Using Sensors and Portable Monitors to Guild an Air Quality Program

Kris Ray
Air Quality Program Manager
Confederated Tribes of the Colville Reservation
June 7
1.4 Million Acres
2013 Series of Unfortunate Events
Used a 3M EVM Environmental Monitor during a plywood plant start up to measure the effects of smoke in the surrounding area. The effort also showed that backyard debris burning contributed to the high concentrations of PM$_{2.5}$. 
3M EVM Environmental Monitor

EVM Concentrations 10/30/2013

Site

Concentration μg/m³
Devil's Elbow Fire 2014

San Poil River Airshed
26,500 acres
725 personnel
Start August 3 burned into September

Carlton Complex 256,000 acres
E- Sampler, Met One
Devil's Elbow E-Sampler Data August 12, 2014

Concentration $\mu$g/m$^3$ vs. Hour
2015 Extreme Fire Year
North Star Fire, August 13, 2015

218,000 acres,
Met One Aerocet 831

- Light Scattering
- Displays PM 1, PM 2.5, PM4 and PM 10
- Concentration range 0 to 1,000 μg/m3
- Sample period fixed at 1 minute or continuous
- Location by number designation
- Stores 2,500 data points
My Sophisticated Sampling Plan

• Walk into building and sample several rooms
• Write down concentrations levels
• Walk out and continue to next building
# What Was Discovered

**Measurements From the Morning of August 25, 2015**

<table>
<thead>
<tr>
<th>Location</th>
<th>Concentration (μg/m³)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Office</td>
<td>405</td>
<td>Hazardous</td>
</tr>
<tr>
<td>Reservation Attorney</td>
<td>394</td>
<td>Hazardous</td>
</tr>
<tr>
<td>Head Start</td>
<td>633</td>
<td>Hazardous</td>
</tr>
<tr>
<td>Admin Building</td>
<td>798</td>
<td>Hazardous</td>
</tr>
<tr>
<td>Archeology Office</td>
<td>630</td>
<td>Hazardous</td>
</tr>
<tr>
<td>Prosecutors Office</td>
<td>278</td>
<td>Hazardous</td>
</tr>
<tr>
<td>IHS Clinic Lobby</td>
<td>166</td>
<td>Very Unhealthy</td>
</tr>
<tr>
<td>Outside Concentration</td>
<td>980</td>
<td>Hazardous</td>
</tr>
</tbody>
</table>
Used the AeroQual 500 Ozone Sensor

- Screening tool
- Concentrations of Ozone
- Need Permanent Monitor
- Relationship of Ozone and Wildfire Smoke
24 Hour Average and Hourly Maximum Ozone Concentrations Omak Site August 2016

Part Per Billion

Date

Max
Ave ppb
Prepare Early for the Next Wildfire Season
How can the Air Quality Index (AQI) Help?

The Colville Tribes Environmental Trust Air Quality Program operates three permanent continuous PM$_{2.5}$ monitors located in Omak, Nespelem, and Inchelium. These monitors measure the weight of small particulate matter and report in milligrams of a gram or micrograms per cubic meter of air.

The AQI is broken down into six categories ranging from good to hazardous using a color coded scale as shown below. The AQI provides guidance for health concerns and recommendations are based on the average concentration over a 24 hour period.

The index can also be used as a guide to activity when viewing the hourly or most current pollution levels.

Even a few hours in the unhealthy category could adversely affect your health. Wildfire smoke concentration tends to vary with wind direction, time of day, size of the fire and duration of the fire. During a large fire concentration may peak in the higher categories one to four hours a day but also may last for a week or more.

If smoke concentrations are high for short duration over multiple days people that usually do not have problems may notice some of the symptoms mentioned previously.

<table>
<thead>
<tr>
<th>Air Quality Index</th>
<th>Air Quality</th>
<th>Health Advisory</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 50</td>
<td>Good</td>
<td>None.</td>
</tr>
<tr>
<td>51 to 100</td>
<td>Moderate</td>
<td>Air quality is acceptable; however, there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution. Sensitive Groups include people with heart or lung disease, elders and children with respiratory problems.</td>
</tr>
<tr>
<td>101 to 150</td>
<td>Unhealthy for Sensitive Groups</td>
<td>Members of sensitive group may experience health effects. The general public is not likely to be affected.</td>
</tr>
<tr>
<td>151 to 200</td>
<td>Unhealthy</td>
<td>Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.</td>
</tr>
<tr>
<td>201 to 300</td>
<td>Very Unhealthy</td>
<td>Health warnings of emergency conditions. The entire population is more likely to be affected.</td>
</tr>
<tr>
<td>301 to 500</td>
<td>Hazardous</td>
<td>Health alert: everyone may experience more serious health effects.</td>
</tr>
</tbody>
</table>

Air Quality Conditions

Check local air conditions at Washington Department of Ecology: https://fortress.wa.gov/ecy/enviwa/

Asthma Action Plan

Is available online at the Washington Department of Health: http://www.doh.wa.gov/YouandYourFamily/IllnessandDisease/Asthma/WhatShouldIExpectfrommyHealthCareProvider.aspx

Colville Tribal Numbers

EMS Fire and Rescue 509-634-2440
Law Enforcement 509-634-2472 or 800-651-5800
Mount Tolman Fire Center (MTFC) 509-634-3100
Natural Resources Enforcement 509-634-2472
TOSHA 509-634-2011
Environmental Trust Program 509-634-2411
Fish & Wildlife 509-634-2110
Fire Prevention Office 509-634-3157
Tribal Health 509-634-2944

Kris Ray, Program Manager
P.O. Box 150
Nespelem, WA 99155
Tel: 509-634-2418
Fax: 509-634-2422
## Poster Visual Guild to Smoke and AQ

### CCT 2016

**Wildfire Smoke**

Wildfire smoke can hurt your eyes, irritate your respiratory system, and worsen chronic heart and lung diseases.

#### Visual Guild to Smoke and Air Quality

During wildfire smoke events you want the best information as quickly as possible but an internet connection or electricity might not be available. This visibility guild to smoke concentration and health protection will help you make safe choices during time of stress.

- **Smoke** is comprised of many materials and sizes of substances. The fine particles are termed Particulate Matter 2.5 (PM2.5) and pose the highest risk to your health.
- **Sensitive groups**, or people who will suffer more from the effects of PM2.5, include Elders, young children, persons with lung or heart problems (asthma and COPD), pregnant women and immune compromised individuals.
- **Symptoms** range from the mild—coughing, scratchy throat, irritated sinuses, shortness of breath and headaches—to more severe symptoms—worsening asthma, chest pains, fatigue, rapid heartbeat, and inability to breath properly. People with chronic cardiac conditions are more susceptible to chest pain, heart attacks, cardiac arrhythmias, acute congestive heart failure or stroke. Stress levels also increase greatly.

Sensitivity to smoke can vary highly from person to person, and individuals can become more sensitive to smoke after extended periods of exposure. Individuals should pay attention to the advice of medical professionals or local health officials, and adjust activity according to their particular tolerance or sensitivity.

#### Air Quality Index Category

<table>
<thead>
<tr>
<th>Category</th>
<th>Visibility Index</th>
<th>Air Quality Distance Estimates</th>
<th>Using the Visibility Index from 5 miles to under 1 mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>15 + miles</td>
<td><strong>Over 15 miles:</strong> Air quality is generally good.</td>
<td>An adult, teenager or older child</td>
</tr>
<tr>
<td>Moderate</td>
<td>5 to 15 miles</td>
<td><strong>Between 5-15 miles:</strong> Air quality is moderate and beginning to deteriorate, but it is generally healthy, except for smoke sensitive persons. The general public should avoid prolonged exposure if visibility is closer to the 5 mile range.</td>
<td>Moderate outdoor activity</td>
</tr>
<tr>
<td>Unhealthy for Sensitive Group</td>
<td>3 to 5 miles</td>
<td><strong>Under 5 miles:</strong> Air quality is moderate and beginning to deteriorate, but it is generally healthy, except for smoke sensitive persons. The general public should avoid prolonged exposure if visibility is closer to the 5 mile range.</td>
<td>Minimize outdoor activity</td>
</tr>
<tr>
<td>Unhealthy</td>
<td>1 to 3 miles</td>
<td><strong>Under 3 miles:</strong> Air quality is unhealthy for everyone. Young children, adults over age 65, pregnant women, people with heart and/or lung disease, asthma or other respirator illnesses. These people should minimize outdoor activity.</td>
<td>Minimize outdoor activity</td>
</tr>
<tr>
<td>Very Unhealthy</td>
<td>Under 1 mile</td>
<td><strong>Under 1 mile:</strong> Air quality is very unhealthy and in some cases may be hazardous. Everyone should avoid all outdoor activities. Consider leaving the area if you are having problems breathing.</td>
<td>Stay inside</td>
</tr>
<tr>
<td>Hazardous</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Contact Information:

- Confederated Tribes of the Colville Reservation
- Environmental Trust Air Quality Program
- Kris Ray, Air Quality Program Manager
  - 509-634-2418
- Medical emergencies call 911
Sampling Tool Box for Indoor Smoke

- Met One Aerocet 831
- Amprobe CO2 Meter
- Amprobe CO Meter
- Clipboard, sampling sheet, education material
- Cell phone – word gets around
Air Resource Advisor Factsheet

- Local Contacts
- Description of the Reservation
- Regulation Governing AQ
- Air Quality Monitoring Site
- Where to Find the Data
- Map of Communities in the Area
Using Masks Effectively

Managing Buildings for Cleaner Air

Smoke Ready Community
Okanogan River Airshed Partnership
A Discussion of Our Air Quality
Clean Air is Important