Measurable Outcomes of a Woodstove Changeout on the Nez Perce Reservation
Final Performance Report
Funded as Part of EPA Grant TX-96079501-0
December 31, 2009

"Measurable Outcomes of a Woodstove Changeout on the Nez Perce Reservation," a collaborative project between the Nez Perce Tribe (NPT) Environmental Restoration and Waste Management Division (ERWM), Air Quality Program, and the University of Montana – Missoula, Center for Environmental Health Sciences (UM-CEHS), was implemented from Fall 2006 through 2009. The project, funded through a grant from EPA, sampled indoor air quality in 16 tribal member homes and supplied each home with an EPA-certified stove.

There was a myriad of successes and challenges of implementing this project on the Nez Perce Reservation. This report will be broken into three categories: Successes and Benefits, Challenges, and Lessons Learned and Recommendations.

SUCCESSES AND BENEFITS

Successes and benefits were achieved in the following areas:

- Student Interns
- Woodstove Changeout
- Outreach and Education
- Collaboration and Partnerships

Student Interns

Over the course of the project, three tribal student interns (Tuiaana Moliga, Kayla Warden, and Angela Knox) were responsible for conducting air sampling in the homes. All were students at the Nez Perce Tribe Distance Learning Center of Northwest Indian College. It is of note that Kayla Warden entered the project as a senior at Kamiah High School and continued on as a college student. Their positions were funded by the EPA Woodstove Changeout grant and the Institute for Tribal Environmental Professionals' Short Internship Program.

There were enormous benefits of working with students not only for their assistance in completion of the project, but what they learned and achieved through their participation. Below were some of the benefits:

- Gaining Science Skills: Students were able to gain invaluable science skills through trainings and hands-on experience. They increased their knowledge by learning about and using air sampling equipment and scientific procedures. They gained first hand experience of research techniques when calibrating, cleaning, and programming scientific equipment. They learned the value of organization and detailed recording keeping.
- Interaction with University Researchers and Air Quality Professionals: Through trainings, conference calls, and meetings, students had much interaction with science and air quality professionals. Dr. Tony Ward and Carolyn Hester from the University of Montana introduced students to studying air quality and led trainings on equipment for measuring PM2.5 and chemical markers of wood smoke. In addition to air, students learned about health issues related to home environments. Curtis Noonan (University of Montana) discussed respiratory illnesses and equipment for breathing measurements. Both UM and ERWM staff worked with the interns to troubleshoot equipment problems, discuss air quality issues, review data, and provide overall professional guidance. It is of note that publications of the report include their name as co-authors. This is quite an honor for young students.

- Public Speaking Skills: Through working with homeowners and developing presentations, interns gained public speaking and outreach/education skills. Interns worked directly with homeowners to schedule visits and go over paperwork the homeowner needed to record during the sampling periods. They also created presentations and communicated information about the project to the public. Kayla Warden used her role in the project to fulfill her high school senior project requirement. She presented information to a panel of school employees and to her community during an open house. Tuiaana Moliga created a poster about the project and presented with ERWM staff during presentations at conferences.

Woodstove Changeout

After baseline sampling was completed, a woodstove changeout occurred in each community. In October 2007, five homes received their new, EPA-certified stove, and another 11 homes received theirs in March 2008. Below were some of the benefits of the changeout:

- Improved Indoor and Ambient Air Quality: Through completion of the project, results show that the changeout improved indoor air quality with a 52% reduction of $PM_{2.5}$ and 63% reduction of levoglocusan. Although ambient $PM_{2.5}$ levels vary widely by season in Lapwai and Kamiah, and our results show that ambient levels had an insignificant influence on indoor air, EPA estimates that "20 old, non-EPA-certified wood stoves can emit more than 1 ton of fine particles into your area during the cold months of the year" (U.S. EPA www.epa.gov/woodstoves). Our changeout reduced particle levels in two communities.
- Pre-changeout "burn off": Prior to the new stoves being installed in the homes, we worked with the installer to have the stoves "burned off." The stoves were filled with wood and burned outdoors for at least 8 hours. We learned from Tony Basabe, Swinomish Tribe, that homes become saturated with chemicals during the first burn in their house. We avoided that problem. Even with the burn-off, we also recommended that homeowners open all the windows and doors in their home during the first burn.
- EPA-Certified Stoves and Attachments: 16 tribal homes received new EPA-certified stoves, new piping and flashing, and a stove thermometer. Homes lacking hearth pads also received those.
- Installation Inspection and Training: Following the changeout, Jerry Marquez, who worked with the Libby, MT changeout, inspected each stove installation. Rich Prill, Washington State University Extension Energy Program, also assisted with the inspection of the first five homes that received their new stove. If corrections needed to be made, we worked with the installer to make the necessary changes. During his visit, Mr. Marquez also spoke with each homeowner about their new stove and how to operate it correctly.
- Old Stoves Recycled: After the changeout, the installer hauled the old stoves to a recycling facility. They supplied us with receipts from the recycler. EPA suggests recycling old, polluting stoves so they don't make their way back into the community.

Outreach and Education

A main goal of the project was to promote awareness of air quality issues with the public and within each participating home. Throughout the project, and through a variety of outreach and education avenues, we provided educational information and materials covering the following areas: health effects of wood smoke, optimal operation of wood stoves, asthma, smoking, and indoor air quality.

- Recruitment and Information Sharing: Beginning with the recruitment process for the project, we shared information about woodsmoke and health (EPA and Environment Canada materials). We received about 40 applications for the project along with over 20 inquiry calls. Even after the participant homes were selected, we continued to receive interest. Below is a list of the office

work, media outlets, and community events along with meeting/conferences we used to disseminate information;

- Office
  - Sent letters to homes with woodstoves from lists shared by NPT Housing Authority and NPT Wood Delivery Program. Letters contained applications and wood smoke and health information.
  - Answered questions via phone, email, and in person about the project and about woodstoves. For homes that didn't qualify, we shared other opportunities for obtaining a new stove, such as USDA grants and loans. We also provided wood smoke and health information.
- Media
  - Interview on local news station, KLEW, on the show Northwest Morning with Margo Aragon
  - Lewiston Morning Tribune article
  - Nez Perce Tribe employee/community email listserv
  - Nez Perce Tribal Newspaper, Tac' Tito'oqan, articles & information notices
  - Church bulletins/ information notices, discussions with pastors
  - Posters with applications in Lapwai and Kamiah Nimiipuu Health Clinic buildings
  - Other publications: EPA's Air Toxics News and ITEP's EEOP Newsletter
- Presentations/Community Events
  - Presentation to Nimiipuu Health Clinic staff
  - Presentation to Lewis Clark Valley Air Quality Advisory Commission
  - Presentation/booth during Kamiah High School Open House (Kayla Warden)
  - Presentation to Lapwai High School Biology classes
  - Presentation to Kamiah High School Environmental Technology class
  - Booth at NPT General Council Meetings
  - Booth at NPT Housing Authority Home Fairs
  - Booth at Talmaks Community Camp
  - Booth at Senior Wellness Fair
  - Booth at Nimipuu Health Fairs in Lapwai, Kamiah, and Orofino
  - Booth at NW Area Indian Health Board Meeting
- Meetings/Conferences
  - EPA Woodsmoke Workshop; Reno, NV, March 2007
  - Big Sky Symposium; Missoula MT, May 2007 (Tuiaana Moliga)
  - EPA Region 10 Tribal Leaders Summit; Shelton, WA, April 2008
  - EPA Region 10 Woodstove Call; April 2008
  - Alaska Tribal Air Workgroup Call; April 2008
  - National Tribal Forum on Air Quality; Las Vegas, NV, June 2008
  - National Tribal Conference on Environmental Management; Billings, MT, June 2008
  - EPA Region 10 Air Toxics Summit; Boise, ID, August 2008
  - EPA Region 10 Tribal Leaders Summit; Lewiston, ID, September 2009
  - Healthy Homes Conference, Boise, ID, September 2009
  - Alaska Tribal Conference on Environmental Management, Anchorage, AK, November 2009

- Participant Homes: Throughout the project, we shared information and answered questions from homeowners. After the installation of their new stove, Jerry Marquez trained homeowners on their new stove and best burning practices. Each home was provided with a packet of information containing a DVD on burning, wood smoke information, asthma information, materials for kids, and manual for their new stove.

After initial post-changeout levels were high at a few homes, we returned to each home to provide a "new stove refresher" on operating the new stove. We met with homeowners to show an Environment Canada film on burning techniques. The film reviewed building small, hot fires and seasoning wood. In addition, each home received a specific, step-by-step protocol on how to use their new stove. Following the "refresher," additional post-changeout samples were taken and levels dropped showing that additional education was successful.

Collaboration and Partnerships

Multi-faceted partnerships were created during this project. Various offices within the Nez Perce Tribe and other tribes and agencies shared information and resources that were useful to our project. Below were our partners:

- EPA
- University of Montana
- Northwest Indian College, Nez Perce Tribe Distance Learning Centers
- Institute for Tribal Environmental Professionals
- Washington State University Extension Energy Program
- Swinomish Tribe
- Nimiipuu Health
- Nez Perce Tribe Housing Authority
- Nez Perce Tribe Forestry & Fire Division
- Nez Perce Tribe Safety Program

Of specific note is the high level of communication that occurred between our office and the University of Montana. This contributed to the success of this collaborative project. UM staff is extremely committed to their work and highly supportive of ERWM staff. Weekly phone calls and email exchanges covered trouble-shooting equipment issues, project suggestions, and changeout and installation details.

CHALLENGES

As with any project there were also a few challenges in implementation. Below were some of the challenges:

- Sampling equipment malfunctions: A few of the Leland pumps stopped working during the study, either the pump itself or the power cords were faulty, which caused delays in sampling.
- Distance to Kamiah from Lapwai: Tribal offices are located in Lapwai. The drive to Kamiah is about 1 ½ hours. During the inclement winter weather, driving to homes in the evening when children were home was challenging. Also supervising an intern without having the opportunity to check-in daily or in person was challenging; only so much can be communicated over the phone and email. As the project progressed, we met in-person regularly.
- Working with homeowners: Balancing the schedules between the intern and the homeowner presented a number of challenges. Many times interns went to scheduled meeting times but the participant did not show-up, so sampling would have to be rescheduled. Another challenge was that sometimes homeowners did not complete their home activity or woodstove usage logs. This presented problems during data analysis when attempting to identify spikes in the particle levels. The last challenge which happened over the course of the study was quickly finding new participants when four homes withdrew from the study for various reasons such as moving.
- Woodstove installer: Through the University of Montana bidding process a woodstove business in Missoula was awarded the installation work. The distance of 200 miles between Missoula and the Nez Perce Reservation presented a few challenges to the project. One issue was that when the

nd round of installations had to be delayed two months due to snow. Multiple avalanches closed Highway 12 to Montana, and the installer was not willing to drive a different route. Overall, the installer did not seem as vested in the project as we expected them to be, perhaps because they were not a local retailer/installer. For example, Jerry Marquez in his installation inspections found areas that needed to be corrected. The installer was not pleased that they had to return to some homes and initially wanted extra payment to fix their mistakes. We spent significant additional time working these needed fixes out with Jerry Marquez, UM, the homeowner, and the installer. Ultimately, UM's contract with the installer insured that the appropriate corrections were completed at no extra cost to the NPT project.

LESSONS LEARNED AND RECOMMENDATIONS

In implementing this project, we learned numerous lessons. The areas in which we gained information will assist us with any future projects, and also may be of interest to others conducting woodstove changeouts.

- Targeted education and outreach: A critical component of the overall success of the program was working with homeowners to ensure their mastery of their new stove's operation. As some homes' post-changeout measurements showed an increase in $PM_{2.5}$ levels, we learned the manner in which to share information on new stoves:
    - Homeowners need to be given specific instructions on how to operate their new stove, and additional visits to the home may be needed to ensure that the residents learn best burn practices for their new stoves.
    - Directions need to be clearly spoken and written down, and reviewed in detail with the homeowner during visits.
    - Homeowners need more information about seasoning wood and yearly chimney cleaning.
    - Overall, providing too much educational material can overwhelm a homeowner. We learned it is better to discuss the most important topics with homeowners rather than briefly reviewing materials and leaving a packet of information.
    - In future changeouts, have a mandatory meeting for participants to show a video on best burning practices and wood storage, and provide handouts with directions on their new stove. After installation of the new stoves, follow-up with each participant at their home.
- Local woodstove installer: If possible, purchase stoves from a business in the local area. Local businesses are typically more vested in their communities and are located within closer proximity to changeout homes. They are, therefore, more accessible if problems arise and additional materials are needed. Also, have a written agreement or include in the installation contract that new stoves will be "burned off" pre-change out and old stoves will be hauled to a recycler. Although our installer agreed to do these tasks, they could have refused later since the tasks were not included in the contract.
- Homeowner agreement: Either through making it a participation requirement or through a written agreement, make it clear that a home's old stove will be removed and recycled. Before receiving their new stove, a few homeowners were hesitant about relinquishing their old stove.
- Continue working with the University of Montana: The UM staff working on this project were extremely committed, truly cared about the homes and air quality, and worked very well with ERWM Air Quality staff. Work between a university and a tribe can often become difficult, with the university tending to conduct itself in a patronizing or capitalizing manner. This was not the case on our woodstove changeout project. Because of the partnerships created and the overall

****

In conclusion, the ERWM Air Quality Program experienced many successes and several challenges during the "Measurable Outcomes of a Woodstove Changeout on the Nez Perce Reservation" grant project. We greatly appreciate having received funding from EPA to support the study and changeout of 16 non-certified woodstoves to improve air quality and health for Nez Perce Reservations residents. With what we learned during this project, we will continue to look for resources and funding to support additional changeouts in homes on the reservation with the goal of ensuring all woodstove homes have an EPA-certified stove in the future.