IAQ Efforts on the Nez Perce Reservation

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Overview

- Nez Perce Reservation
- General IAQ Outreach and Education
- IAQ Assessments of Nez Perce Tribal Administrative Buildings
- Woodstove Study and Changeout
- Air Toxics and Health on the Nez Perce Reservation
Remote Sensing Image

General IAQ Outreach and Education
- Community events
- Presentations
- Newspaper articles

9/13/2009
IAQ Assessments

- 49 assessments (including reassessments)
- Sampled for CO₂ and PM
  - Some buildings for temperature, RH, moisture levels, and pressure
- Building Considerations
  - Type/Design, Age, and Condition
- Common Problem Areas
  - HVAC/thermostats, gutters, crawlspaces
  - Older buildings: carpet, lead, asbestos, water leaks, attics

Challenges

- Communication & Information Sharing
- Staff and Funding
- NPT Maintenance concerns

Outcomes/Successes

- Capacity building
- IAQ awareness in the workplace
- Building assessments
- Reference resource of IAQ reports
- Remediation loan in 2005
- Overall maintenance changes
- Building improvements
Building Improvements

Building 1

Building 2

Woodstove Study & Changeout

- 16 participating households
  - Used old woodstove as primary source of heat
  - Non-smoking, tribal member homes in Kamiah and Lapwai
  - Asthmatic child between ages of 6 and 17
- Sampling before/after changeout
  - Ambient PM$_{2.5}$ mass
  - Indoor PM$_{2.5}$ levels and chemical markers of woodsmoke
- Woodstove changeout
- Outreach and education

Ambient Monitoring

- Utilized existing network
  - PM2.5 TEOM
  - Met Site: temperature, RH, precipitation, wind speed
- EPA PM$_{2.5}$ standards
  - 24/hr is 35 µg/m$^3$
  - Annual is 15 µg/m$^3$
Indoor Sampling

- Equipment
  - DustTrak (Model 8520)
  - Leland Sampler / Personal Environmental Monitor (PEM) with a quartz filter
- Sampled for 24-hour period, 1 to 5 sample days
- Intern sampling duties
- Participant responsibilities
From Old to New

Indoor PM$_{2.5}$ Mass Comparisons

Home PM$_{2.5}$ Concentration (ug/m$^3$)

- Avg PM$_{2.5}$ Pre (log n/d)
- Avg PM$_{2.5}$ Post (log n/d)

9/13/2009
PM2.5 and OC/EC/TC
(Homes with Complete Datasets)

<table>
<thead>
<tr>
<th></th>
<th>Median PM$_{2.5}$ (µg/m$^3$)</th>
<th>Minimum PM$_{2.5}$ (µg/m$^3$)</th>
<th>Maximum PM$_{2.5}$ (µg/m$^3$)</th>
<th>OC (µg/m$^3$)</th>
<th>EC (µg/m$^3$)</th>
<th>TC (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Changeout</td>
<td>21.6±57.5</td>
<td>5.6±6.4</td>
<td>254±731.1</td>
<td>16.8±15.3</td>
<td>0.3±0.4</td>
<td>17.2±15.5</td>
</tr>
<tr>
<td>Post Changeout</td>
<td>18.4±5.1</td>
<td>4.3±1.4</td>
<td>145±278.3</td>
<td>11.4±10.0</td>
<td>0.5±0.4</td>
<td>14.6±10.1</td>
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<tr>
<td>Difference</td>
<td>-15%</td>
<td>-20%</td>
<td>-59%</td>
<td>-21%</td>
<td>-133%</td>
<td>-35%</td>
</tr>
</tbody>
</table>

Chemical Markers of Woodsmoke
(Homes with Complete Datasets)

<table>
<thead>
<tr>
<th></th>
<th>Levoglucosan (ng/m$^3$)</th>
<th>Dehydroabietic acid (ng/m$^3$)</th>
<th>Abietic acid (ng/m$^3$)</th>
<th>Vanillin (ng/m$^3$)</th>
<th>Acetovanillone (ng/m$^3$)</th>
<th>Guaiacol (ng/m$^3$)</th>
<th>Ethylgua (ng/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Changeout</td>
<td>645±1315</td>
<td>311±147.3</td>
<td>11.3±18.7</td>
<td>0.6±2.3</td>
<td>0.6±2.5</td>
<td>8.8±8.8</td>
<td>0.9±2.5</td>
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<tr>
<td>Post Changeout</td>
<td>238±330.3</td>
<td>8.6±37.1</td>
<td>4.1±48.3</td>
<td>0.3±0.0</td>
<td>0.3±0.4</td>
<td>0.1±0.4</td>
<td>0.3±0.4</td>
</tr>
<tr>
<td>Difference</td>
<td>-63%</td>
<td>-100%</td>
<td>+357.8%</td>
<td>No Change</td>
<td>No Change</td>
<td>-42%</td>
<td>-92%</td>
</tr>
</tbody>
</table>

PM2.5 Mass Following Outreach/Education
Challenges

- Sampling equipment malfunctions
- Distance to Kamiah from Lapwai
- Homeowner
  - Learning curve with new stove
  - Paperwork, no shows
  - Selecting 4 new homes mid-study
- Woodstove business & installer
  - Distance (~200 miles away)
  - 2nd round of installations delayed two months due to snow
  - Attitude/not vested in the community

Outcomes/Successes

- Partnerships & intern participation
- Reduced indoor levels
  - PM$_{2.5}$ levels by 52%
  - Levoglucosan by 63%
- Reduced ambient PM2.5 in each community
- 16 tribal homes with EPA certified stoves
  - New stoves “burned off” before change out
  - Old stoves recycled
  - Installation inspection and training
- Outreach and Education

Acknowledgements

- 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
Air Toxics & Health on the Nez Perce Reservation

- Participants
  - Lapwai and Kamiah High Schools
  - NPT Distance Learning Centers, Northwest Indian College
- Sampled for Volatile Organic Compounds (VOCs) indoor/outdoor
- Outreach and Education

VOC Sampling

- Students conducted sampling
- 21 air toxics/EPA Hazardous Air Pollutants
- Sampled for 12 hour period, up to 2 days inside and outside of student homes
- Equipment
  - SKC low-flow pumps
  - Sorbent tubes
- Results
  - Higher concentrations inside
  - Toluene most abundant compound inside and outside in both communities

Outreach and Education

- Presentations
  - University of Montana, Northern Arizona University, NPT Air Quality staff
  - Groups developed research projects
- Articles and info packets
- Projects and Competitions
  - 46th InterMountain Junior Science and Humanities Symposium; Salt Lake City, UT
  - N. Idaho SkillsUSA; Lewiston
  - Air Toxics Symposium; Missoula, MT
Successes & Challenges

- Challenges
  - Communication with teachers
  - VOC sampling
  - Student knowledge base

- Successes
  - Collaboration and partnerships
  - Interaction with university researchers and air quality professionals
  - Gaining hands-on science skills
  - Projects and science competition experience