to cause people downwind to complain, you must comply with ORCAA's Regulation 6.2.5g ("If your open burning creates a nuisance, the fire must be extinguished immediately."). Failure to comply puts you in violation of ORCAA's regulations and could result in a fine of up to \$14,915. To avoid a violation, plan your burn carefully and curtail burning if the weather is not cooperating.

- ◆ **Develop a good communications habit.** Keep the public, your neighbors, and your local regulating and/or fire safety agencies informed of your intentions to burn to avoid unwelcome surprises.
- ◆ **Get specialized training.** Ensure your contractor has the training, credentials, and the expertise to conduct a controlled burn safely and with a minimum of smoke.
- ◆ **Understand that violating regulations can be expensive.** Penalty fees for not complying with air quality regulations run as high as \$14,915 PER VIOLATION. You may also lose your permit and have to reimburse fire agencies for any wildfire suppression costs, as well as paying your neighbors for any property or fire damages.

Besides avoiding fines, the benefits of keeping your burns within legal limits include being a good neighbor and helping ensure a healthful environment for your community.



Burn Checklist

Name _____ Date: _____

Land Clearing Burn Requirements

- **You must have a valid land clearing burn permit.**
- **Only natural vegetation, originating on the property where the burn will be conducted, may be burnt.**
- **Materials must be arranged loosely in the pile for good air circulation.**
- **Avoid burning when wind direction is toward populated areas or public roadways.**

Acres cleared: _____ Number of piles to be burnt: _____

Burn site address: _____

Fuel Type: _____ Pile size: _____

Smoke Sensitive facilities or areas within 20 miles:

Facility: _____ Distance: _____ Direction: _____

Facility: _____ Distance: _____ Direction: _____

Facility: _____ Distance: _____ Direction: _____

Facility: _____ Distance: _____ Direction: _____

Facility: _____ Distance: _____ Direction: _____

Facility: _____ Distance: _____ Direction: _____

Estimated time needed to complete burn: _____

Burning hours (i.e. time of day): _____

Mop-up equipment & personnel: _____ Mop-up start time: _____

Ideal wind direction at ignition: _____ Wind direction at mop-up: _____

Approved ignition device: _____ Ignition technique: _____

Permits required: ORCAA _____ Fire Agency: _____

I need to contact _____, _____, _____ before burning.

Burn Day Status information: _____

Additional Information

Olympic Region Clean Air Agency

ORCAA, Main Office

2940-B Limited Ln NW

Olympia, WA 98502

(360) 539-7610

(800) 422-5623

www.ORCAA.org

You may also call your local fire department or fire district for further assistance. Mason County and some fire districts have their own land clearing burn permit programs. Check with ORCAA if you are uncertain which agency will issue your burn permit.

Alternatives to Burning

Visit ORCAA's website, www.ORCAA.org, for lists of alternatives to burning, including services which may dispose of the material for you.

***Use of Burn Barrels
is ILLEGAL anywhere in
Washington!***

It is also ILLEGAL to burn trash

Painted or treated lumber products, plastic material and even paper products release toxic compounds when burned, which can result in cardiovascular and respiratory problems as well as neurological disorders.





ORCAA

OLYMPIC REGION CLEAN AIR AGENCY

2940 Limited Ln NW

Olympia, WA 98502

(360) 539-7610 • FAX (360) 491-6308

www.ORCAA.org • news.ORCAA.org