

EXHIBIT E

Agricultural Burning in NE Arkansas – the Medical Perspective



Outline

- I Introductions
- II Overview of Environmental safety
- III Our Particular Problem
 - What is happening? Why it's happening and what it's costing.
- III The Solutions
 - What should the goals be? What are the possibilities?
- IV Progress to Date

Introductions



Introductions



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Our Purpose

*We are committed to
protecting and promoting the
growth, development and
health of all children.*

The Children's Clinic

Overview

- Today's topic is an important aspect of the larger picture of **environmental health** – risks resulting from things that surround us –
- Automobiles, firearms, swimming pools, hazardous materials etc....
- Most of those hazards have one common quality – they are **predictable** and **preventable**.
- Things we do for ourselves and our families can reduce the risks.

Overview

- It is the role of physicians and other health care professionals to advise people in how to do that –
- Car restraints, fire arm safety, swimming pool protections....
- Personal behavior changes can make a big difference with many hazards.

Overview

- But there is another domain involving environmental safety where individuals have less personal control over health consequences: **environmental toxins.**
- One of the best known and most studied is **lead.** Until the 1980's, environmental lead was pervasive – in gasoline, in plumbing, in paint, etc.
- In 1980, 88% of children age 1-5 had elevated blood lead levels. By 2004, that figure had dropped to 1.4%.

Overview

- Personal behavior had little to do with the hazard and little to do with reducing the risks, which included permanent brain damage.
- It took a national mandate and extensive monitoring for progress to be made.
- There are other toxins of that nature, and one is the subject of today: **toxic air pollution**.
- Two variations – chronic low-dose (urban) and abrupt/intermittent (crop burning & wildfires)

The Problem

- WHAT is the issue with air quality in Northeast Arkansas?
- We live in farm country!
- Wheat, soy beans, cotton, corn, peanuts, and rice crops surround us.
- Approximately 70,000 acres planted in rice in Craighead Co. 100,000 acres in Poinsett Co.
- More than 1 million acres of rice in Arkansas.

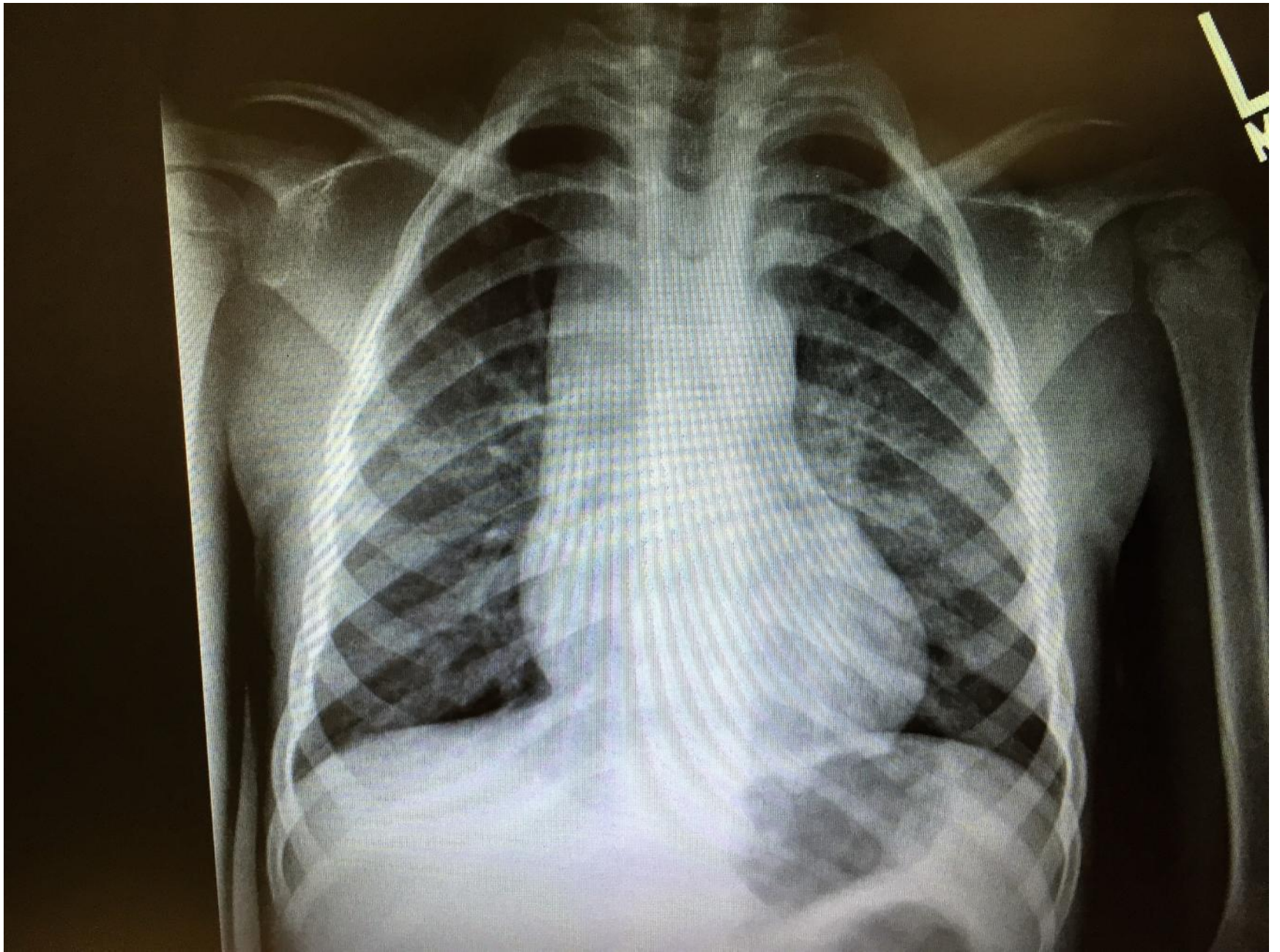
The Problem

- After harvest: rice stubble – it's good for nothing.
- Each Fall, much of the rice stubble is burned.
- The burning is essentially unregulated and unmonitored.
- The cumulative smoke cloud is presenting a significant **health risk** to NE Arkansas residents.









The Problem

- Crop residue Options: (Theisse, others)
- Burn it – cheapest by far; a viable management practice.
- Till (disk) it under- \$15/acre (or more currently); takes 2-5 passes

Dry Fall favors burning

Tilled stubble adds back nutrients to soil but can allow pests to accumulate.

The Problem

- Current **regulations** on burning are almost non-existent
- Womack, Phelps & McNeill – 2011:
 - ADEQ monitors but has no enforcement powers on agricultural burning. Limited locations.
 - County sheriffs have some regulatory power relating to highway safety. Farmers are asked to notify their office prior to burning
 - Burn bans do not apply to farmers.
 - No fees, no disincentives, no regulation

The Problem

- The COSTS:
- Medical experience – every Fall, area providers see an increase in asthma, bronchitis, sinusitis, worsening COPD, and other respiratory conditions.
- Happening for years – more pronounced in recent years.....

The Problem

- What's in agricultural smoke?
- Carbon monoxide, nitrous oxides, ammonia, ozone, sulfur dioxide, methane, particulate carbon (PM 2.5 – PM 10) + ? (~wildfire smoke)
- These are toxins. Agricultural smoke is not just a nuisance.
- What does it do to us? Let's look at **particulate carbon**:
- Worsens breathing effort, decreases oxygen in adults with COPD/emphysema

The Problem

- Increases frequency/severity of respiratory infections
- Exacerbates wheezing in asthmatics
- PM 2.5's enter the blood stream and increase the risk of cardiac ischemia.
- How do we know?
- EPA, multiple independent studies, AND our own experiences...

The Problem

- NEJM, June 29, 2017 –
- Harvard School of Public Health looked at health data on **all** U.S. Medicare beneficiaries (96% of all citizens 65 yrs & older) from 2000-2012.
- Compared **chronic** exposure to fine particulate carbon (PM 2.5) and ozone with risk of death.

The Problem

- Their findings: a 7.3% increase in mortality for each increase in PM 2.5's of 10ug/cubic meter
- They found **no** appreciable level below which the risk of death tapered off – no “safe” level of PM2.5 exists.
- ADEQ data: Arkansas 10 year average PM 2.5 concentration has ranged between 12 and 15 ug/m³.
- The EPA has recently lowered the chronic acceptable exposure risk to 5 ug/m³.

The Problem

- Studies also show the **intermittent** high concentrations to which we are being exposed harm our health – including abnormalizing lung function – and the effect is more pronounced and longer lasting in children
- Am. Journal of Epidemiology; 2000; Vol. 151(8):
- ~8 hour exposure to PM 2.5 of 40+ug/m³ lead to ~15% increase in pediatric ER asthma visits in Atlanta
- Small particulate carbon is a serious health hazard – with both chronic and intermittent exposure.

The Problem

- Particulate carbon from wildfire smoke is even **more** hazardous than that from urban smog – at least to children – several times more harmful! (Pediatrics; April 2021)
- An increase of PM 2.5 of 10 ug/m³ from fires caused a 30% increase in pediatric hospital admissions for respiratory disorders in San Diego CA.

The Problem

- Have **local** health effects been studied?
- Asthma; March 2021 –
- Fall ED visits for Asthma and COPD were compared for Craighead and Sebastian Counties from 2014-2016
- 21% (asthma) and 17% (COPD) increases in ED visits were noted for Craighead Co.
- This difference coincided with statistically higher PM 2.5 levels in Craighead vs Sebastian Co.
- (Rutlen, Orloff, Bates, Porter)

The Problem

- From the mother of a family of eight living near Jonesboro:
- “Harvest season is fiercely dreaded by my family.”
“There are days that the air quality near our home is so bad that just walking outside to our automobile will result in an asthma attack for one or more of us.”
“During the burning of harvested fields, there are many days my children must spend their recess inside as a result of the smoke from surrounding burning fields.” “I believe the farming practice of burning harvested fields is a risk asthmatics should not have to endure.”

The undersigned physicians of Northeast Arkansas would like to express an urgent concern about the adverse health effects of agricultural burning in our area. Each Fall, the air we breathe is repeatedly contaminated with smoke from the burning of crop residue. That smoke contains toxins including particulate carbon, nitrogen oxide, sulfur dioxide, ammonia, and carbon monoxide, and presents a significant health risk to the citizens of N.E. Arkansas, especially those with underlying medical conditions. We would encourage the State of Arkansas to adopt any means necessary to reduce this hazard. (Drafted 8/29/16)

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The Problem

- How do we measure air quality in NE Ark?
- ADEQ has monitoring stations at Newport and Marion that record 24 hour averages for carbon and other toxins. EPA compiles satellite data (airnow.gov)
- Those methods fail to capture the random and localized nature of agricultural burning.

The Problem

- EPA Air Sensor Guidebook recommends – Aerocet 831 Aerosol Mass Monitor
- I & my staff took daily afternoon readings from Sept. through Nov., 2016 thru present within the city of Jonesboro.
- These captured peak PM 2.5 levels, not averages.

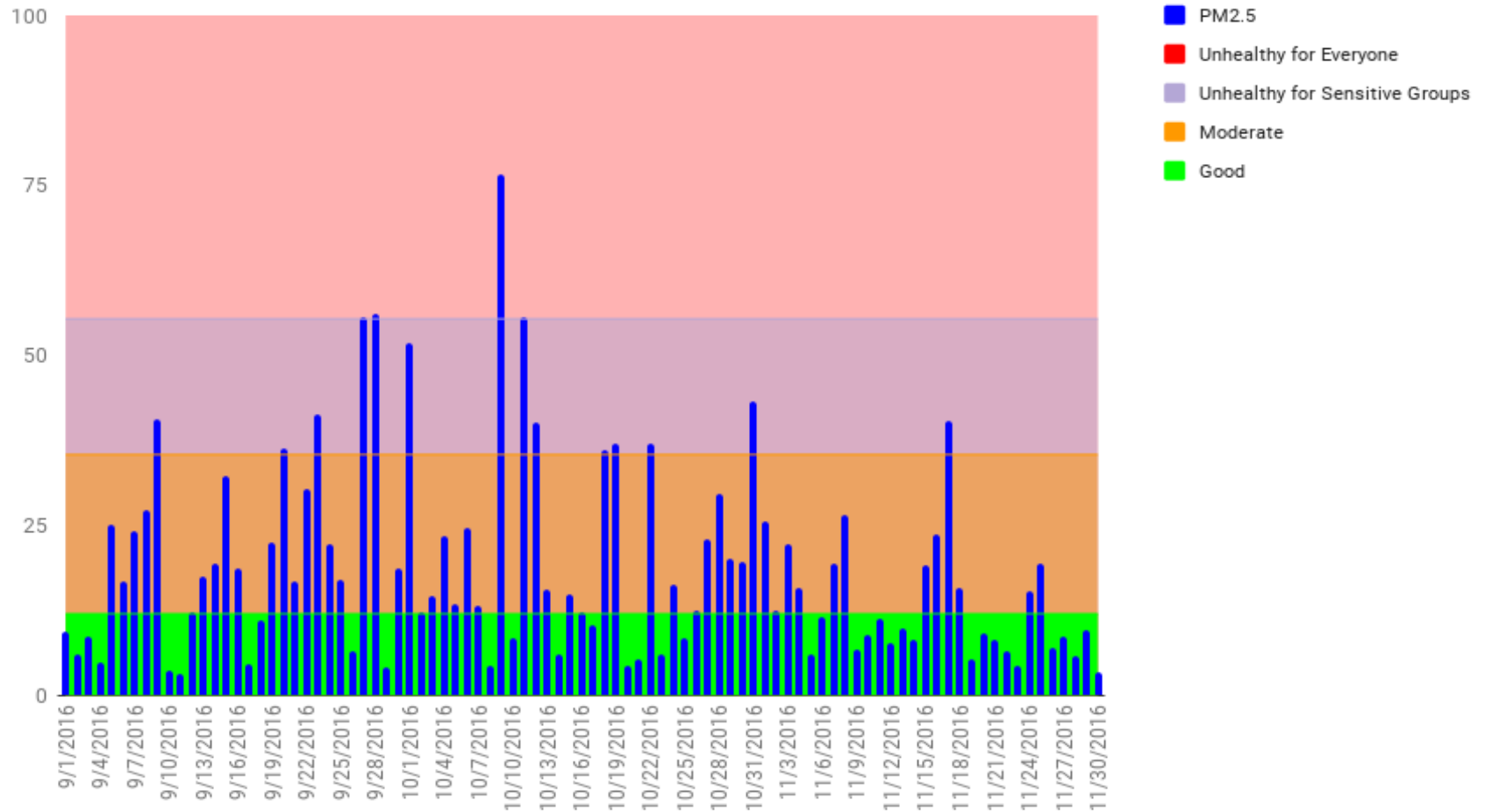
Air Quality Guide for Particle Pollution

Harmful particle pollution is one of our nation's most common air pollutants. Use the chart below to help reduce your exposure and protect your health. For your local air quality forecast, visit www.airnow.gov

Air Quality Index	Who Needs to be Concerned?	What Should I Do?
Good (0-50)		It's a great day to be active outside.
Moderate (51-100)	Some people who may be unusually sensitive to particle pollution.	Unusually sensitive people: Consider reducing prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easier. Everyone else: It's a good day to be active outside.
Unhealthy for Sensitive Groups (101-150)	Sensitive groups include people with heart or lung disease, older adults, children and teenagers.	Sensitive groups: Reduce prolonged or heavy exertion. It's OK to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. People with asthma should follow their asthma action plans and keep quick relief medicine handy. If you have heart disease: Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your health care provider.
Unhealthy (151-200)	Everyone	Sensitive groups: Avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling. Everyone else: Reduce prolonged or heavy exertion. Take more breaks during outdoor activities.
Very Unhealthy (201-300)	Everyone	Sensitive groups: Avoid all physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. Everyone else: Avoid prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.
Hazardous (301-500)	Everyone	Everyone: Avoid all physical activity outdoors. Sensitive groups: Remain indoors and keep activity levels low. Follow tips for keeping particle levels low indoors.

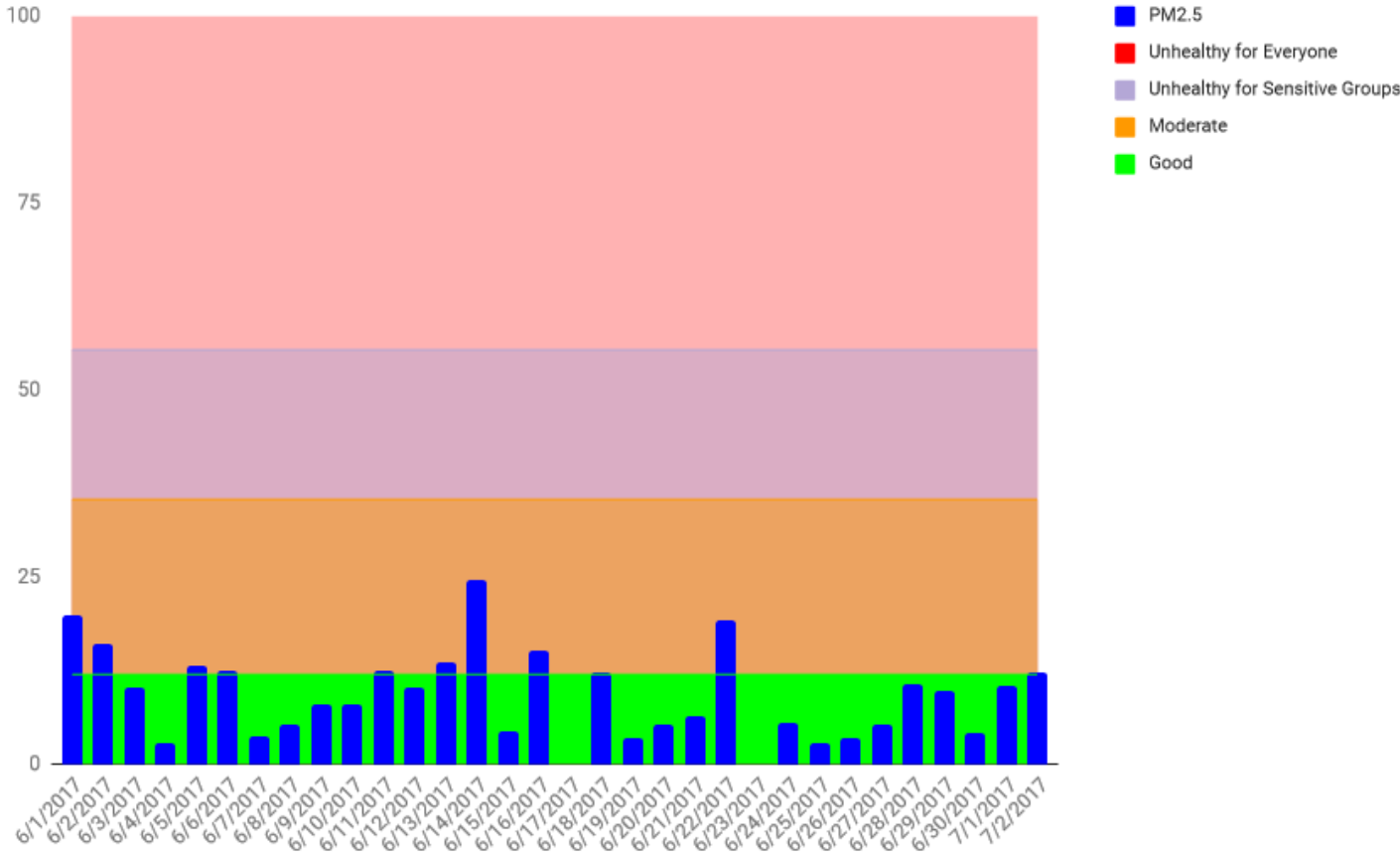
Small particulate Carbon -Fall 2016

PM2.5 $\mu\text{g}/\text{m}^3$

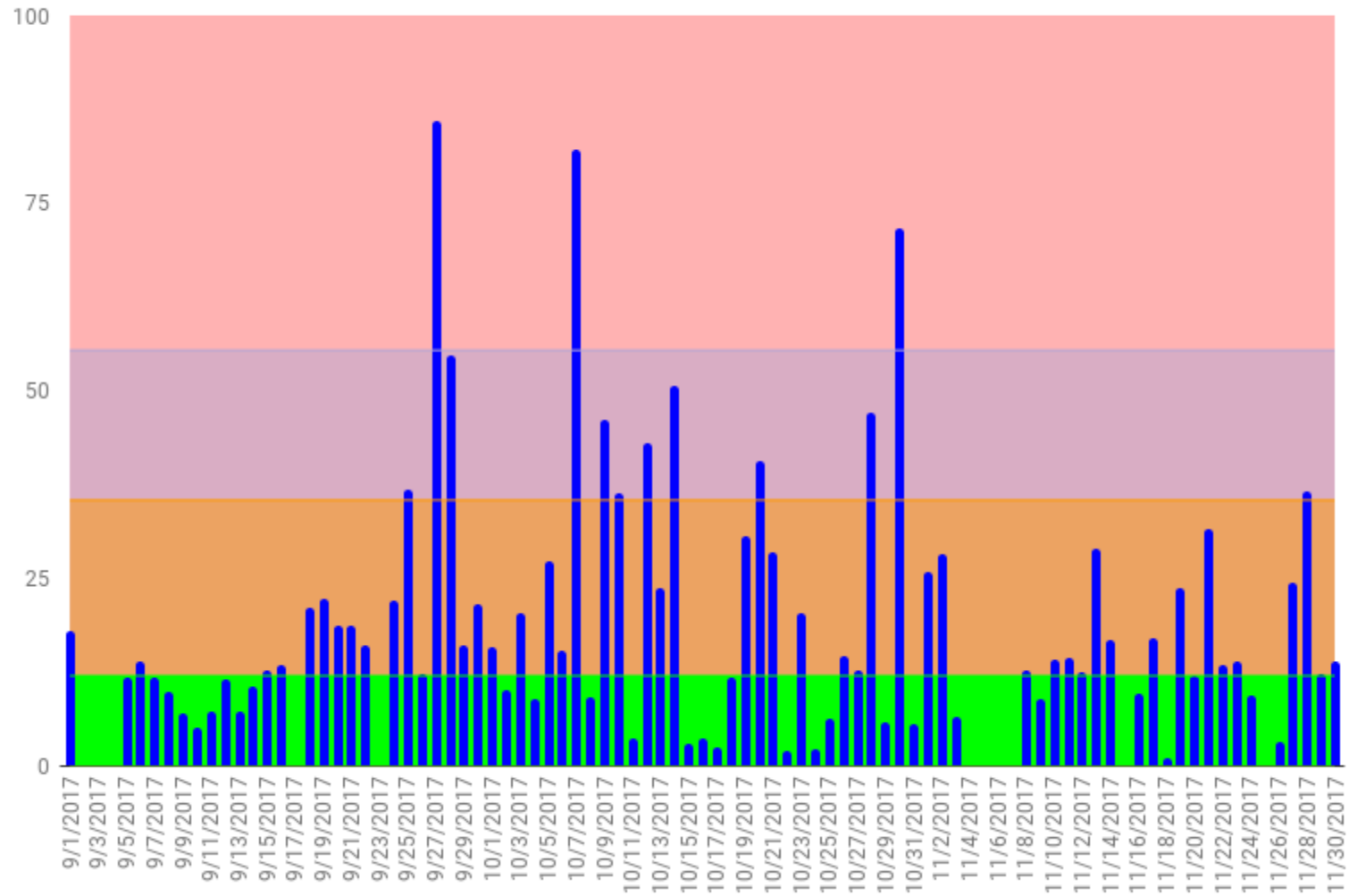




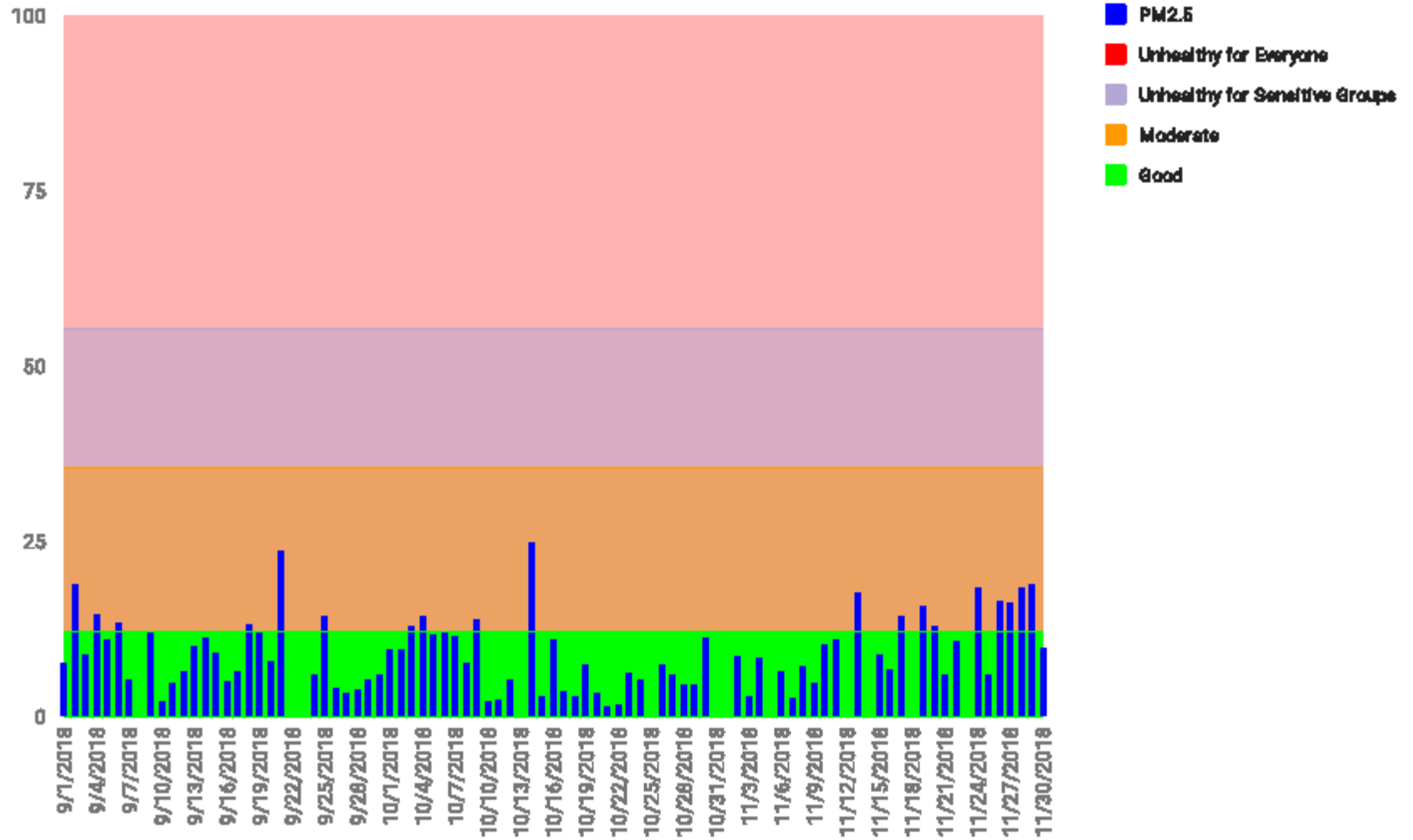
PM2.5 $\mu\text{g}/\text{m}^3$ Summer 2017



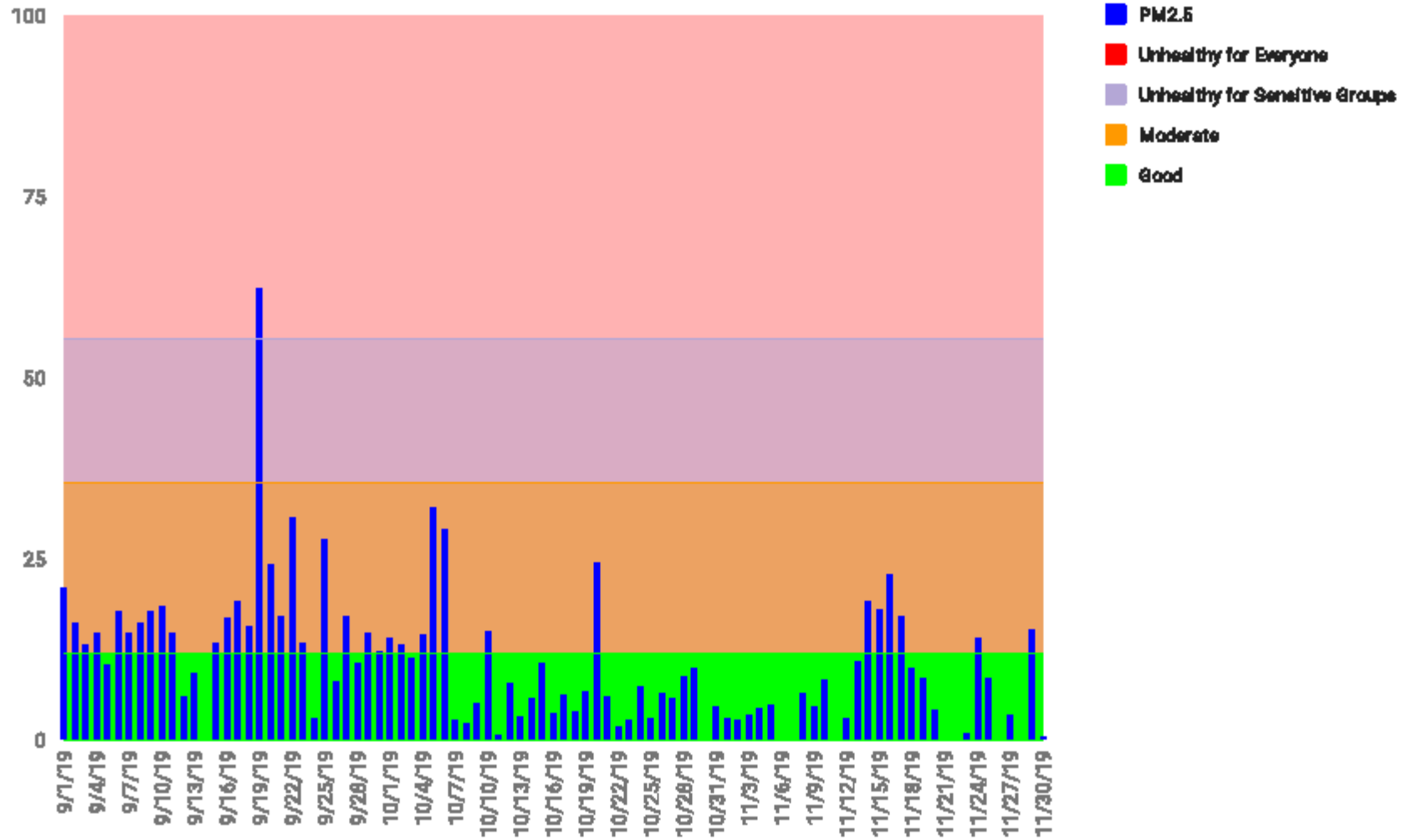
PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2017



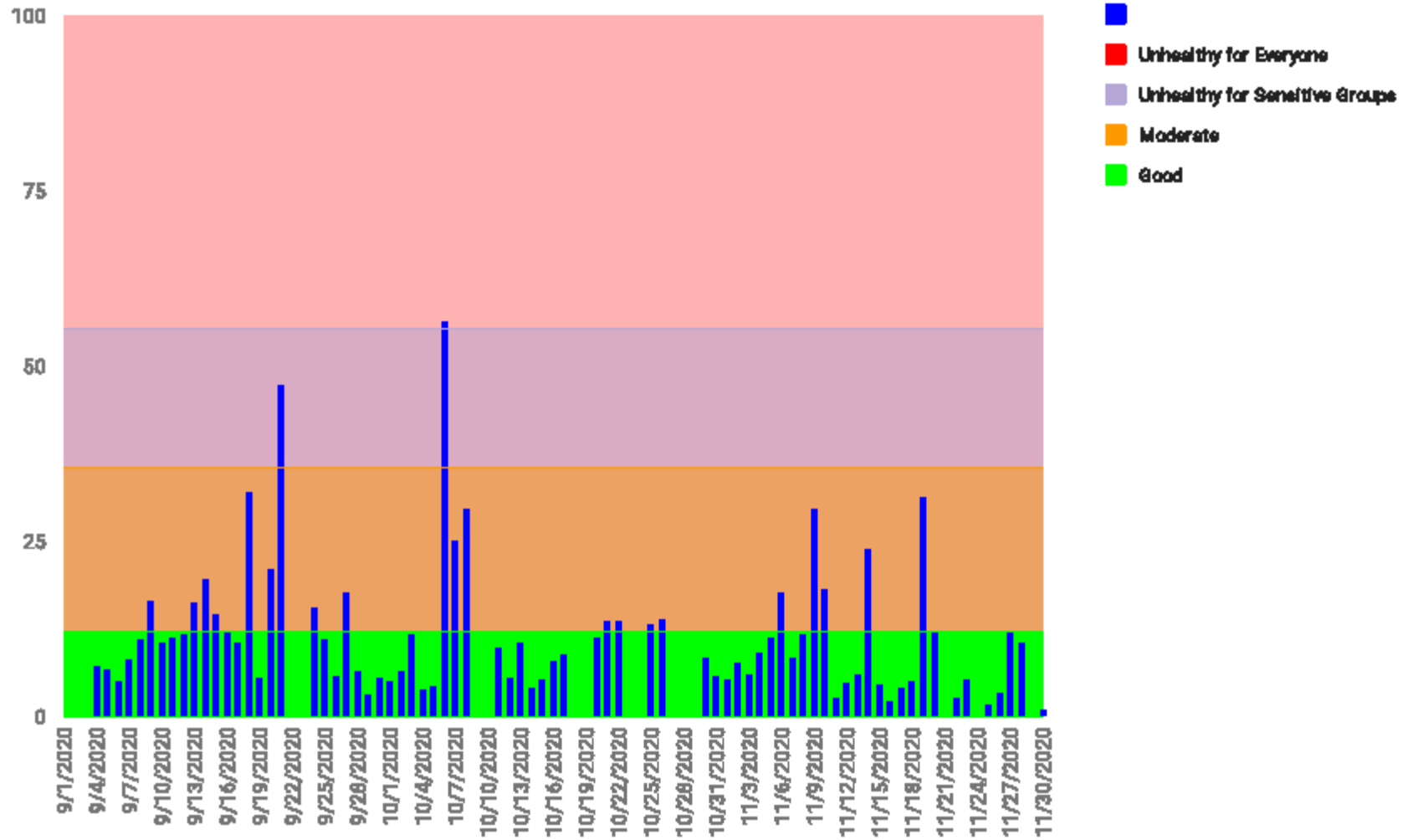
PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2018



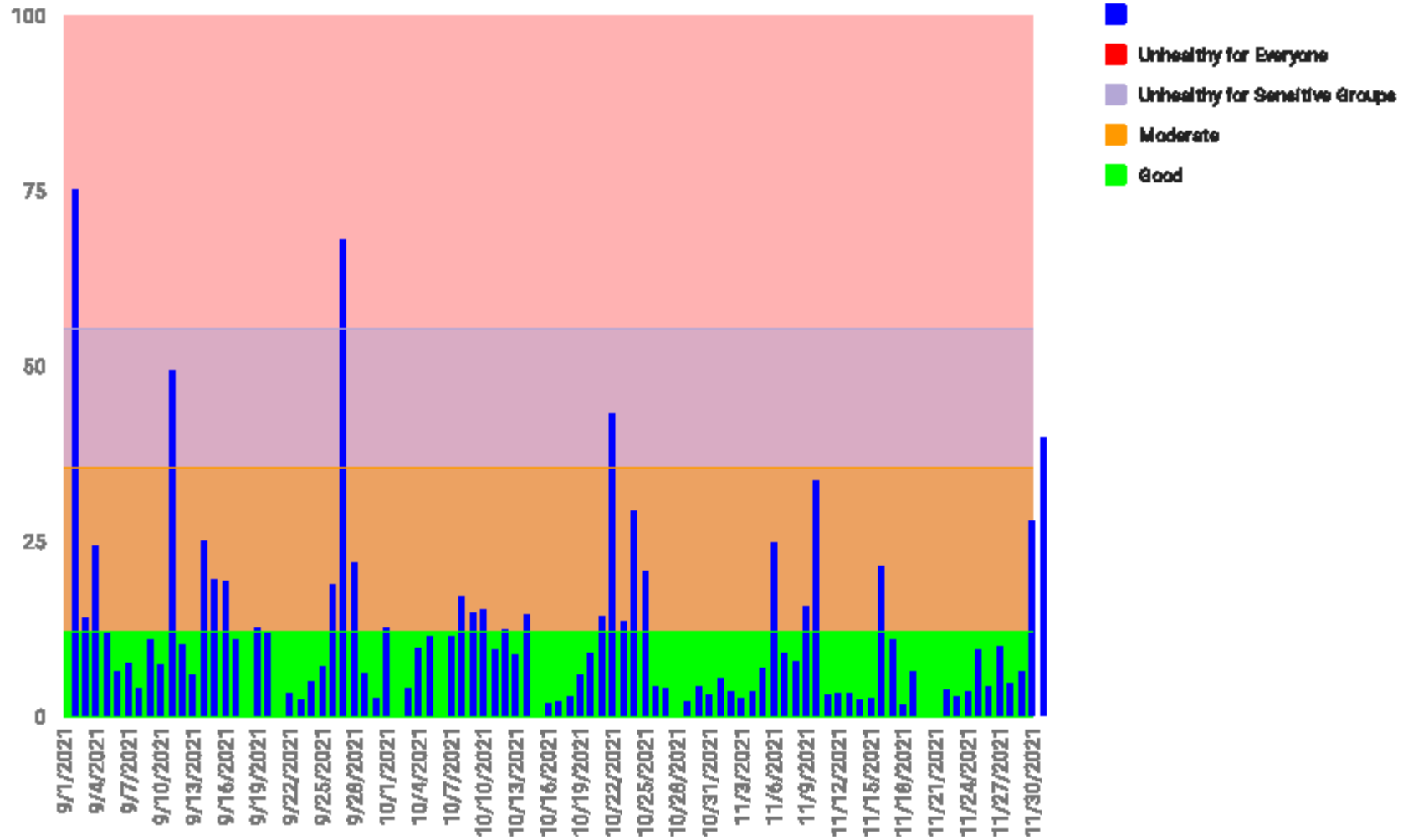
PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2019



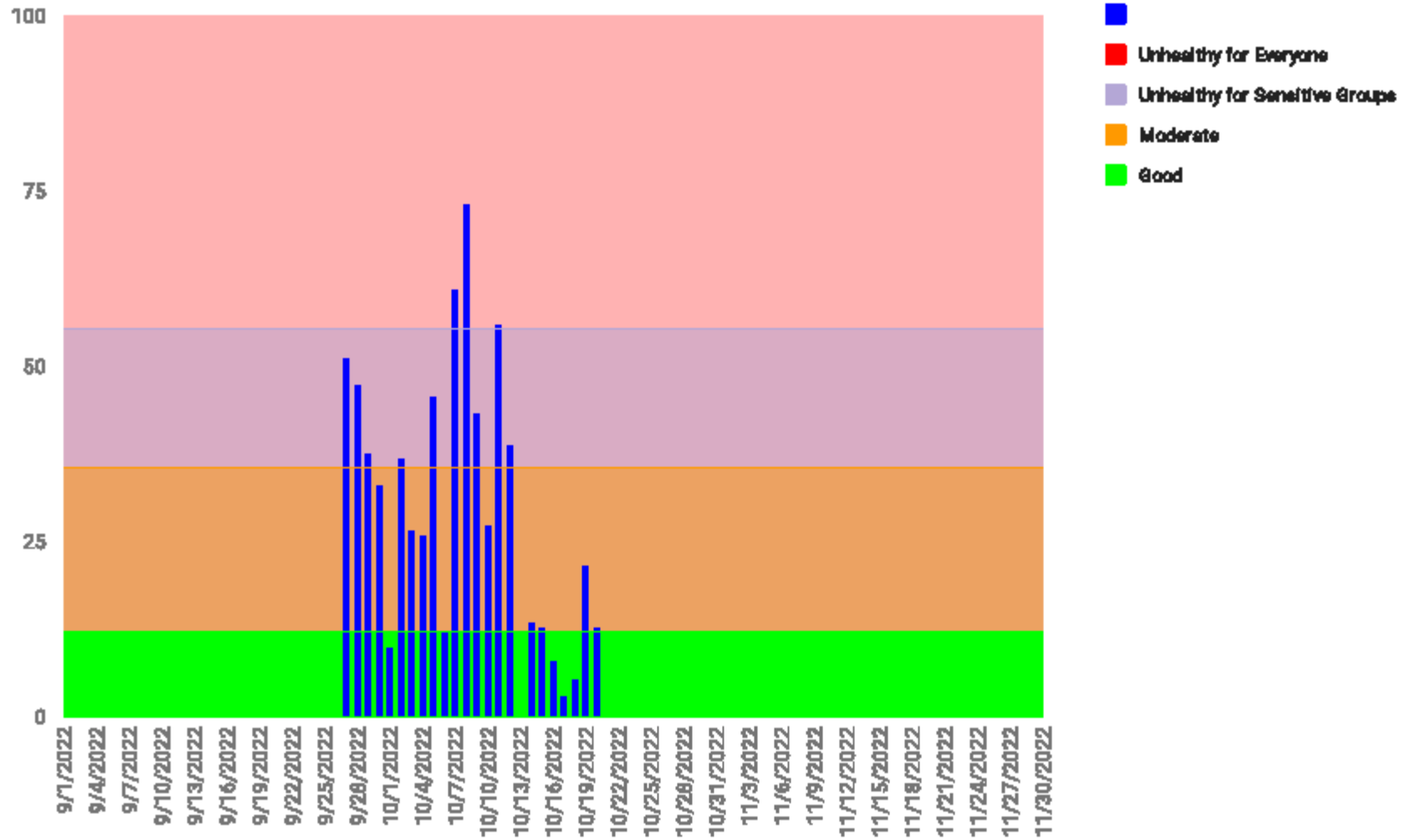
PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2020



PM 2.5 - Fall 2021



PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2022



The Solution

- What should the **goals** be?
- Decrease in total burning
- Eliminate the spikes over population centers
- Least pain for farmers or taxpayers
- **Ultimate goal = to reduce a significant health burden that now exists**

The Solution

- There are three broad components here:
- **Monitoring**
- **Research**
- **Regulation**
- Monitoring:
 1. There are too many gaps in air quality monitoring. We're not adequately measuring the problem.

The Solution

We have some needs:

- Surveillance needs to emphasize our **regional population centers** and include spot checking capability....
- And we need a mechanism for real-time **public advisories** when levels present a hazard
- We need a more robust analysis of hospital, ED, and insurance claims information to better clarify the health effects of agri. burning

The Solution

- Research:
 - Our Arkansas research and educational institutions (Schools of Ag/Coop. Ext. Service) need to be encouraged to consider public health/air quality in their **best practice recommendations**
 - ? improved/cost-effective management of crop residue,
 - ? other productive options

The Solution

- Dr. Li Liang (UA) has been studying regional burn patterns;
- Dr. Hardke has published studies on management of rice stubble.
- ASU (Slew, Wilson, Ford et al) has an ongoing grant to research prescribed crop burns and potentially provide evidence-based recommendations.

The Solution

- Regulation:
- Our state's legislators have many roles in this issue; this is one – can't be done county by county
- The current bar for regulation of burning is not very high
- What are other states doing?

State	Crop Residue Burning Regulations
California	<ul style="list-style-type: none"> • Requires a burning permit; • Burning only on burn days determined by local Air Districts in consultation with the California Air Resource Board; • Residues required to be shredded and piled when possible (CARB, 2006).
Florida	<ul style="list-style-type: none"> • Sugar cane farmers initiated burning oversight with Florida Department of Forestry (FLDOF) in 2004; • FLDOF issues burn permits between November and March (FLDOF, 2005).
Louisiana	<ul style="list-style-type: none"> • Farmers can burn during the daytime and are required to have certified Burn Managers at the burn (LSU Ag Center, 2000).
Oregon	<ul style="list-style-type: none"> • In 1991, House Bill 3343 established an open field burning acreage phase-down, propane flaming limitation, and residue burn permitting issued by the Oregon Department of Agriculture (ODA) for the Willamette Valley; • 102,500 acres of grass seed and cereal residues can be burned per year, which is enforced through aerial and ground surveys; • ODA has the right to fine growers that burn on no-burn days (ODA, 2007).
Washington	<ul style="list-style-type: none"> • Washington Department of Ecology (DOE) under the 1991 Clean Air Act of Washington issues all burning permits and determines burn days based on atmospheric conditions and U.S. Forest Service fire danger ratings; • Cost of permits are \$2.00 per acre to be paid by the farmers; • DOE can fine farmers \$10,000 for any illegal crop residue burning; • DOE uses aerial photography, tip hotline, and remote sensing for enforcement (WA DOE, 2005).

Table 1. State-level regulations for crop residue burning in California, Florida, Louisiana, Oregon, and Washington.

The Solution

- **Arkansas' solution:**
- 2017: Dept. of Agriculture assembled a task force to produce the **Arkansas Voluntary Smoke Management Guideline for Row Crop Burning**
- Modeled after the existing guideline for the Arkansas forestry industry
- Endorsed by ADEQ, Arkansas Farm Bureau, Arkansas Rice, UA Division of Agriculture and others..



Arkansas Voluntary Smoke Management Guidelines for Row Crop Burning

Adapted from voluntary Arkansas Smoke Management Guidelines for Arkansas forests, from the Arkansas Prescribed Fire Council.

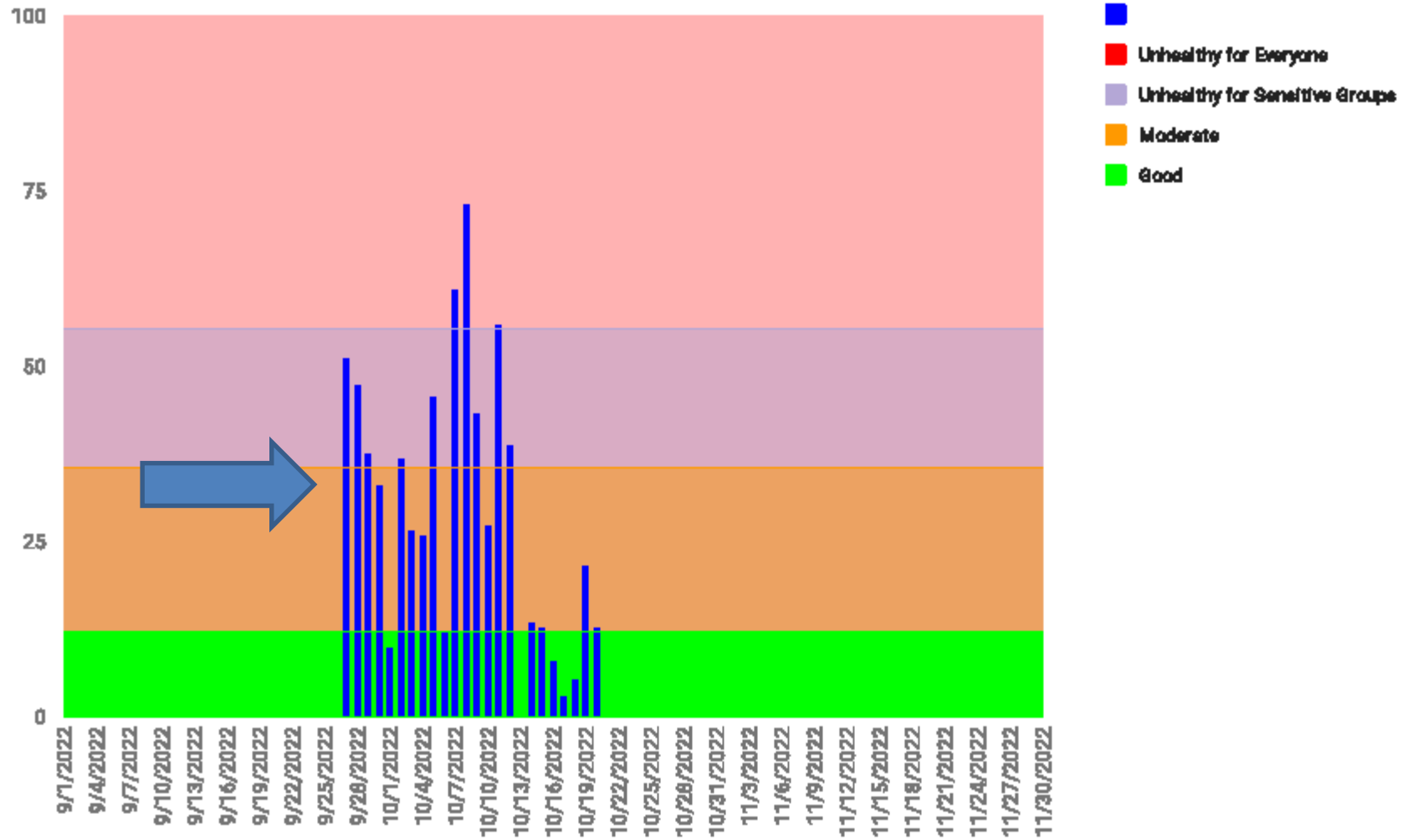
Solution

- This guideline was disseminated & discussed through several venues (Farm Bureau meetings, Ark. Rice Council Exposition, etc.)
- The Arkansas Forestry Commission Call Center is tasked with **coordinating** the burning of rice stubble by area farmers.
- Work in progress: Increasing consensus in the farming community that smoke is a health hazard and participation in the program is worthwhile.

Solution

- Measurable results so far?
- Utilization of the Guideline and AAD Dispatch center has been limited....
- Yet in 2018-21, Jonesboro air quality (peak PM 2.5 levels) showed a detectable improvement from previous years..
- **But** 2022 represents a glaring exception:

PM2.5 $\mu\text{g}/\text{m}^3$ Fall 2022



Final Advice

- There is more work to be done here. Ideas include:
- Some form of **incentivization** will be needed to encourage Guideline usage..
- An imposed **permit system** to regulate burning may yet be required..
- **Measurement** of the impact of any and all interventions, and ongoing surveillance.

Our air is a public resource and all Arkansans have a right to **great air quality**.





Sources

- **Personal Communication:**
- Joseph Bates MD, Gary Wheeler MD, and Richard McMullen PhD – Arkansas Department of Health
- Mark McCorkle – Air Quality Division, Arkansas Department of Environmental Quality
- Brannon Theisse, Craighead County Extension Agent
- Several area farmers
- Li Liang PhD, Asst. Professor – Air Quality, UA School of Agriculture
- Jarod Hardke PhD – Chief Rice Agronomist, UA School of Agriculture
- SHARP-PHO; Quality Assurance Division
- Womack, Phelps and McNeill, P.A.; Attorneys at Law
- Don McBride, Assistant State Forester – Resource Protection
- Wes Ward – Secretary of Agriculture

Sources

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- California Air District Resource Directory (www.arb.ca.gov/capcoa/roster.htm.)
- American Academy of Pediatrics: Pediatric Environmental Health - 3rd Edition;
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- Fine Particles in Wildfire smoke and Pediatric Respiratory Health in California; Aguilera et al; Pediatrics; 147, Issue 4; April 2021