



*Welcome to the EPA Environmental Justice Webinar Series  
for Tribes and Indigenous Peoples*

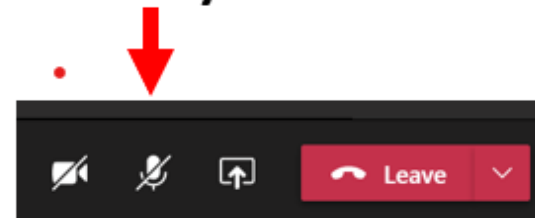
## **Wildfires and Air Quality – Part 2, Smoke Sense and Smoke Ready Communities**

April 21, 2021

***We will begin soon.***

*Please mute your speaker*

**Please mute yourself**



*\* Please note that this webinar will be recorded and posted  
on EPA's EJ Website for Tribes and Indigenous Peoples*



## Presenters

- Kris Ray, Air Quality Program Manager, Confederated Tribes of the Colville Reservation (he/him)
- Ana Rappold, Statistician, Office of Research and Development, U.S. Environmental Protection Agency (she/her)
- Mary Clare Hano, Environmental Health Social Scientist, Office of Research and Development, U.S. Environmental Protection Agency (she/her)

# SMOKE READY PREPARING FOR THE NEXT SMOKE EVENT AND ACTIONS TO PROTECT OUR COMMUNITIES HEALTH



*EPA Environmental Justice Webinar  
Series for Tribes and Indigenous  
Peoples –*

*Wildfires and Air Quality – Part 2*

*Kris Ray, Air Quality Program Manager*

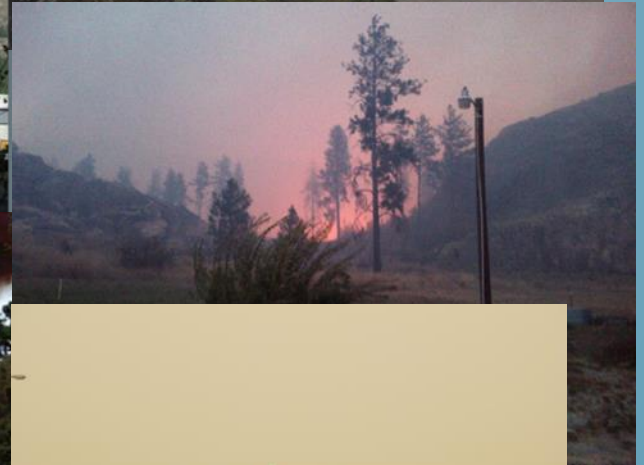
*Confederated Tribes of the Colville Reservation*



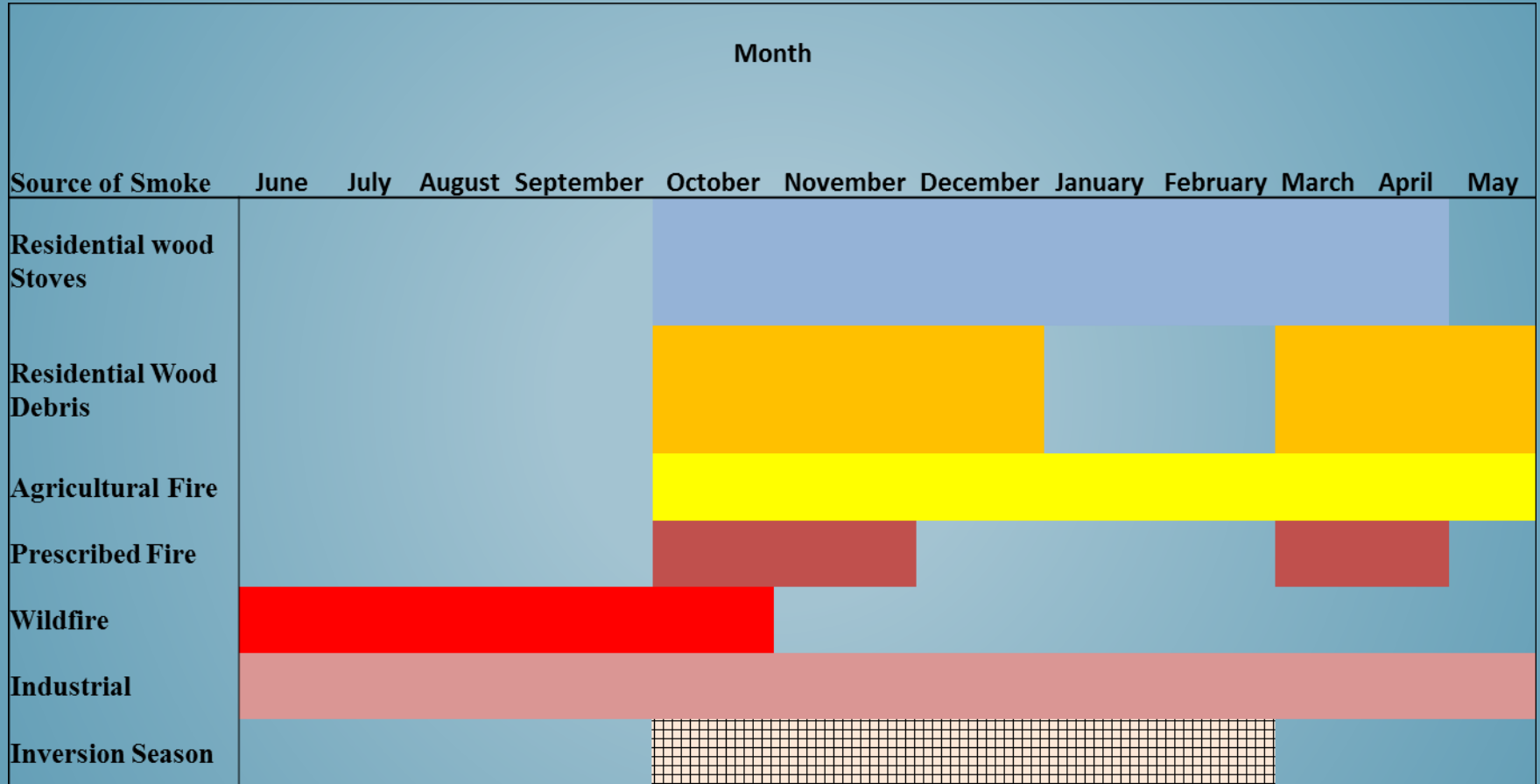
# **WILDFIRE SMOKE**

*The most  
Important Air  
Quality Issue We  
Face*

# SMOKE WILL HAPPEN SO WHY NOT PLAN FOR IT

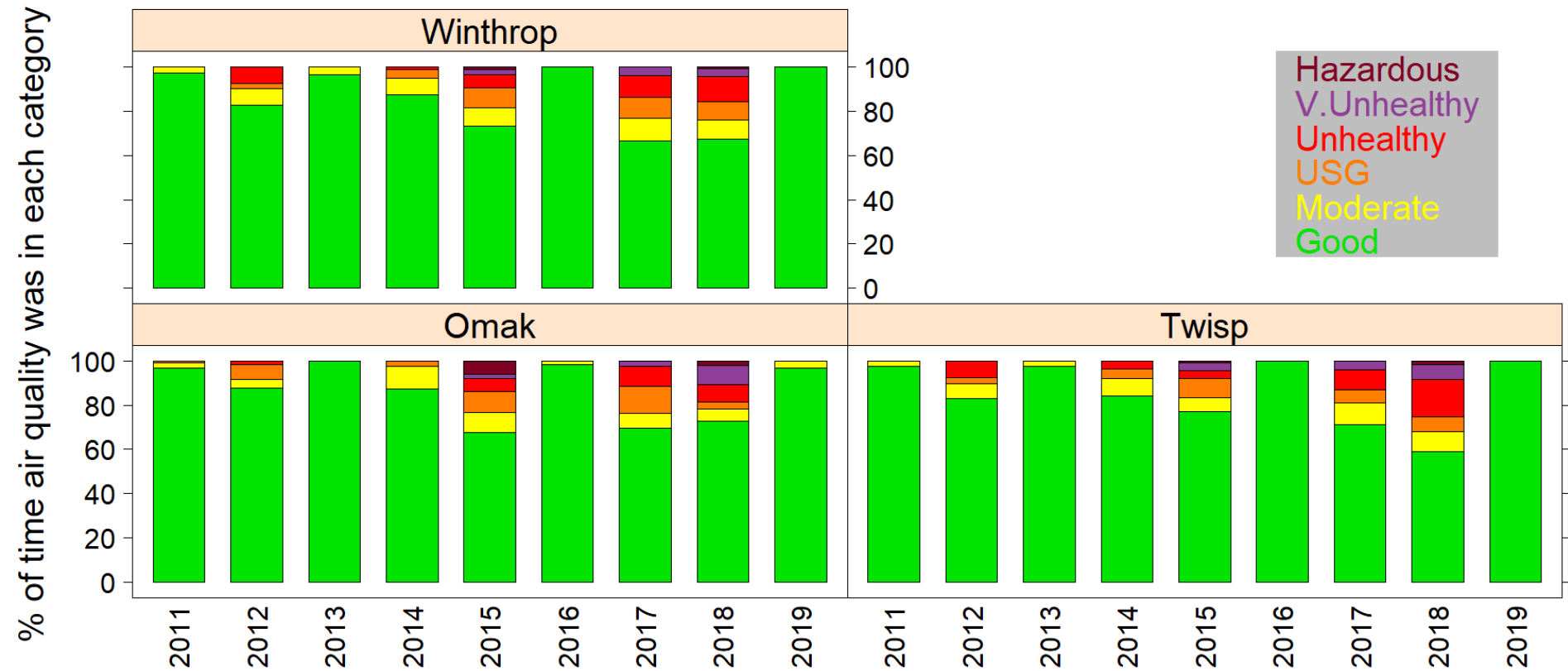


# TIMING OF EMISSIONS



# WHAT DOES THE DATA TELL YOU

## Comparing Okanogan County air quality in last 9 wildfire seasons



V. Unhealthy = very unhealthy  
 USG = unhealthy for sensitive groups  
 WA State Department of Ecology, 2020

# WHAT DOES SMOKE - READY MEAN

- *Community based*
- *All sources of smoke*
- *Yearly smoke exposure*
- *Prevention of health problems*
- *Education and outreach*
- *Mitigation actions*
- *Coordination with partners*





# PRE-SMOKE EVENT PLANNING

## Communications

- Very important during stressful situations
- First task to get dropped during stressful situations

## Establish Communication Lines Before the Event

- In person introductions important
- Increased effectiveness

## Infrastructure Issues

- Electric outages
- Cell tower problems
- Lack of internet




# Maintain Monitoring Network



# Indoor Sampling Toolbox



# AQ Templates



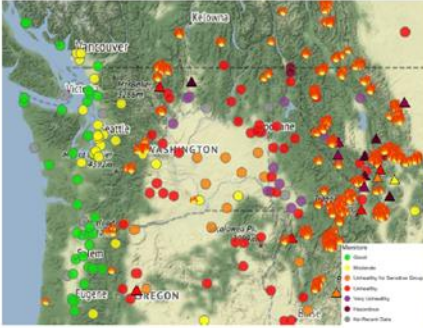
**CONFEDERATED TRIBES OF THE COLVILLE RESERVATION**  
**OFFICE OF ENVIRONMENTAL TRUST**

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**Public Notice - Air Quality Warning**  
**September 8 to 11, 2017**

Air Quality Warning continues through the weekend September 8 to 11, 2017. Smoke will be part of our lives for the foreseeable future from existing fires from around the Northwest. Smoke concentrations have been in the Unhealthy to very Unhealthy for several days with no substantial relief predicted.

<b>Unhealthy</b>	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
<b>Very Unhealthy</b>	Health alert: everyone may experience more serious health effects.
<b>Hazardous</b>	Health warnings of emergency conditions. The entire population is more likely to be affected.



# ARA Factsheet

- Tribal Contacts
- Vicinity Map
- Monitoring Network
- AQI vs WAQA
- Meteorological Sites<sup>10</sup> Links

# ACTIONS DURING SMOKE EVENTS

Measurements From the Morning of August 25, 2015

My Office	405 $\mu\text{g}/\text{m}^3$	Hazardous
Reservation Attorney	394	Hazardous
Head Start	633	Hazardous
Administration Building	798	Hazardous
Archology Office	630	Hazardous
Prosecutors Office	278	Hazardous
IHS Clinic Lobby	166	Very Unhealthy
Outside Concentration	980	Hazardous

## Document and Record



## Visual Guide to AQI

Air Quality Index	Visibility (miles)	Activity Message	Using Visibility Index from 5 to under 1 mile		
<b>Good</b>	15+	Air quality generally good	You Are:		Or You Have:
<b>Moderate</b>	5 to 15	Generally healthy, but maybe deteriorating, should avoid prolonged exposure	Adult, teenager or older child	Age 65 and over, pregnant or young child	Asthma, respiratory, lung or heart disease
<b>Unhealthy for Sensitive Groups</b>	3 to 5	Moderate outdoor activity for sensitive groups	Minimize outdoor activity		
<b>Unhealthy</b>	1 to 3	Minimize outdoor activity	Stay inside		
<b>Very Unhealthy</b>	Under 1	Everyone should avoid all outdoor activities and stay inside	Stay inside or consider leaving the area		
<b>Hazardous</b>					

## N 95 Masks

- *Propper Use*
- *Distribution*
- *Obstacles*




## Managing Buildings for Cleaner Air

- *Limit Door Use*
- *Evaluate AC systems*
- *Air Cleaners*
- *Clean Rooms*
- *Awareness of Smoke in Building*



## Air Quality and Outdoor Activity Guidance for Schools

 <p>UNHEALTHY</p>	<p>For <u>all</u> outdoor activities, students should take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. Consider moving activities indoors or rescheduling.</p> <p>Students with asthma should follow their asthma action plans and keep their quick relief medicine handy.</p>
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# PORTABLE AIR CLEANERS

## Manufactured Air Cleaners

Uses in small rooms

Maintain filters

Ozone generators

3 to 6 per home



## DIY Air Cleaners

Inexpensive

Volume of air

Easy to construct

Noise levels



# COOLING IS ESSENTIAL

- *High ambient temperatures*
- *Managing windows and shades*
- *Cleaner air in the afternoon*



# VEHICLE FILTERS



- *Always use recirculate option*
- *75% reduction while parked in 15 minutes*
- *Less reduction when driving*
- *Replace filters between 25,000 and 35,000 miles*



# DECISIONS AND PROBLEM SOLVING WHEN YOUR WORLD IS ON FIRE AND FULL OF SMOKE

## *What You Breath Matters*

- *High PM 2.5*
- *Carbon Monoxide Levels*
- *Carbon Dioxide Levels*
- *Ozone Concentrations*

## *Stress and Fatigue*

- *Long Work Hours*
- *Bad Diet*
- *Preparing to Evacuate*
- *Helping Someone Evacuate*
- *Evacuating*





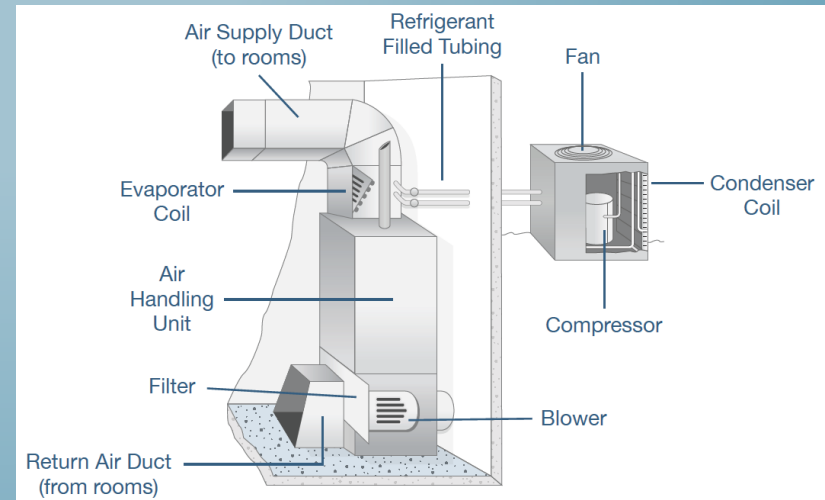
# AFTER THE SMOKE

## Clean Buildings and Homes

- Residuals and Odors
- Wash Inside Walls
- Shampoo Carpets
- Laundry Clothes
- Wash off Outside of House
- Scented Candles and Air Fresheners Mask Smells

## Service AC Units and Filters

- Change Filter
- Activated Charcoal Filters
- Check and Clean Ductworks



# EVALUATE AND GATHER

## *Lessons Learned*

- *Write the Story*
- *Tell What you learned*
- *Listen to Others*

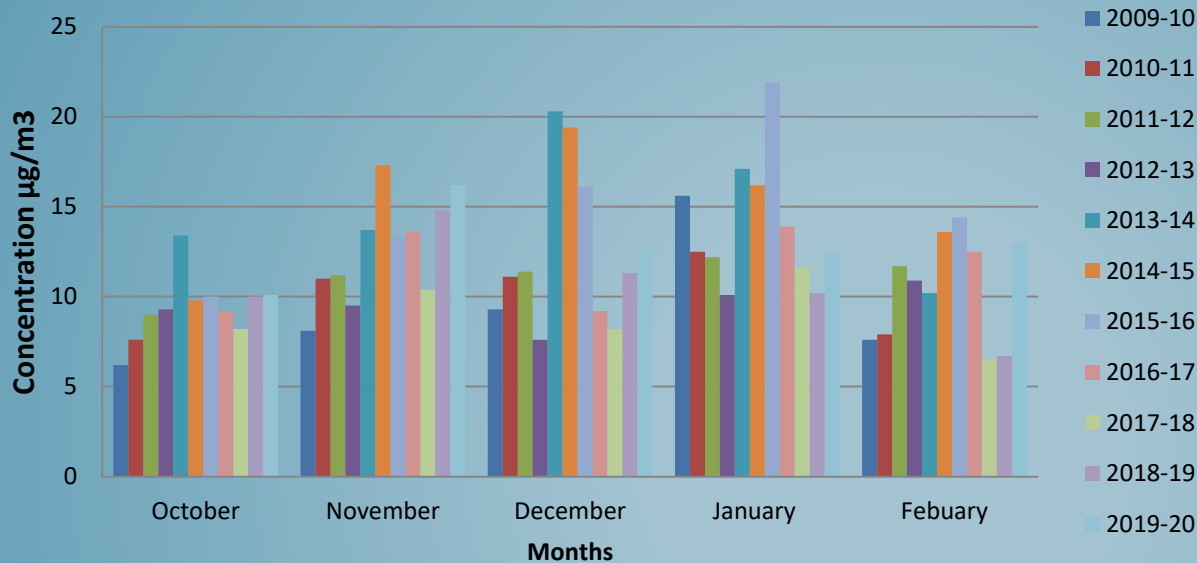
## *Look for New Science*

## *Look at your Monitoring Data*



# WOOD STOVE SMOKE

Comparison of Monthly Heating Season Concentration Averages for Eleven Years, Omak Monitor



Emission Avoided (tons) for 20 Stoves	
<u>Pollutant</u>	<u>Total Emissions Avoided</u>
CO	238.70
SO2	0.90
NOX	4.50
VOC	32.60
PM2.5-PRI	26.60
PM10-PRI	26.60
Total HAP	7.10
<b>Total Tons</b>	<b>337.00</b>

## Actions

- Stove Buy Back
- Wood Stove Changeout
- Dry Wood Promotions
- Look at Your Smoke Outreach

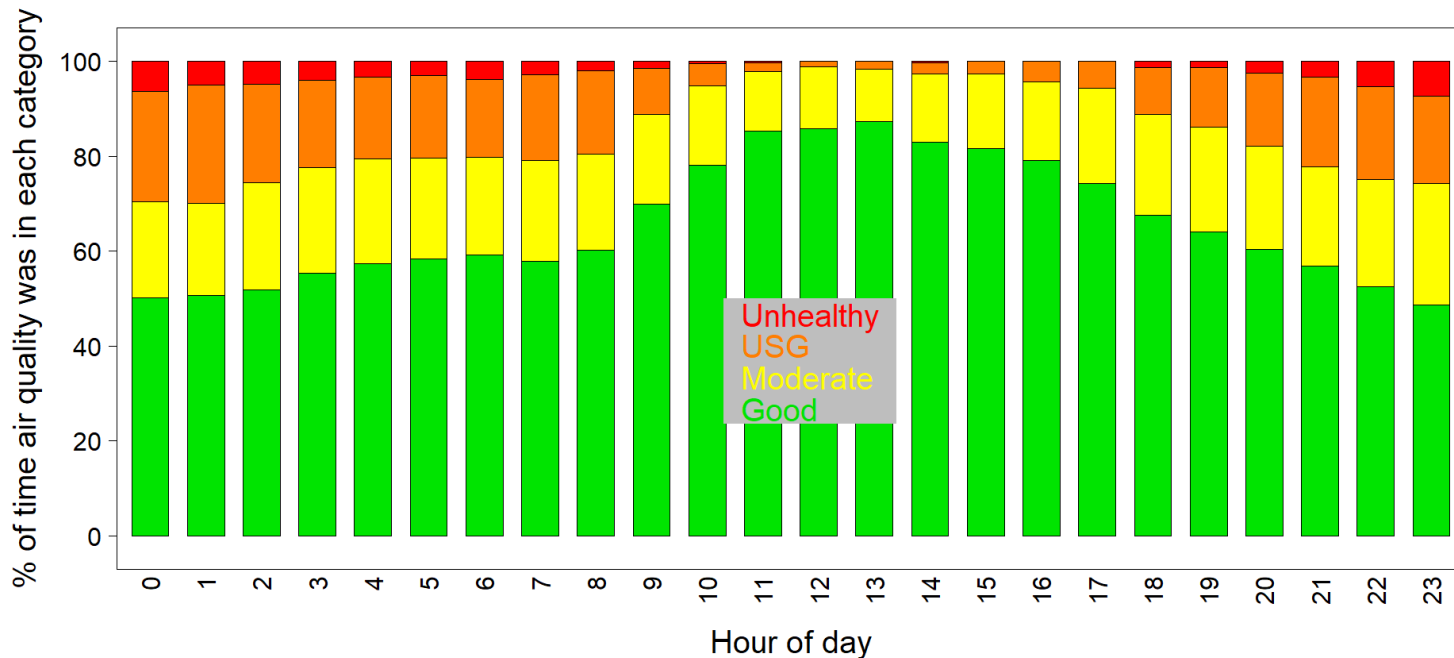
# RESIDENTIAL VEGETATION DEBRIS BURNING



## Alternatives to Burning

- Composting
- Chipping
- Mulching
- Landfill

Omak Nov- Feb air quality since 2017



# SMOKE READY RECOMMENDATIONS

- *Partner with EPA on the Wildfire Smoke Ready Site Content and Smoke Sense app*
- *Works with other Federal Partners to address smoke issues*
- *Promote the awareness of smoke from all sources*
- *Highlight the health impacts and long-term consequence of smoke exposure*
- *Add climate change as the major contributing factor to monster fire occurrence*
- *Consider smoke intrusion into homes, business and facilities*
- *Need a guide to evaluate building for smoke intrusion*
- *Add new category to the AQI - Catastrophic*

**CONTROL THE  
AIR YOU  
BREATHE  
BECOME SMOKE  
READY**



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## REFERENCES

- Wildfire Smoke A Guide for Public Health Officials: [https://www3.epa.gov/airnow/wildfire\\_may2016.pdf](https://www3.epa.gov/airnow/wildfire_may2016.pdf)
- Smoke Management Photographic guide: A visual Aid for Communicating Impacts : [https://www.fs.fed.us/pnw/pubs/pnw\\_gtr925.pdf](https://www.fs.fed.us/pnw/pubs/pnw_gtr925.pdf)
- Air Quality Program, Confederated Tribes of the Colville Reservation: <https://www.cct-enr.com/environmental-trust/>
- Air Pollution and School Activities: <https://www.doh.wa.gov/Portals/1/Documents/Pubs/334-332.pdf>
- Guide to Air Cleaners in the Home: <https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home>
- Smoke Ready Tribal Communities, 2017 National Tribal Forum on Air Quality: [https://www.dropbox.com/sh/wdb9pz373cxb15i/AADsESkgv\\_fOkim8TQrxbeQBa/050117\\_SmokeReady?dl=0](https://www.dropbox.com/sh/wdb9pz373cxb15i/AADsESkgv_fOkim8TQrxbeQBa/050117_SmokeReady?dl=0)
- Smoke Ready Toolbox for Wildfires: <https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires>
- Box Fan Filter Video and Instructions - <https://www.cct-enr.com/box-fan-filter>

# Wildfires, Smoke Sense Citizen Science & Smoke Ready Communities

Ana Rappold, Statistician, Office of Research and Development,  
U.S. Environmental Protection Agency

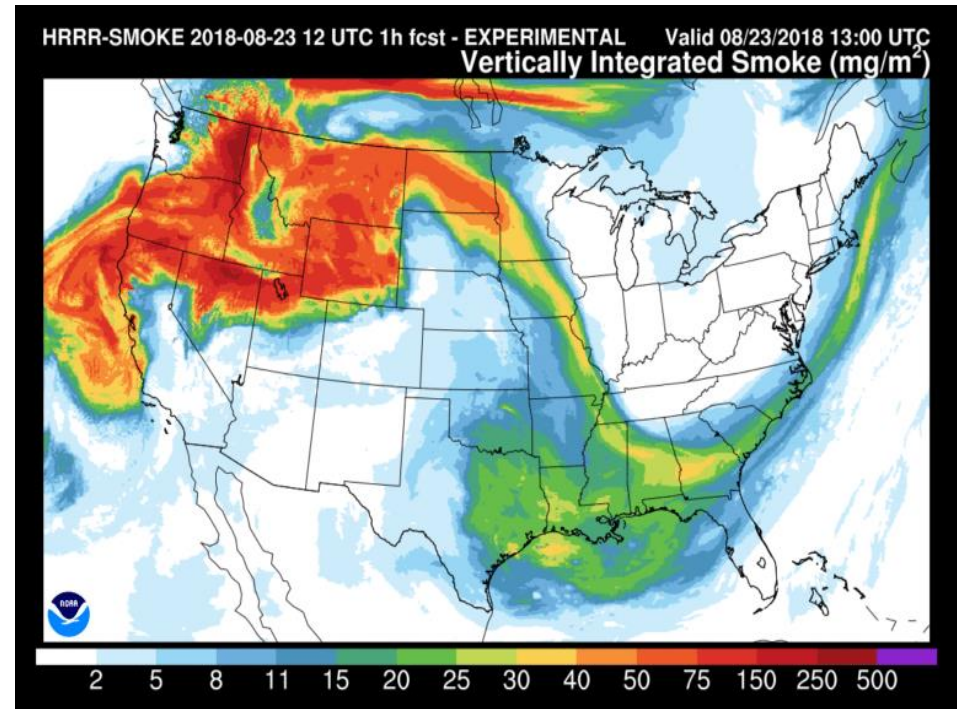
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- ***The views expressed in this presentation are those of the author and do not necessarily reflect the views or policies of the US EPA.***



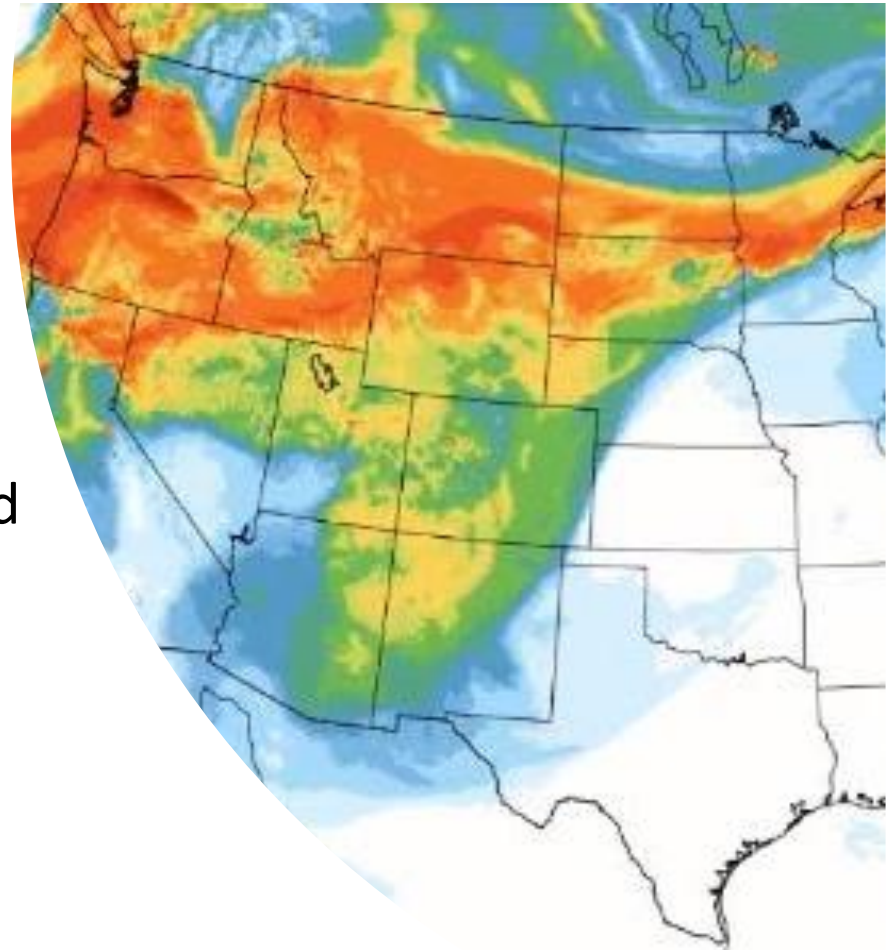
## Context & Background

- Large-scale wildfires are increasing in the western U.S. (e.g., Dennison et al. 2014; Westerling 2016; Joyce et al. 2014; Littell et al. 2009)
- Smoke from these wildfires is significantly impacting air quality, namely particulate matter (PM) (e.g., Phuleria et al. 2005, Larsen et al. 2018)
- Exposure to PM is associated with range of adverse health outcomes (e.g., U.S. EPA 2019; Rappold et al. 2011; Reid et al. 2016; Black et al. 2017; Delfino et al. 2009; Deflorio-Barker et al. 2019; Sacks et al. 2011)



# Background

- Content and context of risk to health is important to effectively communicate actions that should be taken (Glik 2007, US CDC 2019).
- Context includes both the situation individuals face and the intended audience's experiences and perspectives on the issue.
- With wildfire smoke, the 'intended audience' may include entire communities, regions, and states.
- These studies describe experiences and perspectives on wildfire smoke, from participants in Smoke Sense- a citizen science project led by U.S. EPA.



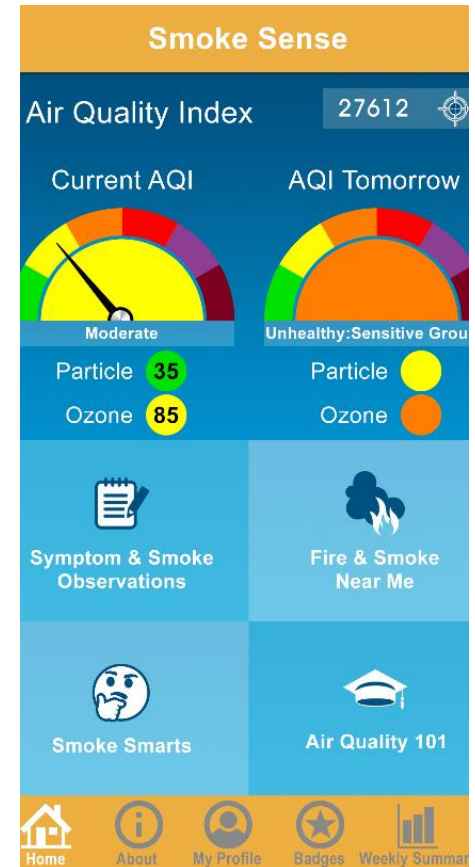
# Smoke Sense Citizen Science Initiative Story

## Objectives

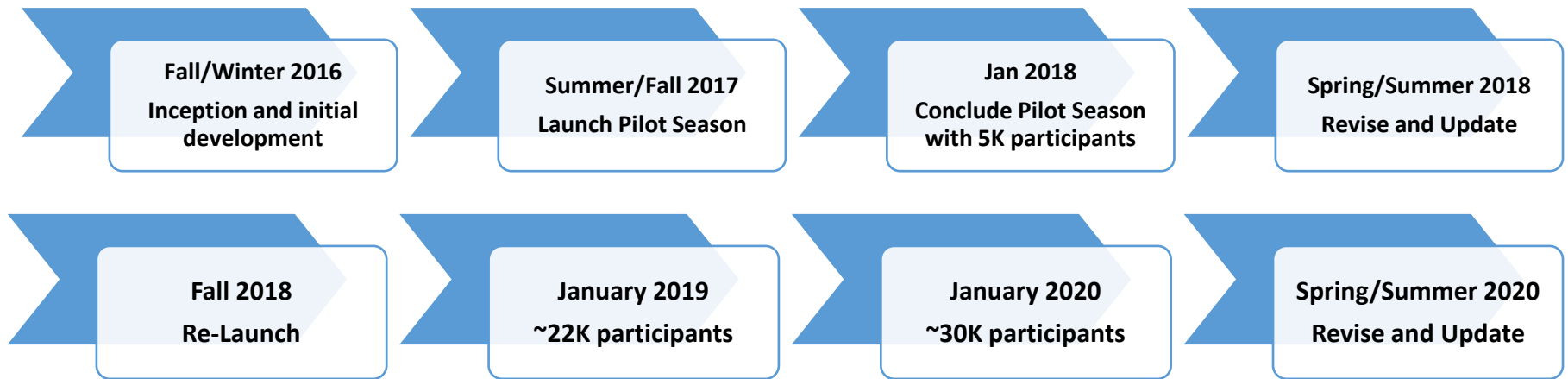
- Understanding the gap between what we know about risk and ways to protect our health and the observed public health outcomes
- Increase engagement issue
- Inform ways to improve effectiveness of health risk messaging and communication strategies

## Methods

- Central component is mobile app; also additional projects that support overall objectives



# Timeline – Smoke Sense Citizen Science Initiative



The newest version combines Smoke Smarts and Air Quality 101 into “*Quiz Corner.*”

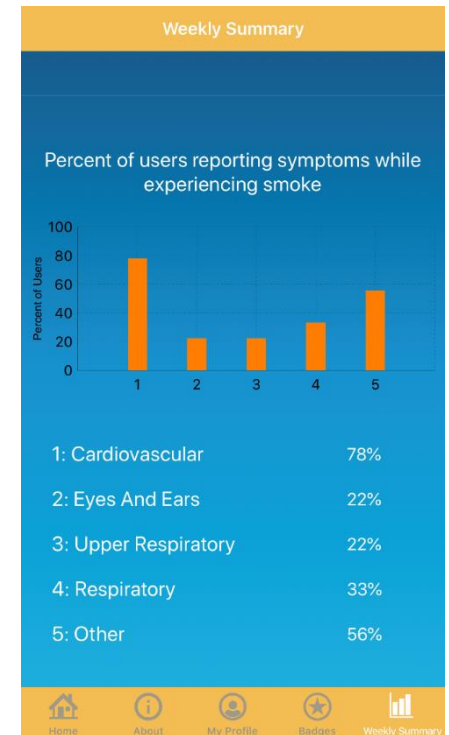
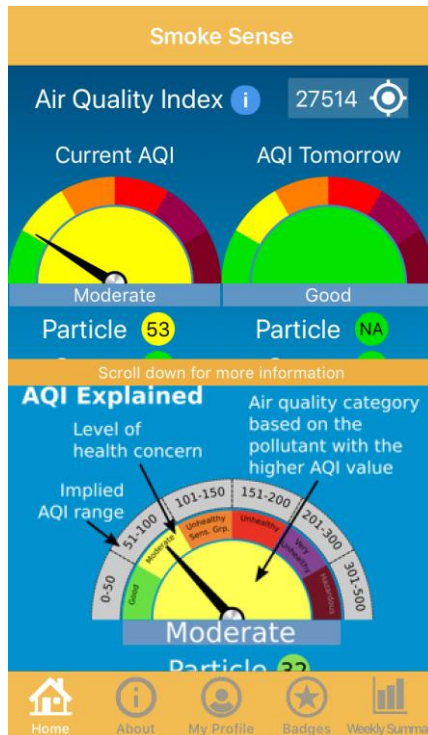
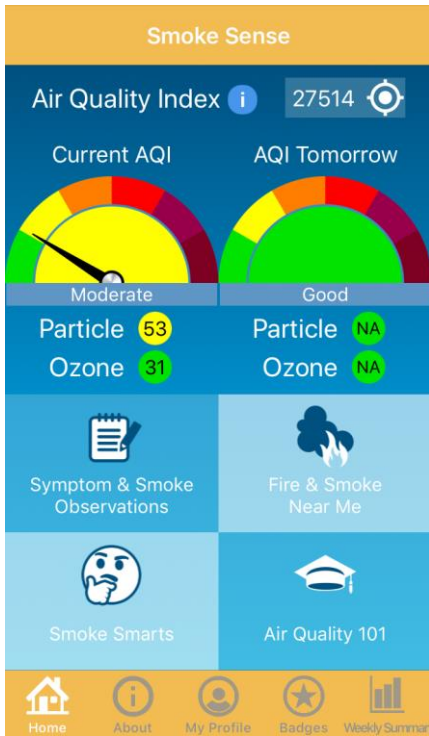
A new “*What Can I Do?*” module provides information about protecting your health.

# Smoke Sense Citizen Science Project

- Participants are anonymous
- Individuals download the app and are asked to review informed consent, provide a ZIP code for anchoring air quality information, and complete the My Profile section
- App Modules: Fire and Smoke Near Me; Air Quality Index (AQI); AQ 101; Symptoms and Smoke Observations
- Badges are awarded for interaction with the app
  - User badges were awarded for interacting with the AQI module
  - Explorer badges were awarded for viewing the Fire and Smoke near me module
  - Observer badges were awarded for submitting a report in Symptoms and Smoke Observations
  - Learner badges were awarded for interacting with the AQ 101 module



# Smoke Sense: 45,000 App users in all 50 States



[www.epa.gov/air-research/smoke-sense-study-citizen-science-project-using-mobile-app](http://www.epa.gov/air-research/smoke-sense-study-citizen-science-project-using-mobile-app)

## Findings from Pilot - Participant Submitted Data

- Very strong demand for understanding air quality during wildfires.
- Spatial and temporal distribution of available air quality data does not meet user's demand.
- Participants clearly recognized smoke as an exposure and as a health risk and majority (89%) responded to smoke by taking action to reduce exposure.
- Health was the reason they participated but health status did not determine how we respond to smoke.
  - *Largely we respond to reduce symptoms rather than prevent symptoms.*

## Findings from Pilot – Continued

- Current information about air quality and health risk, as provided in the app, does not change individual behavior.
- Two insights regarding the content of health risk messages that may increase effectiveness:
  - 1) Increase ***personal relevance*** - focus on health factors and outcomes that individuals identify with, in addition to air quality and susceptibility.
  - 2) Compelling evidence that ***behavioral change is beneficial.***



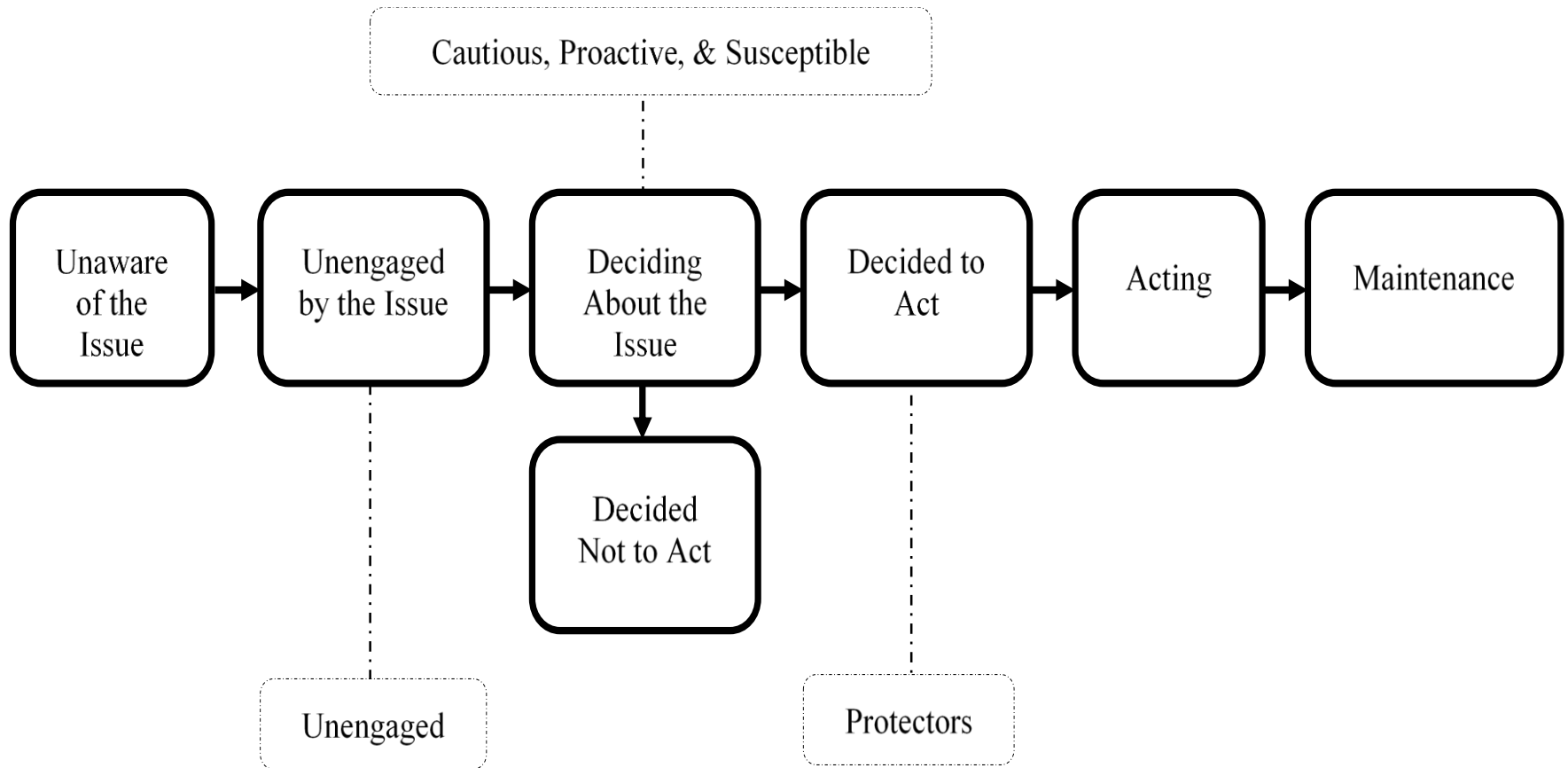
## Communication Analysis

- Do individuals tend to share a global perspective on the issue of wildfire smoke and health, or is there diversity in perspectives?
- Do these perspectives relate to existing theories of individual-level health behavior change?



Hano, M. C., Prince, S. E., Wei, L., Hubbell, B. J., & Rappold, A. G. (2020). Knowing Your Audience: A Typology of Smoke Sense Participants to Inform Wildfire Smoke Health Risk Communication. *Frontiers in public health*, 8, 143. <https://doi.org/10.3389/fpubh.2020.00143>

# Role of Perspectives on the Health Risk of Smoke



# Findings Summary

- Users had high information needs however their perspectives were not homogeneous.
- Perspectives influence our engagement with the issue and health risk messaging may be more successful if flexible and tailored to address those differences.
- All Smoke Sense participants do not share a similar viewpoint on the issue of wildfire smoke and health.
- Level of engagement with the app varies across perspective group.
- Positioning the perspectives on the Precaution Adoption Process Model helps see where each group may be with respect to adopting exposure reducing recommended health behaviors.
- Limitations
  - Limited generalizability
  - Additional important factors that inform perspectives not included in data

# Discussion

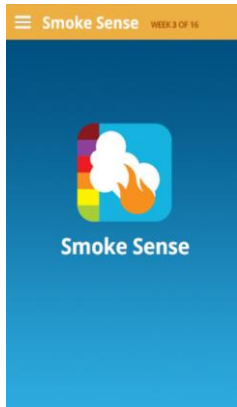
- App-based communication platforms have an opportunity to incorporate messaging for a wide range of audiences.
- Individuals who are at greatest risk (and who may need the messaging the most) engage with 2-way interactive features more than others.
- The emphasis of that messaging may vary depending on perspectives on the issue (rather than by demographics).

	Protector	Cautious	Proactive	Susceptible	Unengaged
Propositions for Health Risk Messaging	Underscore self-efficacy for reducing exposure and nudge toward action	Link exposure with subclinical outcomes	Emphasize exposure as risk to maintaining well-being	Contextualize exposure as a modifiable risk	Underscore impact of smoke on health and activities

# Wildfire Smoke Science Communication Challenges

- Complex social issues, like wildfire smoke and public health, are inherently difficult to reduce into clear, actionable, and accessible messages
- Risk of individual exposure to wildfire smoke can be tough to assess.
- An individual's awareness of and perceptions about the issue influence their actions.
- Risk communication platforms are evolving.
- **Difficult to provide evidence of benefit for behavioral change – lots of circumstances dictate the effectiveness.**

# Why Citizen Science Approach?



- Develops entry points for members of the public to contribute to **research, engage and access** data.
- **Mutually beneficial** – it helps EPA answer questions, and it also serves as a educational/data resource that communities can leverage to address issues related to air quality and health in their communities.
- Allows for **two-way communication** framework in problem formulation and dissemination of knowledge.

- **Data is shared which fosters change.**



# Example Cases of Smoke Sense Community of Practice

- Pilot year partnerships on the content and use of the app.
- Developing standards-based K-12 curriculum leveraging Smoke Sense in the classroom
- Spanish Translation
- Continuing to develop research collaboration
  - Washington State University
  - University of Southern California
  - Stanford University
  - California Department of Public Health
  - California Air Resources Board
  - Commission for Environmental Cooperation extension to Mexico and Canada
  - North Carolina State University



# Smoke Ready Communities

- Community-engaged applied research effort designed to help us understand the outcomes of collaborative planning related to wildland fire smoke.
- Multi-agency: partnering with US Forest Service, and coordinating with CDC, state, and local agencies.
- Includes a range of resources related to wildland fire smoke intrusion and processes for effectively preparing and responding to this emergent issue.
- Intended primary audience: local, state & tribal organizations that focus on wildland fire, public health, environmental quality, and air quality.





# Smoke Ready Communities: Content Areas Overview

1. Identifying vulnerable populations
2. Setting up info delivery methods
3. Distributing communication/education materials to public
4. Creating cleaner air spaces
5. Choosing/deploying air quality monitors
6. Setting decision points for actions



## Smoke Ready Communities: Process Framework

1. **Convene** a multiorganizational, multisector smoke team
2. **Create** a community-specific plan
3. **Activate** the plan when needed
4. **Monitor** plan implementation
5. **Celebrate** annual efforts
6. **Reflect & Revise** on what aspects of the plan worked well and may need adjustments
7. **Repeat** annually as part of overall community preparedness

# Smoke Ready Communities Research Current Status and Next Steps



- Currently partnering with 3 communities in pilot project
- Working with each community to develop a local smoke team and a tailored wildland fire smoke response plan
- Timeline through fall 2022

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