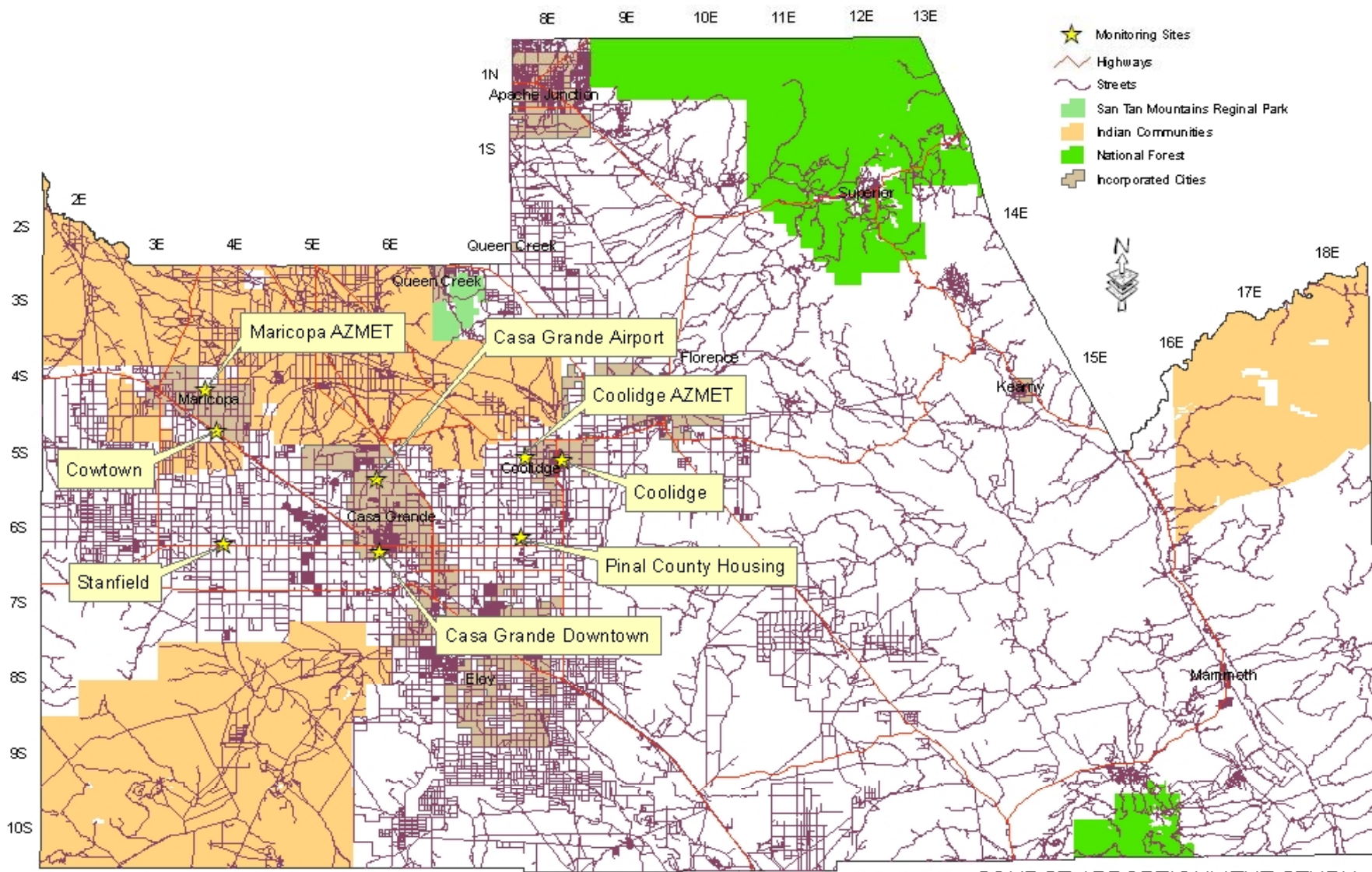


Pinal County
Speciation and Source Apportionment
Project

Kale Walch
June 2, 2007

Project Description

- ❖ The project was designed to identify sources of particulate matter in the Pinal County agricultural basin.
- ❖ PM10 and PM2.5 Mini-Vol samplers utilizing Pallflex quartz filters and Teflon filters were operated at five sites.
 - ❖ Coolidge, Pinal County Housing, Casa Grande, Cowtown, and Stanfield
- ❖ At least one FRM sampler was also located at each site.
- ❖ Road counts and soil sampling were conducted at the Cowtown site.
 - ❖ Soil samples were collected from feedlots, dirt roads, and agricultural fields.



SOURCE APPORTIONMENT STUDY
 MONITORING STATIONS
Air Quality Control

Project Description

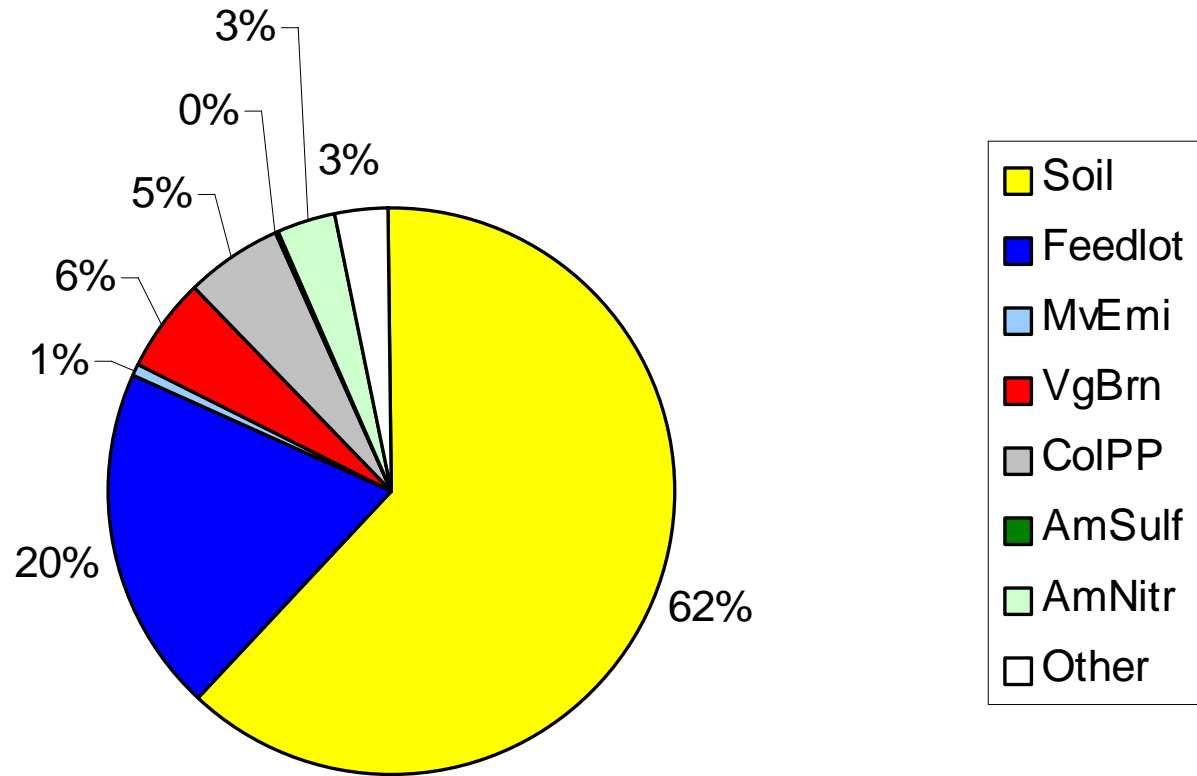
- ❖ Sampling took place from October 1, 2003 to November 10, 2003. The ten runs with the best data recovery were chosen for analysis.
- ❖ Mini-Vols were operated on a 1 in 3 schedule.
- ❖ FRM Hi-Vols were operated at Coolidge, Pinal County Housing, Casa Grande and Stanfield on a 1 in 6 schedule.
- ❖ FEM TEOMs were operated continuously at Pinal County Housing and Cowtown.
- ❖ DRI performed speciation and source apportionment analysis on the Mini-Vol filters.

Casa Grande PM₁₀ Source Apportionment

- ❖ Considered the control site
- ❖ Geological soil emissions were the dominant source contribution with an average of 62%.
- ❖ Feedlot emissions were the second highest contribution with 25.8%.
 - ❖ Could be from nearby dairies and feedlots or cross contamination from agricultural fields
- ❖ Coal power plant emissions were unexpected and could not be contributed to a single source.

Casa Grande PM₁₀

Figure 8: Casa Grande Avg. PM₁₀ Source Attributions

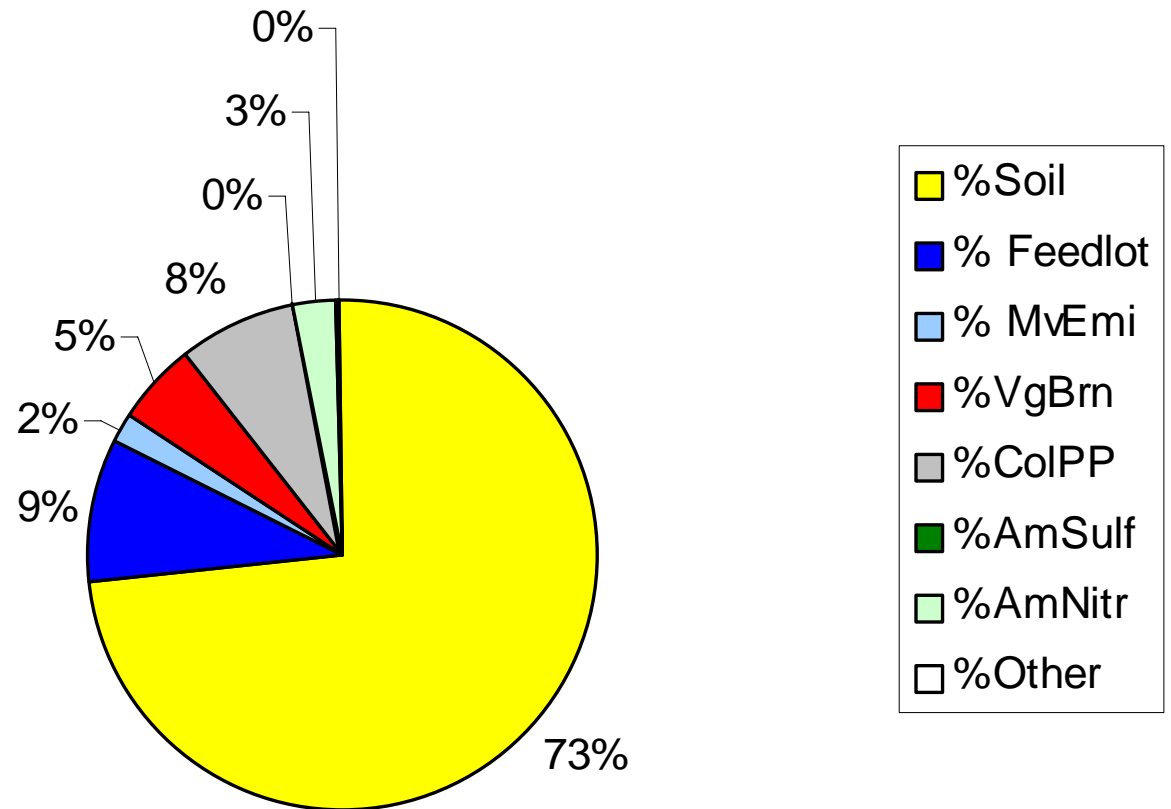


Coolidge PM₁₀ Source Apportionment

- ❖ Geological soil emissions were the dominant source contribution with an average of 73%.
- ❖ Feedlot emissions were the second highest contribution with 9%.
- ❖ Feedlot emissions were only identified in four of the nine runs analyzed.
 - ❖ Two dairies four and five miles away, no feedlots in the vicinity.
- ❖ Ammonium nitrate was identified in small quantities in all but two PM₁₀ runs throughout all the sites.
 - ❖ Local sources of ammonium include agricultural applications, sewage plants, and animal manure.

Coolidge PM₁₀

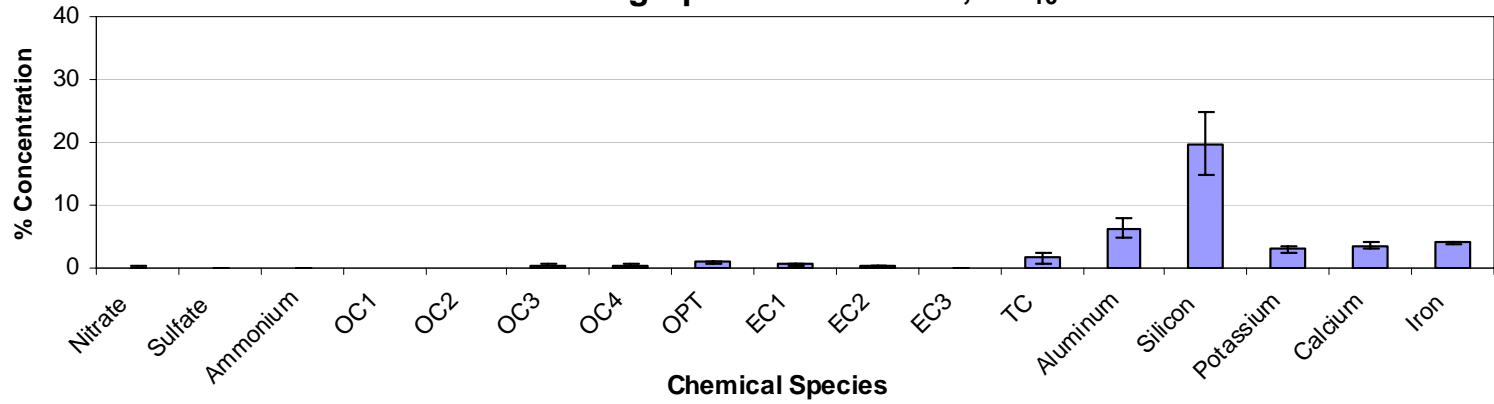
Figure 10: Coolidge Avg. PM10 Source Contributions



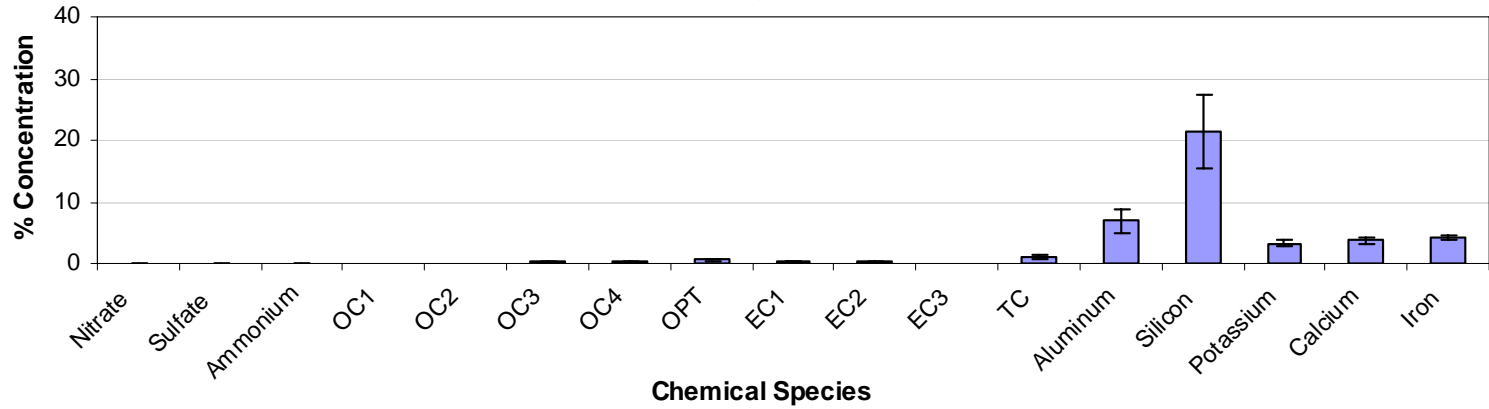
Cowtown PM₁₀ Source Apportionment

- ❖ Feedlot soil emissions were the dominant source contribution with an average of 58%.
- ❖ DRI used the elevated total carbon concentration found in the feedlot soil samples as the identifying chemical fingerprint for feedlot emissions.
- ❖ Four samples had a PM₁₀ concentration over 200 $\mu\text{g}/\text{m}^3$. In all cases the corresponding wind rose showed inversion conditions.

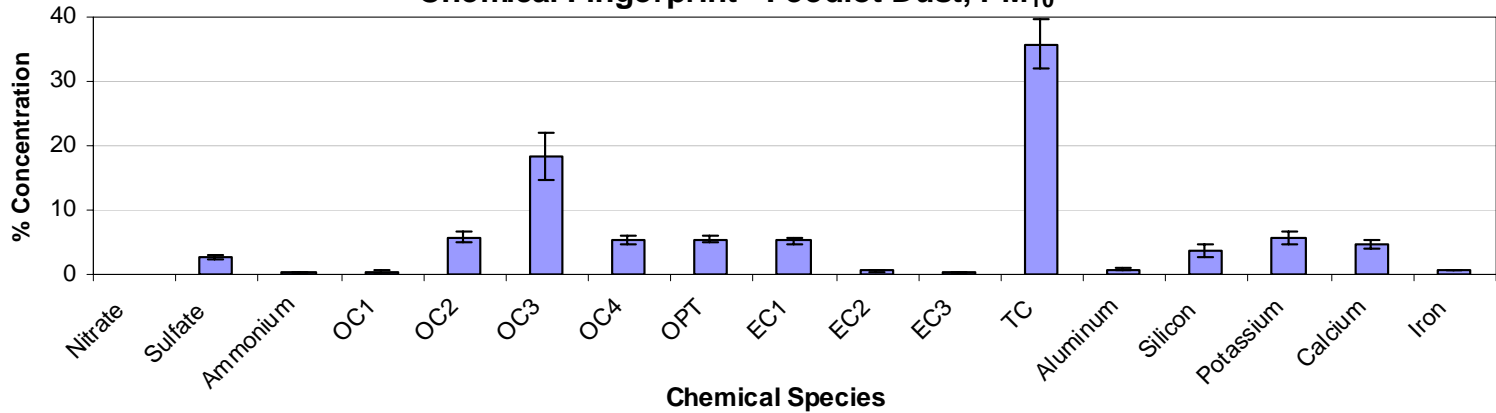
Chemical Fingerprint - Road Dust, PM₁₀

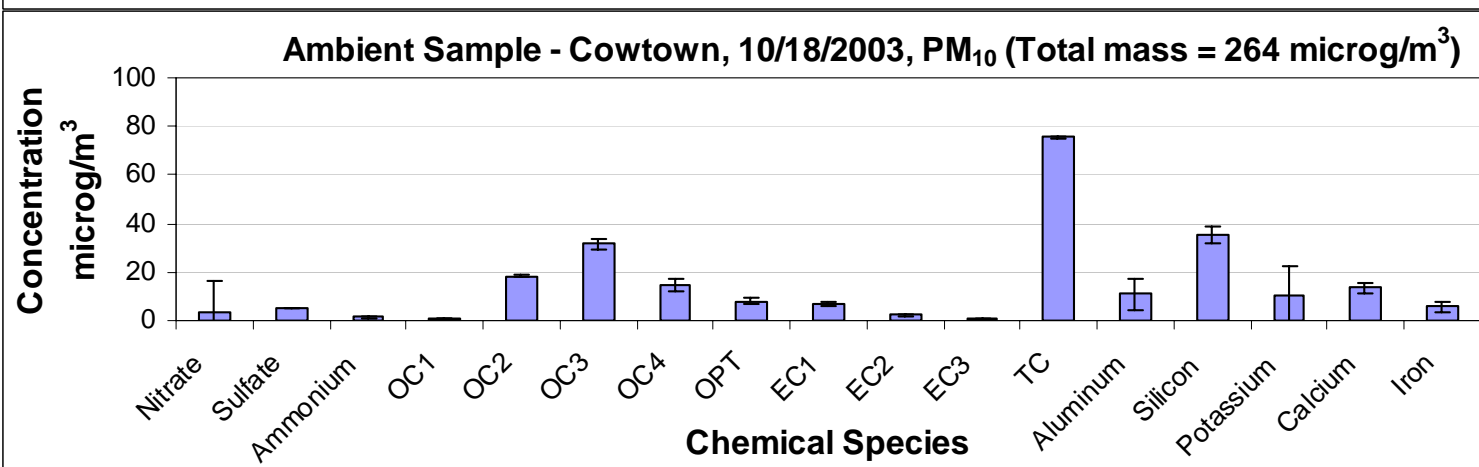
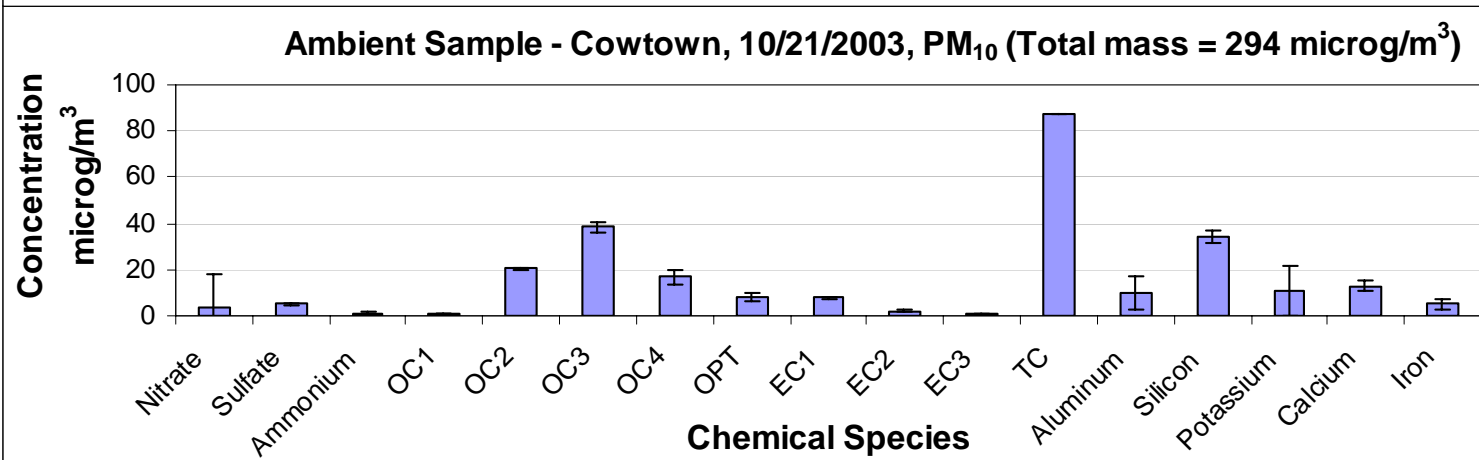
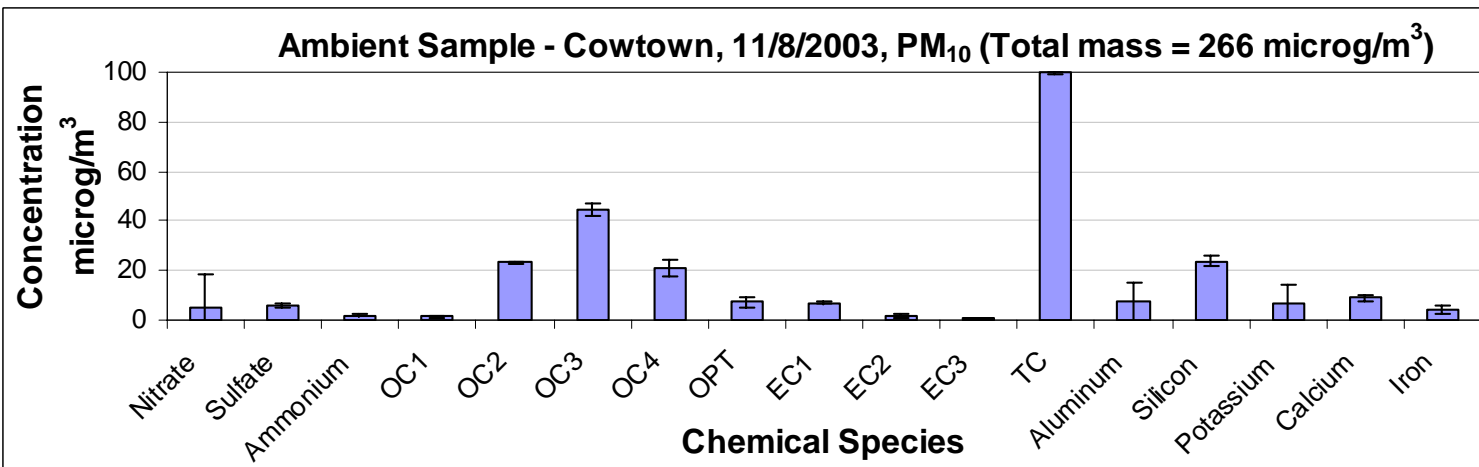


Chemical Fingerprint - Agricultural Dust, PM₁₀



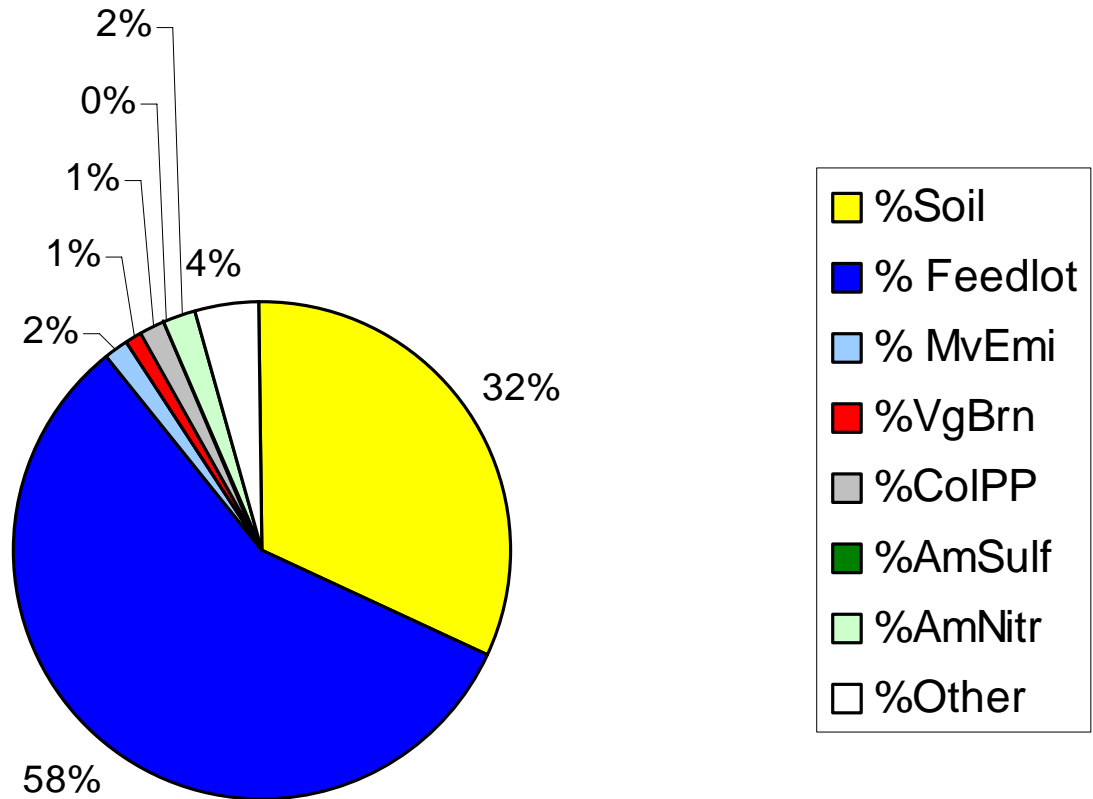
Chemical Fingerprint - Feedlot Dust, PM₁₀





Cowtown PM₁₀

Figure 12: Cowtown Avg. PM₁₀ Source Contributions

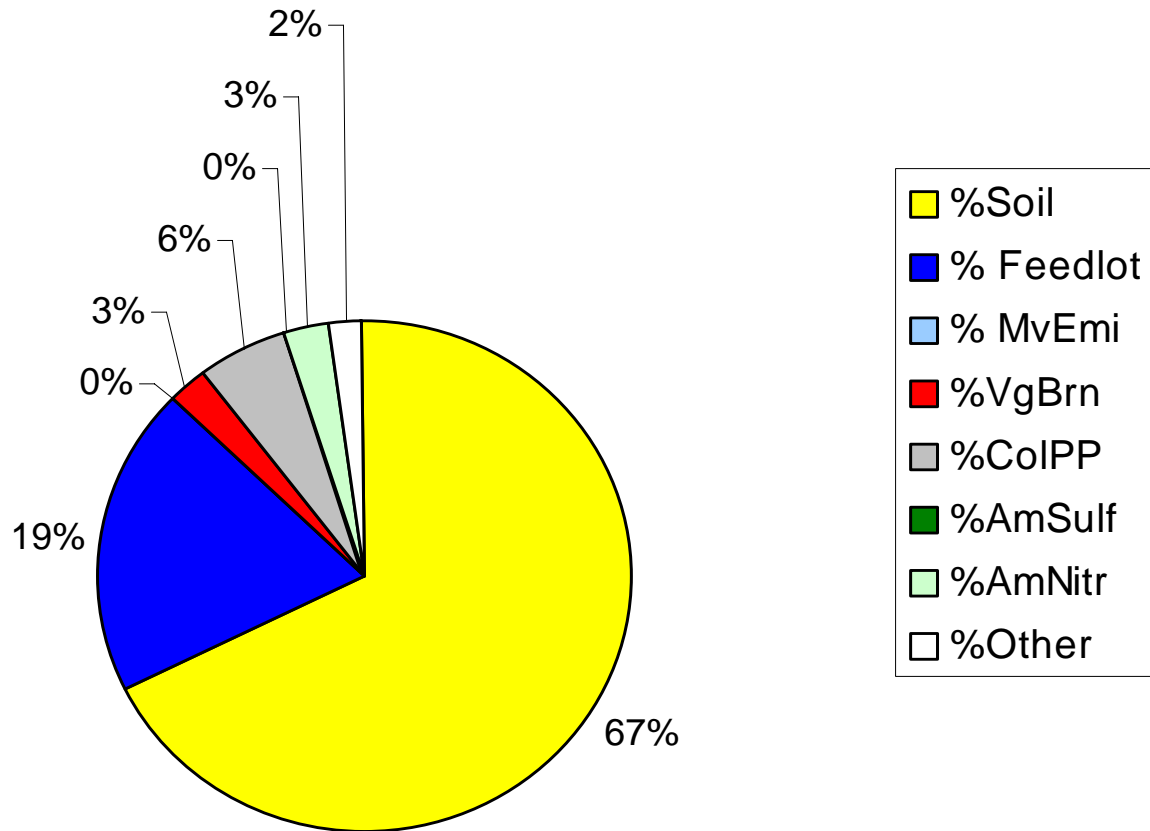


Pinal County Housing PM₁₀ Source Apportionment

- ❖ Geological soil emissions were the dominant source contribution with an average of 67%.
- ❖ Feedlot emissions were the second highest contribution with 19%.
 - ❖ One dairy one mile to the south, three dairies five mile west, no feedlots in the vicinity.
- ❖ The site is surrounded by agricultural fields for ten miles in all directions.

Pinal County Housing PM₁₀

Figure 14: Pinal County Housing Avg. PM10 Source Contributions

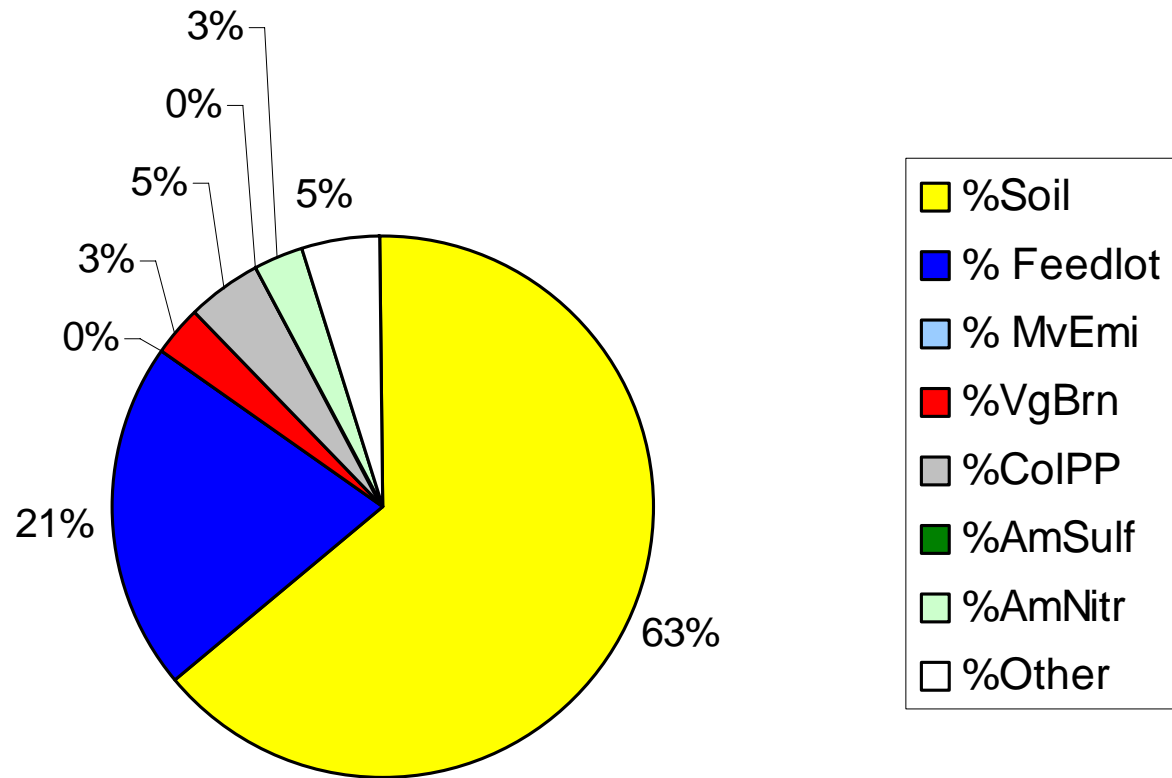


Stanfield PM₁₀ Source Apportionment

- ❖ Geological soil emissions were the dominant source contribution with an average of 63%.
- ❖ Feedlot emissions were the second highest contribution with 21%.
 - ❖ Sizeable feedlot and dairies operations lie three miles to the north, east and west.
- ❖ Meteorological data was not available for this site.

Stanfield PM₁₀

Figure 16: Stanfield Avg. PM₁₀ Source Contributions



Conclusions

- ❖ The project shows soil and feedlot emissions are the prominent sources.
- ❖ Soil emissions could be attributed to dirt roads, open field agricultural, and construction.
- ❖ The identification of the feedlot fingerprint was unique to this project
- ❖ The source attributions for PM_{10} modeled well, generally producing small unidentified components.