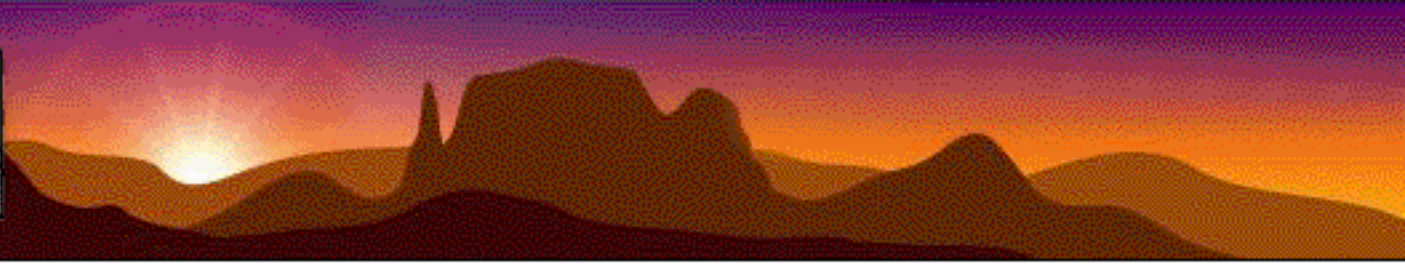


Addressing Air Quality in a Border Setting

Good Neighbor Environmental Board

Rio Rico, Arizona

September 23, 2009



The Nogales Case: Historical Setting

- Environmental link suspected due to incidences of lupus and cancer cases.
 - SLE found to be 2 to 7 times higher than estimated prevalence for U.S. population.
 - <http://aje.oxfordjournals.org/cgi/content/full/154/11/1029>
- EPA financed ambient air quality study.
 - ADEQ conducted 5-year binational air monitoring study.
 - Particulate Matter (PM) and Hazardous Air Pollutants (HAPs)
 - Emissions Inventory
 - Computer Modeling
 - Risk Assessment

The Nogales Case: AQ Study Results

- PM10
 - PM10 was the primary risk factor in air.
 - Unpaved roads were primary sources of PM.
- HAPs
 - Vehicle emissions determined as main source.
- PM10 Non-Attainment Area
 - Designated in 1990 with State Implementation Plan (SIP) prepared in 1993.
 - Finding that attainment would be achievable “but for emissions emanating from outside of the [U.S.]” – estimated at 94%.
 - Included some Arizona emissions controls.

The Nogales Case: Plan of Action

- A. Increase Road Paving and Stabilization
- B. Faster Border Crossings
- C. Reduce Vehicle Emissions
- D. Construct Major Transportation Corridors
- E. Reduce Train Route Impacts
- F. Eliminate Garbage Burning
- G. Promote Revegetation
- H. Reduce Wood Burning
- I. Increase Soil Erosion Engineering Solutions
- J. Establish Recycling Programs
- K. Create or Improve Public Transit
- L. Improve Local Traffic Flow

***Formally Adopted by
Arizona and Sonora
at the
Arizona-Mexico
Commission Plenary
Session
June 17, 2005***

The Nogales Case: Implementing Actions

- Applied Projects Lead by Partners
 - Expansion of FAST Lane program to expedite crossings for commercial vehicles.
 - Opening of SENTRI Lane program to expedite crossings for pre-screened commuters.
 - Construction of railroad overpasses in Nogales, Sonora.
 - Feasibility study of a public transit system in Nogales, AZ completed in 2006.
 - Establishment of a community recycling program in Nogales, AZ (ADEQ grant).
 - Road paving of previously prioritized roads (emissions inventory) in Nogales, Sonora.
 - Biodiesel capacity building in Ambos Nogales.

The Nogales Case: Implementing Actions

- Applied Projects Lead or Contracted by ADEQ
 - Creation of a community-based Ambos Nogales Revegetation Association.
 - Demonstrations of alternative heating and thermal construction technology.
 - Wood/garbage burning assessment and development of community action plan.
 - Retrofits of 33 diesel school buses in Rio Rico and 5 in Nogales.
 - Retrofits of 55 heavy duty diesel haul trucks.
 - Clean air calendar.



Before Retrofit

After Retrofit



THIS IS A CLEANER VEHICLE

**This Vehicle
Has Been
Retrofitted With a
Diesel Oxidation Catalyst
to Reduce Diesel
Emissions**

More Studies

3 major ADEQ Air Quality Studies

Examined air pollution in each of three city-pairs:

Ambos Nogales – Douglas / Agua Prieta – Yuma / San Luis

- **Ambos Nogales Study** (Supplemental Source Apportionment)
- **Douglas/Agua Prieta Study**
- **Western Arizona/Sonora Border Air Quality Study (WASBAQS)**

Nogales Source Apportionment

3 weeks in 2005 and 2006

- This study can be considered an update to the previous Nogales Emission Inventory (now more than 10 years old)
- Goal – To better identify Sources of pollutants so control strategies can be focused on critical sources

Nogales Source Apportionment

- A filter based monitor was located at the Nogales Post office
- Monitor was ran for 3 weeks in December 05 and January 06
- The filters were analyzed for elemental and organic carbons
 - Diesel Combustion Vs. Gasoline Combustion
 - Combustion PM Vs. Geological PM
 - Organic-Tracer method used to evaluate contributions from: Biomass burning (refuse, wood, cooking)
 - SEM used to evaluate contributions from: Black Carbon (coal, natural gas, fuel oil, biomass and trash burning.)

Nogales Source Apportionment

Findings

- Based on the correlation of high PM_{2.5} measurements with light southerly winds and the small number of emission sources between the sampling site and the border, the predominant sources of PM_{2.5} measured at the sampling site originated south of the border.
 - 94% PM_{2.5} at the Nogales, AZ post office originate in Mexico.
 - Overnight PM_{2.5} is main contributor to daily average (10-38 ug/m³)
 - Dominant emissions sources are open burning, food cooking and dust.

The Nogales Case: New PM_{2.5} Issue

- 24 hour standard exceeded in 05, 06 and 07.
- Governor's Nonattainment Recommendation
 - Submitted December 19, 2007.
 - Nogales PM_{2.5} Nonattainment Area the same as the PM₁₀ Nonattainment Area.
 - EPA accepted, announced December 22, 2008; Federal Register publication pending.
 - Technical support document contains detailed rationale of the State and discuss challenges.

The Nogales Case: New PM_{2.5} Issue

Challenges of implementing SIPs due to transborder contributors

- Can't control emissions coming from Mexico
- Terrain produces Katabatic winds, which can transport air pollution across the border

Douglas Agua Prieta Study

1999-2005

- Goals
 - Identify the sources of both gaseous and particulate air pollutants
 - Communicate Risks to Residents

Douglas Agua Prieta Study

- Findings
 - PM was major issue
 - Roadways are comprised of chalky lime stone powder which can become easily suspended
 - Road paving has reduced PM measurements

WASBAQS

Western Arizona Sonora Border Air Quality Study

2004 - current

- Goals
 - Identify the sources of both gaseous and particulate air pollutants
 - Communicate Risks to Residents

WASBAQS

Western Arizona Sonora Border Air Quality Study

- 5 meteorological site in AZ
- 3 Meteorological sites in San Luis
- 2 monitoring sites for gaseous and particulate pollutants. One in Yuma, Az and the other in San Luis, Sonora.

WASBAQS

Western Arizona Sonora Border Air Quality Study

- Findings
 - Projected finish date – June 2010

WASBAQS

Western Arizona Sonora Border Air Quality Study

- Special Purpose Studies as part of WASBAQS
 - Pesticides / Herbicides
 - Air pollution from Brick Kilns
 - Agricultural Burning
 - Cross-Border Flux

Effectiveness of PM_{2.5} Mitigation Resulting From the New Commercial Port of Entry at San Luis

- Goal
 - To establish a baseline for quantifying the proposed mitigating effect from constructing the new port of entry at San Luis, Sonora.

Published Air Quality Modeling Studies

- Ozone Modeling
 - Contributors to ozone episodes in three U.S./Mexico border twin-cities
 - The efficacy of Satellite Information in Improving CMAQ/Models-3 Prediction of Ozone Episodes in the US-Mexico border
- PM Modeling
 - Modeling of episodic particulate matter events using a 3-D air quality model with fine grid: Applications to a pair of cities in the US/Mexico border
 - Implementation of a windblown dust parameterization into MODELS-3/CMAQ; Application to episodic PM events in the US/Mexico border
- Fire Modeling
 - Simulation of Smoke Plumes from Agricultural Burns: Application to the San Luis/Rio Colorado Airshed in the U.S./Mexico Border

Interesting proposals

- Use Neural Network to predict High PM events in cities along the border

Overview of the binational monitoring efforts

Why Monitor Along the Border?

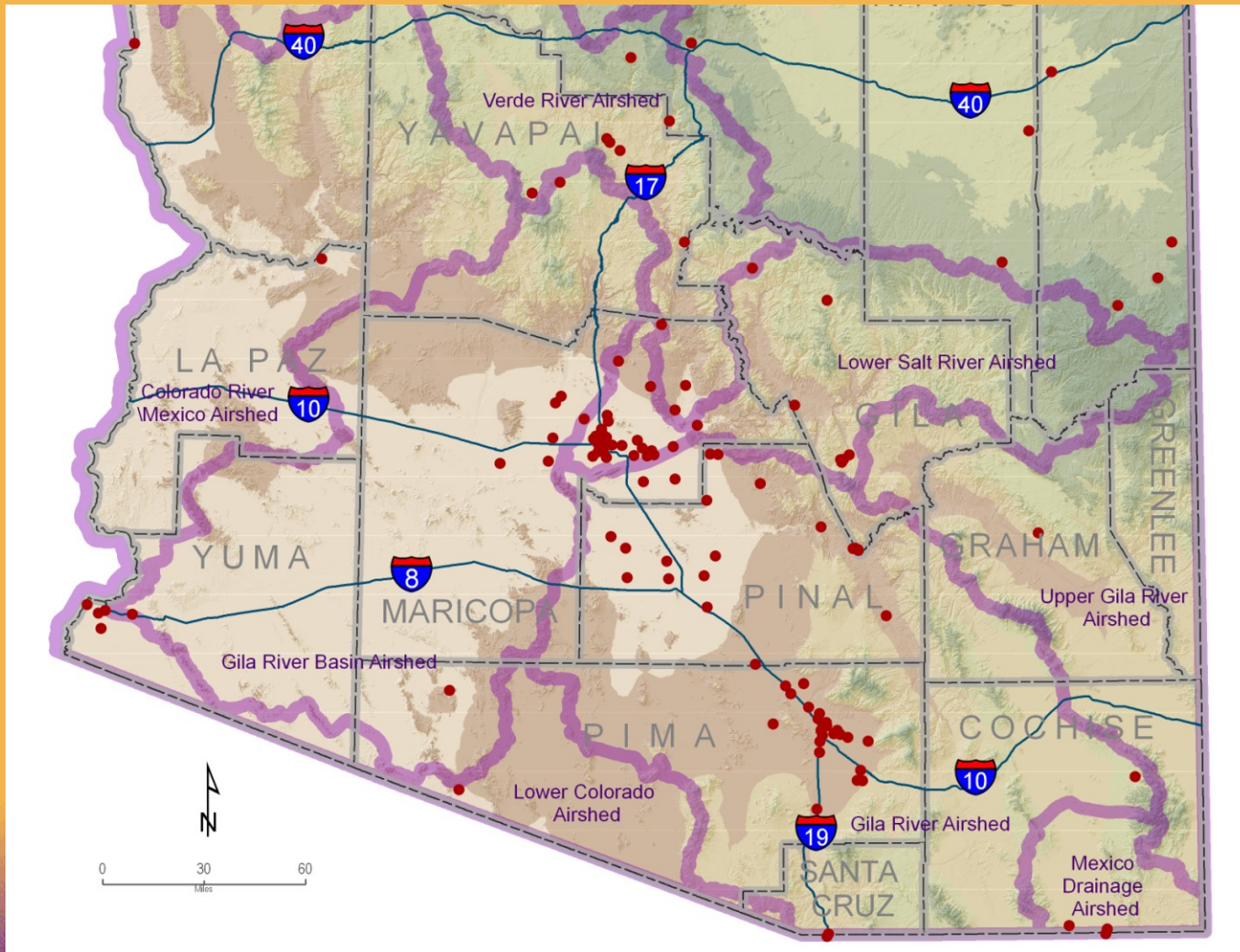
- Support Special Studies (Risk Assessment, Source Apportionment, transport)
- Essential to know if border air sheds are meeting air quality standards
- Gauge effectiveness of control strategies on both sides of the border

The ADEQ Border Air Monitoring Program

- Ambos Nogales
- Douglas / Agua Prieta
- San Luis / Yuma



Arizona Airsheds and border related monitoring sites



The ADEQ Border Air Monitoring Program

- Nogales, AZ – *Continuous and Filter*
 - Partisol Samplers: PM10/PM2.5 samples collected every sixth day.
 - Beta Attenuation Monitors (BAMs): PM10/PM2.5 samples collected every hour (7 days/week).
 - Meteorology: Wind Speed, Wind Direction.
- Nogales, Sonora – *Upgraded Dichot*
 - Dichotomous Sampler: PM10 (coarse, fine) collected every sixth day.

The ADEQ Border Air Monitoring Program

- Douglas, AZ - *Filter*
 - Partisol Samplers: PM10/PM2.5 samples collected every sixth day.
- Agua Prieta, Sonora – *Upgraded Filter Dichot*
 - Dichotomous Sampler: PM10 (coarse, fine) collected every sixth day.
 - Meteorology (Wind Speed, Direction, Temp. and RH)

Other Locations

Site	Pollutants	Agency
Douglas	PM _{2.5} , PM ₁₀ , Visibility	ADEQ
Agua Prieta	Met, PM ₁₀ , PM _{2.5}	ADEQ
Nogales, Arizona	continuous PM _{2.5} and PM ₁₀ collocated filter-based PM _{2.5} , PM ₁₀ , Met	ADEQ
Nogales, Sonora	PM ₁₀ , Met	ADEQ
Yuma	Met, ozone, NO_x, PM₁₀	ADEQ
San Luis	PM₁₀, PM_{2.5}	
Paul Spur	Met, PM₁₀	ADEQ
Ajo	Met, PM₁₀	ADEQ
Organ Pipe National Monument	PM₁₀, speciated PM_{2.5} light scattering, met	NPS ADEQ

Monitoring

- Monitoring must continue to ensure air sheds are protected
- Monitoring efforts could be improved through better collaboration and data sharing

Next Steps

- Additional Bus Retrofits
 - Douglas, Palominas, Naco (Cochise County)
 - Yuma
- Truck Stop Electrification Stations
 - Pending completion of procurement process

Contact Information:

ADEQ Air Quality Division / Assessment Section

Leonard Montenegro, 602-771-7642

montenegro.leonard@azdeq.gov

ADEQ Office of Border Environmental Protection

Edna Mendoza, 520-628-6710

mendoza.edna@azdeq.gov