Columbia Gorge Air Quality Project Emission Inventory Analysis

Christopher Swab
Oregon Department of Environmental Quality
Air Quality Division

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Overview

- What is the purpose of an Emission Inventory (EI)
  - ✓ Provides emission estimates for air pollution sources in the Gorge
    - * Emissions are not equal to ambient concentrations
    - * Identifies estimated amount of each pollutant from various sources
  - ✓ Used to conduct air dispersion & chemical transport modeling
    - * Part of a larger picture to identify a source's contribution to impairment (EI, chemical transformation & meteorology)

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Scope

- 4-km domain wide analysis
- Base year (2004) and future year (2018)
- Summer and winter episodes
  - ✓ Analysis: Representative day from each episode
- Source types
  - ✓ Area
  - ✓ On-road
  - ✓ Industrial Point
  - ✓ Natural
  - ✓ Nonroad
- Pollutants of concern
  - ✓ $PM_{2.5}$
  - ✓ NO_X
  - ✓ VOC
  - ✓ NH_3
  - ✓ SO_X

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Emission Inventory (EI): Generation and Compilation

- 2004 data
  - ✓ Actual
    - * Industrial Point Sources
    - * Wildfires: US Forest Service
    - * Mt. St. Helens: US Geological Survey
  - ✓ Modeled
    - * On-road: EPA Mobile6.2
    - * Some Nonroad: EPA NONROAD2005
    - * Natural sources: EPA Biogenic Emissions Inventory System (BEIS)
  - ✓ Remaining
    - * Grown from 2002 EPA national EI
    - * Metro growth factors
    - * ODOT projections
    - * Population, housing, employment forecasts

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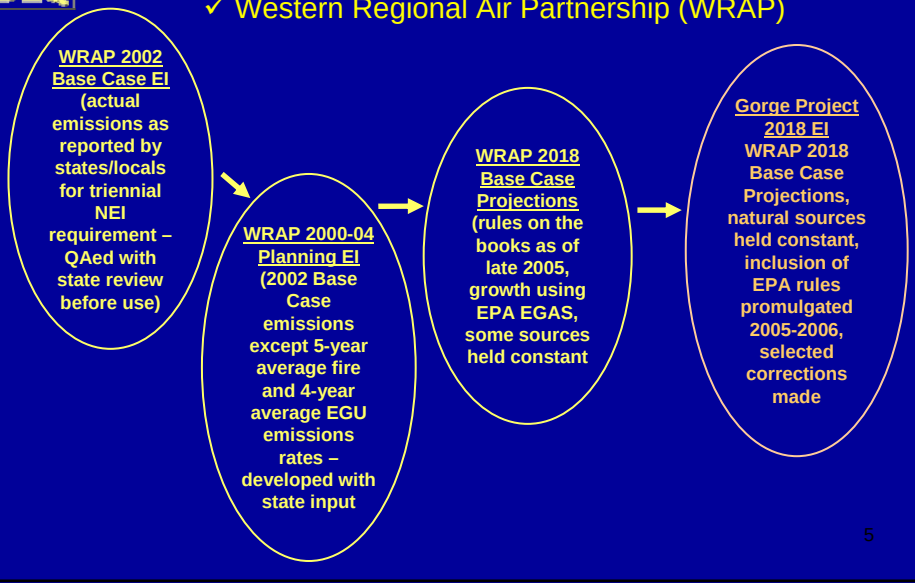
Emission Inventory: Generation and Compilation

- 2018 data
  - ✓ Western Regional Air Partnership (WRAP)



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Emission Inventory: Data processing and analysis

- SMOKE: Data processing tool
  - ✓ Processes data for air quality model input
  - ✓ Annual refined to month, day, and hour
  - ✓ County-wide allocated to land use type
    - * Example: lawnmower use to residential areas
  - ✓ Emissions converted to modeling grid
    - * PSAT region
- Data analysis
  - ✓ Import to database: Microsoft Access
  - ✓ Episode Days: August 18th and November 12th
  - ✓ Classification used: EPA convention
    - * Source Classification Code (SCC)
    - * Wildfires included under area sources

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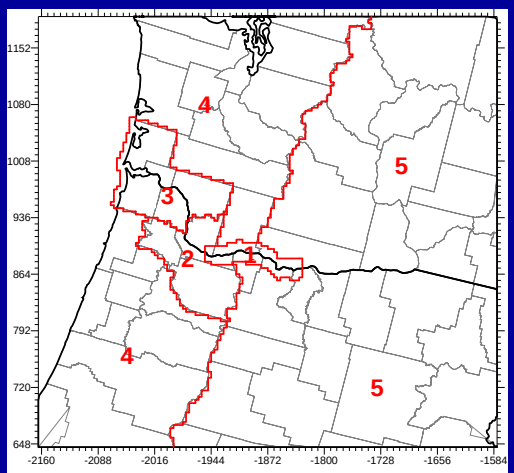
Inventory Area

Gorge Modeling Domain: 4-km grid size

PSAT Regions shown in red



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)

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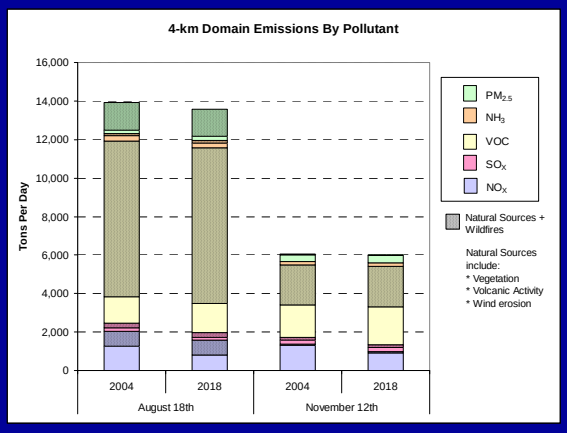
Gorge Domain: Natural vs. Man-Made Source Pollutant Contribution



- Natural sources + wildfires
  - ✓ 77% of August data on average
  - ✓ 39% of November data on average
  - ✓ Vegetation: VOC
  - ✓ Wildfires: $PM_{2.5}$, NH_3, NO_X

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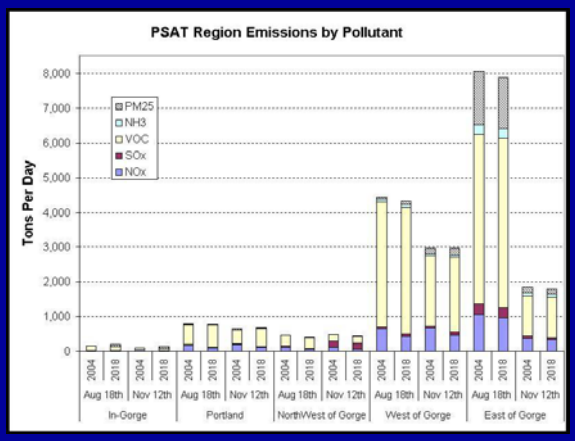
Gorge Domain: PSAT region emissions by pollutant



- Wildfires = East and West of Gorge
- Population = Portland and West of Gorge

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Magnitude of wildfire emissions comparison

- Domain wildfire emissions divided by regional non-fire emissions: August 18th, 2004

Region	VOC	SO_X	NO_X	NH_3	$PM_{2.5}$
In-Gorge	11	98	22	56	352
Portland	2	15	3	8	81
NorthWest of Gorge	4	6	5	23	156
West of Gorge	0.4	5	1	2	23
East of Gorge	0.4	4	1	1	9

✓ Example: Wildfires burning within the domain on August 18th, 2004 emitted 81 times the amount of non-wildfire $PM_{2.5}$ emitted in the Portland region on that day

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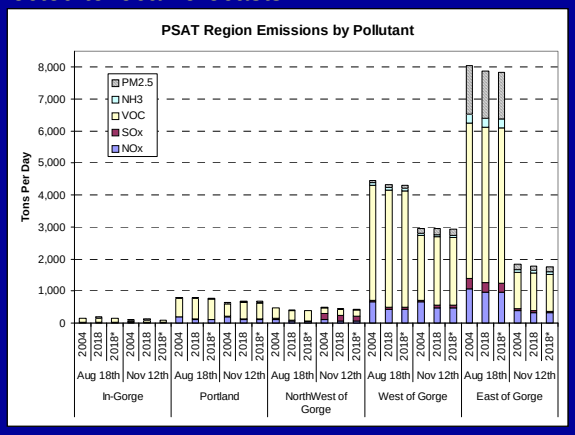
Industrial Point Sources: Aluminum Production and Pulp & Paper incorrectly grown to 2018

- EPA EGAS model used for 2018 growth
  - ✓ Not representative of local economic forecasts
- "2018*" shows Al production and pulp and paper corrected to local forecasts



- Uncorrected data used for modeling

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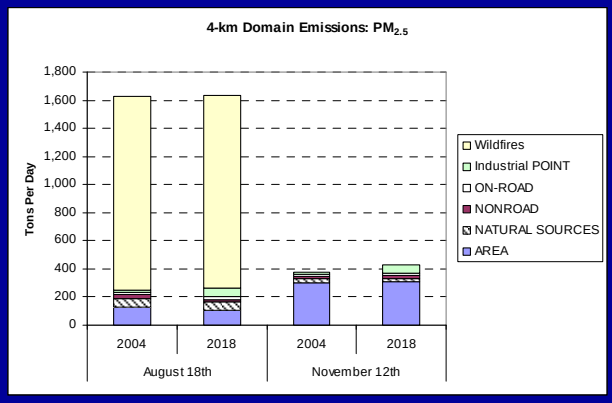
$PM_{2.5}$: Particulate Matter less than 2.5 microns



- August: Wildfires
- November: Residential Wood Combustion
- 2018 Industrial Point
  - ✓ One source, Aluminum production
  - ✓ Incorrectly grown

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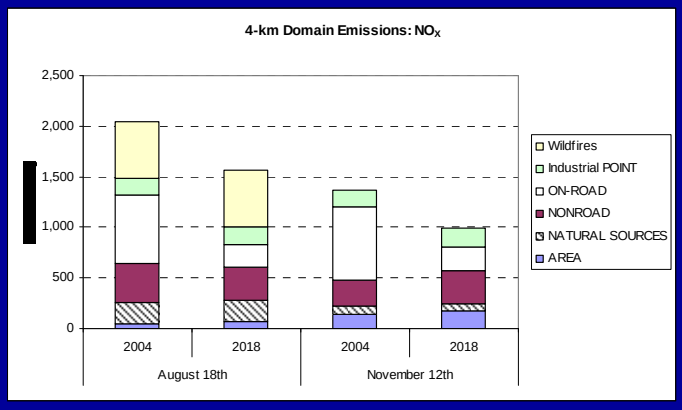
NO_X: Nitrogen oxides



- On-road decrease
  - ✓ EPA regulations to reduce tailpipe emissions
  - ✓ Does not include reductions due to OR-LEV or WA-LEV

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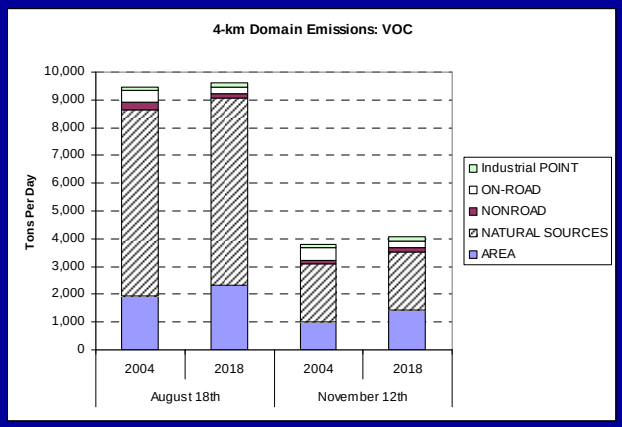
VOC: Volatile Organic Compounds



- Natural Sources = vegetation
- Area sources = human activity
  - ✓ Surface coating (painting), degreasing, printing/graphic arts, Misc. non-industrial solvent use, consumer products

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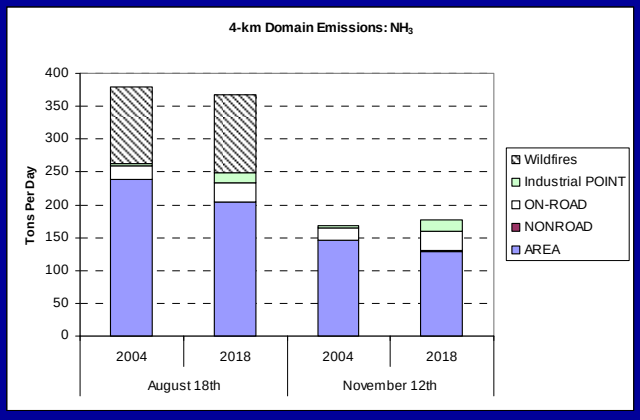
NH_3: Ammonia



- Area and point sources
  - ✓ Agricultural and livestock operations

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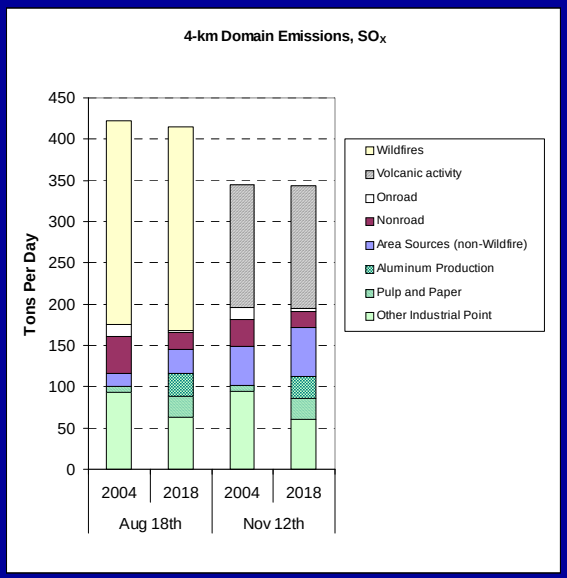
SO_X: Sulfur oxides

- Wildfires
- Volcanic activity
- 2018 Al production and pulp & paper
  - ✓ incorrectly grown
  - ✓ represent 12% of domain SO_X emissions on average
- On-road & nonroad reduction
  - ✓ EPA regulations designed to reduce SO_X through the use of emission control technologies in conjunction with decreased fuel sulfur content



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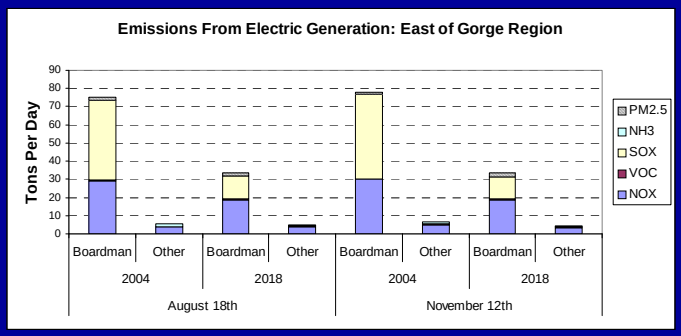
TransAlta facility location discrepancy

- Incorrect latitude: 2004 dataset
- Coal-fired boilers
- Represents 6% of total 2004 SO_X emissions

EGU's: East of the Gorge



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Conclusions

- Large contribution of haze forming pollutants from wildfires during summer episode
- In-Gorge emissions are low compared to other regions
- 2018 errors result in a conservative (high) emissions estimate
- Evaluating emissions + chemical transformation + meteorological conditions can help identify a source category's contribution to impairment

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Contact

Christopher Swab
Oregon Department of Environmental Quality
Air Quality Division
Technical Services Section

(503) 229-5661
swab.christopher@deq.state.or.us

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