Clean Air Needs Assessment:

Addressing wildfire smoke in public schools within Missoula County

A project funded by United Way of Missoula County

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Copies of this report can be found here: www.missoulaclimate.org/clean-air-for-schools--daycares.html

Additional information about wildfire smoke can be found here: www.missoulaclimate.org/wildfire-smoke.html

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Amy and Sarah give three portable air cleaners to John Rouse, principle of Potomac school, for use in the room of a student with special needs.

Sarah measures the rooms of Potomac School in order to determine how many PAC's are needed.

Acknowledgements

We are grateful to all principals, facility managers, administrators and others who helped retrieve the information needed to complete this Needs Assessment. We especially thank Superintendent Mark Thane and Terry Phelan with Missoula County Public Schools. Thank you all.

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Glossary of Terms

PM 2.5 – Particulate matter less than or equal to 2.5 micrometers (microns) in diameter. Most of the particulate matter in wildfire smoke is less than 1 micron in diameter. These tiny particles are especially harmful to human health because their small size allows them to travel deep into the lungs and pass into the bloodstream.

HVAC – Heating, Ventilating, and Air Conditioning system. HVAC systems have one or more filter components; exactly what type of filter is variable and depends on the size, age, and type of system.

MERV – Minimum Efficiency Reporting Value. Created by ASHRAE, the American Society of Heating, Refrigerating, and Air Conditioning Engineers, the MERV scale rates filters' ability to remove particles from the air. The scale ranges from 1-20, and the higher the MERV rating, the more effectively a filter will remove smaller particles. The lowest rated filter for effectively removing particles 0.3-1.0 micron in diameter is a MERV 13. MERV 13 rated filters have been found to capture ~70% of particles 0.3 microns – 1.0 microns with each pass, and more when systems are run on recirculate. Hospitals and clean rooms will typically have MERV ratings of 16 or greater. MERV ratings are most commonly used to describe the filters in HVAC systems.

HEPA – High Efficiency Particulate Air filter. A HEPA filter is in the 17-20 range on the MERV scale, and effectively traps 99.97% of particles larger than 0.3 microns. In this report, we mainly talk about portable HEPA air cleaners.

PAC – Portable Air Cleaner. A small fan unit with a HEPA filter component, typically able to filter particulates out of individual rooms less than 500 square feet in size. Also commonly known as HEPA air filtration units or air purifiers.

Background

There is a growing body of evidence that wildfire smoke is harmful to human health. The fine particulate matter in wildfire smoke (PM2.5) is small enough to penetrate deep into the lungs and pass into the blood stream, where it sets off an inflammatory response. The fine particulate matter in wildfire smoke is associated with increased symptoms of asthma, bronchitis, pneumonia, and chronic obstructive

pulmonary disease (Cascio, 2018). Studies suggest that exposure to various PM2.5 particles may also impact cardiovascular health, prenatal health, lung growth and capacity in children (Gauderman et al., 2000), mental health, cognition, and premature mortality (Cascio, 2018; Reardon, 2018; Stieb, 2012).

Certain populations are particularly vulnerable to wildfire smoke. Children, with still growing lungs, brains, and immune systems are one of these high-risk groups. Wildfire smoke exposure in children may affect lung capacity and immune function into adulthood, but more studies are needed to understand the long-term health impacts of smoke exposure on youth. Other vulnerable groups include pregnant women and fetuses, the elderly, and people with chronic health conditions such as lung or heart disease.

While seasonal smoke exposure is variable and dependent on many factors, it is an increasing issue for western Montana as wildfire seasons lengthen and become more severe. Climate change has resulted in hotter temperatures, earlier snowmelt, and reduced late summer precipitation in western Montana, and these factors all contributes to longer, more intense wildfire seasons (Whitlock et al., 2017). This trend is expected to continue.

The Missoula valley is particularly susceptible to wildfire smoke events due to the ease with which smoke becomes trapped in valley floors during inversions. Further, because wildfire smoke can travel many hundreds of miles, Missoula County often experiences extended periods of smoke from fires as far away as California or British Columbia.

In 2017, Missoula County experienced the worst wildfire smoke season on record. Smoke from surrounding wildfires covered the county from mid-July into mid-September. While no Missoula County community escaped the smoke, Seeley Lake was by far the hardest hit. The 165,000 acre Rice Ridge Fire started just outside Seeley Lake on July 25th, and by August 1st, the community began seeing hazardous smoke levels on a near daily basis. Meanwhile, as the Lolo Peak Fire grew south of Missoula, conditions in the lower Bitterroot Valley deteriorated. By mid-August, air quality in Lolo was routinely fluctuating between unhealthy and hazardous conditions. As the fire season dragged on, it became clear smoke impacts would continue until a season-ending snowfall, which meant smoke would be an issue for the start of the 2017 school year. In response to the smoke, Climate Smart Missoula with the Missoula City-County Health Department (MCCHD) were able to provide several of the most affected elementary schools with portable air cleaners (~ 2 per classroom, concentrated in the classrooms of the youngest students), but were overwhelmed by the number needing assistance.

This project formed out of the recognition during the 2017 season that our community is not prepared for wildfire smoke season. Climate Smart Missoula and MCCHD identified several key ways to prepare for wildfire smoke: build a cache of portable HEPA air cleaners to donate or loan to institutions in need; identify groups of people in Missoula with greater health risks and need for assistance; encourage individuals and institutions to purchase portable air cleaners or upgrade their HVAC filters, and understand the air quality needs of schools in the county.

The Clean Air Needs Assessment for Missoula County Schools aims to understand the air quality needs of public schools in Missoula County in order to empower the community to become better prepared for wildfire smoke and limit the health impacts on school children. We view this project as the initial step to being ready for wildfire smoke season and ensuring our school children are protected.

Methods

To conduct this assessment, superintendents, principals, and facility managers were contacted via phone and email during the summer of 2018. For the schools outside of the Missoula County Public School district (MCPS), once we established contact, a survey was conducted via phone interview. The survey consisted of a series of questions about the current school and any plans for remodeling or upgrading of systems. For all MCPS district schools, staff and administrators were able to collect and collate all the information needed from each school and then relay that to Climate Smart Missoula. Results presented here are dependent on the knowledge and correspondence of each contact (administrators or facility managers) at each school. All information is current as of September 2018. We recognize that facilities are periodically upgraded or situations change over time and the status of some schools will undoubtedly shift. Data was not collected from several schools, so certain results may not accurately reflect the status and needs of the entire Missoula County. Finally, specific measurements regarding classroom size are based on information provided by school staff or administrators and should be considered estimates.

Summary of Results

Missoula County has 32 public schools. The majority of these are within the city of Missoula and under the jurisdiction of Missoula County Public Schools (MCPS), District 1.

Grades pre-k: One
Grades K-5: Ten
Grades K-6: One
Grades K-8: Ten
Grades 6-8: Three
Grades 7-8: One
Grades 9-12: Six

Five public schools (15.6%) in Missoula County already have effective mechanisms to filter indoor air during periods of wildfire smoke.

Of these schools, three have new HVAC systems with MERV 13 filters, and two have portable air cleaners (PACs) with HEPA filters for each classroom. The three public schools currently with MERV 13 or higher filters are Rattlesnake Elementary, Russell Elementary, and Jeannette Rankin Elementary.

The two schools with a sufficient number of PACs for all classrooms include Frenchtown K-6 (Elementary and Intermediate), and Woodman School. However, these schools only have filters for classrooms—libraries, staff offices, and gymnasiums do not have adequate filtration.

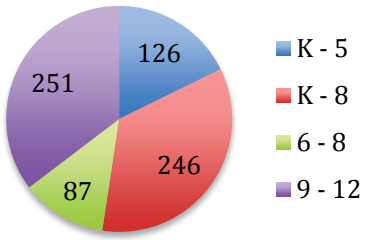
The majority of public schools in Missoula County are *not* equipped to filter wildfire smoke particulates out of the indoor air of each classroom.

Percent of all schools currently with filters rated MERV 8 or lower:

84.4%

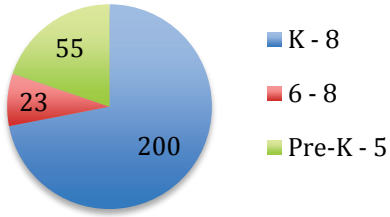
Number of classrooms without portable HEPA air cleaners and with poor or no central air filtration (MERV 8 or less)

698
Classrooms which lack filtration for wildfire smoke



Number of classrooms without air conditioning. Approximately 280 classrooms (of the 698) do not have air conditioning. It is challenging to keep windows shut during periods of wildfire smoke when indoor air temperatures creep up. Many classrooms open the windows in the morning when temperatures are cooler but this is when smoke levels can be unhealthy.

280
Classrooms do not have air conditioning



Missoula County Public Schools (MCPS) administration plans to upgrade HVAC filters as schools are remodeled, installing MERV 13 filters as upgrades are made. Several other school administrators, board members, and/or principals for schools outside of MCPS are also interested in making these upgrades.

> Percent of all public schools with a plan to install MERV 13 filters by 2020: (not including schools which already have MERV 13 filtration): 31% → 10 schools

However, there are still many schools that do not currently have plans to install better HVAC system filters, and are currently unable to filter out the fine particulates in wildfire smoke. These schools would benefit from appropriately sized and placed HEPA PACs during wildfire smoke events.

> Number of portable HEPA air cleaners needed to cover all classrooms in schools with no plans to upgrade their HVAC systems to MERV 13 filters (*excluding classrooms that already have HEPA PACs*):
>
> 357 classrooms → ~714 portable HEPA air cleaners
> Approximate cost: $107,100 (714 filters x $150)

*Cost estimate is based on typical classroom size of ~ 800 sq. ft., requiring two PACs, and price estimate of $150 per PAC. See individual school reports for more accurate square footage of classrooms. HEPA PACs may vary in cost (~ $100-$350).

General Guidelines for Schools in Smoke Impacted Areas

1. **Schools in smoke impacted areas should plan to upgrade HVAC systems** in order to utilize MERV 13 + rated filters (either throughout the year, or for the duration of each wildfire smoke season). Ideally, updated HVAC systems should have an easy mechanism for switching to the recirculate function* for facility managers or administrators to utilize when air quality deteriorates. Higher rated filters must be replaced more frequently, particularly during periods of heavy wildfire smoke. The higher the MERV rating, the more often filters will need to be changed. Schools should consider using a digital monitoring system that detects when filters need to be replaced. **Whenever central air systems are switched to recirculate, carbon dioxide levels should be monitored.*

2. **If no plans to update the HVAC system are in place**, or such plans will be multiple years before completion, schools should develop a plan to obtain or purchase portable HEPA air cleaners for as many rooms as possible, beginning with the most vulnerable classrooms *i.e.* the youngest children and any particularly sensitive individuals. If schools use portable HEPA air cleaners, they should plan for regular upkeep and maintenance of the units, including the purchase of replacement HEPA filters, and, if applicable, replacement pre-filters.

3. **When air quality outside reaches 'unhealthy for sensitive groups' or higher**, schools should keep windows and doors closed, and run the HVAC system on recirculate, and/or run any portable HEPA units.

4. **Schools without air conditioning** should take steps to keep the building cool, so that windows can stay closed when air quality is poor. We strongly recommend that all schools build or grow shade outside, especially on the south and west sides of buildings, as this works well to keep a building cool. Balancing temperature and air quality can be challenging in schools without air conditioning. Sometimes, it may be more important to cool off than to ensure air quality is healthy, especially when air quality is marginal but not extremely unhealthy.

5. **There may be opportunities to open windows at night, then close them early and run filter systems** before students arrive in order to both cool rooms and create safe indoor space. However, it's difficult to gauge exactly how much time an HVAC system or HEPA filters would need to effectively clean the air after a full night with windows open. This may not be an appropriate option when there are high levels of smoke pollution. Administrators should carefully monitor air quality and consider impacts to sensitive individuals. Contact your local health department for specific recommendations.

6. **Don't underreact, and don't overreact either.** Smoke exposure is harmful to children, and should be taken seriously. However, exercise and time spent outdoors are also important for physical and mental health, especially in children. Administrators should closely monitor air

quality levels on any given day, view local health department guidelines, and consider the overall health costs and benefits of keeping students indoors.

7. **Systems with MERV 8 filters are effective at removing *some* wildfire smoke particulates from the air when they are run on recirculate**. This strategy should be utilized during periods of wildfire smoke if other filtration methods aren't available. Note that MERV 8 filters are not rated for removing fine particulate, and as smoke levels increase, the effectiveness of a MERV 8 filter will decrease.

Future Needs and Discussion

There are still a number of steps that should be taken in order to better understand the health impacts of wildfire smoke, as well as best practices in preparing for smoke events. One step is to learn more about air quality within Missoula County. Currently, there is one air quality monitor in the south end of Missoula city, one monitor in Seeley Lake, and one in Frenchtown. Permanent or temporary monitors in more locations throughout the County, especially during wildfire season would provide the County with better information about where the smoke is settling, and any variation in air quality. This information would allow schools and individuals to make informed decisions about health, and would let the health department know which locations within the county are most impacted, and therefore who to prioritize when distributing the HEPA filter cache. And indoor air study in which monitors are placed inside classrooms that have MERV 13 filters or HEPA units is needed to further evaluate the effectiveness of these intervention strategies. More research is also needed on the long-term health impacts of wildfire smoke on various populations, including children.

There are currently no widely accepted 'best practices' for community health responses to wildfire smoke, but we can identify several strategies that are useful, such as assessing the air filtration needs of facilities that hold large numbers of at-risk populations (schools, daycares and pre-schools, nursing homes, etc.); building a cache of emergency HEPA PACs; providing air quality and health information to the community via websites and social media; and cooperating with local non-profits, school administrators, university researchers, and the city-county health department on these efforts. Specific distribution strategies would be helpful for quick deployment of PACs. Possibilities include utilizing school nurses to identify and distribute PACs to classrooms with sensitive students, using childcare resource systems to contact daycares, and pushing for adoption of MERV 13+ filters during remodel planning processes. However, additional funding is needed in order to continue current community health efforts regarding wildfire smoke, and to progress forward.

As the Missoula community moves forward with wildfire smoke best practices, it is critical to remember the connection to climate change. While updated HVAC systems and portable HEPA air cleaners in buildings do help protect our lungs, a hazardous summer environment will inevitably cause widespread health issues and general unhappiness within a community that prides itself in having a beautiful outdoors. Climate change is at the root of Missoula County's increasing summer smoke problem; it is essential that we reduce our local and global carbon footprint.

Individual School Reports

Much of the information provided below is similar to, or based on, the general guidelines listed on page 8 of this report. Please read all general guidelines before reading any specific school's recommendations.

Chief Charlo Elementary

District: 1, K-5

Recent remodel completed: 8/25/2016
MERV rating of filters in new HVAC system: MERV 8
System serviced: annually
Total number of classrooms: 19
Approximate classroom size: 900-950 square feet
Gymnasium size: 5000 square feet
Air Conditioning: No
How many portable HEPA air cleaners do the school own: 0

Recommendations

Chief Charlo Elementary school's new HVAC system may be able to function well with MERV 13 + filters during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filters are suitable. This strategy would require running the HVAC system in order to move air through the filters, even though there is no air conditioning and likely no need for heat. Otherwise, 38 portable HEPA units are needed to filter particulates out of the 19 classrooms (two per room), costing between $3,800 and $11,400. See numbers 1, 4, and 7 of the general guidelines.

Hawthorne Elementary

District: 1, K-5

Expected remodel completion: 8/23/2019
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
System serviced: annually
Total number of classrooms: 20
Approximate classroom size: 800-900 square feet
Gymnasium size: 5000 square feet
Central Air Conditioning: No
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Hawthorne Elementary is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Franklin Elementary

District 1, K-5

Recent remodel completed: 8/25/2017
MERV rating of filters in new HVAC system: 8
System serviced: Annually
Total number of classrooms: 14
Approximate classroom size: 750-900 square feet
Gymnasium size: 4500 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

Franklin school's new HVAC system may be able to function well with a MERV 13 filter during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filter is suitable. If not, 28 portable HEPA units are needed to filter particulates out of the 14 classrooms (two per room), costing between $2800 and $8400. See numbers 1 and 7 of the general guidelines.

Jeannette Rankin (Cold Springs) Elementary

District 1, K-5

Recent remodel completed: 8/24/2018
MERV rating of filters in new HVAC system: 13
Total number of classrooms: 21
Approximate classroom size: 800-900 square feet
Gymnasium size: 5000 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

The new HVAC system with MERV 13 filters should work well to keep indoor air at healthier levels during periods of wildfire smoke. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Jefferson Elementary

District 1, Pre-k

Recent remodel completed: 8/25/16
MERV rating of filters in new HVAC system: 8
Total number of classrooms: ~16
Approximate classroom size: 800-900 square feet
Gymnasium size: 4500 square feet
Central Air Conditioning: No

How do administrators keep the school cool? Shades, close windows
How many portable HEPA air cleaners do the school own: 0

Recommendations
Jefferson school's new HVAC system may be able to function well with a MERV 13 filter during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filter is suitable. This strategy would require running the HVAC system in order to move air through the filter, even though there is no air conditioning and likely no need for heat. Otherwise, ~32 portable HEPA PACs are needed to filter particulates out of each classroom, costing between $3200 and $9600. Since there is no air conditioning, school staff may consider opening windows at night to cool the school, but shut them again before students arrive and run HEPA filters or the HVAC system on recirculate. See numbers 1, 4, 5, and 7 of general guidelines.

Lewis & Clark Elementary

District 1, K-5

Expected remodel completion: 8/23/2019
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
System serviced: annually
Total number of classrooms: 21
Approximate classroom size: 750-900 square feet
Gymnasium size: 4500 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations
If the remodel of Lewis & Clarke Elementary is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. See number 1 of the general guidelines.

Lowell Elementary

District 1, K-5

Recent remodel completed: 8/25/2017
MERV rating of filters in new HVAC system: 8
System serviced: annually
Total number of classrooms: 15
Approximate classroom size: 750-950
Gymnasium size: 4000 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations
Lowell school's new HVAC system may be able to function well with a MERV 13 filter during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filter is suitable. If not, 30 portable HEPA air cleaners are needed to filter particulates out of the 15 classrooms (two per room), costing between $3,000 and $9,000. See numbers 1 and 7 of general guidelines.

Paxon Elementary

District 1, K-5

Recent remodel completed: 1/10/2017
MERV rating of filters in new HVAC system: 8
System serviced: annually
Total number of classrooms: 21
Approximate classroom size: 750-900 square feet
Gymnasium size: 4000 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations
Paxon School's new HVAC system may be able to function well with a MERV 13 filter during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filter is suitable. If not, 42 portable HEPA air cleaners are needed to filter particulates out of the 21 classrooms, costing between $4,200 and $12,600. See numbers 1 and 7 of the general guidelines.

Rattlesnake Elementary

District 1, K-5

Recent remodel completed: 7/21/2017
MERV rating of filters in new HVAC system: 13
Total number of classrooms: 21
Approximate classroom size: 850-950 square feet
Gymnasium size: 5000 square feet (x2)
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations
The new HVAC system with MERV 13 filters should work well to keep indoor air at healthier levels during periods of wildfire smoke. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Russell Elementary

District 1, K-5

Recent remodel completed: 8/24/2018
MERV rating of filters in new HVAC system: 13
Total number of classrooms: 18
Approximate classroom size: 800-900 square feet
Gymnasium size: 5000 square feet
Central Air Conditioning: No
How do administrators keep the school cool? Windows, shades, HVAC purge
How many portable HEPA air cleaners do the school own: 0

Recommendations

The new HVAC system with MERV 13 filters should work well to keep indoor air at healthier levels during periods of wildfire smoke. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

6-8 Middle Schools

C.S Porter

District 1, 6-8

Expected remodel completion: 8/21/2020
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 23
Approximate classroom size: 850-950 square feet
Gymnasium size: 5500 square feet (x2)
Central Air Conditioning: No
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of C.S. Porter is completed by the proposed date, the new HVAC system should work well for the 2020 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. If the 2019 wildfire season is bad, 64 portable HEPA PACs may be needed to filter harmful particulates out of all classrooms, costing between $6,400 and $19,200. Once the new HVAC system is completed, administrators should consider keeping children out of any rooms that the new system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 7 of the general guidelines.

Meadow Hill

District 1, 6-8

Expected remodel completion: 8/23/2019
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: ~30
Approximate classroom size: 850-850 square feet
Gymnasium size: 5500 square feet (x2)
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Meadow Hill is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Washington

District 1, 6-8

Expected remodel completion: 8/23/2019
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 34
Approximate classroom size: 850-950 square feet
Gymnasium size: 5500 square feet (x2)
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Washington Middle School is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Frenchtown Junior High (7-8)

No information was received from this school.

9-12 High Schools

Big Sky High School

District 1, 9-12

Expected remodel completion: 8/21/2020
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 73
Approximate classroom size: 850-1000 square feet
Gymnasium size: 7000 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Big Sky High School is completed by the proposed date, the new HVAC system should work well for the 2020 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). If the 2019 wildfire season is bad, 146 portable HEPA filters are be needed in order to filter harmful particulates out of all classrooms, costing between $14,600 and $43,800. See numbers 1 and 7 of the general guidelines.

Hellgate High School

District 1; 9-12

Expected remodel completion: 12/31/2018
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: ~70
Approximate classroom size: 850-950 square feet
Gymnasium size: 7000 square feet (x2)
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Hellgate High School is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Seeley-Swan

District 1, 9-12

Recent remodel completed: 1/20/2017
MERV rating of filters in new HVAC system: 8
Total number of classrooms: 24
Approximate classroom size: 900 square feet
Gymnasium size: 6500 square feet
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

Seeley Swan's new HVAC system may be able to function well with MERV 13 filters during periods of wildfire smoke. An HVAC technician can be consulted to check if the higher rated filters are suitable. If not, 48 portable HEPA PACs are needed to filter particulates out of all 24 classrooms, costing between $4,800 and $14,400. See numbers 1 and 7 of the general guidelines.

Sentinel High School

District 1, 9-12

Expected remodel completion: 12/19/2019
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: ~70
Approximate classroom size: 850-950 square feet
Gymnasium size: 7000 square feet (x2)
Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations

If the remodel of Sentinel High School is completed by the proposed date, the new HVAC system should work well for the 2020 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). If the 2019 wildfire season is bad, 140 portable HEPA filters may be needed to filter particulates out of all 70 classrooms. See numbers 1 and 7 of the general guidelines.

Willard

District 1, 9-12

Expected remodel completion: 9/7/2018
MERV rating of filters in future HVAC system: 13
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 14
Approximate classroom size: 750-900 square feet

Central Air Conditioning: Yes
How many portable HEPA air cleaners do the school own: 0

Recommendations
If the remodel of Willard High School is completed by the proposed date, the new HVAC system should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). See number 1 of the general guidelines.

Frenchtown High School
No information was received from this school.

K-8 Schools

Hellgate Elementary
District: 4; K-8

Expected remodel completion: One additional building, completed by December, 2018. There are no plans to remodel existing buildings.
MERV rating of filters in future HVAC system: 13 – Administration is also considering upgrading to filters rated higher than MERV 13 for the duration of events.
MERV rating of filters in current HVAC systems: 8
Total number of classrooms: 72
Approximate classroom size: 900 square feet
Central Air Conditioning: No, except in new building, to be completed December, 2018.
How many portable HEPA air cleaners do the school own: 2

Recommendations
If the addition to Hellgate Elementary is completed by the proposed date, the new HVAC system in that building should work well for the 2019 wildfire season. Administrators and facility managers should have a plan for controlling window and door usage on smoky days, and be able to switch the HVAC system to recirculate indoor air. Administrators should consider keeping children out of any rooms that the new HVAC system does not serve for the duration of any smoke event, or obtain portable HEPA air cleaners for them (~two per room). Upgrades to the existing HVAC systems would improve smoke filtration as well. Without upgrading to MERV 13 or higher filters in the older buildings, 142 portable HEPA units are needed to filter particulates out of the air in all 72 classrooms, costing between $14,200 and $42,600. See numbers 1 and 7 of the general guidelines.

Lolo

District: 7, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 60
Approximate classroom size: thirty five classrooms at 700-1050 square feet, about six classrooms between 350-700 square feet, and about fourteen classrooms less than 350 square feet
Gymnasium size: N/A
Central Air Conditioning: Yes in some buildings: top floor of building 5, main portion of building two (library and adjacent classrooms), kindergarten building (two rooms).
How many portable HEPA air cleaners do the school own: 0

Recommendations

Due to the structural nature of the school (multiple buildings with different heating and cooling systems), as well as no immediate plans for remodeling, utilizing portable HEPA air cleaners may be the most effective way to protect indoor air during periods of wildfire smoke at Lolo School. In order to filter smoke particulates out of all 60 classrooms, 90 portable HEPA units would be necessary, costing between $9,000 and $27,000. See number 7 of the general guidelines.

Potomac

District: 11, K-8

Expected remodel completion: No official plans for remodeling. There is hope to remodel the neighboring community center, which houses the school's gymnasium and 7th & 8th grade classrooms.
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: ≤8 (in both the main building and community center)
Total number of classrooms: 9
Approximate classroom size: seven 500-600 square foot classrooms, two 1050 square foot classrooms (the two upstairs rooms in the main building).
Gymnasium size: 5000 square feet
Library: 500 square feet
Central Air Conditioning: No, AC window units in two classrooms.
How many portable HEPA air cleaners do the school own: 3 - From Climate Smart Missoula, specifically for use in the room of one particularly sensitive individual.

Recommendations

If Potomac is able to remodel the neighboring community center, plans should include the installation of a new HVAC system with MERV 13 + rated filters. Because no remodel plans are currently in effect, and the number of classrooms is small, utilizing portable HEPA air cleaners would be highly effective for relatively little cost. Ten additional PACs would be enough to cover all classrooms and the library, costing between $1,000 and $3,000. Two units in each of the 1050 sq. ft. rooms, and one unit in all other rooms would be sufficient to filter most harmful particulates out of the indoor air.

Bonner

District: 14, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in current HVAC system: ≤8
Total number of classrooms: 32
Approximate classroom size: 890 square feet
Gymnasium size: N/A
Central Air Conditioning: No, about 40% of classrooms have individual AC units.
How many portable HEPA air cleaners do the school own: 0

Recommendations

Since there are no plans for remodeling, utilizing portable HEPA air cleaners is a good option. In order to filter wildfire smoke particulates out of the indoor air in all 32 classrooms, 64 PACs are necessary, costing between $6,400 and $19,200. See number 7 of the general guidelines.

Woodman

District: 18, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in current HVAC system: N/A
Total number of classrooms: 5
Approximate classroom size: N/A
Gymnasium size: N/A
Central Air Conditioning: No
How many portable HEPA air cleaners do the school own: Five

Recommendations

Administrators should make sure that the five classrooms at Woodman are approximately 500 square feet or smaller, so that each of the five PACs are effective. If rooms are larger than 500 square feet, additional portable HEPA air cleaners may be needed. It is also important to regularly replace dirty filters in each of these PAC units.

Desmet

District 20, K-8

Expected remodel completion: No, except gymnasium in the next five years. Could perhaps replace whole school HVAC system then.
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: ≤8
Total number of classrooms: 16
Approximate classroom size: 300 – 900 square feet
Gymnasium size: 6000 square feet
Central Air Conditioning: No
How many portable HEPA air cleaners do the school own: 0

Recommendations
Administrators should look into replacing the school's HVAC system when the gym is remodeled, and explore the possibility of upgrading to MERV 13 filters at that time. Since there are few classrooms, portable HEPA air cleaners would also be highly effective for relatively little cost. In order to filter wildfire particulates out of the air in each classroom, 16 - 32 HEPA units are needed, costing between $1,600 and $9,600. See numbers 4 and 7 of the general guidelines.
*The estimated classroom size provided by school staff was 300 square feet, but this seems small. Square footage should be checked before any portable HEPA air cleaners are purchased.

Target Range

District 23, K-8

Expected remodel completion: N/A, the board of directors is in very early planning stages.
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: 8
Total number of classrooms: 33
Approximate classroom size: 660 square feet
Gymnasium size: ≥1000 square feet (x2)
Central Air Conditioning: Yes, but doesn't work very well.
How many portable HEPA air cleaners does the school own: 0

Recommendations
Administrators and the board of directors should consider upgrading to MERV 13 + filters whenever the school is remodeled. In the meantime, portable HEPA air cleaners would be effective. The school would need 66 PACs in order to effectively filter smoke particulates out of all 33 classrooms, costing between $6,600 and $19,800. See numbers 4 and 7 of the general guidelines.

Sunset

District 30, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in current HVAC system: N/A
Total number of classrooms: 2
Approximate classroom size: N/A
Gymnasium size: No gym
Central Air Conditioning: No
How many portable HEPA air cleaners does the school own: 0

Recommendations
Administrators should determine the approximate square footage of each classroom. The school should consider using portable HEPA air cleaners during periods of wildfire smoke, as there are only two classrooms. The cost of two to four PACs would be between $200 and $1,200.

Clinton

District 32, K-8

Expected remodel completion: The school hopes to pass a bond in November 2018, to remodel at least the modular classrooms and gymnasium. If passed, completion could take several years.
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: ≤8
Total number of classrooms: 15
Approximate classroom size: 800 square feet, four modular classrooms 500 square feet
Gymnasium size: 3000 square feet
Central Air Conditioning: Modulars have AC, but the main building does not
How many portable HEPA air cleaners do the school own: 0

Recommendations

Administrators should consider including an upgrade to the school's HVAC system in the bond, with MERV 13 + filters. Portable HEPA air cleaners would also be effective in filtering wildfire smoke particulates out of the indoor air. For the 15 classrooms, 26 PACs would be needed (one in each modular and two in each of the other classrooms), costing between $2600 and $7,800. See numbers 4 and 7 of the general guidelines.

Swan Valley

District 33, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in current HVAC system: N/A
Total number of classrooms: 6
Approximate classroom size: 832 square feet
Gymnasium size: N/A
Central Air Conditioning: No, one window AC unit
How many portable HEPA air cleaners do the school own: 8

Recommendations

Swan Valley School has enough portable HEPA air cleaners to effectively filter particulates in four out of the six classrooms. Four more PACs would allow good wildfire smoke filtration in the last two rooms, and would cost between $400 and $1,200. With only eight PACs currently, limiting students (especially younger ones) to the four rooms with PACs running during periods of heavy wildfire smoke is another possibility, eliminating the need to purchase more units.

Seeley Lake

District 34, K-8

Expected remodel completion: No remodel plans.
MERV rating of filters in current HVAC system: ≤8
Total number of classrooms: 20
Approximate classroom size: 900 square feet
Gymnasium size: N/A

Central Air Conditioning: No
How many portable HEPA air cleaners do the school own: 20

Recommendations
During the 2017 wildfire season, the Health Department was able to lend Seeley Lake School 20 portable HEPA air cleaners, and the school matched by purchasing 20 of their own. The 20 PACs that the school owns can be used for half (10) of their classrooms, as two are needed in each 900 square foot space. Administrators and/or community members may want to consider purchasing 20 more HEPA PACs to ensure all classrooms are taken care of in future smoke events. This would cost between $2,000 and $6,000. See number 4 of the general guidelines.

Frenchtown Elementary and Intermediate School (K-4, 5-6)

District 40, K-6

Expected remodel completion: N/A
MERV rating of filters in future HVAC system: N/A
MERV rating of filters in current HVAC system: ≤8
Total number of classrooms: 32
Approximate classroom size: 800 square feet
Gymnasium size: N/A
Central Air Conditioning: N/A
How many portable HEPA air cleaners do the school own: 64

Recommendations
One Frenchtown parent was able to raise money during the 2017 wildfire season to purchase 64 portable HEPA air cleaners for the school. This is enough to effectively filter the air in each of the 32 classrooms. School staff should regularly replace dirty filters in each of these PACs to ensure continued effectiveness.

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