



## San Joaquin Valley Unified Air Pollution Control District

### Emission Inventory Methodology 670 – Range Improvement

#### I. Purpose

This document describes the Area Source Methodology used to estimate criteria emissions from range improvement operations in the San Joaquin Valley Air Basin.

#### II. Applicability

The emission calculations from this Area Source Methodology applies to operations that are identified by the following CES and EIC code(s):

CES	REIC	Description
47282	670-664-0200-0000	Range Improvement

#### III. Point Source Reconciliation

These categories do not reconcile against the point source inventory.

#### IV. Methodology Description

This source category is used to measure emissions from range improvement burning operations. Range improvement is defined as the removal of unwanted vegetation through burning operations for the purpose of maintaining a wildlife habitat or to establish an agricultural practice. This includes vegetation management programs (VMPs), duck clubs, wildlife reserves, and grassland burning operations.

The District's Compliance Department uses the Smoke Management System (SMS) to record burning activity throughout the district every year. The SMS calculates emissions based on the characteristics of the burning activity entered into it. This is discussed in further detail throughout the rest of this methodology.

## V. Activity Data

Activity data for prescribed burning was obtained from the San Joaquin Valley Unified Air Pollution Control District's Smoke Management System. Activity data for this category is defined by:

- a. ACRES - Acres is defined as the area from which the waste was produced, in acres. For example, if the vegetation came from 40 acres of land, 40 acres should be entered into the database. The Smoke Management System directs the burn permit holder to enter ACRES into the Smoke Management System database in this manner.
- b. FUEL LOADING - Fuel loading is a factor that defines the tonnage of burn material that is generated from an acre of a particular crop or tons reported in the Smoke Management System.
- c. TONS - Tons of burn material is calculated by multiplying ACRES by FUEL LOADING.

For 2005, only Kern county reported range improvement burning operations. Overall, 20 burns took place in Kern County, with 10 occurring in April and 5 apiece in August and September. The characteristics (acres, fuel loading) of these burns have been entered into the districts Smoke Management System.

## V. Emission Factors

Emission factors for forest management and range improvement operations are included in Appendix A. These factors were obtained from the California Air Resources Board (CARB).

## VI. Temporal Variation

Monthly temporal variation for range improvement burning was developed from the District's Smoke Management System. Temporal variation data for range improvement is provided below and is based on burn dates entered in the database.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	25.0%	25.0%	0.0%	0.0%	0.0%

## VII. Spatial Variation

Burn locations are defined by street address in the San Joaquin Valley Unified Air Pollution Control District's Smoke Management System (SMS). The street address is converted to Latitude and Longitude or UTM based on software needs.

**VIII. Growth Factor**

The growth factors associated with this emissions category are presented in Appendix B.

**IX. Control Level**

Range Improvement Operations are subject to District Rule 4106 (Prescribed Burning).

**X. Assumptions**

a. The data obtained from the Smoke Management System (SMS) is accurate.

**XI. ARB Chemical Speciation**

Profile Description	ARB Profile#		Fractions			
	Organic Gas	PM	ROG	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>
Range Improvement Burning	307	441	0.569767	0.569767	0.9825	0.9316

**XII. Assessment Of Methodology**

The District's Smoke Management System (SMS) is used to record both activity data and emissions from prescribed burns within the District. The accuracy of the emissions estimations in this methodology is dependent on the accuracy of the information reported into the SMS system.

### XIII. Emissions Comparison

District staff refined the EIC code used for the emission category Range Improvement (EIC 670-664-0200-0000) by separating it into several smaller groups based on fuel type and assigning new sub EIC codes for them within the main code.

Due to this enhancement, the data in the District's current emissions inventory database is not comparable to the 2004 data in CEIDARs which uses the main EIC noted above. For the 2005 year, the only fuel category used was fuel in the "unspecified" category (sub EIC 670-664-0200-0001). The emissions from 2005 range improvement burning operations within the District are provided below:

2005 Emissions Calculated Using this Methodology						
County	Emissions (tons/year)					
	NOx	CO	SOx	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>Range Improvement</b>						
Fresno	0.00	0.00	0.00	0.00	0.00	0.00
Kern	0.04	0.99	0.01	0.09	0.14	0.13
Kings	0.00	0.00	0.00	0.00	0.00	0.00
Madera	0.00	0.00	0.00	0.00	0.00	0.00
Merced	0.00	0.00	0.00	0.00	0.00	0.00
San Joaquin	0.00	0.00	0.00	0.00	0.00	0.00
Stanislaus	0.00	0.00	0.00	0.00	0.00	0.00
Tulare	0.00	0.00	0.00	0.00	0.00	0.00
<b>TOTAL</b>	<b>0.04</b>	<b>0.99</b>	<b>0.01</b>	<b>0.09</b>	<b>0.14</b>	<b>0.13</b>

### XIV. Update Schedule

The Smoke Management System (SMS) is regularly updated with burning operations within the district. It is therefore recommended to update the forest management category on a yearly basis.

EIC	Frequency (In years)	Source of Emissions (Point Source Inventory / Data Gathering)
670-664-0200-0000	1	Data Gathering

### XV. References

- a. Smoke Management System - San Joaquin Valley Air Pollution Control District. 2006.

**Appendix A - Prescribed Burning Emission Factors**

**Managed Burning Emission Factor Table**

Crop Code	Crop Name	EIC Description	EIC Code	Emission Factors (lbs/ton)							Fuel Loading (tons/acre)
				PM10	PM25	NOX	SO2	VOC	CO	NH3	
<b>Range Improvement</b>											
362	Chaparral	Range Improvement	670-660-0200-0000	20.10	17.30	3.50	0.10	14.40	153.70	2.43	23.000
398	Grassland	Range Improvement	670-660-0200-0000	15.90	15.20	4.50	0.60	10.70	114.00	1.80	3.200
607	Pasture	Range Improvement	670-660-0200-0000	15.90	15.18	4.49	0.61	10.73	113.95	1.80	2.175
<b>Forest</b>											
471	Slash	Forest	670-666-0200-0000	7.80	7.30	5.20	0.10	6.30	66.00	1.04	70.000

**Managed Burning Emission Factor Table**

Crop Code	Crop Name	EIC Description	EIC Code	Source of Data
<b>Range Improvement</b>				
362	Chaparral	Range Improvement	670-660-0200-0000	Jenkins fir & pine; Hardy, 1996, NOx & SO2 avg.
398	Grassland	Range Improvement	670-660-0200-0000	Average of Alfalfa, Barley, Corn, Oats, Rice, Dafflower, Sorghum, and Wheat (as of 9/12/00, Patrick Gaffney's letter)
607	Pasture	Range Improvement	670-660-0200-0000	Average of Alfalfa, Barley, Corn, Oats, Rice, Dafflower, Sorghum, and Wheat (as of 9/12/00, Patrick Gaffney's letter)
<b>Forest</b>				
471	Slash	Forest	670-666-0200-0000	Average of Almond, Apple, Apricot, Avocado, Bean/Pea, Date Palm, Fig, Grape, Nectarine, Olive, Peach, Pear, Prune, and Walnut (as of 9/12/00, Patrick Gaffney's letter)

**Appendix B. California Air Resources Board growth parameters for EIC 670-664-0200-0000.**

Year	Growth Activity Parameter by County							
	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
2000	0.86	0.86	0.89	0.72	0.9	0.88	0.78	0.89
2001	0.86	0.85	0.89	0.71	0.89	0.87	0.77	0.88
2002	0.85	0.85	0.88	0.7	0.89	0.87	0.76	0.88
2003	0.85	0.84	0.88	0.69	0.89	0.86	0.76	0.87
2004	0.84	0.84	0.88	0.68	0.88	0.86	0.75	0.87
2005	0.84	0.83	0.87	0.67	0.88	0.85	0.74	0.87
2006	0.83	0.83	0.87	0.66	0.88	0.85	0.73	0.87
2007	0.83	0.82	0.87	0.65	0.87	0.85	0.73	0.86
2008	0.82	0.82	0.86	0.64	0.87	0.84	0.72	0.86
2009	0.82	0.82	0.86	0.63	0.87	0.84	0.71	0.86
2010	0.81	0.81	0.86	0.62	0.87	0.84	0.71	0.86
2015	0.78	0.79	0.85	0.57	0.86	0.82	0.67	0.84
2020	0.74	0.76	0.82	0.51	0.83	0.79	0.63	0.81
2025	0.69	0.73	0.79	0.45	0.8	0.75	0.58	0.78
2030	0.65	0.69	0.74	0.39	0.77	0.72	0.53	0.74