

Superfund-Related Partnerships University of Arizona



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TUCSON, ARIZONA

University of Arizona NIEHS Superfund Program

2

UNIVERSITY OF ARIZONA COLLEGE OF PHARMACY NIEHS



Superfund Research Program
The University of Arizona

CENTER FOR TOXICOLOGY SWEHSC SUPERFUND BINATIONAL CENTER TRAINING OUTREACH

Search

Home
Our Program
News & Highlights
Professional & Community Information
Research Projects
Research Translation
Outreach to Mexico
SBRP Students Trainees
Personnel
Helpful Links
Questions/Comments?
Contact Us
Downloads

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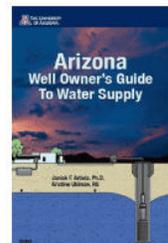
Our Mission is to advance science and to apply the biomedical and environmental research conducted by our program for the improvement of human health and the environment. Our program investigates the hazardous waste and public health issues currently confronting the Southwestern region of the United States, specifically arsenic, chlorinated hydrocarbon, and mine tailings contamination. We are committed to an interdisciplinary approach to environmental research and education.

UA SRP and Binational Center Participates in TCE Teacher Symposium



The University of Arizona Southwest Environmental Health Science Center & Sunnyside School District coordinated this symposium to provide high school teachers with information regarding contamination and clean-up of the Tucson International Airport Area Superfund Site.

NEW! INFORMATIONAL BOOKLET



ARSENIC

We study exposures to arsenic, low-level toxic effects of arsenic, the human genetics of arsenic transformation and remediation techniques to remove arsenic from water and the stabilization of arsenic bearing residuals. [Read more...](#)

CHLORINATED HYDROCARBONS

We focus on chlorinated solvent contaminated sites to understand the health effects of these contaminants, their transport behavior, and to develop innovative remediation technologies. [Read more...](#)

MINE TAILINGS

We explore phytostabilization techniques, and its potential for long-term stabilization of mine tailings found in the arid and semi-arid Southwest. [Read more...](#)

Partnerships

Federal – EPA

State – ADEQ

County – PDEQ

City – Tucson

School District – Sunnyside

Private sector – ASARCO

Not for profit – SERI

Mine Tailings Field Sites

3

Iron King (Dewey-Humboldt)

- Superfund site
- Inactive mine, inactive smelter
- Arsenic and lead contaminated mine tailings

Hayden/Winkelman

- Administrative Settlement Agreement and Order on Consent
- Active open cast mine and smelter
- Arsenic and lead contaminated soil

Mount Lemmon

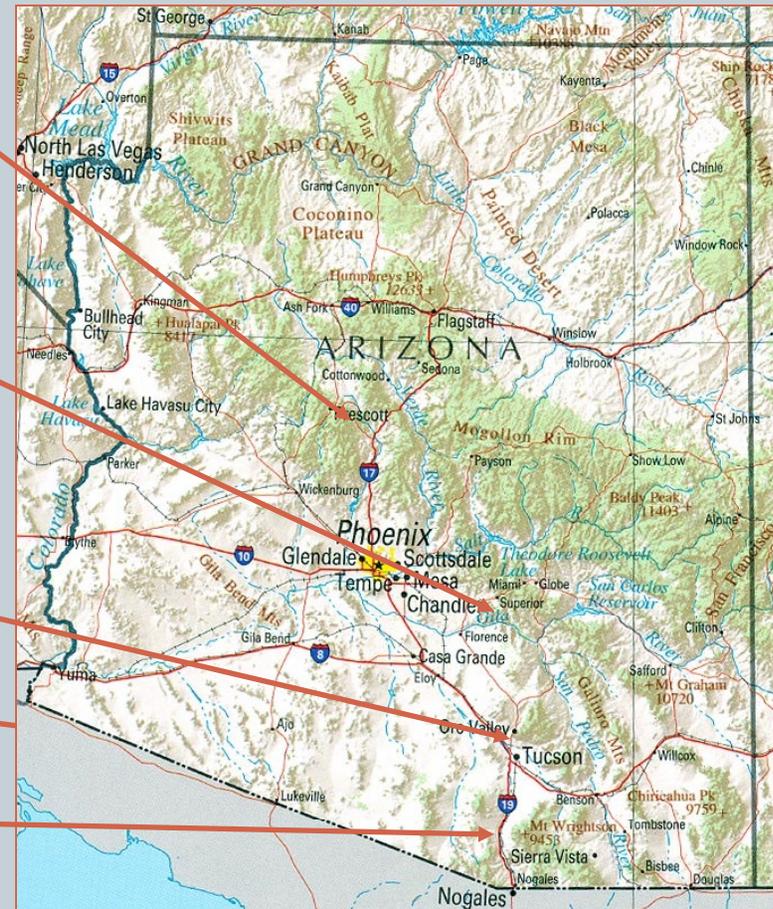
- Natural background (9000 ft)

Wilcox Playa

- Large natural dust source

Green Valley

- Active open cast copper mines
- “Clean” mine tailings



Hayden/Winkelman, AZ

4



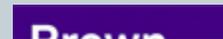
Aerosol Concentration	Hayden PM10 01/08/07	AZ Ambient HAPS (chronic)
PM ₁₀ (μg/m ³)	39.7	-
Arsenic (ng/m ³)	150	0.441
Cadmium (ng/m ³)	14	1.05
Chromium (ng/m ³)	1.5	0.158
Lead (ng/m ³)	470	150 (NAAQS 3-month)

Courtesy John Hillenbrand, EPA, Region 9

Hayden/Winkleman Management



2.13



EPA Region 9



How to set up an EPA-SRP Seminar Series

EPA Region 9 Iron King (Dewey-Humboldt)

7



Soil Concentration	Large Tailings Pile West (mg/kg)	AZ Residential SRL (mg/kg)
Antimony	38.6 (est.)	-
Arsenic	6,460	10
Cadmium	33.1 (est.)	39
Lead	5910 (est.)	400

Leah Butler, EPA, Region 9

Monika O'Sullivan

Aerosol data
Site reports
Region 9 Seminars
Risk-E Seminars



Professional Community Mine Tailings Workshops

8

UA SBRP BRINGS TOGETHER INTERNATIONAL EXPERTS TO EXPLORE NOVEL APPROACHES TO RECLAMATION OF MINE TAILINGS



(left to right) Dr. Raina Maier, NIEHS Conference Proposal recipient and Workshop Moderator (UA) and Dr. Sally Brown, Workshop presenter (University of Washington).

Motivation

In arid and semi-arid areas of the world such as the western United States, northern Mexico, and parts of South America, Africa, Australia, China, and India, mine tailings and their associated contaminants are prone to eolian dispersion and water erosion. These problems are extensive and persist for

The University of Arizona Superfund Basic Research Program (UA SBRP) hosted a workshop in Tucson, Arizona, entitled, "Mine Tailings Stabilization in Arid and Semi-Arid Environments: Assessment, Problems, and Solutions", June 5-6, 2008. This international Workshop, sponsored by the National Institute of Environmental Health Sciences (NIEHS), focused on eolian and water-borne dispersion of arid and semi-arid mine tailings, and identifying research needs in this area.



Workshop participants at The University of Arizona.

MINE TAILINGS STABILIZATION IN ARID AND SEMI-ARID ENVIRONMENTS: ASSESSMENT, PROBLEMS, AND SOLUTIONS WORKSHOP PRESENTATIONS

Introduction to the Workshop – Goals and Objectives – Raina Maier, The University of Arizona

Topic Area I. Problem Definition and Health Impacts

Eolian and water-borne dispersion of mine tailings — Eric Betterton, The University of Arizona
Human health consequences — Fernando Díaz-Barriga Martínez, Universidad Autónoma de San Luís Potosí
Riparian ecosystem consequences — James Gannon, University of Montana

Topic Area II. Recent Advances and Issues in Design and Management of Tailings Impoundments for Closure

Tailings deposition strategies, water balance, liners — David J. Williams, University of Queensland
Seepage from containment walls and into foundation — David Bentel, SRK, Geotechnics
Mine tailings surface stabilization issues chemical and physical — Brian Rademeyer, Golder Associates
Mine tailings slope stabilization issues — Michelle Theron and Martin Rust, RGC

Topic Area III: Recent Advances and Issues in Cover Strategies for Tailings in a Dry Climate

Phytostabilization — Christopher Grandlic, The University of Arizona
Capping (ET caps) — Isabel Weiersbye, University of the Witwatersrand - Coming Soon!
Solidification — David Bentel, SRK, Geotechnics

Topic Area IV: Stabilization Successes and Challenges

Example 1 — Israel Razo Soto, Universidad Autónoma de San Luís Potosí
Example 2 — Sally Brown, University of Washington
Example 3 — Diana Meza Figueroa, Universidad de Sonora
Example 4 — Monica Mendez, The University of Arizona

Selected Meeting Notes taken by David J. Williams, University of Queensland

[Click here to view highlight "UA SBRP Brings Together International Experts to Explore Novel Approaches to Reclamation of Mine Tailings".](#)

Dewey-Humboldt Community

9



Monica D Ramirez

PhD Candidate, Soil, Water and Environmental Science

Project Partners:

Town of Dewey-Humboldt, AZ

AZ Department of Environmental Quality (ADEQ)

US Environmental Protection Agency (USEPA)

Department of Soil, Water and Environmental Science, The University of Arizona

Yavapai County Cooperative Extension, The University of Arizona

Dewey-Humboldt Community Outcomes

10

- Over 300 people have been reached through educational outreach events and products
- 42 community members are signed up, and have received *Gardenroots* kits



Dewey/Humboldt Community

11

Agua Fria Festival

UA SRP ATTENDS DEWEY-HUMBOLDT, ARIZONA, AGUA FRIA COMMUNITY FESTIVAL TO SPREAD THE WORD ABOUT MINE TAILINGS

On October 10, 2009 a team of UA SRP personnel attended the Dewey-Humboldt Agua Fria Festival in Humboldt, Arizona to serve as a resource to the community regarding the newly designated Superfund site in their vicinity entitled: Iron King Mine and Humboldt Smelter Site. Investigator and Associate Director, Raina Maier, Research Translation Coordinator, Monica Ramirez, and UA SRP Student Trainee, Sarah Hayes worked with the US Environmental Protection Agency (EPA) and Arizona Department of Environmental Quality (ADEQ) to listen to community concerns and needs, distribute information regarding mine tailings, arsenic, lead, and risk assessment, and discuss the UA SRP research projects at the site.

Currently, Eric Betterton (UA SRP, Project 8) has set up a ten-stage air sampler to analyze the chemical composition of the air particulates by size fraction in the town of Humboldt, Arizona. Raina Maier, (UA SRP, Project 9) is also currently performing greenhouse studies to determine the phytostabilization potential of the Iron King mine tailings. Drs. Betterton and Maier have provided EPA Project manager, Leah Butler, their methodologies and current results to incorporate into her Remedial Investigation/Feasibility Study Report.

This community festival provided a great opportunity for the UA SRP to disseminate information regarding the research methodologies and results to community members, as well as to answer any questions the community had in regard to the cleanup. Previously, the RTC attended a "Community Kick-Off" meeting (August 2008), where EPA R9 introduced them as part of the "research team". Over 40 community members attended the meeting and were eager to learn more about the site's remedial investigation and site characterization. The UA SRP and Binational Center's informational brochures: "What are Mine Tailings?", "What is Arsenic?" and "Lead and Our Health" was distributed to the attendees.

It is anticipated that participating in community events and meetings will



left to right, Len Marinaccio (and son), Mayor, Dewey-Humboldt, AZ, Leah Butler, Project Manager, US EPA R9, Brian Stonebrink, Project Manager, ADEQ, Monica Ramirez Research Translation Coordinator, UA SRP, David Cooper, Community Involvement Coordinator, US EPA R9 and Raina M. Maier, Associate Director, UA SRP.



Step 1: The site is ripped and then disked to even and homogenize the tailings



EPA P2 Grant



UA SBRP RECEIVES US EPA POLLUTION PREVENTION GRANT

Dr. Eric Betterton, Denise Moreno Ramirez and Monica Ramirez, University of Arizona Superfund Basic Research Program (UA SBRP) and Ann Marie Wolf, [Sonora Environmental Research Institute, Inc. \(SERI\)](#) received a US EPA Pollution Prevention (P2) grant. The P2 project's purpose is to reduce the amount of hazardous substances entering the environment, conserve energy and water, and improve the environmental health of the community. The goals are: (1) to establish a comprehensive multimedia P2 training program for trained community health educators; (2) to conduct a minimum of 900 business visits by promotoras that result in measurable P2 outcomes; (3) to conduct a minimum of 8 workshops that focus on industry-specific source reduction methods and help eliminate hazardous substances; and (4) to create community leaders in P2 and thereby strengthen the ability to make informed environmental health improvement choices and participate in long-term environmental health improvement efforts.



(front to back) CASA Promotoras and Binational Center Coordinator Rocio Estrella entering their training session on the UA campus.

The UA SBRP has partnered with SERI to expand SERI's Community Assist of Southern Arizona (CASA) program for businesses. CASA partners with neighborhoods to address economic, environmental, and health stress and helps reduce environmental risks to which the neighborhoods are exposed. CASA's primary focus is to help neighborhoods take steps to reduce those risks. However, over the past year, trained community health educators (promotoras) have been visiting businesses as well as conducting environmental assessments. The UA SBRP has been instrumental in the development of CASA by serving on their advisory board and providing technical expertise. Now with the P2 grant, the UA SBRP will provide training for the promotoras that will equip them to effectively conduct environmental prevention and source reduction strategies to the following:



Sonora Environmental Research Institute, Inc.



who we are
Researchers working hand-in-hand with communities on community driven issues +

what we do
Finding innovative solutions to environmental problems and new ways of thinking about our environmental future +

resources
Publications, reports, and brochures from our projects +

support us
pursuing research and projects through a variety of means including volunteers, interns, grants and your support +

contact us:
seri@seriaz.org
TEL: (520) 321-9488
FAX: (520) 321-9498

Sonora Environmental Research Institute, Inc. (SERI) is in no manner connected with Sonora Environmental LLC. Please do not contact us regarding this organization. We have no contact information for them.

SERI
P. O. Box 65782
Tucson, AZ 85728

OUR MAIN PROJECTS :::::

-  **RESEARCHING AIR TOXICS IN SOUTHERN ARIZONA**
-  **ANALYZING FOLK REMEDIES FOR HEAVY METALS**
-  **FINDING NEW USES FOR RECYCLABLES**
-  **HELPING COMMUNITIES WITH AIR QUALITY ISSUES**
-  **CASA (Community Assist of Southern Arizona)**

:: :: ::

EPA P2 Award
University of Arizona
Sonora Environmental Research Institute (SERI)

13

Tasks

Train Promotoras on Pollution Prevention

Develop Pollution Prevention Packets for Businesses

Conduct Business Visits

Implement Shade Tree Planting Program

Develop and hold workshops for businesses

Measure Output

Prepare Reports

POLLUTION PREVENTION ACT OF 1990

“...pollution should be prevented or reduced at the source whenever feasible...”

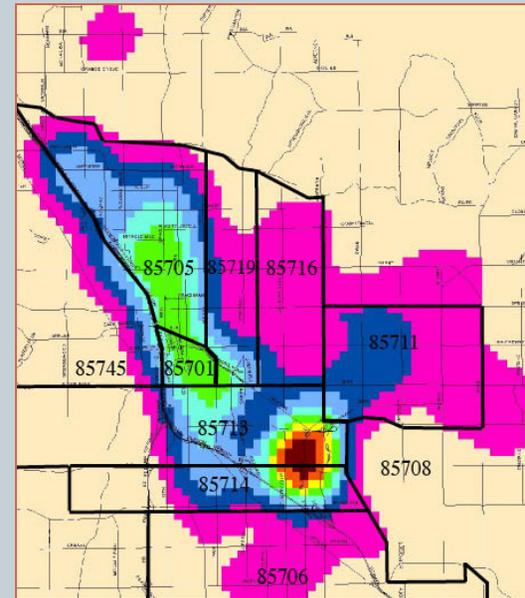


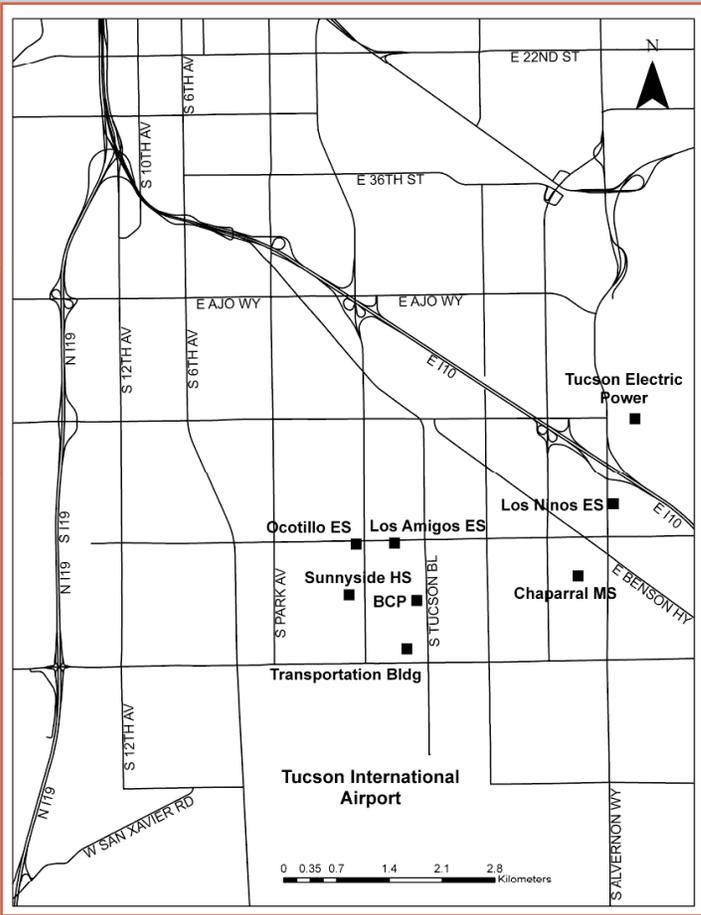
Figure 1: Hazard risk analysis based on chemical usage at facilities in Tucson, AZ (red = greatest risk).

EPA P2 Award

14

- **493 On-site Business Visits, including:**
 - 110 new business visits
 - 72 hair salons
 - 17 nail salons
 - 8 woodworking shops
 - 5 auto repair
 - 8 other
- **City of Tucson Green Business certification pilot program under development**
- **Shade Tree Planting Program**
 - 495 for the grant,
 - Tucson Clean and Beautiful provides trees at a discounted price
- **Hold 8 workshops for businesses**
 - Including workshop for beauty salon owners in Spanish

Pima County DEQ Beryllium Monitoring Network



Sunnyside Unified School District

16



- 17,000 students preK-12 in 22 schools
- 87.7% Hispanic

Presentations made to Sunnyside Unified School District

Richard Grimaldi

Deputy Director, Pima County Department of Environmental Quality

Dr. Eric Betterton

Head, Department of Atmospheric Sciences, University of Arizona

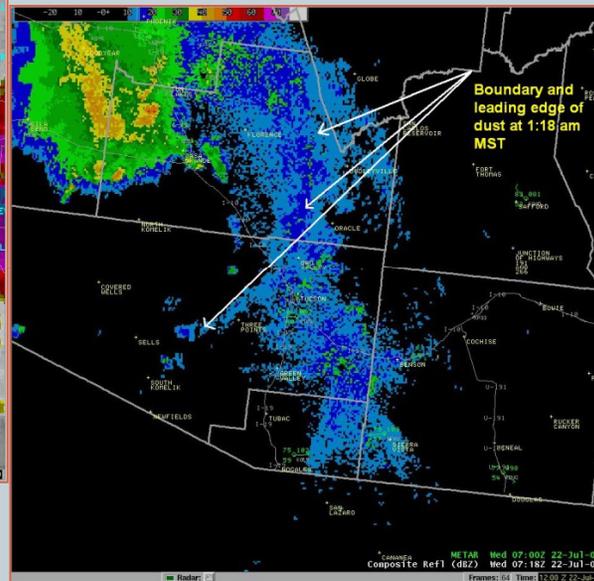
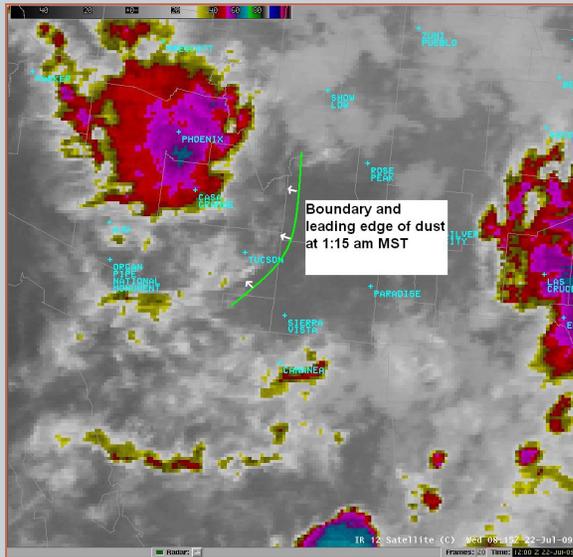
Ann Marie Wolf

President, Sonora Environmental Research Institute

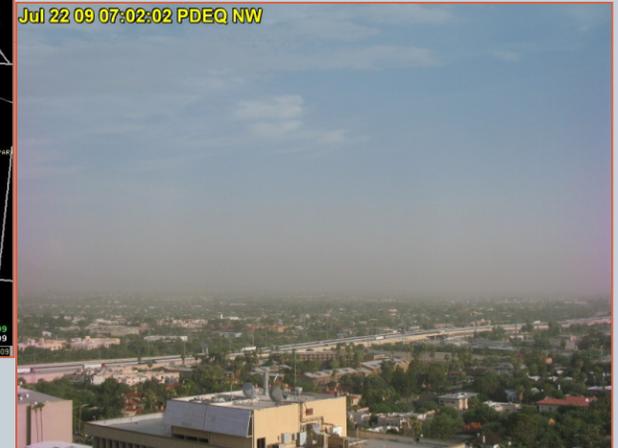
Pima County Board of Health

17

- **Wind Blown Dust Event - Beryllium**
Wednesday, July 22, 2009



Jul 22 09 07:02:02 PDEQ NW



P2/NASA/NIEHS Superfund

18

UA SBRP SUPPORTS PROMOTORA TRAININGS AT STATE AND COUNTY LABORATORIES

In response to the recently awarded US EPA Pollution Prevention Grant and NASA Spacegrant Fellowship recipient, Theresa Foley (advisor, Eric Betterton) the UA SBRP Research Translation and Community Outreach Coordinators, Monica Ramirez and Denise Moreno Ramirez have been providing technical and linguistic translation of the air monitoring practices and laboratory methodologies being used to determine the levels of airborne metals in the heavily industrial southside of metropolitan Tucson to *Promotoras* (community advocates).

Ms. Foley is analyzing the metals data and collaborates with UA SBRP Coordinators, Monica Ramirez and Denise Moreno Ramirez, to translate her results and observations into a scientifically digestible format that is culturally sensitive and relevant for Mexican and Mexican American Promotoras in Tucson. So far, together, we have conducted the following three bilingual trainings:

1. Introduction to National Air Monitoring Standards and the Air Monitoring Office, October 6, 2008.
2. Tour of Filter Weighing Lab: Description of Collection and Archival Monitoring Laboratory, November 21, 2008
3. Explanation of Air Filter and Metal Analysis, PDEQ Laboratory, M



Introduction to National Air Monitoring Standards and the Air Monitoring Station Mechanics and Function, SBRP Office



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Home
Our Program
News & Highlights
Professional & Community Information
Research Projects
Research Translation
Outreach to Mexico
SBRP Students Trainees
Personnel
Helpful Links

POWER TO THE PEOPLE: TRAINING PROMOTORAS IN THE CITY OF SOUTH TUCSON



Promotoras and their children arrive at The University of Arizona.

On April 19, 2008, The University of Arizona's (UA) U.S.-Mexico Binational Center and Superfund Basic Research Program (SBRP) team coordinated a "Fundamentals of Toxicology" workshop for the Community Assist of Southern Arizona community health advocates (promotoras). A total of 19 female promotoras and one male promoter ventured to the UA campus for this half-day training session. Dr. A. Jay Gandolfi and Dr. Mercedes Meza, taught the session while Ms. Rocio Estrella served as the event translator. To help facilitate the training, the promotoras were encouraged to bring their children. Science educational activities were provided by Flandreau Planetarium Science Center at the UA. Both Ms. Monica Ramirez and Ms. Denise Moreno Ramirez helped guide the children on their science exploratory activities.

The training objective was to increase the promotoras level of knowledge in toxicology and epidemiology from both the Mexican and American academic perspective. Dr. Gandolfi focused on the fundamentals of toxicology while Dr. Meza described epidemiological studies and provided a case study from

Pima County DEQ Beryllium Monitoring Network

19

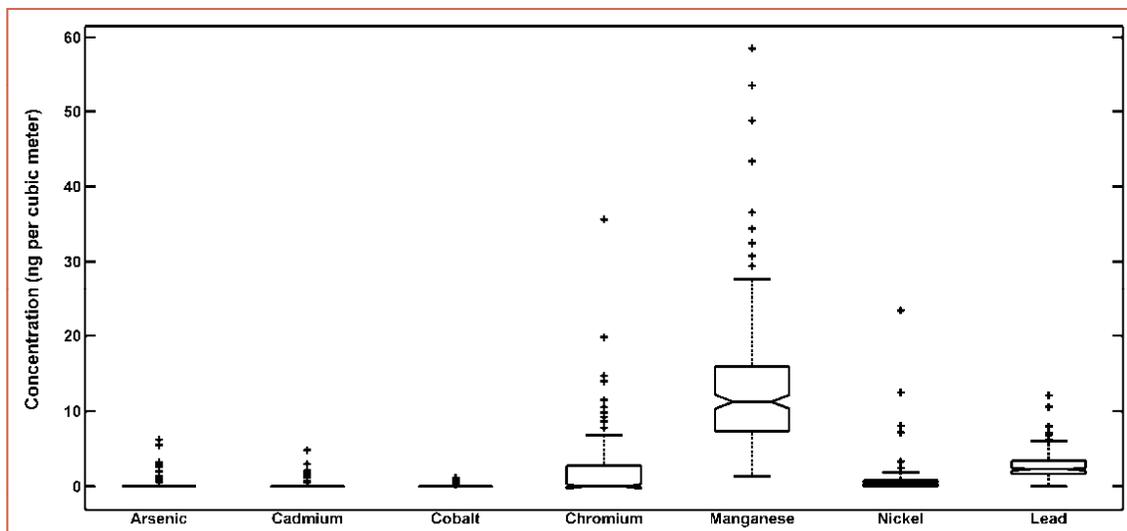


Figure 2: Box plot of metals found in PM_{10} collected in SUSD. The sampling period was from June 2, 2008 to September 1, 2009, and $n = 218$.

- **PM_{10} AND METAL CONCENTRATIONS IN THE SUNNYSIDE UNIFIED (SUSD) SCHOOL DISTRICT OF TUCSON, ARIZONA**
- Theresa Foley and Eric A. Betterton*, University of Arizona, Department of Atmospheric Sciences, 1118 E 4th St, PO Box 210081, Tucson, Arizona 85721-0081
- Ann Marie A. Wolf, Sonora Environmental Research Institute, Inc., P.O. Box 65782, Tucson, AZ 85728

Promotora Training - Asthma

20

UA SBRP AND BINATIONAL CENTER HOST ASTHMA AND ALLERGIES PROMOTORA TRAINING, CONDUCTED BY RENOWNED RESEARCHER, DR. FERNANDO MARTINEZ



Dr. Fernando Martinez with Tucson Promotoras.

The UA SBRP and U.S.-Mexico Binational Center for Environmental Sciences and Toxicology (Binational Center) hosted its third Promotora training entitled: "Asthma and Allergies" for the [Sonora Environmental Research Institute, Inc. \(SERI\)](#) community health advocates (Promotoras) at the St. Elizabeth of the Hungary Clinic in Tucson, Arizona on May 13, 2009. A total of 15 Promotoras participated in the training.

Dr. Fernando Martinez, Director, Arizona Respiratory Center and Interim Director, BIO5 Institute, conducted the training in Spanish

and provided an excellent introduction and overview regarding asthma and allergies, environmental triggers, genetic predispositions, intervention techniques and current research questions. Dr. Martinez' presentation was energetic and well received by the Promotoras. The presentation ended with a flurry of questions.



Dr. Fernando Martinez' listening to Palmira Henriquez, Environmental Health Promotora.



Promotoras using peak flow meters at the "Susceptibility Factors and Managing Asthma and Allergy" station.

To complement Dr. Martinez' presentation, Promotoras were guided through the "[Asthma and Allergy Museum Walk](#)". UA SBRP and Binational Center Coordinators (Rocio Estrella, Denise Moreno Ramirez and Monica Ramirez) worked collaboratively with the [UA Southwest Environmental Health Sciences Center's](#) Community Outreach and Education Program Director, [Marti Lindsey](#) to translate the museum walk into Spanish and facilitate the museum at the training. The interactive, hands-on, museum walk consisted of the following five stations: 1) "Know Your Lungs"; 2) "What is Asthma and Allergy?"; 3) "Indoor Allergens"; 4) "Outdoor Pollutants"; and 5) "Susceptibility Factors and Managing Asthma and Allergy".

Summary

Partnerships Arising from NIEHS Superfund

21

FEDERAL – EPA
STATE – ADEQ
COUNTY – PDEQ
CITY – TUCSON
SCHOOL DISTRICT – SUNNYSIDE
PRIVATE SECTOR – ASARCO
NOT FOR PROFIT – SERI