

E.H. Pechan & Associates, Inc.

National Emissions Inventory for Commercial Cooking

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Commercial Cooking Processes

- ❖ Charbroiling:
 - Under-fired charbroiling;
 - Conveyorized charbroiling;
- ❖ Frying:
 - Deep fat frying;
 - Flat griddle frying;
 - Clamshell griddle frying.

Categorization based on work originally carried out by SCAQMD.

Commercial Cooking SCC's

SCC	Descriptor 1	Descriptor 2	Descriptor 3	Descriptor 4
2302002000	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Charbroiling	Charbroiling Total
2302002100	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Charbroiling	Conveyorized Charbroiling
2302002200	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Charbroiling	Under-fired Charbroiling
2302003000	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Frying	Deep Fat Frying
2302003100	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Frying	Flat Griddle Frying
2302003200	Industrial Processes	Food and Kindred Spirits: SIC 20	Commercial Cooking - Frying	Clamshell Griddle Frying

Emission Factors

- ❖ Include criteria pollutants and HAPs developed from a literature review;
- ❖ Source - mainly from U.C. Riverside test programs; some HAPs from an EPA program on street vendor emissions
- ❖ Emission factors developed for meat/equipment pairs.

Activity Data

- ❖ Surveys sponsored by SCAQMD and CARB;
- ❖ CARB survey data selected;
- ❖ For each restaurant type: information on equipment type and number, amount of meat cooked.

Activity Data (cont.)

- ❖ 2002 National, county-level facility counts from Dunn & Bradstreet;
- ❖ U.S. Dept. of Agriculture and literature sources used to estimate national french fry consumption;
- ❖ National french fry consumption allocated to counties by the number of deep fat fryers.

Control Programs

- ❖ Only known program in 2002 was in the SCAQMD (Rule 1138);
- ❖ Applies to conveyORIZED charbroilers;
- ❖ 86% CE applied to VOC;
- ❖ 83% applied to PMx.

Results: National Criteria Pollutant Emissions

Pollutant	Emissions by Source Classification Code (SCC) in tons per year					
	2302002000	2302002100	2302002200	2302003100	2302003200	2302003000
VOC	11,499	2,113	7,234	940	39	1,173
CO	33,004	7,401	23,662	1,941		
PM ₁₀	85,515	8,460	60,304	15,679	1,073	
PM _{2.5}	79,320	8,201	58,295	11,916	909	

Results: National HAP Emissions

Pollutant	Emissions by Source Classification Code (SCC) in tons per year					
	2302002000	2302002100	2302002200	2302003100	2302003200	2302003000
PAH, TOTAL	205.6	42.9	121.9	40.8		
BIPHENYL	6.44	1.92	4.12	0.40		
BENZENE	1,237	154.3	1,083			
TOLUENE	489.7	61.2	428.5			
ETHYL BENZENE	94.4	12.2	82.2			
O-XYLENE	79.0	10.1	68.9			
XYLENES	69.6	8.57	61.1			
STYRENE	468.7	58.2	410.6			
FORMALDEHYDE	987.8	120.3	867.5			
ACETALDEHYDE	715.6	86.3	629.3			
PROPIONALDEHYDE	193.1	23.3	169.9			

Figure 1. PM_{2.5} emissions by commercial cooking source category.

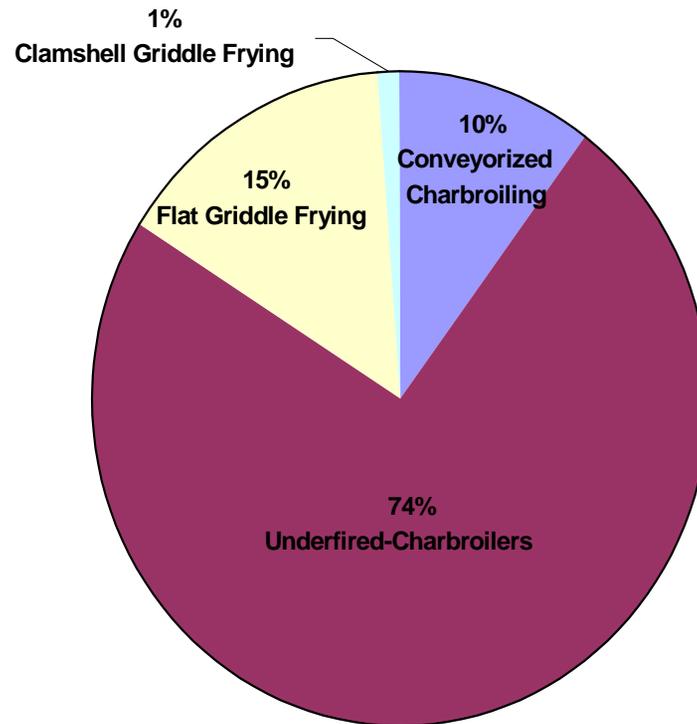


Figure 2. Comparison of commercial cooking PM_{2.5} emissions to NEI 2001 PM_{2.5} emissions.

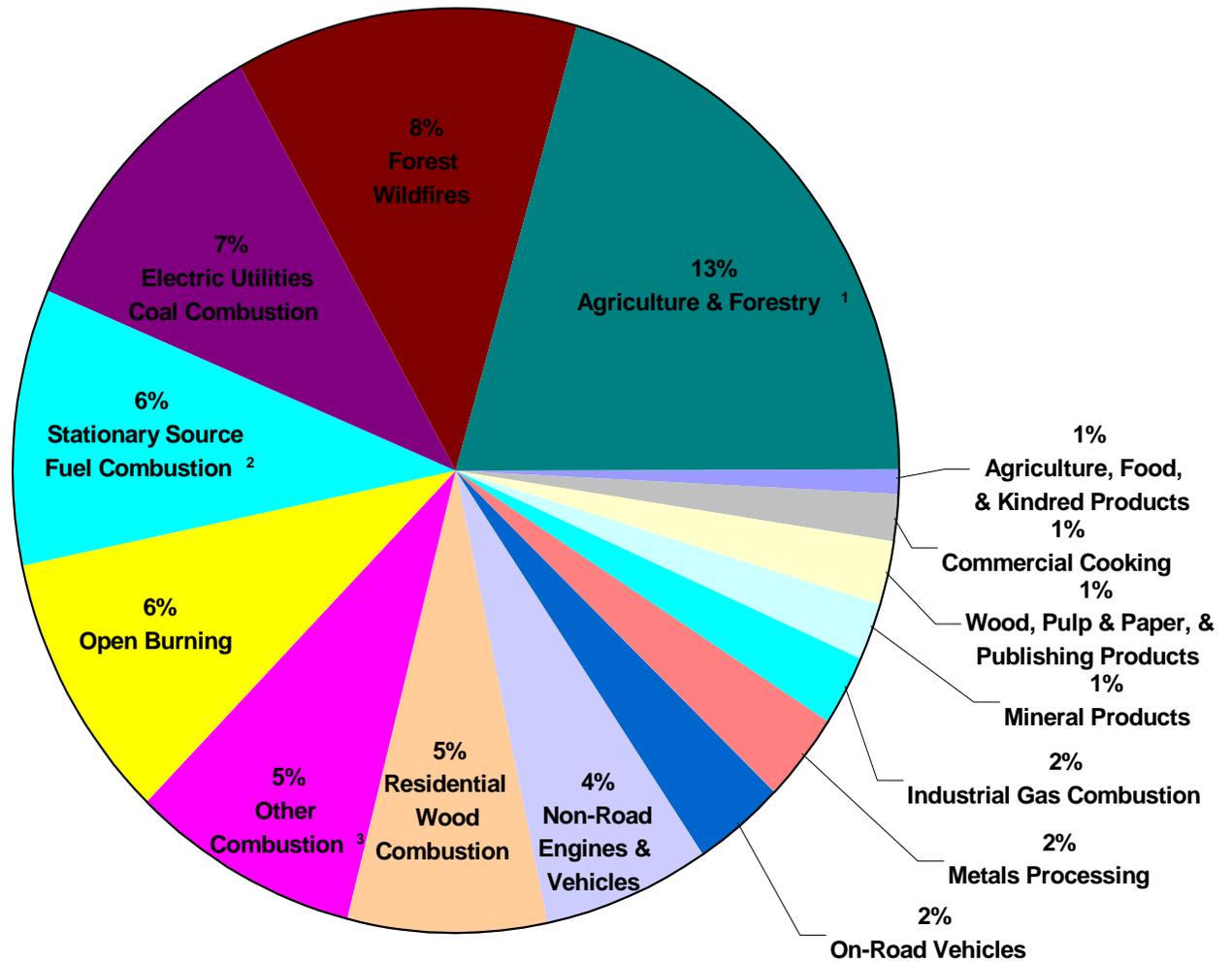


Figure 4. Comparison of commercial cooking PAH emissions to NEI 1999 PAH emissions.

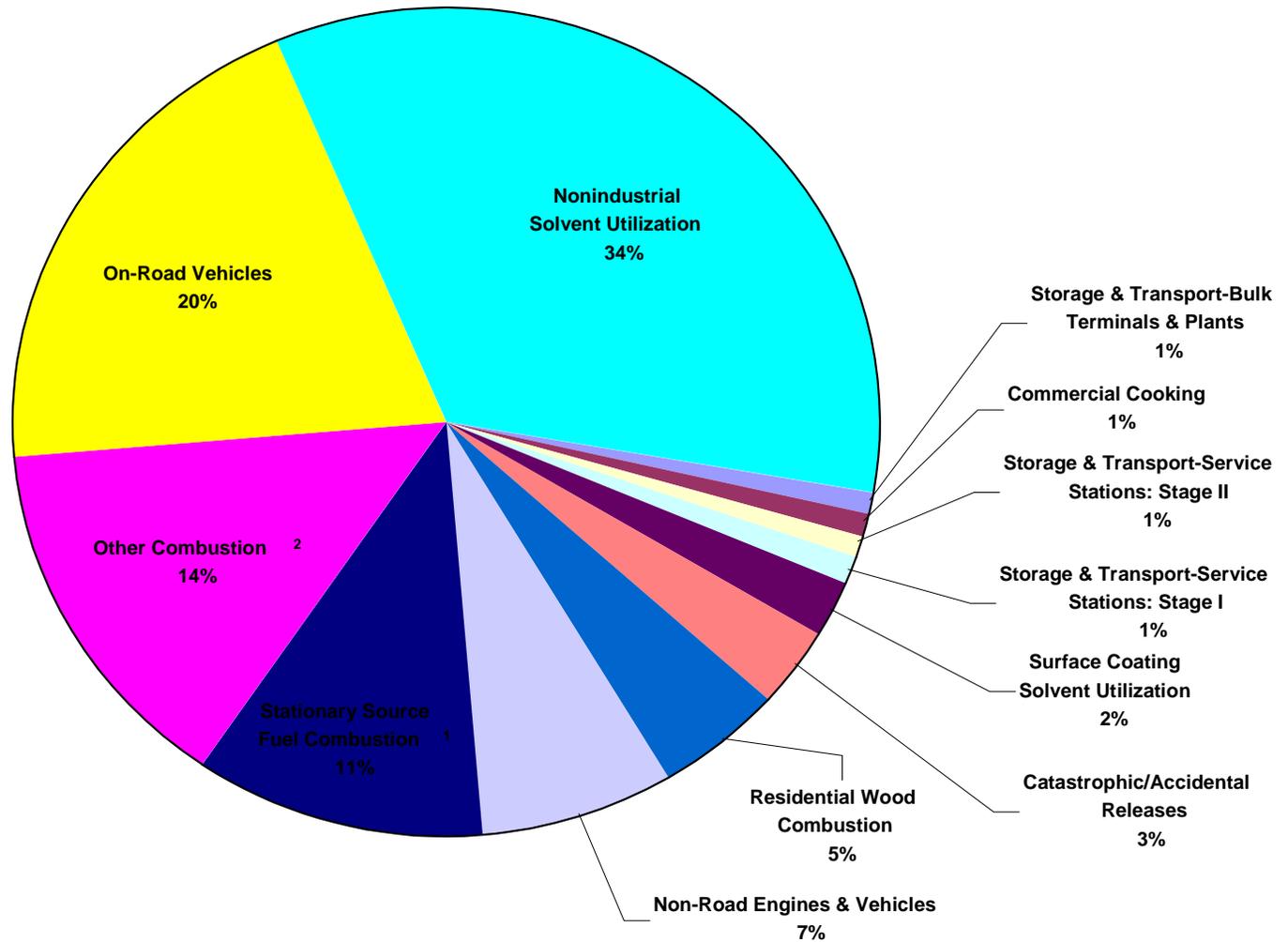
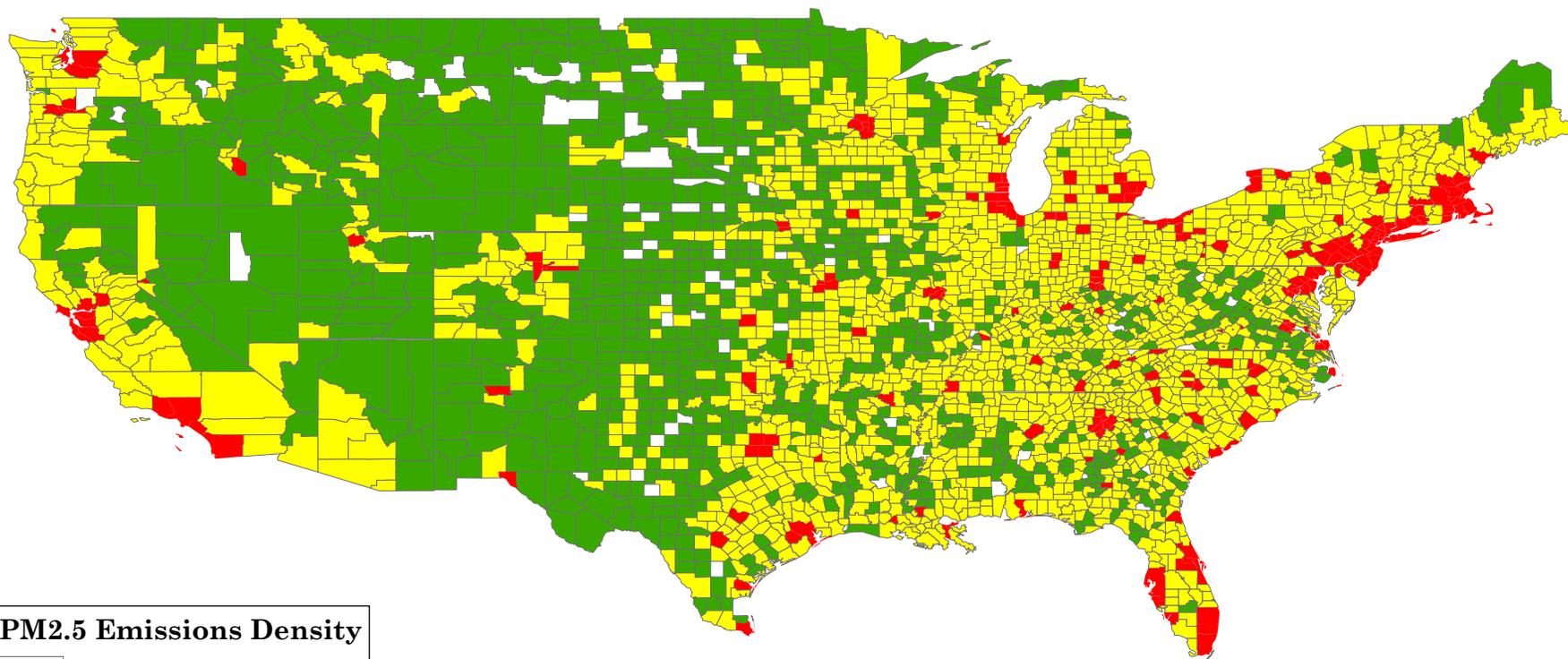


Figure 5. 2002 NEI PM2.5 Emissions Density for the 48 Contiguous States
(tons/year/mi²)



PM2.5 Emissions Density

-  No activity data
-  < 0.005
-  0.005 - 0.1
-  > 0.1