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Modeling of Columbia River Gorge Emissions

Overview

- The Columbia River Gorge National Scenic Area
- Goals of the Gorge Study
- Overview of the Gorge Air Quality Modeling Study
- Quality Assurance of Emissions Data
- Conclusions and Going Forward

Columbia River Gorge National Scenic Area

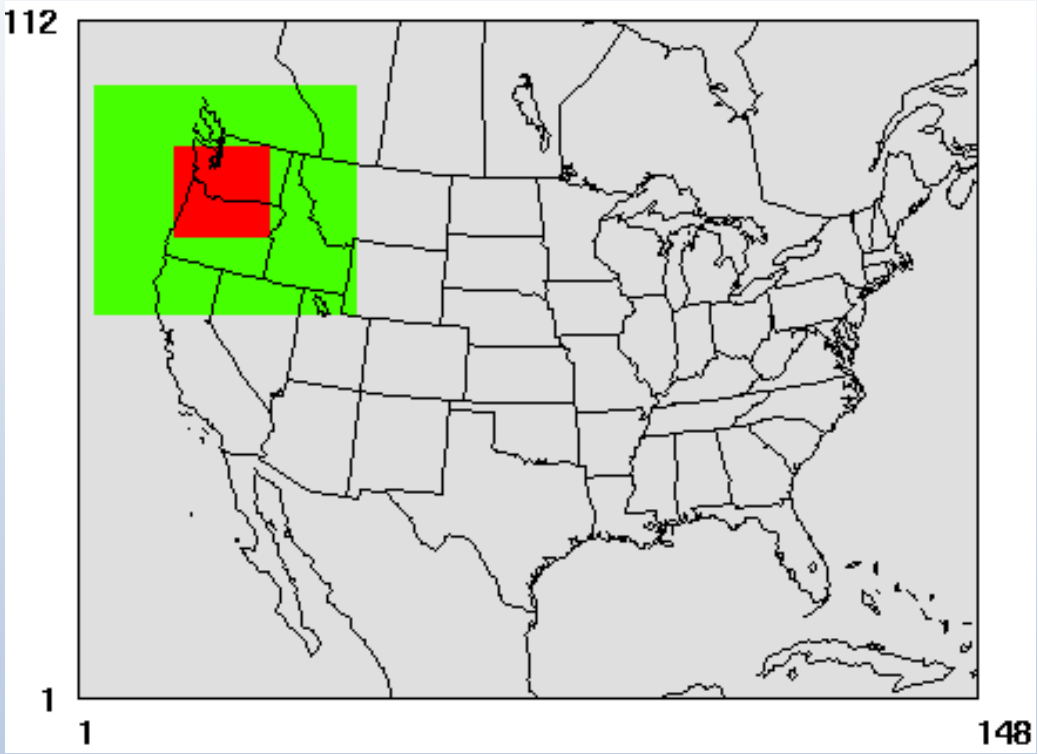
- The Columbia River Gorge is a spectacular river canyon cutting the only sea-level route through the Cascade Mountain Range.
- It is 80 miles long and up to 4,000 feet deep with the north canyon walls in Washington State and the south canyon walls in Oregon State.

Goals of the Gorge Study

- Provide an assessment of the causes of visibility impairment in the Columbia River Gorge National Scenic Area;
- Identify emission source regions, emission source categories, and individual emission sources that significantly contribute to visibility impairment in the Gorge;
- Provide predictive modeling tools or methods that will allow the evaluation of emission reduction strategies;
- Provide an initial assessment of air quality benefits to the Gorge from upcoming state and federal air quality programs; and
- Refine or adapt predictive modeling tools already being developed for visibility or other air quality programs, including but not limited to Regional Haze.

Overview of the Gorge Air Quality Modeling Study

- MM5 (meteorology) – SMOKE (emissions) – CAMx (air quality) modeling system
- Summer (10-22 Aug 2004) and Autumn (4-18 Nov 2004) episodes and corresponding future year (2018) episodes
- Nested 36-12-4 km domains



Quality Assurance of Emissions Data

- For the most part, the emissions inventory is reviewed almost exclusively by the regulatory staff
- Certainly there are situations where industry reviews its own emissions estimates, but this usually entails only a review of a single facility's emissions before the estimates are modeled
- Rarely are the emissions presented for review after the emissions are modeled
- Further, when the emissions are presented for review after the modeling process is complete, they are seldom presented in a form conducive for review
- In addition, the emissions are almost exclusively presented without context to other categories of emissions (e.g., point sources, area sources, nonroad mobile sources, on-road mobile sources, biogenics)

Quality Assurance of Emissions Data

- In the Gorge Study, the stakeholders decided to conduct a candid, open review of the emissions data and estimates
- The review was conducted in three stages:
  - Raw data and estimates input to SMOKE
  - CAMx-ready emissions estimates output from SMOKE
  - Review of emissions estimates by comparison to CAMx predictions of air quality
- Emissions estimates provided in spreadsheets to stakeholders (more on this in a bit)

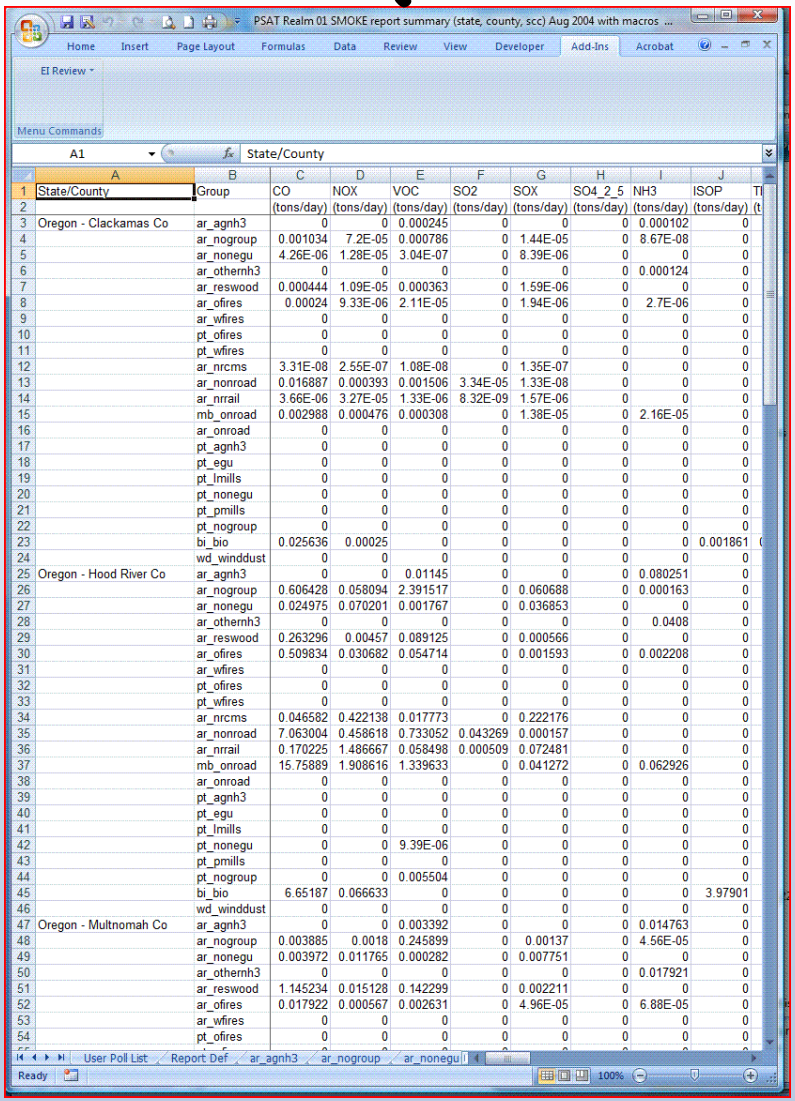
Quality Assurance of Emissions Data: Stage 1 Findings

- Eliminated a few emissions source categories (e.g., residential coal combustion) that were none existent in Washington and Oregon;
- Removed duplicated emissions (e.g., commercial marine shipping in the Gorge);
- Through inventory reconciliation between WRAP emissions estimates and sponsor-provided emissions estimates, included numerous WRAP emissions source categories not estimated in the sponsor-provided data;
- Rebuilt the commercial marine shipping surrogate to cover much more of the Columbia River and Willamette River ship channel; and
- Corrected formatting errors in the data sets.

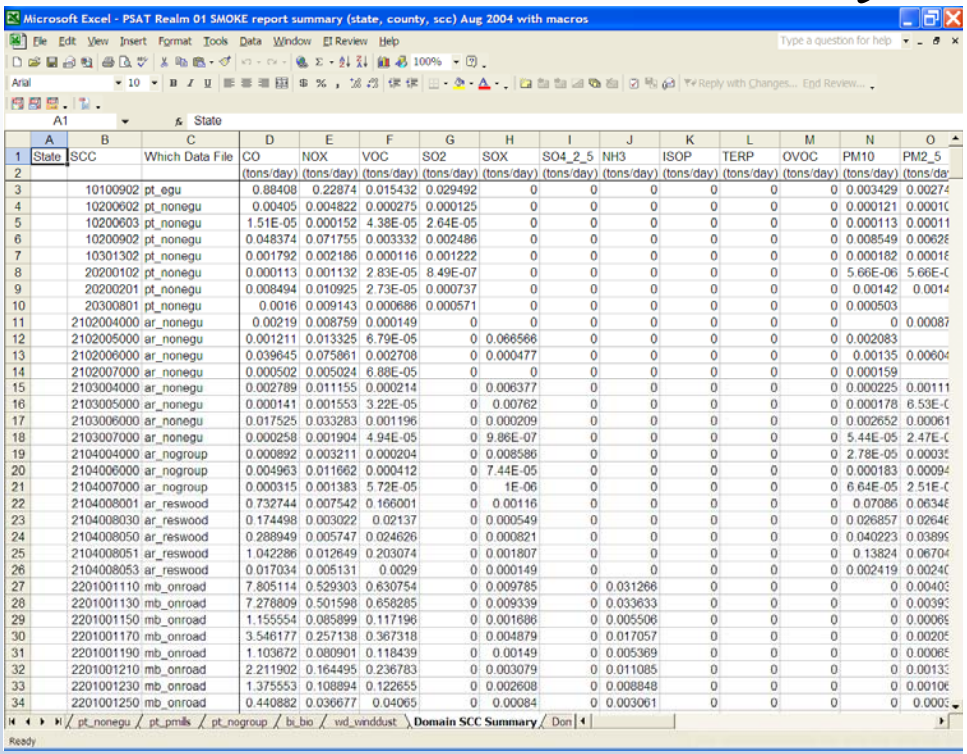
Development of the Emissions Inventory Review Tool

- Once raw inputs were of satisfactory quality, SMOKE modeling was performed (moving to the second stage of QA)
- Excel workbook with associated Visual Basic macros was developed
- Provides the following capabilities
  - Ingests SMOKE (i.e., Smkreport) emissions reports
  - Prepares canned emissions summary reports
  - Mechanism to produce ad-hoc reports of emissions
- This tool puts in the hands of a lay-person the ability to review the CAMx-ready emissions estimates!
- More “eyes” are now able to scrutinize the emissions inventory!

Emissions Inventory Review Tool: Menu Selection (Excel 2007 and Excel 97-2003)

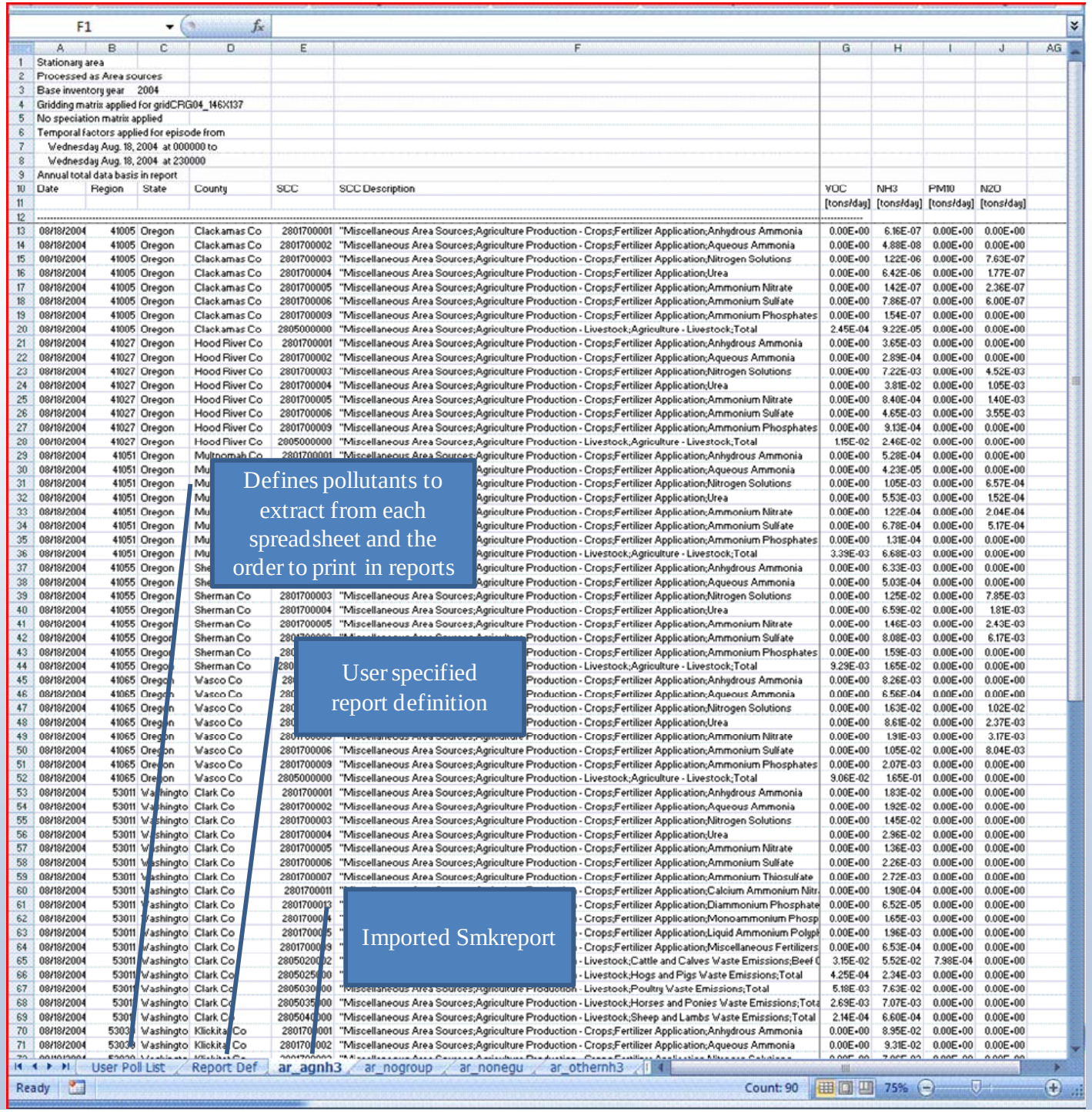


	A	B	C	D	E	F	G	H	I	J
1	State/County	Group	CO	NOX	VOC	SO2	SOX	SO4_2_5	NH3	ISOP
2			(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)
3	Oregon - Clackamas Co	ar_agnh3	0	0	0.000245	0	0	0	0.000102	0
4		ar_nogroup	0.001034	7.2E-05	0.000786	0	1.44E-05	0	8.67E-08	0
5		ar_nonegu	4.26E-06	1.28E-05	3.04E-07	0	8.39E-06	0	0	0
6		ar_othernh3	0	0	0	0	0	0	0.000124	0
7		ar_reswood	0.000444	1.09E-05	0.000363	0	1.59E-06	0	0	0
8		ar_ofires	0.00024	9.33E-06	2.11E-05	0	1.94E-06	0	2.7E-06	0
9		ar_wfires	0	0	0	0	0	0	0	0
10		pt_ofires	0	0	0	0	0	0	0	0
11		pt_wfires	0	0	0	0	0	0	0	0
12		ar_nrcms	3.31E-08	2.55E-07	1.08E-08	0	1.35E-07	0	0	0
13		ar_nonroad	0.016887	0.000393	0.001506	3.34E-05	1.33E-08	0	0	0
14		ar_nrrail	3.66E-06	3.27E-05	1.33E-06	8.32E-09	1.57E-06	0	0	0
15		mb_onroad	0.002988	0.000476	0.000308	0	1.38E-05	0	2.16E-05	0
16		ar_onroad	0	0	0	0	0	0	0	0
17		pt_agnh3	0	0	0	0	0	0	0	0
18		pt_egu	0	0	0	0	0	0	0	0
19		pt_lmills	0	0	0	0	0	0	0	0
20		pt_nonegu	0	0	0	0	0	0	0	0
21		pt_pmills	0	0	0	0	0	0	0	0
22		pt_nogroup	0	0	0	0	0	0	0	0
23		bi_bio	0.025636	0.00025	0	0	0	0	0	0.001861
24		wd_winddust	0	0	0	0	0	0	0	0
25	Oregon - Hood River Co	ar_agnh3	0	0	0.01145	0	0	0	0.080251	0
26		ar_nogroup	0.606428	0.058094	2.391517	0	0.060688	0	0.000163	0
27		ar_nonegu	0.024975	0.070201	0.001767	0	0.036853	0	0	0
28		ar_othernh3	0	0	0	0	0	0	0.0408	0
29		ar_reswood	0.263296	0.00457	0.089125	0	0.000566	0	0	0
30		ar_ofires	0.509834	0.030682	0.054714	0	0.001593	0	0.002208	0
31		ar_wfires	0	0	0	0	0	0	0	0
32		pt_ofires	0	0	0	0	0	0	0	0
33		pt_wfires	0	0	0	0	0	0	0	0
34		ar_nrcms	0.046582	0.422138	0.017773	0	0.222176	0	0	0
35		ar_nonroad	7.063004	0.458618	0.733052	0.043269	0.000157	0	0	0
36		ar_nrrail	0.170225	1.486667	0.058498	0.000509	0.072481	0	0	0
37		mb_onroad	15.75889	1.908616	1.339633	0	0.041272	0	0.062926	0
38		ar_onroad	0	0	0	0	0	0	0	0
39		pt_agnh3	0	0	0	0	0	0	0	0
40		pt_egu	0	0	0	0	0	0	0	0
41		pt_lmills	0	0	0	0	0	0	0	0
42		pt_nonegu	0	0	9.39E-06	0	0	0	0	0
43		pt_pmills	0	0	0	0	0	0	0	0
44		pt_nogroup	0	0	0.005504	0	0	0	0	0
45		bi_bio	6.65187	0.066633	0	0	0	0	0	3.97901
46		wd_winddust	0	0	0	0	0	0	0	0
47	Oregon - Multnomah Co	ar_agnh3	0	0	0.003392	0	0	0	0.014763	0
48		ar_nogroup	0.003885	0.0018	0.245899	0	0.00137	0	4.56E-05	0
49		ar_nonegu	0.003972	0.011765	0.000282	0	0.007751	0	0	0
50		ar_othernh3	0	0	0	0	0	0	0.017921	0
51		ar_reswood	1.145234	0.015128	0.142299	0	0.002211	0	0	0
52		ar_ofires	0.017922	0.000567	0.002631	0	4.96E-05	0	6.88E-05	0
53		ar_wfires	0	0	0	0	0	0	0	0
54		pt_ofires	0	0	0	0	0	0	0	0



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	State	SCC	Which Data File	CO	NOX	VOC	SO2	SOX	SO4_2_5	NH3	ISOP	TERP	OVOC	PM10	PM2_5
2				(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day
3		10100902	pt_egu	0.88408	0.22874	0.015432	0.029492	0	0	0	0	0	0	0.003429	0.00274
4		10200602	pt_nonegu	0.00405	0.004822	0.000275	0.000125	0	0	0	0	0	0	0.000121	0.00010
5		10200603	pt_nonegu	1.51E-05	0.000152	4.38E-05	2.64E-05	0	0	0	0	0	0	0.000113	0.00011
6		10200902	pt_nonegu	0.048374	0.071755	0.003332	0.002486	0	0	0	0	0	0	0.008549	0.00628
7		10301302	pt_nonegu	0.001792	0.002186	0.000116	0.001222	0	0	0	0	0	0	0.000182	0.00018
8		20200102	pt_nonegu	0.000113	0.001132	2.83E-05	8.49E-07	0	0	0	0	0	0	5.66E-06	5.66E-0
9		20200201	pt_nonegu	0.008494	0.010925	2.73E-05	0.000737	0	0	0	0	0	0	0.00142	0.0014
10		20300801	pt_nonegu	0.0016	0.009143	0.000686	0.000571	0	0	0	0	0	0	0.000503	
11		2102004000	ar_nonegu	0.00219	0.008759	0.000149	0	0	0	0	0	0	0	0	0.00087
12		2102005000	ar_nonegu	0.001211	0.013325	6.79E-05	0	0.066566	0	0	0	0	0	0.002083	
13		2102006000	ar_nonegu	0.039645	0.075861	0.002708	0	0.000477	0	0	0	0	0	0.00135	0.00604
14		2102007000	ar_nonegu	0.000502	0.005024	6.88E-05	0	0	0	0	0	0	0	0.000159	
15		2103004000	ar_nonegu	0.002789	0.011155	0.000214	0	0.006377	0	0	0	0	0	0.000225	0.00111
16		2103005000	ar_nonegu	0.000141	0.001553	3.22E-05	0	0.00762	0	0	0	0	0	0.000178	6.53E-0
17		2103006000	ar_nonegu	0.017525	0.033283	0.001196	0	0.000209	0	0	0	0	0	0.002652	0.00061
18		2103007000	ar_nonegu	0.000258	0.001904	4.94E-05	0	9.86E-07	0	0	0	0	0	5.44E-05	2.47E-0
19		2104004000	ar_nogroup	0.000892	0.003211	0.000204	0	0.008586	0	0	0	0	0	2.78E-05	0.00035
20		2104006000	ar_nogroup	0.004963	0.011662	0.000412	0	7.44E-05	0	0	0	0	0	0.000183	0.00094
21		2104007000	ar_nogroup	0.000315	0.001383	5.72E-05	0	1E-06	0	0	0	0	0	6.64E-05	2.51E-0
22		2104008001	ar_reswood	0.732744	0.007542	0.166001	0	0.00116	0	0	0	0	0	0.07086	0.06348
23		2104008030	ar_reswood	0.174498	0.003022	0.02137	0	0.000549	0	0	0	0	0	0.026857	0.02648
24		2104008050	ar_reswood	0.288949	0.005747	0.024626	0	0.000821	0	0	0	0	0	0.040223	0.03899
25		2104008051	ar_reswood	1.042286	0.012649	0.203074	0	0.001807	0	0	0	0	0	0.13824	0.06704
26		2104008053	ar_reswood	0.017034	0.005131	0.0029	0	0.000149	0	0	0	0	0	0.002419	0.00240
27		2201001110	mb_onroad	7.805114	0.529303	0.630754	0	0.009785	0	0.031266	0	0	0	0	0.00403
28		2201001130	mb_onroad	7.278809	0.501598	0.658285	0	0.009339	0	0.033633	0	0	0	0	0.00393
29		2201001150	mb_onroad	1.155554	0.085899	0.117196	0	0.001686	0	0.005506	0	0	0	0	0.00069
30		2201001170	mb_onroad	3.546177	0.257138	0.367318	0	0.004879	0	0.017057	0	0	0	0	0.00205
31		2201001190	mb_onroad	1.103672	0.080901	0.118439	0	0.00149	0	0.005369	0	0	0	0	0.00065
32		2201001210	mb_onroad	2.211902	0.164495	0.236783	0	0.003079	0	0.011085	0	0	0	0	0.00133
33		2201001230	mb_onroad	1.375553	0.108894	0.122655	0	0.002608	0	0.008848	0	0	0	0	0.00106
34		2201001250	mb_onroad	0.440882	0.036677	0.04065	0	0.00084	0	0.003061	0	0	0	0	0.0003

```
EI Review
 |
 |--- Import SMOKE Reports
 |
 |--- Standard Reports
 |      |--- Domain Summary
 |      |--- State Summary
 |      |--- County Summary
 |
 |--- Ad-hoc Reports
 |      |--- Source Group
 |      |--- State-County Group
 |
 |--- Quit
```



Stationary area
Processed as Area sources
Base inventory year 2004
Gridding matrix applied for gridCRG04_146X137
No speciation matrix applied
Temporal factors applied for episode from
Wednesday Aug. 18, 2004 at 000000 to
Wednesday Aug. 18, 2004 at 230000
Annual total data basis in report

Date	Region	State	County	SCC	SCC Description	VOC [tons/day]	NH3 [tons/day]	PM10 [tons/day]	N2O [tons/day]
08/18/2004	41005	Oregon	Clackamas Co	2801700001	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	6.16E-07	0.00E+00	0.00E+00
08/18/2004	41005	Oregon	Clackamas Co	2801700002	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	4.88E-08	0.00E+00	0.00E+00
08/18/2004	41005	Oregon	Clackamas Co	2801700003	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	1.22E-06	0.00E+00	7.63E-07
08/18/2004	41005	Oregon	Clackamas Co	2801700004	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Urea	0.00E+00	6.42E-06	0.00E+00	1.77E-07
08/18/2004	41005	Oregon	Clackamas Co	2801700005	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	1.42E-07	0.00E+00	2.36E-07
08/18/2004	41005	Oregon	Clackamas Co	2801700006	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	7.86E-07	0.00E+00	6.00E-07
08/18/2004	41005	Oregon	Clackamas Co	2801700009	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Phosphates	0.00E+00	1.54E-07	0.00E+00	0.00E+00
08/18/2004	41005	Oregon	Clackamas Co	2805000000	"Miscellaneous Area Sources;Agriculture Production - Livestock;Agriculture - Livestock;Total	2.45E-04	9.22E-05	0.00E+00	0.00E+00
08/18/2004	41027	Oregon	Hood River Co	2801700001	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	3.65E-03	0.00E+00	0.00E+00
08/18/2004	41027	Oregon	Hood River Co	2801700002	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	2.89E-04	0.00E+00	0.00E+00
08/18/2004	41027	Oregon	Hood River Co	2801700003	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	7.22E-03	0.00E+00	4.52E-03
08/18/2004	41027	Oregon	Hood River Co	2801700004	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Urea	0.00E+00	3.81E-02	0.00E+00	1.05E-03
08/18/2004	41027	Oregon	Hood River Co	2801700005	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	8.40E-04	0.00E+00	1.40E-03
08/18/2004	41027	Oregon	Hood River Co	2801700006	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	4.65E-03	0.00E+00	3.55E-03
08/18/2004	41027	Oregon	Hood River Co	2801700009	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Phosphates	0.00E+00	9.13E-04	0.00E+00	0.00E+00
08/18/2004	41027	Oregon	Hood River Co	2805000000	"Miscellaneous Area Sources;Agriculture Production - Livestock;Agriculture - Livestock;Total	1.15E-02	2.46E-02	0.00E+00	0.00E+00
08/18/2004	41051	Oregon	Multnomah Co	2801700001	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	5.28E-04	0.00E+00	0.00E+00
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	4.23E-05	0.00E+00	0.00E+00
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	1.05E-03	0.00E+00	6.57E-04
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Urea	0.00E+00	5.53E-03	0.00E+00	1.52E-04
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	1.22E-04	0.00E+00	2.04E-04
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	6.78E-04	0.00E+00	5.17E-04
08/18/2004	41051	Oregon	Mu		Agriculture Production - Crops;Fertilizer Application;Ammonium Phosphates	0.00E+00	1.31E-04	0.00E+00	0.00E+00
08/18/2004	41051	Oregon	Mu		Agriculture Production - Livestock;Agriculture - Livestock;Total	3.39E-03	6.68E-03	0.00E+00	0.00E+00
08/18/2004	41055	Oregon	She		Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	6.33E-03	0.00E+00	0.00E+00
08/18/2004	41055	Oregon	She		Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	5.03E-04	0.00E+00	0.00E+00
08/18/2004	41055	Oregon	Sherman Co	2801700003	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	1.25E-02	0.00E+00	7.85E-03
08/18/2004	41055	Oregon	Sherman Co	2801700004	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Urea	0.00E+00	6.59E-02	0.00E+00	1.81E-03
08/18/2004	41055	Oregon	Sherman Co	2801700005	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	1.46E-03	0.00E+00	2.43E-03
08/18/2004	41055	Oregon	Sherman Co	280	Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	8.08E-03	0.00E+00	6.17E-03
08/18/2004	41055	Oregon	Sherman Co	280	Production - Crops;Fertilizer Application;Ammonium Phosphates	0.00E+00	1.59E-03	0.00E+00	0.00E+00
08/18/2004	41055	Oregon	Sherman Co	280	Production - Livestock;Agriculture - Livestock;Total	9.29E-03	1.65E-02	0.00E+00	0.00E+00
08/18/2004	41065	Oregon	Wasco Co	28	Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	8.26E-03	0.00E+00	0.00E+00
08/18/2004	41065	Oregon	Wasco Co	280	Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	6.56E-04	0.00E+00	0.00E+00
08/18/2004	41065	Oregon	Wasco Co	280	Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	1.63E-02	0.00E+00	1.02E-02
08/18/2004	41065	Oregon	Wasco Co	280	Production - Crops;Fertilizer Application;Urea	0.00E+00	8.61E-02	0.00E+00	2.37E-03
08/18/2004	41065	Oregon	Wasco Co	280	Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	1.91E-03	0.00E+00	3.17E-03
08/18/2004	41065	Oregon	Wasco Co	2801700006	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	1.05E-02	0.00E+00	8.04E-03
08/18/2004	41065	Oregon	Wasco Co	2801700009	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Phosphates	0.00E+00	2.07E-03	0.00E+00	0.00E+00
08/18/2004	41065	Oregon	Wasco Co	2805000000	"Miscellaneous Area Sources;Agriculture Production - Livestock;Agriculture - Livestock;Total	9.06E-02	1.65E-01	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700001	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	1.83E-02	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700002	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	1.92E-02	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700003	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Nitrogen Solutions	0.00E+00	1.45E-02	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700004	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Urea	0.00E+00	2.96E-02	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700005	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Nitrate	0.00E+00	1.36E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700006	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Sulfate	0.00E+00	2.26E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700007	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Ammonium Thiosulfate	0.00E+00	2.72E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700011	- Crops;Fertilizer Application;Calcium Ammonium Nitr	0.00E+00	1.90E-04	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700013	- Crops;Fertilizer Application;Diammonium Phosphate	0.00E+00	6.52E-05	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700014	- Crops;Fertilizer Application;Monoammonium Phosp	0.00E+00	1.65E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700015	- Crops;Fertilizer Application;Liquid Ammonium Polyp	0.00E+00	1.96E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2801700019	- Crops;Fertilizer Application;Miscellaneous Fertilizers	0.00E+00	6.53E-04	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2805020002	- Livestock;Cattle and Calves Waste Emissions;Beef C	3.15E-02	5.52E-02	7.98E-04	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2805025000	- Livestock;Hogs and Pigs Waste Emissions;Total	4.25E-04	2.34E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2805030000	- Livestock;Poultry Waste Emissions;Total	5.18E-03	7.63E-02	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2805035000	"Miscellaneous Area Sources;Agriculture Production - Livestock;Horses and Ponies Waste Emissions;Tota	2.69E-03	7.07E-03	0.00E+00	0.00E+00
08/18/2004	53011	Washingto	Clark Co	2805040000	"Miscellaneous Area Sources;Agriculture Production - Livestock;Sheep and Lambs Waste Emissions;Total	2.14E-04	6.60E-04	0.00E+00	0.00E+00
08/18/2004	53039	Washingto	Klickitat Co	2801700001	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Anhydrous Ammonia	0.00E+00	8.95E-02	0.00E+00	0.00E+00
08/18/2004	53039	Washingto	Klickitat Co	2801700002	"Miscellaneous Area Sources;Agriculture Production - Crops;Fertilizer Application;Aqueous Ammonia	0.00E+00	9.31E-02	0.00E+00	0.00E+00

User Poll List | Report Def | ar_agnh3 | ar_nogroup | ar_nonegu | ar_othernh3

Ready | Count: 90 | 75%

A1 | Report Name

	B	C	D	E	F	G
1		OR-WA Summary				State
2						
3	Crop Tilling/Harvesting	Nonroad: CMV	Nonroad: Aircraft & Aircraft Refueling	Misc. Non-Industrial Solvent Utilization	CAFO: Total	Residential NG/Oil Consump
4	2801000003	2280000000	2275000000	2460500000	2805000000	2104004000
5	2801000005	2280002000	2275001000	2461021000	2805020002	2104006000
6		2280002010	2275020000	2461022000	2805025000	2104007000
7		2280002020	2275050000	2461023000	2805030000	
8		2280003010	2275060000	2461850000	2805035000	
9		2280003020	2275900101	2465100000	2805040000	
10			2275900201	2465200000		
11				2465400000		
12				2465600000		
13				2465800000		
14				2465900000		

List the SCC and AMS to include in summary

Name of the user specified report

Defines header for the summary column

Defines whether to prepare estimates by State or by State-County

User Poll List | Report Def | ar_agnh3 | ar_nogroup | ar_nonegu | ar_othernh3

Ready 100%

A1 State

State	SCC	Which Data File	CO (tons/day)	NOX (tons/day)	VOC (tons/day)	SO2 (tons/day)	SOX (tons/day)	SO4_2_5 (tons/day)	NH3 (tons/day)	ISOP (tons/day)	TERP (tons/day)	OVOC (tons/day)	PM10 (tons/day)	PM2_ (tons/
	10100902	pt_egu	0.88408	0.22874	0.015432	0.029492	0	0	0	0	0	0	0.003429	0.00
	10200602	pt_nonegu	0.00405	0.004822	0.000275	0.000125	0	0	0	0	0	0	0.000121	0.00
	10200603	pt_nonegu	1.51E-05	0.000152	4.38E-05	2.64E-05	0	0	0	0	0	0	0.000113	0.00
	10200902	pt_nonegu	0.048374	0.071755	0.003332	0.002486	0	0	0	0	0	0	0.008549	0.00
	10301302	pt_nonegu	0.001792	0.002186	0.000116	0.001222	0	0	0	0	0	0	0.000182	0.00
	20200102	pt_nonegu	0.000113	0.001132	2.83E-05	8.49E-07	0	0	0	0	0	0	5.66E-06	5.66
	20200201	pt_nonegu	0.008494	0.010925	2.73E-05	0.000737	0	0	0	0	0	0	0.00142	0.0
	20300801	pt_nonegu	0.0016	0.009143	0.000686	0.000571	0	0	0	0	0	0	0.000503	
	2102004000	ar_nonegu	0.00219	0.008759	0.000149	0	0	0	0	0	0	0	0	0.00
	2102005000	ar_nonegu	0.001211	0.013325	6.79E-05	0	0.066566	0	0	0	0	0	0.002083	
	2102006000	ar_nonegu	0.039645	0.075861	0.002708	0	0.000477	0	0	0	0	0	0.00135	0.00
	2102007000	ar_nonegu	0.000502	0.005024	6.88E-05	0	0	0	0	0	0	0	0.000159	
	2103004000	ar_nonegu	0.002789	0.011155	0.000214	0	0.006377	0	0	0	0	0	0.000225	0.00
	2103005000	ar_nonegu	0.000141	0.001553	3.22E-05	0	0.00762	0	0	0	0	0	0.000178	6.53
	2103006000	ar_nonegu	0.017525	0.033283	0.001196	0	0.000209	0	0	0	0	0	0.002652	0.00
	2103007000	ar_nonegu	0.000258	0.001904	4.94E-05	0	9.86E-07	0	0	0	0	0	5.44E-05	2.47
	2104004000	ar_nogroup	0.000892	0.003211	0.000204	0	0.008586	0	0	0	0	0	2.78E-05	0.00
	2104006000	ar_nogroup	0.004963	0.011662	0.000412	0	7.44E-05	0	0	0	0	0	0.000183	0.00
	2104007000	ar_nogroup	0.000315	0.001383	5.72E-05	0	1E-06	0	0	0	0	0	6.64E-05	2.51
	2104008001	ar_reswood	0.732744	0.007542	0.166001	0	0.00116	0	0	0	0	0	0.07086	0.06
	2104008030	ar_reswood	0.174498	0.003022	0.02137	0	0.000549	0	0	0	0	0	0.026857	0.02
	2104008050	ar_reswood	0.288949	0.005747	0.024626	0	0.000821	0	0	0	0	0	0.040223	0.03
	2104008051	ar_reswood	1.042286	0.012649	0.203074	0	0.001807	0	0	0	0	0	0.13824	0.06
	2104008053	ar_reswood	0.017034	0.005131	0.0029	0	0.000149	0	0	0	0	0	0.002419	0.00
	2201001110	mb_onroad	7.805114	0.529303	0.630754	0	0.009785	0	0.031266	0	0	0	0	0.00
	2201001130	mb_onroad	7.278809	0.501598	0.658285					0	0	0	0	0.00
	2201001150	mb_onroad	1.155554	0.085899	0.117196					0	0	0	0	0.00
	2201001170	mb_onroad	3.546177	0.257138	0.367318					0	0	0	0	0.00
	2201001190	mb_onroad	1.103672	0.080901	0.116439					0	0	0	0	0.00
	2201001210	mb_onroad	2.211902	0.164495	0.236783					0	0	0	0	0.00
	2201001230	mb_onroad	1.375553	0.108894	0.122655					0	0	0	0	0.00
	2201001250	mb_onroad	0.440882	0.036677	0.04065	0	0.00084	0	0.003061	0	0	0	0	0.0
	2201001270	mb_onroad	1.053552	0.094321	0.128424	0	0.002051	0	0.006883	0	0	0	0	0.00
	2201001290	mb_onroad	0.681573	0.061878	0.080699	0	0.001434	0	0.004791				0	0.00
	2201001310	mb_onroad	0.389342	0.035612	0.045822	0	0.000835	0	0.002				0	0.00
	2201001330	mb_onroad	0.837184	0.07334	0.101418	0	0.001557	0	0.005				0	0.00
	2201020110	mb_onroad	5.655925	0.349111	0.402592	0	0.007608	0	0.019				0	0.00
	2201020130	mb_onroad	4.945015	0.309924	0.371084	0	0.006621	0	0.018				0	0.00
	2201020150	mb_onroad	0.85995	0.056216	0.072038	0	0.001282	0	0.003				0	0.00
	2201020170	mb_onroad	2.450343	0.15897	0.209403	0	0.003504	0	0.009				0	0.00
	2201020190	mb_onroad	0.749335	0.049325	0.066412	0	0.001057	0	0.00				0	0.00
	2201020210	mb_onroad	1.519392	0.101162	0.134291	0	0.002203	0	0.006196	0	0	0	0	0.00
	2201020230	mb_onroad	1.040067	0.07238	0.074224	0	0.002038	0	0.005386	0	0	0	0	0.00
	2201020250				0.023849	0	0.000641	0	0.001809	0	0	0	0	0.00
	2201020270				0.078472	0	0.001609	0	0.004204	0	0	0	0	0.00
	2201020290				0.049219	0	0.001136	0	0.002946	0	0	0	0	0.0
	2201020310				0.027872	0	0.000661	0	0.001722	0	0	0	0	0.00
	2201020330				0.062449	0	0.00123	0	0.003182	0	0	0	0	0.00
	2201040110				0.162907	0	0.003849	0	0.007326	0	0	0	0	0.0
	2201040130	mb_onroad	2.168153	0.15107	0.168351	0	0.003578	0	0.00769	0	0	0	0	0.00
	2201040150	mb_onroad	0.356476	0.025833	0.029876	0	0.000662	0	0.001281	0	0	0	0	0.00
	2201040170	mb_onroad	1.07648	0.077174	0.091916	0	0.001827	0	0.003899	0	0	0	0	0.00

VBA-generated canned report summary

VBA-generated ad-hoc report summary based on user definition

Imported Smkreport

pt_nogroup | bi_bio | wd_winddust | Domain SCC Summary | OR-WA Summary

Ready 100%

A1 | Group

	A	B	C	D	E	F	G	H	I	J	K	L
1	Group	State	VOC	NH3	PM10	N2O	CO	NOX	SO2	SOX	PM2_5	PMC
2			(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/day)	(tons/d
3	Residential Wood Combustion	Oregon	0.31	0	0.20	0	1.65	0.02	0	0.00	0.12	0
4		Washington	0.10	0	0.08	0	0.61	0.01	0	0.00	0.08	0
5	Crop Tilling/Harvesting	Oregon	0	0	0.66	0	0	0	0	0	0	0
6		Washington	0	0	0.62	0	0	0	0	0	0.12	0
7	Nonroad: CMV	Oregon	0.05	0	0.17	0	0.16	1.29	0	0.68	0.17	
8		Washington	0.03	0	0.09	0	0.09	0.65	0	0.35	0.09	
9	Nonroad: Aircraft & Aircraft Refueling	Oregon	0.01	0	0.00	0	0.22	0.02	0	0.00	0.00	0
10		Washington	0.00	0	0	0	0.13	0.00	0	0.00	0	
11	Misc. Non-Industrial Solvent Utilization	Oregon	1.30	0	0	0	0	0	0	0	0	
12		Washington	0.34	0	0	0	0	0	0	0	0	
13	CAFO: Total	Oregon	0.11	0.21	0	0	0	0	0	0	0	
14		Washington	0.18	0.40	0.00	0	0	0	0	0	0	
15	Residential NG/Oil Consumption	Oregon	0.00	0	0.00	0	0.00	0.01	0	0.00	0.00	0
16		Washington	0.00	0	0.00	0	0.00	0.00	0	0.00	0.00	
17	Open Burning: Residential	Oregon	0.08	0	0.29	0	1.30	0.09	0	0.01	0.27	0
18		Washington	0.03	0	0.08	0	0.18	0.01	0	0.00	0.08	0
19	Domestic	Oregon	0	0	0	0	0	0	0	0	0	
20		Washington	0	0.05	0	0	0	0	0	0	0	
21	Commercial/Institutional Fuel Consumption	Oregon	0.00	0	0.00	0	0.01	0.04	0	0.01	0.00	0
22		Washington	0.00	0	0.00	0	0.01	0.01	0	0.01	0.00	
23	Non-Perc Drycleaning	Oregon	0.00	0	0	0	0	0	0	0	0	
24		Washington	0	0	0	0	0	0	0	0	0	
25	Perc Drycleaning	Oregon	0	0	0	0	0	0	0	0	0	
26		Washington	0.00	0	0	0	0	0	0	0	0	
27	Industrial Fuel Consumption	Oregon	0.00	0	0.00	0	0.03	0.09	0	0.07	0.01	0
28		Washington	0.00					0.02	0	0.00	0.00	
29	POTWs	Oregon	0.01	0.				0	0	0	0	
30		Washington	0.02	0.				0	0	0	0	
31	Auto Gas: Storage & Transport	Oregon	0.53					0	0	0	0	
32		Washington	0.09					0	0	0	0	
33	Degreasing: Open Top	Oregon	0.03					0	0	0	0	
34		Washington	0.00					0	0	0	0	
35	Degreasing: Conveyerized	Oregon	0.03	0	0	0	0	0	0	0	0	
36		Washington	0.00	0	0	0					0	
37	Fertilizer Application	Oregon	0	0.29	0	0.05					0	
38		Washington	0	0.58	0	0					0	
39	Food Preparation	Oregon	0.01	0	0.06	0					0	0
40		Washington	0	0	0	0					0	
41	Degreasing: Cold Cleaning	Oregon	0.25	0	0	0					0	
42		Washington	0.05	0	0	0					0	
43	Structure Fires	Oregon	0.06	0	0.06	0	0.1				0	0
44		Washington	0	0	0	0	0	0	0	0	0	
45	Nonroad: Diesel	Oregon	0.00	0	0.00	0	0.00	0.00	0	0.00	0.00	0
46			0	0	0	0	0	0	0	0	0	
47	Municipal (non-T) L		0.13	0	0.04	0	0.25	0.10	0	0.00	0	0
48			0	0	0	0	0	0	0	0	0	
49	Graphic Arts		0.06	0	0	0	0	0	0	0	0	
50			0.05	0	0	0	0	0	0	0	0	
51	Nonroad: Locomotive	Oregon	0.15	0	0.10	0	0.39	3.76	0	0.18	0.09	0
52		Washington	0.13	0	0.09	0	0.72	7.04	0	0.70	0.17	0
53	Surface Coating	Oregon	1.30	0	0	0	0	0	0	0	0	
54		Washington	0.26	0	0	0	0	0	0	0	0	

VBA-generated canned report summary

VBA-generated ad-hoc report summary based on user definition

Imported Smkreport

pt_nogroup | bi_bio | wd_winddust | Domain SCC Summary | OR-WA Summary

Ready | 100%

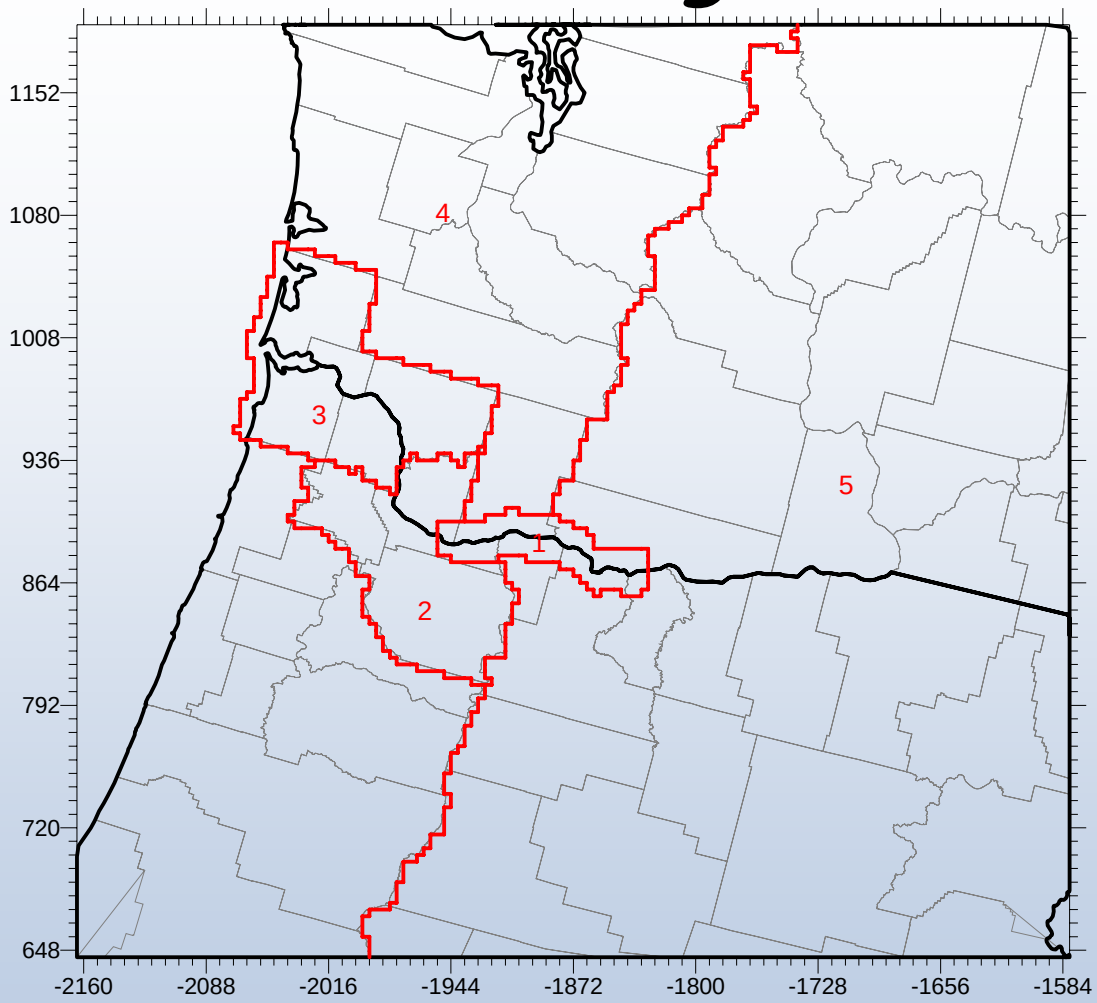
Quality Assurance of Emissions Data: Stage 2 & 3 Findings

- Residential wood smoke emissions reduced by 50% (error found in interpretation of 1999 fireplace survey) for 2004 and subsequently re-grown to 2018
- NH3 emissions
  - CAFO NH3 increased as high as a factor of four
  - Fertilizer NH3 increased as high as a factor of three
  - Based on detailed comparison of OR/WA data to recent literature
- Fugitive dust sources reduced by about 75% through application of canopy escape factor

Conclusions & Going Forward

- CAMx-ready emissions developed for two episodes
- Emissions Inventory Review Tool developed to facility QA of emissions estimates
- Other QA findings to be addressed in future
  - The Centralia TransAlta power plant in Lewis County, Washington is potentially misplaced in the 2004 data base. Further, the use of Wyoming coal in lieu of local coal at this facility will likely result in a decrease of SO2 emissions in 2018 (currently, the 2018 WRAP data base reflects SO2 emissions using local, high sulfur content coal).
  - WRAP's 2002 to 2018 emissions growth for "pulp and paper" and "aluminum ore production," and potentially other industrial source categories, have been overstated based on growth factors in EGAS.
  - There appears to be inconsistent growth of NOx emissions for industrial point sources between the PSAT regions "West of Gorge" and "East of Gorge."
  - There appears to be an inconsistency in temporal allocation of area source emissions estimates between 2018 and 2004 (i.e., 2004 shows a definite seasonal influence between August and November, whereas in 2018 the emissions are essentially the same); this is especially noticeable in the 12km grid.
  - Commercial marine shipping emissions estimates in the Puget Sound area are inconsistent between 2004 and 2018, with 2004 showing far lower emissions than are indicated for 2018.

PSAT Regions



Source Region Map - 4km domain

1. In-Gorge
2. Portland
3. NorthWest of Gorge
4. West of Gorge
5. East of Gorge

(LCP Definition: -97, 40, 45, 33)