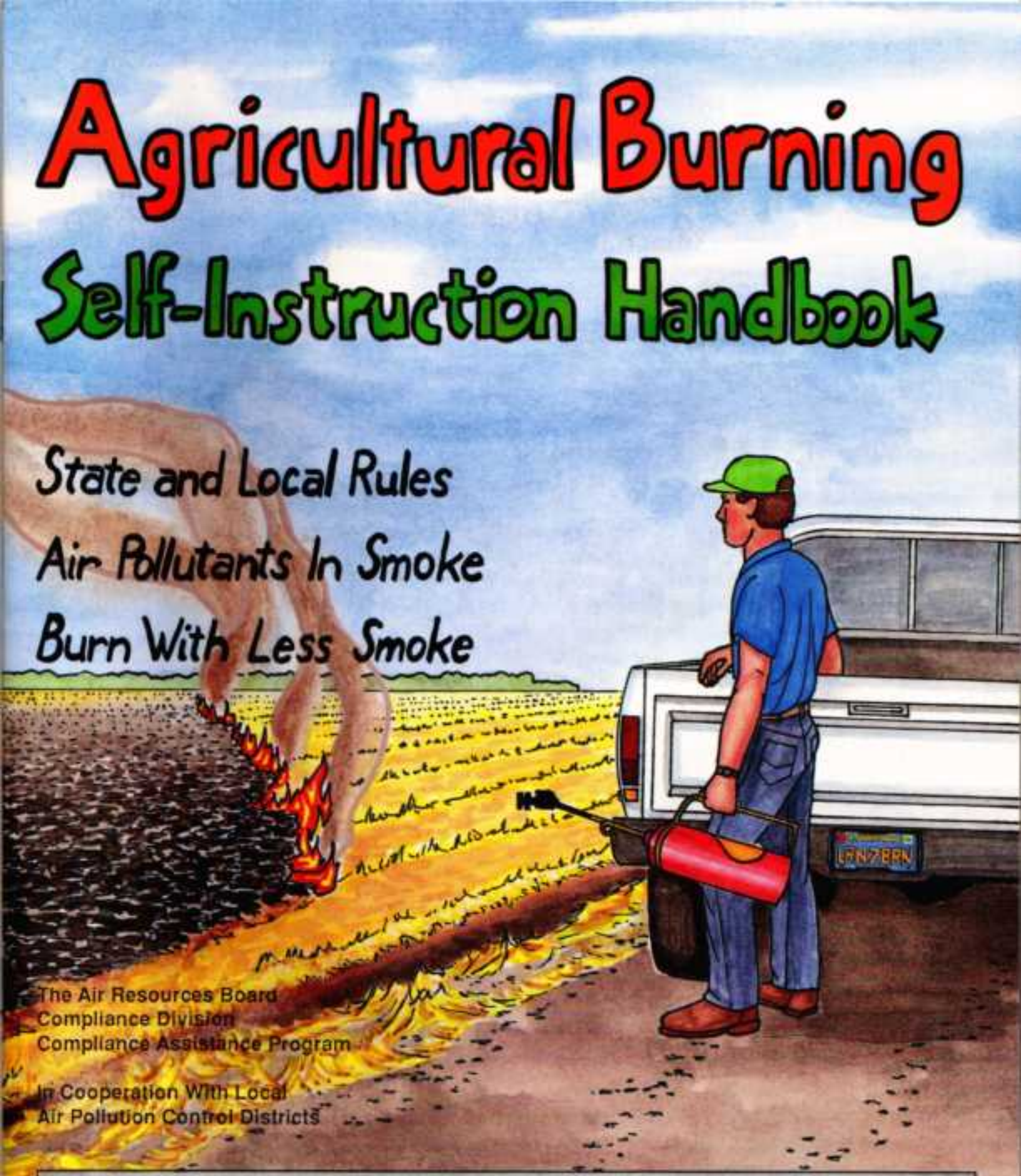
Agricultural Burning

Self-Instruction Handbook

State and Local Rules

Air Pollutants In Smoke

Burn With Less Smoke



The Air Resources Board
Compliance Division
Compliance Assistance Program

In Cooperation With Local
Air Pollution Control Districts

This handbook discusses the burning of agricultural materials produced on cultivated farmland only. It does not cover Range Improvement, Forest Management, Wildland Vegetation Management, and Wildlife Habitat Improvement burning. Nor does it cover other regulated Open Burning. Contact your local district for more information about these types of burns.

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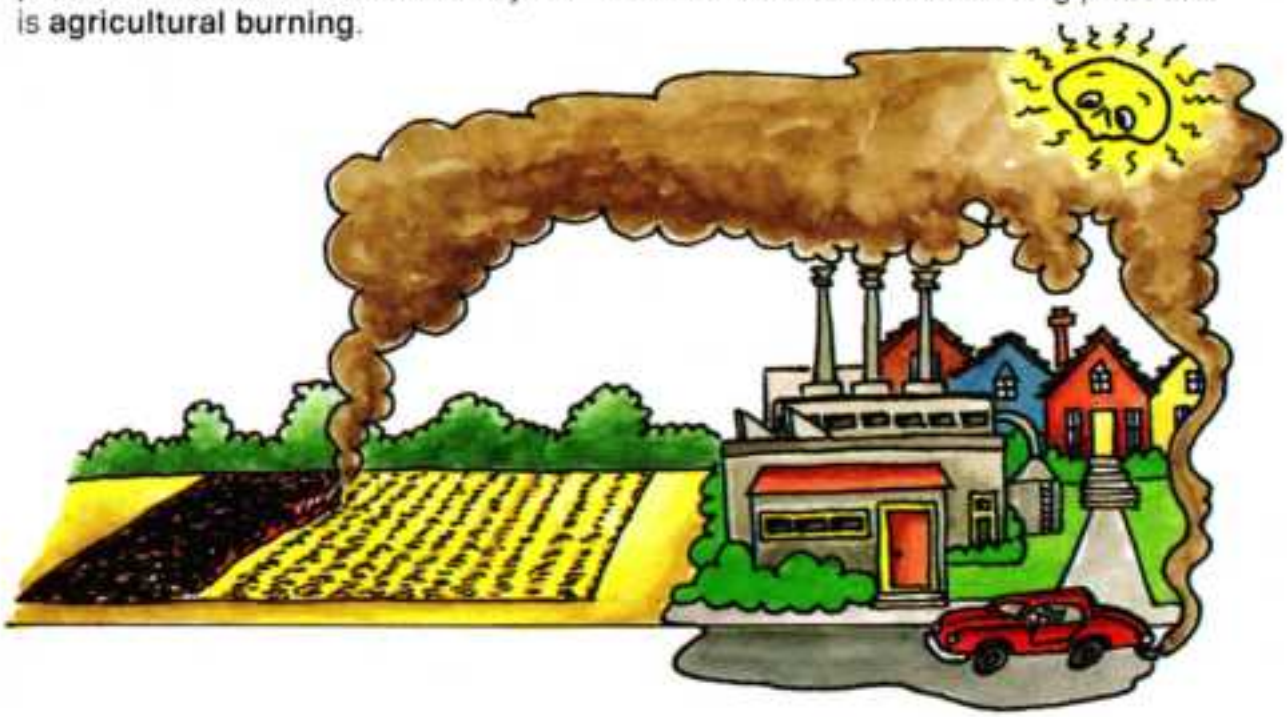
Why Reduce Air Pollution?

Air pollution affects millions of Californians every day. Sometimes you can see it and feel it with every breath. In most urban areas, vehicles and industrial sources create and contribute equally to the air pollution problem. In many rural areas where agriculture is a major industry, air pollution from cities may be carried in by the wind. But some farming practices can contribute a **significant** amount of harmful air pollutants in certain months of the year. The most visible of these farming practices is **agricultural burning**.



The Compliance Assistance Program at the California Air Resources Board and your local air pollution control district are asking for **your help** to reduce air pollution. This handbook is designed to help you **know the laws,** learn about the pollutants in smoke, and to understand how to burn your agricultural waste with less smoke. Fill in the Burn Checklist on page 14 and keep it handy for easy reference. **You can** make a difference!

What is Agricultural Burning?

"The burning in the open of materials produced wholly from operations in the growing and harvesting of crops or raising of fowl or animals for the primary purpose of making a profit, of providing a livelihood..." *Agricultural Burning Guidelines, Title 17, California Code of Regulations*

This handbook discusses the burning of agricultural waste materials produced on **cultivated** farmland only. This includes:

Field Crops - residues left in the field after harvesting grain or vegetable crops such as rice, corn, wheat, and beans;

Orchard Crops - prunings, stumps, weeds and grass from and around nut and fruit trees and vines;

Irrigation Ditches and Ditchbanks - the removal of weeds and grass from these areas in order to improve irrigation water management;

Weed Abatement - the removal of weeds, including tumbleweeds, in and adjacent to fields under cultivation;

Crop Production Refuse - the burning of certain items "intimately related" to the crops and **used in the field**, such as fertilizer and pesticide sacks, raisin drying trays, and date palm protection paper.

Note - some districts prohibit burning specific items. Check with your district.

Disease or Pest Prevention - Crop material is infected, and there is an immediate need for and no reasonable alternative to burning.

Note - May require written verification by the Agricultural Commissioner. Ask your district.

Agricultural Burning is Regulated

What is NOT Agricultural Waste?

Petroleum products, demolition debris, tires, tar, wood pallets, yard trimmings, household trash, almost **anything** processed or manufactured, not produced in an agricultural operation.

You Need A Permit To Burn

State law **requires** the regulation of agricultural burning. The state board declares a Permissive Burn Day when expected weather conditions will provide enough ventilation to disperse the added burden of smoke pollutants. Your Agricultural Burn Permit is valid **only** on Permissive Burn days. Your local fire and air pollution control agencies want you to know:

- You must know the air pollution and fire control rules **before** you can burn.
- You must conduct your burn **responsibly**.
- The fire you are lighting could become a significant **air pollution nuisance** and/or a **fire hazard,** unless you follow the rules and use your common sense.

Who May Burn Agricultural Waste?

Only the owners and/or operators of **commercial agricultural operations:**

- who have a **valid Agricultural Burn Permit** issued by a designated county or state agency, and;
- who have been given **authorization** to burn **on that day**. The local fire agency and/or the air pollution control district may have to be contacted prior to **each burn**.

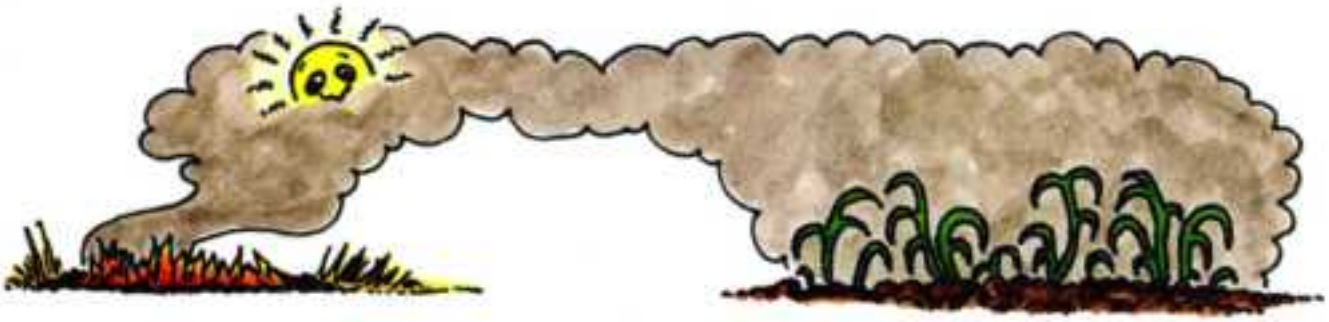
What Information Will They Want?

- Your Agricultural Burn Permit number;
- The type of crop waste you want to burn;
- How long it has been drying;
- The location of the field you will burn; and
- The number of acres you want to burn today.

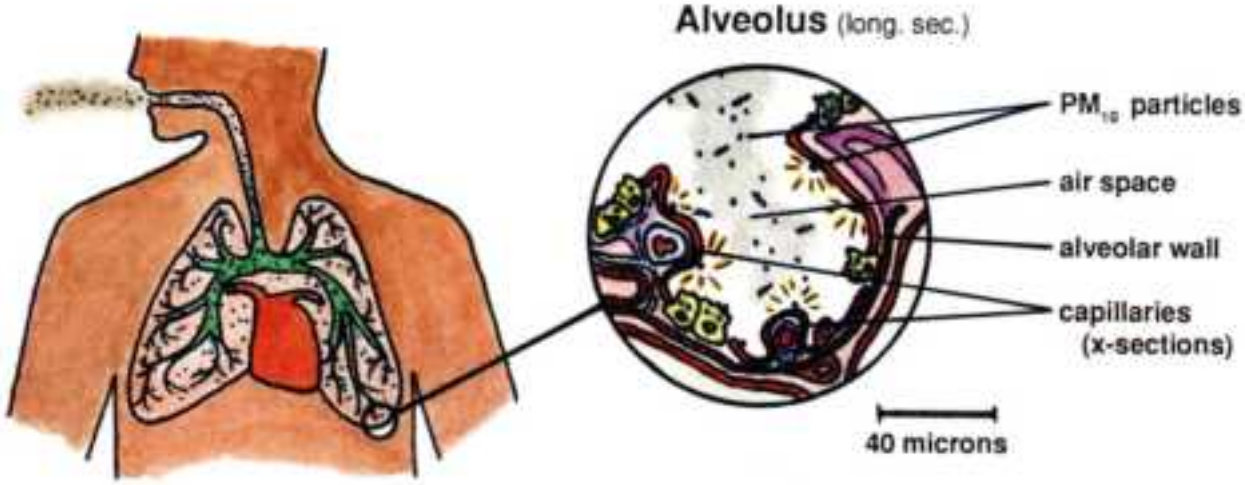
Please call them back if you burn a different amount.

Air Pollution Problems

Most areas in California have two **significant** ambient (outdoor) air pollution problems. One is ozone. **Ozone, the major ingredient in photochemical smog,** is formed mainly on warm, sunny, calm days from pollutants with familiar names - **NO_x** (oxides of nitrogen) and hydrocarbons (**HC**). Ozone irritates your lungs and eyes, makes your breathing difficult, and **damages vegetation.** Recent research conducted at the University of California at Riverside estimates that **crop yield reductions** in California due to **ozone damage** equal at least **330 million dollars each year.**



Particulate Matter is the second major problem, especially the microscopic particles, **ten microns** or smaller (known as **PM_{10}** or aerosols) which, because of their very small size and weight (an average human hair is 70 microns in diameter), can remain **airborne** for **weeks**. When inhaled, PM_{10} particles travel easily to the deep parts of the lungs, past the protective mucus lining the airways. In the **alveoli**, the billions of tiny air-filled sacs lined with capillaries where the crucial blood gas exchanges are made, PM_{10} particles come to rest. The alveoli cannot expell these particles easily or defend the body against them. Substances contained **in** or **coating** these particles can cause **serious** harm.



Smoke from Burning is a Significant Source of Air Pollution.

The **smoke** from **agricultural burning** contains both of the precursors of **ozone** (HC and NO_x), **significant** amounts of small **PM_{10}** particles, and other air pollutants.

What IS Smoke?

A Mixture of Two Types of Air Pollutants: Particulate Matter and Gases.

1. Particulate Matter is microscopic **particles**, solid or liquid. Burning produces particles of **soot** (unburned carbon), **ash** (unburnable minerals), condensed **fumes**, and other products of incomplete combustion. **Most smoke particles are VERY small**, less than one micron (1 millionth of a meter) in size, qualifying them as **small PM_{10}** particles. The carbon particles absorb organic vapors (possibly toxic) from the smoke. The solid particles may be coated with harmful contaminants. In the alveoli, with their "cargo" diffusing into nearby blood capillaries, **smoke particles** may be trapped in the lungs for years.

2. The Pollutant Gases in Smoke are Products of Incomplete Combustion:

CO - carbon monoxide - produced in **large** amounts by burning, CO reduces the blood's ability to supply **oxygen** to body tissues by binding strongly to the hemoglobin in the red blood cells, preventing oxygen take-up in the lungs and impairing its release in the tissues. Those most at risk have heart disease, lung disease, or anemia, or are infants or elderly.

HC - hydrocarbons - volatile organic compounds that react with oxides of nitrogen (NO, NO_2) in sunlight to form **ozone**, or photochemical **smog.** Ozone aggravates allergies, asthma and emphysema, and impairs overall lung function.

NO_x - oxides of nitrogen (NO, NO_2) - nitric oxide and nitrogen dioxide, which combine with hydrocarbons to produce **ozone**, and also combine with water vapor in the air to form **acid rain** or **acid fog.**

SO_2 - sulfur dioxide - a respiratory irritant, it also combines with water vapor to form **acid rain** and **acid fog**.

Pounds of Pollutants Emitted* from Burning 10 Acres

Crop	1987 Acres	LF**	CO	HC+	PM	NO_2
Almond	416,172	16	736	96	96	42
Avocado	75,297	15	1740	375	315	65
Barley	350,417	17	2669	255	374	92
Citrus	238,951	10	810	90	60	43
Corn	217,725	42	4536	504	588	176
Grape	674,654	25	1275	125	125	98
Peach	57,780	25	1050	100	150	118
Prune	73,421	12	504	24	36	52
Rice	398,613	30	2640	240	270	180
Safflower	72,912	13	1872	260	234	56
Walnut	183,312	12	564	72	72	52
Wheat	675,899	19	2052	171	247	76

* Emission factors taken from EPA publication AP-42, Compilation of Air Pollutant Emission Factors, 1983 edition, with the exception of the NO_2 data, which is not listed in AP-42. NO_2 emission factors taken from E.F. Darley's 1979 CAL/ARB Project A7-068-30. 1987 California crop acreages taken from the county agricultural commissioners' annual reports for 1987.

** Loading Factor: Tons of crop waste generated on 10 acres.

+ Excluding Methane

Smoke Contains Toxics

Smoke from open burning also contains some materials which are **toxic**. The hydrocarbon **benzene** and the polycyclic aromatic hydrocarbons (**PAH**) have been implicated in causing cancer. Recently, attention has been drawn to PM_{10} **silica fibers**. Research is currently underway to study these materials to find out in what ambient concentrations they could affect human health.

Ambient Air Quality Standards

Both the Federal Government and California have established **ambient air quality standards,** legally defined **health-protecting** maximim levels of some air pollutants. California's **geography, weather,** and growing **population** cause our air quality to **violate** these standards at times. In many areas the state ozone standard is exceeded an average of **every other day**, April through October. The PM_{10} standard is exceeded in the Central Valley in almost every month of the year, in some months on every day it is measured. This means that people are being subjected to **unhealthy** air.

Is Agricultural Burning the Only Culprit?

No! In most cases agricultural burning, when properly conducted and regulated, is only the most **visible** source of air pollution in an area, not the principal source. In some months, however, it is a significant **contributing** source.

Why Do People Complain?

Two major air pollution complaints are **odor** and **interference with visibility,** both aesthetically and from a safety standpoint. Smoke from agricultural burning is a high-profile source of these problems. These additional annoyances must be **added** to the health-related problems caused by breathing in smoke particles and gases.

Minimize Smoke Production

To Burn Clean and Reduce Smoke, the Fire Must Be HOT!

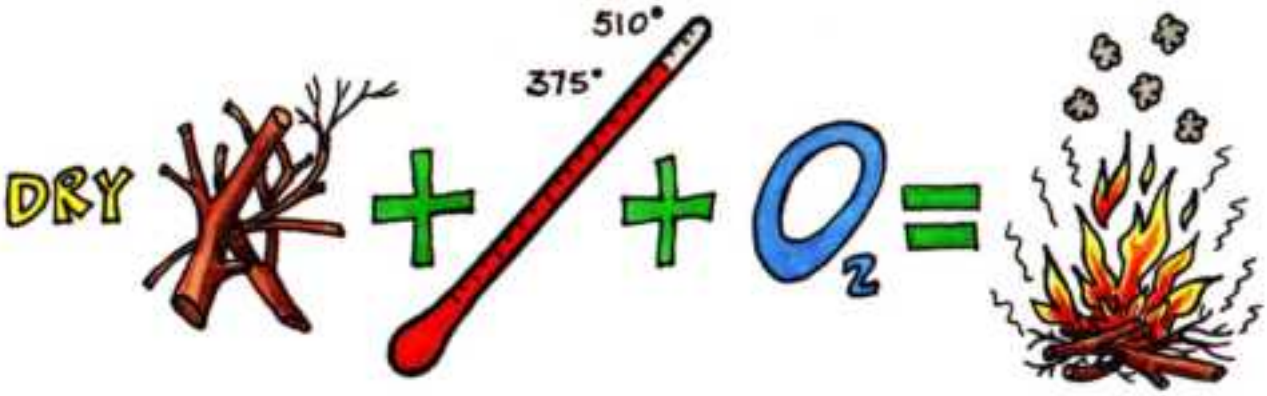
Burning, or **combustion,** is the result of the rapid union of oxygen with other substances, producing **light** (as flames), **heat,** carbon dioxide and water vapor.

Three conditions must exist to **start** and **maintain** a fire:

1. **Fuel** - a substance, usually containing carbon-hydrogen compounds, which will burn. Agricultural waste is a **solid fuel,** ranging from light straw to dense wood, containing varying amounts of **minerals** (which produce **ash** upon burning) and **moisture.**

2. **Kindling Temperature -** the temperature to which a fuel must be **heated** to catch fire. Wood ignites at temperatures between 375° and 510° F. Any **moisture** in or on the fuel will have to be **boiled off** (at 212° F, or less for volatile plant sap) before the fuel can get hot enough to burn well. Burning at low temperatures creates **smoke**, the result of incomplete combuston.

3. **Oxygen** - all fuels don't burn the same way, but all require **plenty** of oxygen from the surrounding air. Smaller pieces of fuel will burn easier and faster than large chunks because of **more fuel surface area** to interact with oxygen. If too little oxygen is available, **carbon monoxide** and **soot** are produced.



REMEMBER!! Dry Fuel, High Temperatures, and <u>Plenty</u> of Oxygen Help Reduce The Amount of Smoke Generated During A Burn.

NOTE: Do Not Leave your Fire Unattended. In addition to creating a potential runaway fire hazard, you are not maintaining the fuel arrangement. Once the center of the pile is consumed the temperature will drop and the fire will **smolder, emitting more smoke.**

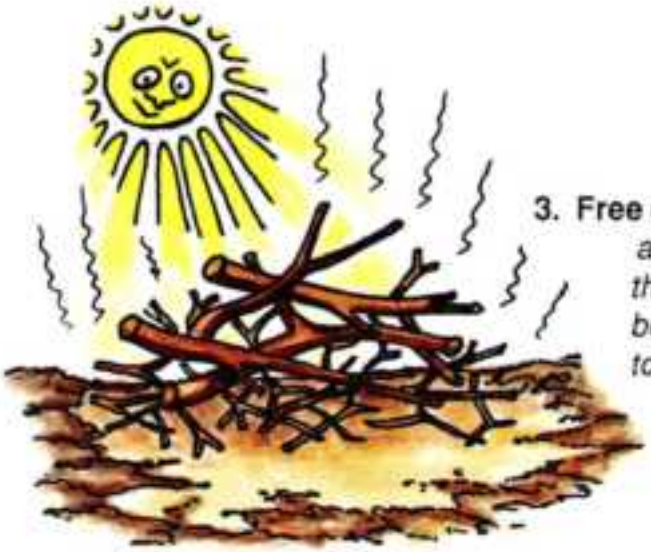
State Agricultural Burning Requirements

Following the **Burning Requirements** listed below will help you light a **Hot** fire quickly that will burn with a minimum of smoke. The heat will help carry the pollutants high into the air, out of breathing range, and scatter them over a broad area.

The material to be burned should be:

1. **Free of Non-Agricultural Materials -** *no tar paper, construction debris, petroleum wastes, tires, tar, metal salvage, plastics, etc.*

2. **Arranged so as to Allow Air to Circulate Freely.** *Stack loosely. Let that oxygen in there!*



3. **Free of Dirt or Surface Moisture.** *Dirt won't burn, and it also keeps the air, and oxygen, away from the fuel. And that surface moisture will have to be boiled off before the fuel can heat up enough to burn without excess smoke.*

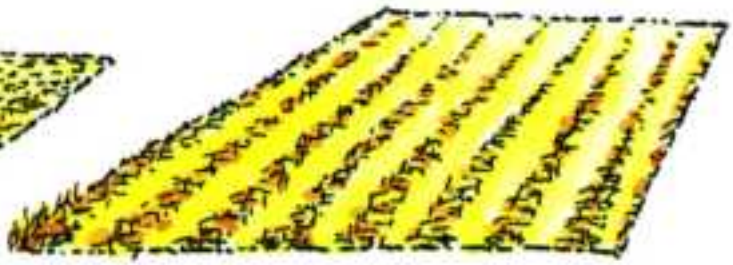
4. **Dried For at Least the Minimum Drying Periods.** *You are wasting fuel energy to boil off* ***water*** *in the fuel, and* ***will*** *generate more smoke.*

Field Crop Drying Times

This depends on the **crop** and the fuel moisture. Check with your district.

RICE Drying Time: Required in the Sacramento and San Joaquin Valley Air Basins.

3 Days for Spread Straw



10 Days for Rowed Straw

The "Crackle" Test

Sample Several Areas

If the rice straw makes an audible "**crackle**" when it is **bent sharply**, it is dry enough to burn, even if the minimum drying times are not completed. **Several** straw samples must be tested, including some from **under** the mat, in the **center** of the mat, and from several places in the field.

Burning after 0.15" or more Rain - the rice straw **must pass** the **"Crackle" Test!**

Field Crop Igniting Techniques

1. Use an **Approved Ignition Device** which does **not** produce black smoke, such as butane, propane, LPG or diesel oil burners. Ask your district what is approved in your area. **NOTE:** A burning tire is **not** an approved ignition device.

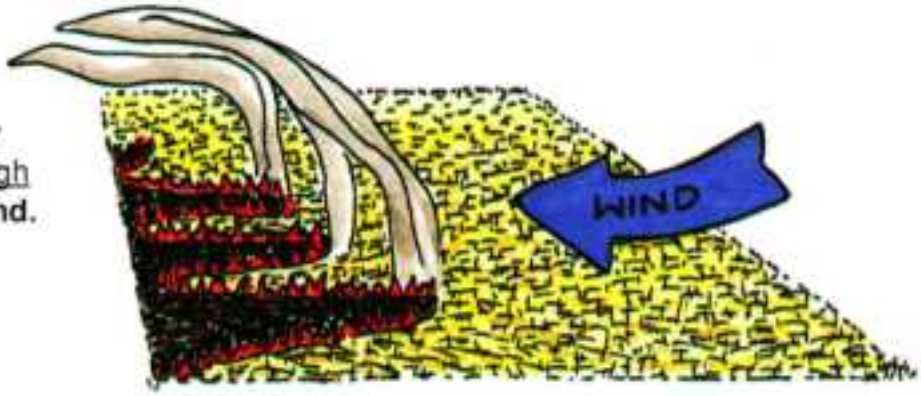
2. Light a Test Fire. See how well the waste material burns and where the smoke is going. Quit for now if the fuel is too damp or smoke is blowing toward populated areas.

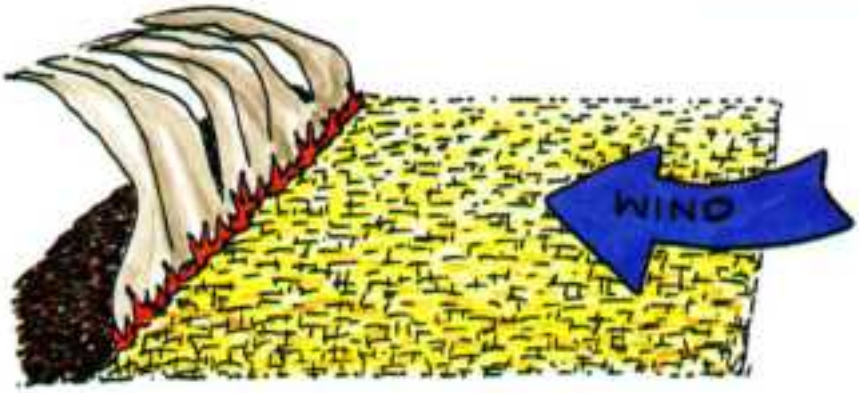
3. Light the Downwind Side of the Field. The fire burns **slower**, but more **thoroughly**. It produces less particles and doesn't leave behind as many smoldering, smoky patches.

NOTE: In the Sacramento and San Joaquin Valley Air Basins, Rice, Barley, Oat and Wheat Fields are to be Ignited ONLY by Stripfiring into-the -Wind or by Backfiring, except by special permit issued by the district. Your district may have similar rules - ask!

What is **Stripfiring**?

Lighting the field in **strips** by walking straight through the field **INTO the wind.**





What is **Backfiring**?

Lighting the **downwind** edge of the field, so that the fire must creep **into** the wind.

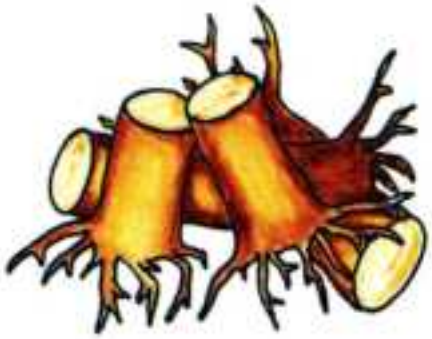
Ditch and Weed Burning

Kill the grass and/or weeds first and allow them to dry. Burn wastes using field crop igniting techniques.

Orchard and Vine Crop Burning

Recommended Drying Times:

Prunings and Small Branches
Three Weeks



Large Branches and Stumps
Six Weeks

Check Your Permit For The Exact Drying Times Required In Your District.

Igniting Techniques:

Stack brush loosely to allow **lots of air** into the pile.

Ignite at or near the **top** of the pile.

Avoid pushing dirt into the pile with the prunings.

Don't make the pile **too large.**

Use An **Approved Ignition Device** to start your fire. Check with your local district to find out what kinds are legal. **Remember, No Tires or Pouring Diesel Oil on the Pile.**

Permissive Burn and No-Burn Days

When Can I Burn?

On Permissive Burn Days - meteorologists have determined that weather conditions will permit good dispersal of the smoke. You may also need authorization to burn on that day from your local permit agency.

NOTE: Your fire district may declare this a No-Burn Day if windy conditions could create a potential fire hazard.

Not on No-Burn Days - meteorologists have determined that the air is **stagnant**, with little movement or ventilation, and possibly already loaded with pollutants. Smoke would **not** disperse.

Burning on a No-burn Day - you must apply for a special permit **and** show your air pollution control officer that "imminent and substantial economic loss" will result from your **not** being able to burn **TODAY**. Check with your district office - some districts prohibit such burns.

Burning Hours

Your burn permit should list the hours. If not, call your district. **Note** - Igniting before or after allowed hours is **illegal,** as is **adding fuel to an existing fire.**

Restricted Burning Hours - NO Burning before 10 am or **after 3 pm.**
More restrictive burning hours may be instituted in your area at certain times of the year. Check with your district for the exact hours. *Late morning burns allow the sun to evaporate the dew and warm the ground, lifting the inversion lid so the smoke will rise. Smoke hugs the ground as the sun goes down and temperatures and the inversion lid drop - and that smoke may not leave the area until the sun has warmed the ground the next day.*

How Can I Find Out if it's a Burn Day?

Check with your local fire department or district. There may be a local toll-free phone number to call, or a radio station that gives out that information at regular times during the day.

How Come My Neighbor Can Burn Today and I Can't !?

Remember, your district is required by state law to **regulate** the total amount of material burned in the district each day, on Burn and No-Burn Days.

To **minimize** the smoke's impact on people, your district may take **many factors** into account, such as:

- ✓ The types of crop waste requested to be burned.
- ✓ How many acres are requested and their locations.
- ✓ Are they upwind of populated areas, roads or airports?
- ✓ What's the forecast of the air quality in nearby cities?
- ✓ How's the weather been? What's it like today?
- ✓ How much burned yesterday? Any smoke still around?

So **Plan Ahead**. Call the District **early** the morning you want to burn. And be prepared, in some areas, to be placed on a waiting list.

What Happens to Me if I Go Ahead and Burn Anyway?

Violating California Law Can Be Very Costly!

The penalties for violating air pollution regulations can be as much as **$25,000 per day.** You could be issued a Citation or a Notice of Violation, and you could be taken to court and/or be required to pay penalty fees. You may **also lose** your agricultural burn permit and have to **reimburse** the fire department the cost of putting out your **illegal** fire. Use the checklist on the page opposite to record the air pollution regulations in your district. Regulations of other agencies may apply to your operation as well. Remember, the benefit of keeping your agricultural burns within legal limits is not simply avoiding penalties, but also being a **good neighbor**, helping to provide a healthier environment for everyone.

Agricultural Burn Checklist

State Agricultural Burning Requirements:

You must have a valid Agricultural Burn Permit.
No non-agricultural materials may be burned.
Waste materials are to be arranged loosely for good air circulation.
Material to be burned must be free of dirt and surface moisture.
Material must be dried for the minimum drying times.

Local District Rules Which Apply:

Drying Times:

Field Crop _____ Prunings _____ Stumps _____

Approved Ignition Devices _____

Approved Ignition Techniques _____

I Need Permits From:

APC District _____ Fire Station _____

Ag Commissioner _____ Fish and Game _____

I Need to Contact _____ **Before Burning.**

Burning Hours _____

Burn Day Status Information _____

Prohibited Items _____

Other _____

More That You, the Grower, Can Do to Reduce Air Pollution from Burning:

Report Any Suspicious Burns You See Promptly. Don't Let Violators Make the Farm Industry Look Bad.

Instruct Your Workers in the Correct Burning Practices.

Think Twice. Do I HAVE to burn it? Is there another way?

Encourage New Ideas and Technology in Agricultural Waste Management.

Compare Notes With Your Neighbors and Fellow Growers. Learn Why They Don't Burn.

Make Your Agricultural Wastes Available to Nearby Biomass Burning Plants.

Need More Information?

Air Resources Board (800) 952-5588 **District** _____

Multi-County Districts

1 - Bay Area (415) 771-6000
2 - Feather River (530) 634-7659
3 - Great Basin (760) 872-8211
4 - Monterey Bay (408) 647-9411
5 - North Coast (707) 443-3093
6 - Northern Sierra (530) 274-9360
7 - South Coast (909) 396-2000
8 - Yolo-Solano (530) 757-3650
9 - San Joaquin Valley (209) 497-1000

County APC Districts

Amador (209) 223-6406
Antelope Valley (805) 723-8070
Butte (530) 891-2882
Calaveras (209) 754-6504
Colusa (530) 458-0590
El Dorado (530) 621-6662
Glenn (530) 934-6500
Imperial (760) 339-4314
Kern (805) 862-5250
Lake (707) 263-7000
Lassen (530) 251-8110
Mariposa (209) 966-5151
Mendocino (707) 463-4354
Modoc (530) 233-6419
Mojave Desert (760) 245-1661
No. Sonoma (707) 433-5911
Placer (530) 889-7130
Sacramento (916) 386-6650
San Diego (619) 694-3340
San Luis Obispo (805) 781-5912
Santa Barbara (805) 961-8800
Shasta (530) 225-5674
Siskiyou (530) 841-4029
Tehama (530) 527-3717
Tuolumne (209) 533-5693
Ventura (805) 645-1440

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Illustrations by D. Czarnecki
http://www.arb.ca.gov
CSP 98 10054

California Environmental Protection Agency
Air Resources Board