

Instruction Guide for Completing the Arizona Department of Environmental Quality ADEQ Burn Plan Form

The Interagency Smoke Management Program was created in 1991 to support the Arizona Department of Environmental Quality (ADEQ) in the management of emissions from federal and state forest and range management burns. ADEQ has a mandate to protect the health and welfare of Arizona citizens from adverse air pollution impacts (CAA, Sec. 118; ARS 49:5011). Information provided on the ADEQ Burn Plan Form will be used by the Program to prevent smoke intrusions from entering smoke-sensitive, Class I, and non-attainment areas, and to improve its inventory of air pollution emissions from federal and state prescribed burning activities using the fuel consumption model Consume.

Pursuant to [Arizona Revised Statute \(ARS18-2-15\)](#) governing smoke emissions from forest and range management burns, federal and state land managers must submit a [ADEQ Burn Plan Form](#), [smoke dispersion map](#), and smoke modeling if necessary, to ADEQ at least two weeks prior to the scheduled ignition date of the prescribed burn project. Individual plans must be completed for projects that involve both broadcast burning and piled activity fuels in the same project area, which will allow for more accurate fuel consumption and subsequent emissions calculations.

Please indicate on smoke dispersion map, the location of the burn project relative to the locations of any smoke-sensitive areas, [Class I areas, or Non-Attainment Areas](#) within 15 miles in any direction of the project. Avoiding these areas, use a 30° arc that extends 15 miles from the project area to illustrate how smoke will disperse under favorable daytime wind directions. Also show how smoke will disperse from the project area during the nighttime hours. The map should have enough resolution to depict topographical features, especially the drainages, through which the diurnal smoke will flow. For projects that involve both broadcast burning and piled activity fuels, only one smoke dispersion map is required if the piled activity fuels are within the broadcast area.

The [Simple Approach Smoke Estimation Model \(SASEM\)](#) is used to calculate fuel consumption, particulate emissions, and dispersion of particulate matter (PM) produced by prescribed burning of forest and rangeland vegetation. Modeling should be submitted with the ADEQ Burn Plan Form for all burn projects that are greater than 250 acres per day, or greater than 50 acres per day if the burn is within 15 miles of a Class I Area, an area that is in non-attainment for PM or carbon-monoxide, or any other smoke sensitive area. Select “New SASEM” as the calculation type for broadcast projects that do not involve timber fuel types. For timber and piled fuel projects, select the “Emissions Production Model (EPM) as the calculation type. For piles, do not include the fuel loading of duff unless the area around the piles is to be simultaneously broadcast burned. Select “PM-10” and “PM-2.5” as the standards compared in all calculations. The acres in the model runs should correspond with the anticipated maximum area to be burned (blackened) per day.

The ADEQ Burn Plan provides the fuel consumption model Consume with “default” fuel loading and fuel composition information. Information provided on the ADEQ Burn Plan should characterize the primary fuel type and associated loading that will be burned most frequently throughout the project area.

FORM INSTRUCTIONS

Contact Number: The telephone number of the individual who may be contacted for clarification or questions with the information submitted on the ADEQ Burn Plan Form.

Contact Name: The name of the individual who may be contacted for clarification or questions with the information submitted on the ADEQ Burn Plan Form.

Township/Range/Section: Provide the complete legal location(s) of the project area where burning will occur. Each Township/Range/Section column, or “group,” must contain only one township, one range, and one or more sections. Please enter all legal locations where burning will occur using either of the following formats: (TT/RR/SS; TT/RR/SS) or (TT/RR/SS-SS). There is sufficient room on the ADEQ Burn Plan Form for six groups of legal locations. For larger burn projects, please submit additional groups on a separate sheet of paper. Provide the complete legal location where burning will occur.

Prescribed burns that have no specific legal location (such as district-wide pile burns) must provide burning locations on both the Daily Burn and Accomplishment Forms. Type or write the word “multiple” for legal location on the ADEQ Burn Plan Form.

Burn Name: The name of the burn project.

Burn Number: Burn numbers generally include an agency’s unit designator, as described in the Southwest Area Mobilization Guide, and four numerical values. The value that is assigned to a prescribed burn project should be unique to that project. A new burn project should always be given a new burn number. A new or existing burn number may be used for a second-entry or maintenance burn project in that same project area, but an updated ADEQ Burn Plan Form is required. Please contact the Interagency Smoke Management Program if there is uncertainty with the assignment of a new burn number, or if there is a change to an existing burn number.

Forest Service Districts use the third value of the burn number as a district identifier. For example, burn numbers on the Clifton Ranger District of the Apache-Sitgreaves National Forest all begin with “ASF03” where the number “3” is used as the district’s identifier.

Note: For projects that involve both broadcast burning and piled activity fuels, specify between burn types on the ADEQ Burn Plan Form by including a “B” for broadcast, and “P” for piles, at the end of the burn number. Two separate ADEQ Burn Plan Forms are required.

Agency: Please provide the name of the Agency that is responsible for conducting the prescribed burn.

County: The name of the county where the prescribed burn will take place. For burns that will occur over multiple counties, please provide the name of the county where most of the burning will occur.

Burn Latitude/Longitude: Provide the latitude and longitude of the approximate center of the project area.

Acres In Burn Unit: The total acreage to be treated within the project area. The number provided will be used to determine when a project has been completed, or when an updated burn plan may be required. Please round up to the nearest whole acre.

Acres Daily: The maximum number of acres that will be treated daily. Please round up to the nearest whole acre.

Primary Smoke Management Unit Number: (1-11) The number of the airshed where the burn is located. Arizona Department of Environmental Quality has defined eleven [Smoke Management Units \(SMU's\)](#) statewide that identify geographical areas with similar hydrology, topography and localized meteorological conditions. SMU's are more commonly referred to as "airsheds," and like water within a "watershed," smoke can flow downhill and accumulate within drainages, valleys, and other low-lying areas. Smoke impacts within these basins are heaviest during the evening and morning hours as cooler temperatures and stable conditions prevent adequate dispersion.

Elevation: Provide the average elevation, in feet, that best represents the elevation of the entire project area.

Unit Lined By: Choose any one or all control line types that are used to delineate burn blocks within the project area.

Burn Type: Choose only one burn type. Choose "Broadcast (Natural)" for all projects that do not involve activity (anthropogenic) fuels created from mechanical treatment. Choose "Broadcast (Activity Non-Piled)" if any non-piled activity fuels are present within the project area. Choose "Piles" if the project contains piled activity fuels.

Separate ADEQ Burn Plan Forms are required for burn projects that involve both broadcast burning and piled slash. Select the appropriate burn type for each plan and complete either the broadcast burning or piled slash fuels information section accordingly on each plan.

Burn Purpose: Use the principal funding source of the burn project to determine the primary purpose for treating the project area. Indicate the number of the primary burn purpose first on the ADEQ Burn Plan Form. If treatment will accomplish multiple objectives, list the other purposes after the primary burn purpose.

Firing Technique: Choose the firing techniques that will be used. Heading fires spread with the wind or uphill (flames tilt the direction of the spread). Backing fires spread against the wind or downhill (flames tilt away from the direction of the spread). Heading and backing fire may both be used throughout the project area. Select the Piles / Jackpot technique only for those projects that involve the burning of piles or specific patches of isolated fuels.

Ignition Method: Choose any one or all ignition methods that will be used. Please select "Aerial" if a helitorch or sphere dispenser will be used. Hand methods include the use of fusees and drip-torches. Machine methods are those that involve the use of terra-torches and ATV's equipped with back end propane burners.

Average Slope: The average slope of the project area. Slope is expressed in percent. Project areas that are predominantly flat areas will have 0% slope.

Aspect: Provide the predominant aspects of the project area. If the project contains numerous aspects, then choose the aspects that best characterize the majority of the project area. Project areas that are predominantly flat will not have an aspect.

Temperature: Provide the highest and lowest air temperature values, in degrees Fahrenheit, as documented within the burn prescription of the project's burn plan.

Relative Humidity: Provide the highest and lowest relative humidity values, in percent, as documented within the burn prescription of the project's burn plan

Wind Speed: The highest and lowest midflame windspeed, in miles per hour (mph), as documented within the burn prescription of the project's burn plan. The maximum allowable windspeed Consume will accept is 35 mph.

Wind Direction: Provide a single wind direction, or a range of favorable wind directions, that will direct daytime smoke away from smoke-sensitive, Class I, and non-attainment areas. If all wind directions are acceptable, indicate the favorable wind direction as N-NNW. Favorable wind directions provided on the ADEQ Burn Plan Form should be identical to those directions that are used in the SASEM smoke model and shown on the smoke dispersion map.

Representative Weather Station: Provide the name and number of a single [Remote Automated Weather Station \(RAWS\)](#) that is nearest to the project area, or one that best represents weather conditions similar to those of the project area. Do not provide the names or numbers of any micro RAWS units.

BMP's (Best Management Practices): To reduce smoke emissions or minimize smoke impacts, land managers are required to implement as many BMP's as are feasible for their burn projects. Please document all of the BMP's that will be utilized prior to, during, or after ignition.

- ✓ Permanent Fuel Exclusion: Some or all of the fuel within a project can be permanently removed from the site. Methods for permanently excluding fuels include mechanical removal, mechanical processing, firewood sales, the use of biomass for electrical generation and any other biomass utilization.
- ✓ Temporary Fuel Exclusion: Some or all of the fuel may also be temporarily excluded from burning. Methods include burning with high moisture in large diameter fuels, with moist litter and duff, before precipitation, and before large fuels cure.
- ✓ Increasing Combustion Efficiency: Increasing combustion efficiency, or shifting the majority of consumption away from the smoldering phase and into the more efficient flaming phase, reduces particulate emissions. Methods of increasing efficiency include pile and windrow burning, the chunking of piles, the use of backing fires, burning during dry conditions, initiating rapid mop-up, the use of aerial or mass ignition techniques, and the use of air curtain destructors.

- ✓ Spring and summer months between March 15 and September 15 are generally characterized as having meteorological conditions that allow for excellent smoke dispersion.
- ✓ Burning during optimum mid-day dispersion hours, with all ignitions in a burn unit complete by 3:00 pm helps to prevent the trapping of smoke in inversions or diurnal windflow patterns.
- ✓ Reducing Fuel Production: Sometimes fuels can be prevented from being produced. Methods of preventing fuel production include chemical treatments, such as herbicides, and site conversion, such as forest to farmland.
- ✓ Implementing maintenance burning in a periodic rotation that mimics natural fire cycles reduces excessive fuel accumulations and subsequent excessive smoke production through smoldering or wildfire.
- ✓ When possible, prescribed burns should only be ignited under good to excellent ventilation conditions. Operations should be suspended under poor smoke dispersion conditions.
- ✓ Reducing the Area Burned: Reducing the area burned can be accomplished by concentration burning, Jackpot burning, burning isolating fuels, and mosaic burning. This best management practice should only be selected if emissions will be reduced over time, and not just deferred to a later date.
- ✓ Igniting Before New Fuels Appear: Burning can sometimes be scheduled for times of the year before new fuels appear. Includes underburning before litter fall during the summer months and before green-up in the spring.

Plume Sensitive Areas Within 15 Miles: Provide the names and distances of any sensitive areas that may be impacted by a daytime smoke plume 15 miles in any direction of the project area, under favorable wind directions. Please indicate if there are no sensitive areas. Any sensitive areas identified ADEQ Burn Plan Form should be included on the smoke trajectory map and used as receptors in SASEM modeling.

Diurnal Drainage Sensitive Areas Within 15 Miles: Provide the names and distances of any sensitive areas that may be impacted by nighttime smoke impacts along drainages and within valleys within 15 miles in any direction of the project area. Please indicate if there are no sensitive areas. Any sensitive areas identified on the ADEQ Burn Plan Form should be included on the smoke trajectory map and used as receptors in SASEM modeling.

Fuels Information - (Broadcast Burning): The information provided in this section will be used to calculate fuel consumption and emission production unless otherwise provided on the Daily Burn Accomplishment Form. Fuels information for broadcast burning should ONLY be completed if “Broadcast (Activity)” or “Broadcast (Natural)” was selected as the primary burn type on the ADEQ Burn Plan Form. Do not include in the broadcast burning section any activity fuels that have been piled. Identical fuels information should be used where appropriate in the SASEM model.

- **Primary Fuel Type:** Choose only one fuel category as the primary fuel type. The primary fuel type is identified as having the greatest estimated fuel loading that will be burned within the project area, not necessarily as the fuel type that covers the greatest acreage.
- **Primary NFDRS Fuel Model:** Select only one fuel model, A-U, as described below. The same fuel model should be used for SASEM modeling.

A Western annual grasslands	N Reedy marsh fuels
B Dense tall brush	K Light conifer slash/partial cuts
C Open pine perennial grass understory	L Western perennial grasslands
D Pine with Palmetto-gallberry understory	M Reedy marsh fuels
E Leaf fall from hardwood and conifer	O Southeast brush-like fuels
F Mature closed chemise and oak brush	P Closed south long-needle pine
G Dense conifer w/ heavy downed duff	Q Dense Alaskan black spruce
H Short-needle conifers with thin litter	R Hardwoods after leaf out
I Clear-cut conifer slash < 6 in	S Alaskan and alpine tundra
J Clear-cut/heavily thinned conifer <6 in	T Sagebrush-grasslands
K Light conifer slash/partial cuts	U Closed west long-needle pine
L Western perennial grasslands	

- **Harvest Date:** For piled or broadcast activity burns provide the date that the timber within the project area was cut. If the timber was cut over an extended period of time, enter the date when 70 percent of the timber was cut.
- **Primary Duff Type:** The primary type of duff type that will be burned. Choose either red (rotten log type), or black (litter type).
- **Fuel Loading:** Provide the pre-burn loading of all types and sizes of fuels within the “Sound and Rotten”, “Sound”, “Rotten”, and “Other” categories. Do not include piled slash within any category in this section. It is also very important not to include fuel types across the categories. For example, do not include grass in both the grass/herb section of the “Other” category, and in the 0.0-2.5 inch fuels section of the “Sound and Rotten” category.

Provide all fuel types and sizes in tons per acre. Please provide the litter and duff depths in inches. Use the table below to convert tons per acre into inches.

Inches	Litter	Black Duff	Red Duff
	T / A	T / A	T / A
0.1	00.03	01.21	01.87
0.2	00.06	02.42	03.74
0.3	00.09	03.63	05.61
0.4	00.12	04.84	07.48
0.5	00.15	06.05	09.35
0.6	00.18	07.26	11.22
0.7	00.21	08.47	13.09
0.8	00.24	09.68	14.96
0.9	00.27	10.89	16.83
1.0	03.00	12.10	18.70
2.0	06.00	24.20	37.40
3.0	09.00	36.30	56.10
4.0	12.00	48.40	74.80
5.0	15.00	60.50	93.50

Fuels Information - (Piled Slash): The information provided in this section will be used to calculate fuel consumption and emission production unless otherwise provided on the Daily Burn Accomplishment Form. Fuels information for piled slash should ONLY be completed if “Piles” was selected as the primary burn type on the ADEQ Burn Plan Form. Identical fuels information should be used where appropriate for SASEM modeling.

- **Number of Piles Per Acre:** The average number of individual piles per acre that will be burned throughout the project area. This number will be used to calculate how many piles were burned using the reported “acreage treated” on the Daily Burn Accomplishment Form.
- **Tons of Piles Per Acre:** The average fuel loading of the piles per acre that will be burned throughout the project area. The average weight of the piles is often equivalent to the fuel loading of the primary fuel component before it was cut and piled. For example, if the fuel loading of ponderosa pine was 10 tons per acre before mechanical treatment, then there are 10 tons of piles per acre.
- **Percent Soil in Piles:** The best estimate of the percent of the pile that consists of soil. Hand piles will generally contain very little soil, whereas dozer piles typically contain high soil content.
- **Primary Species:** Select the species that represents the largest percentage (greater than 50%) of the fuel in the piles.
- **Percentage of Primary Species:** The percentage of the primary species within the piles. For piles that consist of only one fuel type, this number will be 100%. For piles that consist of two or more fuel types, this percentage added to the percentage of secondary species below must total 100%.
- **Secondary Species:** For piles consisting of two or more species, identify the species that makes up the second largest percentage (less than 50%) of the piles.
- **Percentage of Secondary Species:** The percentage of the secondary species within the piles. For piles that consist of only one fuel type, this number will be 0%. For piles that consist of two or more fuel types, this percentage added to the percentage of the primary species must equal 100%.
- **Quality:** Describes piles relative to the content of combustible material. Clean piles will generally experience complete combustion, whereas piles that are really dirty may leave a large amount of soil within the ash and unconsumed pile residue.
- **Dimensions:** Provide the average width and height and length of piles throughout the project area. For piles that are essentially round, tee-pee-like, or half-spherical, provide only the average width and the height.
- **Packing Ratio:** Air comprises much of the gross volume of a pile. The ratio of wood volume to the total pile volume, the packing ratio, ranges from 6 to 26 percent.

Piles with species content dominated by ponderosa pine, with mean diameters of the large woody fuel averaging less than 10 inches, have a packing ratio of 10 percent (Select packing ratio #1).

Piles dominated by short-needed conifers have packing ratios from 15 to 20 percent (Select packing ratio #2).

Piles that are highly compacted and clean with large logs that are greater than 10 inches, especially those built with a crane or loader, can have packing ratios as high as 25 percent. (Select packing ratio #3).