Final Report

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Fostering Binational Sustainability In the New Mexico-Chihuahua Border Region

Submitted by

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Cover Photo

Palomas science instructor Adrian Fernandez Almeda demonstrates how to build a home water filter using every day, low-cost materials.

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This report summarizes accomplishments of the project "Sustaining the Environment in the New Mexico-Chihuahua Border Region," conducted by the New Mexico Environment Department (NMED) in partnership with the New Mexico Water Resources Research Institute (WRRI) at New Mexico State University and contractors Claudia Laffont-Castañón of Ciudad Juárez, Chihuahua, and Allyson Siwik of Silver City, NM. The report provides sections on project background, objectives, limitations, approach, methods, a table of tasks and deliverables, discussion and recommendations. A section at the end lists additional tasks leveraged by the project principals.

Deliverables for each project task are described in the table of Tasks and Deliverables and provided in detail in the Attachments section.

Background

The project was initiated in response to environmental priorities identified by communities in the New Mexico-Chihuahua border region. Officials with the village of Columbus called for instruction on how to reduce household water consumption for the purpose of reducing their utility bills. Residents of Palomas lack good quality, household water and must walk or drive to one of three community taps and haul purified water to their homes. Citizens of Columbus, Palomas, Deming and Las Cruces suffer from seasonal high wind events that compromise air quality, reduce visibility and raise questions about impacts to respiratory health. These and other issues are addressed in this report.

Water

More than 1,600 households in Luna County lack access to municipal sewer treatment. Most of these homes rely on septic systems. As a rule, septic wastewater systems pose little or no threat to groundwater. However, a system placed over a shallow water table or several systems crowded within a small area can pose a risk to groundwater quality. In 2010, the New Mexico Water Quality Control Commission stated, "Nonpoint sources of ground water pollution are predominantly household septic tanks or cesspools and are the major sources of contamination of New Mexico's ground water."[1] To address this risk, project partners conducted a series of

[1] *2012-2014 State of New Mexico Clean Water Act δ303(d) / δ305(b) Integrated Report, Water Quality Control Commission, p. ix. Approved March 13, 2012.*

septic system maintenance and decommissioning workshops that demonstrated low-cost tips for extending the life of a septic system and provided guidance in how to decommission a system for connection to a nearby sewer line. Written materials leveraged from earlier Border Program projects were adapted to focus on issues relevant to Luna County, including the need to understand state regulations for minimum home lot size for installing a new septic (0.75 acre) and the terms for meeting requirements to become an authorized state septic installer. This last issue was deemed a special problem in Luna County, where residents have complained of threats by unauthorized individuals who allegedly extort elderly homeowners into purchasing costly new septic systems.

A second issue concerned requests from elected officials in Columbus, NM, for an educational workshop on how to reduce household water consumption for the purpose of reducing rising water bills. The higher monthly bills are the result of increased operating costs to support the Village's reverse osmosis (RO) water treatment system. The system was commissioned in April 2008 to meet federal environmental standards for the naturally occurring fluoride and arsenic found in high concentrations in the Village's well water. Since that time, more than 5% of households -- some with school-age children -- have faced cut off of water supplies from the inability to pay their monthly bills. Based on these circumstances, the project partners conducted a half-day household water conservation workshop, demonstrating methods for reducing water consumption, reusing supplies, finding plumbing leaks and showing how to repair leaks. At the request of former Columbus Mayor Nicole Lawson, the project partners provided educational games and entertainment for school-age children at the Columbus Fire Station so parents could attend the half-day workshop.

In Palomas, residents there lack good-quality, household tap water. For higher-quality domestic supplies, residents must walk or drive to one of three community taps and haul water in containers or drums to their homes. In March 2014, the city's water utility began charging five pesos per five-gallon container to cover the high cost of maintaining the three community purification taps. The five-peso charge, although small by some standards, adds one more obstacle to the daily task of hauling water. To address this issue, the project partners provided a demonstration to Palomas *promotoras* (community health workers) and public school science teachers, showing how to make a simple, low-cost home water filter. The home filter will allow access to improved water quality for those who cannot haul water or who are unable to afford the five-peso charge.

Air Quality

Citizens of Columbus, Palomas, Deming, Las Cruces and other communities suffer from seasonal high wind events that compromise air quality, reduce visibility and raise questions about air quality impact on respiratory health. In the more rural areas, limited attention to local infrastructure such as cattle yards and unpaved roads generates unhealthy quantities of airborne dust and sand. Health impacts from long-term exposure pose a concern to regional residents and have been identified as a regional priority by the Border Program's Air Policy Forum air monitoring subcommittee. Based on these issues, participants of the regional NM-

Chihuahua Rural Task Force requested that project partners finalize system and maintenance plans, still in draft in both English and Spanish, for potential long-term monitoring of air quality in the Columbus-Palomas region.

On the Mexican side of the border, project partner and Border 2020 Tri-State Environmental Education Task Force Co-leader Claudia Laffont-Castañón identified a lack of knowledge of air contamination and the impact on human health as a priority issue among poorer communities on the outskirts of Ciudad Juárez. As a consequence, project partner Laffont was tasked with delivering presentations on the health impacts of air contamination. Venues for distributing written information included annual environmental festivals held in Palomas, Ascensión and Janos.

Environmental Health

A recent study by the New Mexico Office of Border Health titled "Assessment of Land-based Sources of Air Quality Contaminants in the Binational Border Region of Southwestern New Mexico, Northwestern Chihuahua, and West Texas" identified the specific chemical components of blowing particles found during seasonal wind and dust storms. Presenting the findings from this study was deemed a priority by the New Mexico Office of Border Health and was identified as a priority initiative of the New Mexico-Chihuahua Rural Task Force. Project partners scheduled public events in Columbus and Palomas as forum for public presentation of this study and its findings.

Objectives

This project addressed its major objectives:

- Reduce the risk of groundwater contamination in Luna County, NM, by reducing the risk of septic failures and overflows in targeted, low-income communities.
- Reduce household water bills in Columbus, NM, by improved understanding by residents of household water consumption and conservation methods.
- Demonstrate use of household water filters for residents of Palomas, Chihuahua, for possible adoption in homes and public buildings, especially targeted to those with limited access to the community's purified water taps.
- Finalize a system and maintenance plan for long-term monitoring of air quality in the Columbus-Palomas region.
- Increase public awareness in southern New Mexico and northern Chihuahua of health risks associated with exposure to land-based sources of airborne contaminants.

In addition to these objectives, the project met an indirect objective of the EPA-SEMARNAT U.S.-Mexico Border Environmental Program by enhancing the dialogue among regional participants and stakeholders in the New Mexico-Chihuahua border region.

Limitations

As noted in the project's quarterly reports, bureaucratic holdups at the start of the project caused a four- to five-month delay in initiating most of the project's tasks. As a result, project

partners were pressed into completing many tasks in the final months of the project period. NMED's PI, Mary Rose, hopes to address this issue in the future by initiating paperwork earlier in the project period, allowing adequate time to complete each border activity.

Approach

This project's overall goal was to serve as a catalyst for improving the natural environmental and public health in the New Mexico-Chihuahua border region. To accomplish this, NMED and its project team continued to build upon a series of successful projects, using community collaboration and based on a practical, resource-leveraged approach.

Methods

This project funded a series of tasks that, upon completion, successfully addressed priority issues of the New Mexico-Chihuahua border region. Activities used included organizing education workshops, providing demonstrations and presentations; administering before-and-after evaluations; and enlisting written feedback from participants. Methods for this project relied on leveraging the institutional resources of project team members. Guidance and support were provided by the faculty and staff of NMSU and the environmental professionals employed by NMED. Other resources included community leaders from Deming, Columbus and Palomas. The project partners sincerely thank the following individuals for their help and guidance:

- Nicole Lawson, former Mayor, Columbus
- Phil Skinner, Mayor, Columbus
- Rick McInturff, City Manager (now retired), Deming
- Michael Montoya, Liquid Waste Specialist, NMED District III, Las Cruces
- Cynthia Owens, Environmental Scientist, NMED District III Environmental Scientist, Deming
- Cristina Acosta, Office Manager, NMED District III, Deming
- Carol Felsing, Luna County Ranchette Owners Association, Luna County
- Connie Maag, Principal, Ruben S. Torres Elementary School, Deming
- Peter and Polly Edmunds, Border Partners nonprofit, Palomas
- Robert Gomez, Public Works Director, Columbus
- Marisol Guillen, Border Partners nonprofit, Palomas
- Ing. Roman Alvidrez Pernado, Water Utility Director, Palomas
- Dr. David DuBois, New Mexico State Climatologist, NMSU
- Dr. Shuguang Deng, Professor, Department of Chemical Engineering, NMSU

In addition to these individuals, Border Partners' Samuel Muñoz H. tended to the metered water filter that project partners attached to the garden hose at the Palomas community garden. The filter was used to improve the final design of the household filter adopted by the community.

Tasks and Deliverables

Tasks	Deliverables
Water Issues	
Plan, organize and conduct workshops for low-income communities in Luna County to demonstrate low-cost septic maintenance and best practices for decommissioning of systems; develop or revise existing written materials (English and Spanish) for distribution and posting in public locations; conduct pre- and post-workshop evaluations to measure knowledge improvement of septic system operations and familiarity with state septic regulations.	Sixty-nine (69) participants attended six workshops; 44 posters and 220 brochures distributed in English and Spanish (of the total 40 brochures were distributed in Spanish); the workshops accounted for 4.3% of the total estimated 1,600 onsite septic owners (by another count, 10.3% of known permitted systems) in Luna County; participant evaluations conducted both before and after the workshops identified an average 70.2% overall improvement in participant understanding of septic operations and knowledge of septic system regulations (See Attachments Section for evaluation results by individual workshop).
Half-day workshop on residential water conservation methods for 50-70 households in Columbus	Participants gave workshop speakers and their presentations an 84.8% overall approval rating; more significantly, the Columbus water utility reports an overall 3.5% reduction in individual household water bills measured from August 2013 through March 2014 (See the Discussion section and documents in the Attachments section for more information on this finding); the reduction in water consumption is estimated to have saved 309,623 gallons (0.95 acre feet) of treated municipal water.
Presentation to Palomas officials and residents of home filter for removal of contaminants specific to the region's municipal groundwater. Pilot project to determine community acceptance of these in-home water filter.	Project members found the home water filters were accepted by Palomas *promotoras* and, significantly, were adopted for use by Palomas public school science teachers Adrian Fernandez Almeda, José Luis Casada M., and Juan Esqueval. The teachers scheduled their own workshop at the Border Partners building in Palomas to demonstrate to other community members how to assemble the filters (See photos in Attachments section). It seems possible that adoption of these simple, low-cost water filters will continue in Palomas; based on earlier research, household use of the filters is estimated to reduce fluoride concentrations in home tap water by 90% and reduce arsenic by a minimum of 20-30%. (See Recommendations section of this report regarding follow-up to this effort.)
Air Quality Issues	
Develop Air Quality Monitoring Needs Assessment for the NM-Chihuahua Rural Task Force region and finalize a borderwide air	The Rural Task Force successfully completed this task. The written assessment and plan were submitted to Task Force members during meetings held in Columbus and Palomas on Nov. 12 and 14. In addition, former Task Force co-leader Allyson Siwik agreed to work

quality needs assessment and recommendations for the Border 2020 Air Policy Forum.	with the NM State Climatologist, Dr. David Dubois, to finalize his study on air quality monitoring and training needs and a plan for long-term air monitoring in the Columbus-Palomas region. The documents can be found in the Attachments section of this report.
Environmental Health	
Six presentations at events in northern Chihuahua and distribution of written materials highlighting public health risks of exposure to airborne contaminants.	Project partner Claudia Laffont, co-leader of Border 2020's Tri-State Environmental Education Task Force, conducted presentations on "El polvo, precauciones y riesgos para la salud" at three low-income neighborhoods on the outskirts of Ciudad Juárez. The neighborhoods are characterized by families with young children living on dusty, unpaved streets. The first workshop was held Feb. 20, 2014, at the Colegio México Libre at kilometer 27 on the Pan American Highway, south of Juárez. A second set of workshops were conducted Feb. 28 and March 7, 2014, at the Centro Educativo Multicultura Yermo y Parres, A.C. (CEMYP), located in the city's southern zone. Another workshop was held March 7, 2014, at the Biblioteca Miguel Lerdo de Tejada in the Centro Comunitario Felipe Ángeles "El Retiro" on the west side of Juárez. Fifty-six participants attended the workshops. Evaluations conducted before and after the workshops measured an 88.9% overall improvement in knowledge of health risks associated with airborne particulates (See Attachments section for details of individual presentations). Additional environmental health information was distributed during three environmental fairs held in Palomas, Ascensión and Janos (See photos in Attachments sections).
Written report and online data map in English and Spanish, tracking contaminant concentrations in municipal and public monitoring wells near the Columbus-Palomas cattle crossing; introduction of best practices by enforcement officials for mitigating blowing dust and manure.	During the course of this project, the city of Las Cruces adopted a new soil erosion/dust control ordinance to better enforce containment of blowing soils during large-scale land development. A copy of this ordinance can be found in the Attachments section. A related project at NMSU identified that cracked pecan shells, available free of charge during harvest season, provide the best low-cost, short-term mitigation of dry or eroded soils. Commercial applications, such as Gorilla Glue, were identified as providing better long-term mitigation, but at a higher cost (See presentation with results of NMSU student land-application project in Attachments). Reports to project partners of water well contamination from the Columbus cattle crossing proved inaccurate. Nevertheless, project partners determined it was important to address the project deliverable and prepared a brochure (in English and Spanish) on Blue Baby syndrome, a known health effect of groundwater contamination from cattle and feed yards. The brochures were distributed during environmental fairs in Chihuahua and during septic workshops in New Mexico (See Attachments section for brochure).

U.S.-Mexico Border Environmental Program	
Coordination and identification of U.S. co-leaders for the Border 2020 NM-Chihuahua Rural and Environmental Education task forces.	Two meetings of the NM-Chih Rural Task Force were held Nov. 12 and 14 in Columbus and Palomas, respectively, with a total 42 in attendance. EPA identified UTEP's Dr. Patricia Juarez as the new U.S. co-leader of the regional Environmental Education Task Force. No co-leader has been identified as yet for the NM-Chihuahua Rural Task Force.

Discussion

Several issues arose during the course of this project that merit discussion. During the septic workshops, several septic owners cited a problem with a "particular individual" who threatened to stop the sale of their homes if they did not hire him to dig up their old systems and install a new one at a cost of more than $7,000. This individual was cited by real estate professionals at Sun City Realtors in Deming as "aggressive," and Sun City was forced to alert Deming police when the individual at one time entered their office. Once this issue was identified, project partners redefined requirements for the septic presentations. PowerPoint slides were included in the presentations to highlight the state's requirements for qualification as an "authorized" septic installer. As follow-up to this project, new septic system brochures are proposed in the future for Luna County's NMED office to describe in English and Spanish the state regulations for qualification as an authorized installer.

During the course of this project, project partners also learned of the need to assist certain remote communities in Luna County where homeowners have built their own homes and dug their own septic systems. These systems were installed without proper permitting, and many homeowners in these areas neglected to obtain the necessary self-installer permit prior to completing their septic systems. These issues – unauthorized septic installers and homeowner failure to obtain the necessary self-installer permit - highlight environmental concerns relevant to Luna County that may require additional attention in the future.

Project partners planned, organized and conducted a half-day workshop in Columbus to demonstrate household water conservation methods, how to repair leaky faucets and pipes, and how to understand water utility rates for the purpose of finding out which methods work best for reducing monthly bills. This effort proved especially popular with Columbus residents. Project partner Erin Ward of WRRI received several phone calls to email workshop materials. She also received requests for more information on household water conservation. A list of telephone messages from Columbus residents and their requests is included in the Attachments section.

Recommendations

In many respect, this border project was a continuation of earlier efforts. The project leveraged materials from earlier border projects, updating and modifying the information to address the

specific needs of the current project. This approach – leveraging resources from earlier efforts -- has reduced direct costs for EPA-SEMARNAT border projects and provided updates and improvements to important educational materials and resources. NMED recommends that a focus on leveraging resources continue to drive strategies for successful completion of future Border 2020 efforts.

The Palomas filter design proved successful in lowering fluoride and arsenic concentrations from groundwater pumped from Palomas' municipal wells. The homemade devices function much like the Brita filters sold in the United States and Europe, but target the specific contaminants found in Columbus-Palomas groundwater supplies. Project partners recommend a second, targeted project to further test the filters and to determine the full extent of contaminant removal and compare several filter shapes and sizes to identify the most efficient design for removal of contaminants from Palomas well water.

In addition, an initial project objective to file a grant application to cover the cost of constructing future household water filters for the Palomas community was found unnecessary. With encouragement from the Border Partners nonprofit, the Palomas community has adopted the NMSU filter. Community leaders are conducting their own workshops to show other residents how to build these simple water filters. Construction of the filters is ongoing and is now under discussion as part of the curriculum for the Palomas schools (See photos in the Attachments Section of this report). With this level of acceptance, the project team proposes instead to help the community identify funding to cover the cost of purchasing the filters' required activated alumina, a low-cost material when purchased in bulk but difficult to find locally.

Project partners recommend a continued focus on water conservation education in the Columbus-Palomas region. The topic remains relevant for both communities as Columbus continues to charge high rates to residents to cover the cost of its RO treatment system and Palomas continues to charge residents for water purification at its community taps.

During the course of this project, air quality monitors in Columbus were removed by NMED. This change in monitoring altered enthusiasm for the project's air quality activities. Project partners recommend a return to air monitoring in the region, if only for research or educational purposes.

According to former Columbus Mayor Nicole Lawson, recent monitoring at municipal well sites in Luna County identified the presence of contaminants in groundwater near the location of a community septic lagoon and not far from the border cattle crossing, a federal livestock port-of-entry. Initial project activities included attention to the mayor's request for water quality mapping of wells sites in the Columbus area. However, a follow up with NMED staff found the mayor's information to be incorrect. The partners recommend that future activities be driven by proven or confirmed environmental information.

ATTACHMENTS

This section includes:

Summary of Septic Maintenance Workshops

- Example of postcard invitations
- Press release from the Luna County Ranchette Owners Association
- Workshop PowerPoint slides (English and Spanish)
- Brochures (English and Spanish)
- Database with participant names, contact information, gender and ethnicity, pre- and post-workshop evaluations, written comments and summary calculations of knowledge improvement for all workshop participants
- Workshop brochure (English and Spanish)

Summary of half-day Columbus, NM, Household Water Conservation Workshop

- News Release from NMED
- Workshop flyers (English and Spanish)
- Flyers for children's events at Columbus Fire Station
- Example of Water Bingo game, an activity sponsored at the Fire Station
- Photos of firefighters and volunteers who provided water games and other activities at the Columbus Fire Station for children of parents who attended the Columbus workshop
- Workshop agenda (English and Spanish)
- Workshop sign-in sheet
- Workshop presentations
- Workshop evaluations and participant comments
- List of requests made for more information

Summary of Palomas, Chihuahua, Home Water Filter Demonstration

- Brochure describing how to assembly the NMSU home water filter
- Photo of first prototype of home water filter
- Photos of filter attached to water meter at Palomas community garden
- Photo of NMSU Chemical Engineering student Joshua Gomez demonstrating how to assembly a simple faucet filter
- Photos of community workshops sponsored by Palomas science teachers showing other residents how to assemble a household water filter

Deliverables from air quality tasks

- Air Monitoring Needs and Recommendations for New Mexico-Chihuahua Rural Task Force (Final)
- Border 2012 (original) Air Policy Forum Air Monitoring Needs Assesment (borderwide)
- Final Report to the Border 2020 Air Policy Forum on Border Air Quality Monitoring Needs, April 2014
- Overview of the Spring 2012 Columbus and Palomas Dust Study (English and Spanish)
- Columbus/Palomas Aerosol Saturation Study: Final Report
- Procedimiento Estándar de Operación para Muestreador Minivol para PM10 de Airmetrics

Summary and deliverables of environmental education tasks

- Border 2020 Reporte Final del Proyecto para NMSU (Lic. Claudia Laffont Castañón)
  - Informe
  - Participantes
  - Evaluaciones
  - Fotos
- "Dust Control in the Mesilla Valley" (presentation by NMSU graduate student Elizabeth Smith)
- Información sobre la enfermedad de los niños azules (flyer)