DATE: November 19, 2015

TO: SJVUAPCD Governing Board

FROM: Seyed Sadredin, Executive Director/APCO
Project Coordinator: Sheraz Gill

RE: **ITEM NUMBER 9: DEVASTATING HEALTH IMPACTS ASSOCIATED WITH AIR POLLUTION FROM WILDFIRES AND POTENTIAL ACTIONS BY THE DISTRICT AIMED AT REDUCING THE NUMBER AND INTENSITY OF WILDFIRES IN THE FUTURE**

RECOMMENDATIONS:

1. Review the enormous damage to public health from wildfires.

2. Develop potential changes to District's rules, policies, and procedures to facilitate more effective use of prescribed burning as a means to reduce the number and severity of future wildfires.

3. Work with local, state, and federal land managers and fire suppression agencies in an ongoing effort to identify gaps in land management and fire suppression policies and practices and develop solutions.

4. Support S. 235 (Wildfire Disaster Funding Act of 2015) and similar federal and state legislation to enhance and preserve funding for land and forest management.

5. Support and pursue legislative or administrative initiatives to allow for mechanical removal of forest fuel buildup in high hazard zones.

6. Develop a targeted public education campaign to increase public awareness of the enormous damage to public health due to wildfires and build public support for increased prescribed burning that may help reduce the number and severity of future wildfires.

BACKGROUND:

The extreme drought currently being experienced in the San Joaquin Valley and across the western United States has led to a number of conditions that have exacerbated the Valley's air quality challenge. Due to the excessively dry conditions, the buildup of combustible materials, and the mortality of millions of trees from the drought and beetle bark infestation, the region has experienced a number of large wildfires and California has reached an all-time high for fire danger.

Air pollution generated from wildfires can routinely overwhelm emission reduction efforts in the San Joaquin Valley and result in periods of excessively high particulate matter and ozone concentrations. To minimize public health impacts, the District implements a multi-faceted strategy as summarized below.

When wildfires do occur, District staff step up efforts by conducting more field observations of smoke impacts on downwind receptors. When smoke is impacting the District's valley floor or mountain residents, staff works with public land managers to see if more firefighting resources can be put in place in those areas to minimize smoke, particularly near sensitive receptors. Lastly, District staff work with the California Office of Emergency Response and public land managers to deploy portable monitoring equipment in areas being impacted by smoke. This information combined with public land manager data allows for more precise characterization of smoke impacts, more informed decisions, and more accurate and timely information for the public.

During severe wildfire impact situations, the District strives to provide timely information to Valley residents to minimize wildfire smoke exposure. The District's state of the art Real-time Air Advisory Network (RAAN) serves to inform Valley residents about local air quality conditions. RAAN notifications are particularly important when wildfire plumes enter the Valley and elevate ozone and PM2.5 levels to particularly dangerous levels. During this past wildfire season, these notifications were utilized by schools and the public in order to curtail outdoor activities during high pollution/smoke episodes. Anticipating the public's need for additional information regarding the wildfires, the District created a wildfire information website that serves as a clearinghouse for updated fire and air quality information from various sources.

During the 2015 summer wildfire season, the District issued eight health cautionary statements and press releases advising Valley residents to protect themselves from wildfire smoke. Staff also fielded 178 public calls and responded to 43 media inquiries regarding wildfire activity this year. Additionally, District staff worked closely with county health officials to communicate potential impacts to the public and actions to be taken to minimize exposure.

Despite significant efforts by the District to minimize public exposure, failure to take effective action to reduce the number and intensity of wildfires will result in significant

damage to public health throughout the San Joaquin Valley. Today's recommendations for actions aimed at reducing wildfire emissions reflect the District's current understanding of major factors that contribute to wildfires derived from extensive engagement with land managers throughout the Valley. Today's recommendations also include additional actions to gain a more complete understanding of the factors that contribute to frequent and intensive wildfires, and engage in a more collaborative effort to develop and implement additional solutions.

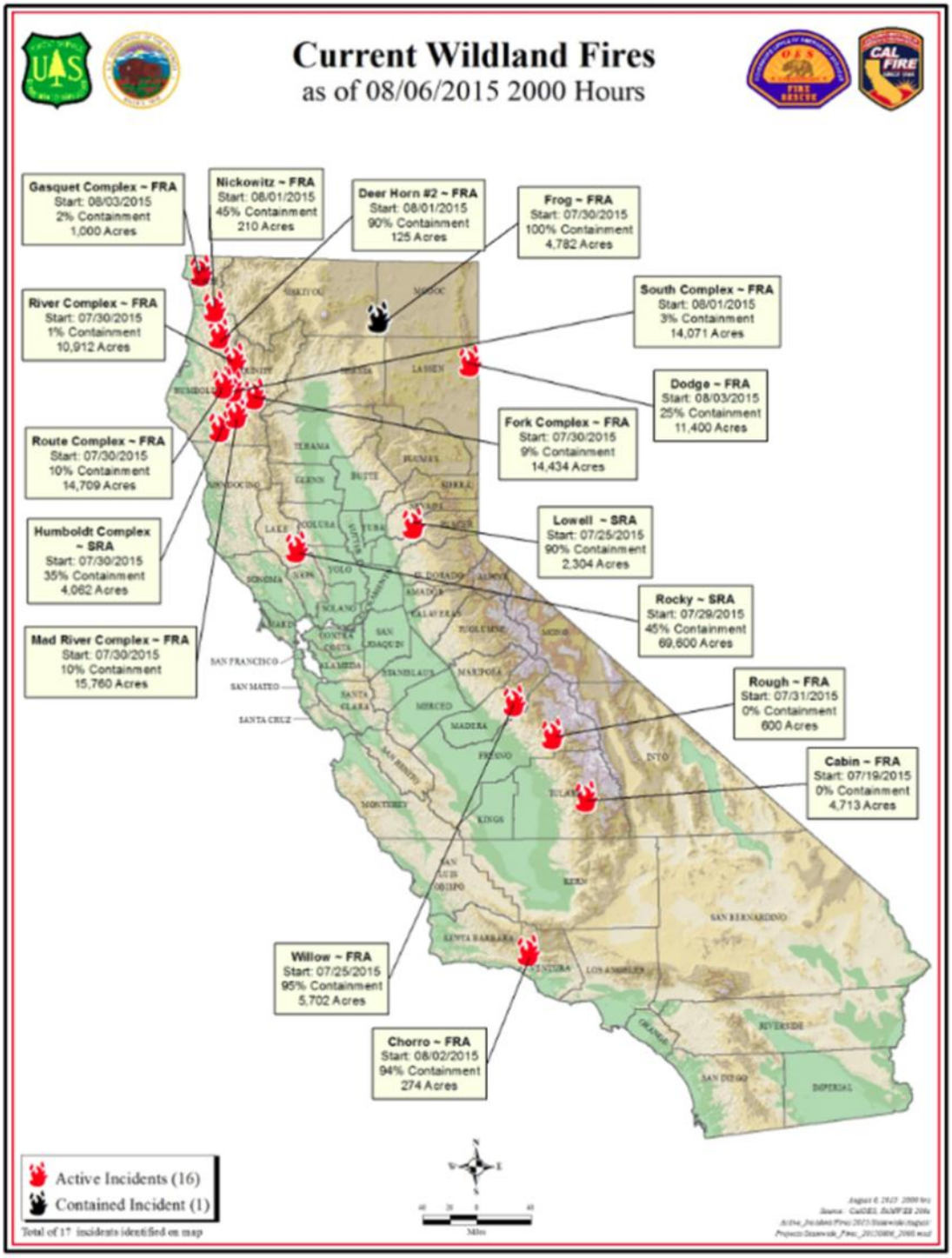
REVIEW THE ENORMOUS DAMAGE TO PUBLIC HEALTH FROM WILDFIRES:

The San Joaquin Valley experienced an extensive number of wildfires during the 2015 summer that severely impacted the Valley's air quality. Although the Sierra Nevada received light precipitation from thunderstorms that infiltrated the region during July and August 2015, most locations received less than an inch of rainfall. These storms produced numerous lightning strikes that ignited many wildfires across the Sierra Nevada, most notably the Willow, Cabin, Butte, and Rough fires.

Wildfires have burned over 850,000 acres in California so far in 2015. Figure 1 shows the extent of wildfires in California on August 6, 2015. The Rough Fire had the greatest impact on air quality conditions in the San Joaquin Valley air basin. The Rough Fire, which was discovered on July 31, 2015, burned over 150,000 acres and was the largest wildfire in California this year. The Rough Fire burned primarily in the Sierra and Sequoia National Forest and the Kings Canyon National Park.

Wildfires have the potential to generate tremendous emissions, depending on the acreage burned, fuel loading, and fuel type. The length of time it takes for these emissions to occur depends on the severity of the wildfire. In addition to causing elevated PM2.5 concentrations, wildfires also generate and transport ozone precursors. When wildfire emissions are combined with the Valley's common summertime high temperatures and stagnant conditions, the potential for the production of peak ground level ozone is elevated. In fact, the highest ozone readings during the 2015 ozone season coincided with a time of heavy smoke impacts on the Valley floor from the Rough Fire.

Figure 1 Wildfires Consumed over 850,000 acres in California in 2015



The largest fire impacting the San Joaquin Valley in 2015, the Rough Fire, was fast-moving, and consisted of heavy fuel loads with high emissions estimates per acre of fuel burned. As compared to the Valley's emissions, PM10 emissions from the Rough Fire at its peak day were 25 times greater than the PM10 emissions from the District's entire stationary, area, and mobile source inventories combined. Similarly, the Rough Fire's PM2.5, NOx and VOC emissions were 105, 8, and 16 times larger than the District's entire emissions inventory, respectively. Clearly, the emissions from a large wildfire can easily surpass emissions from all sources in the Valley, including all industrial, farming, and mobile sources, and overwhelm even the most robust emissions control programs.

Figure 2 Rough Fire Peak Emissions Comparison to District Emission Inventory

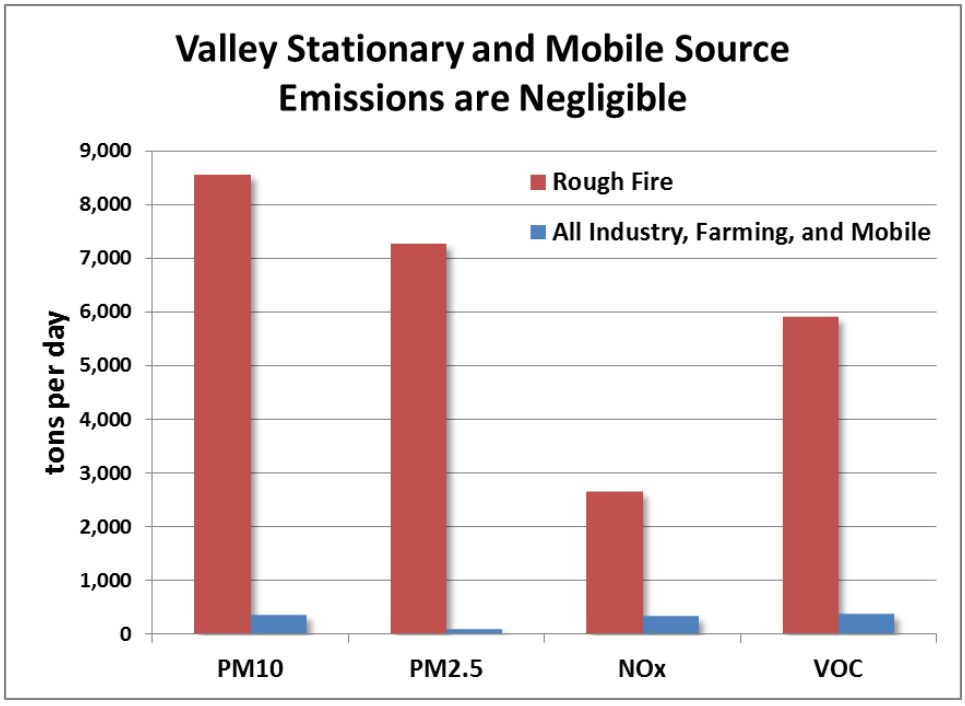
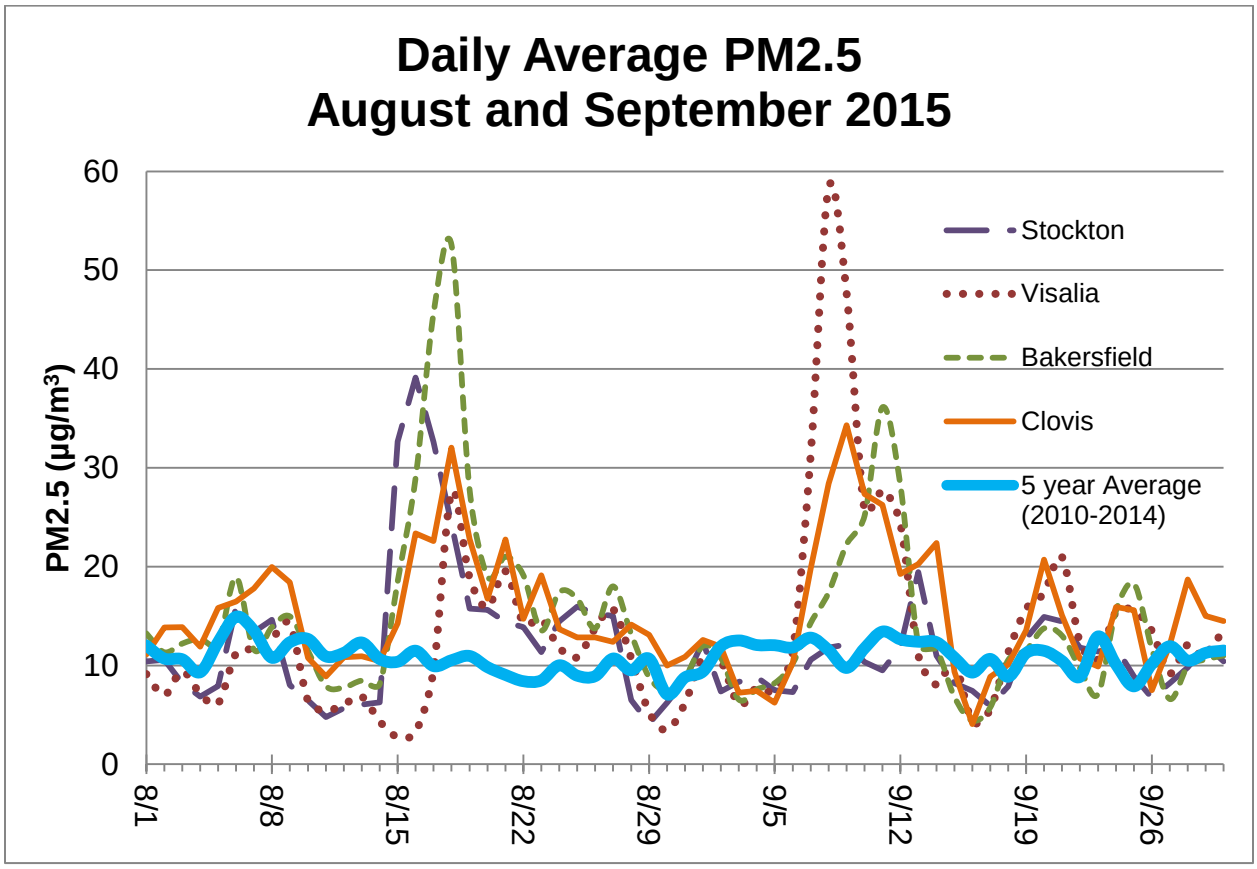


Figure 3 illustrates smoke from the Rough Fire that fumigated the Valley floor and mountainous areas on September 7, 2015. Although the Valley experienced direct smoke impacts during the life of these fires, meteorological dispersion and transport flow lessened the intensity of the air quality impact in the region.

Figure 3 Rough Fire Smoke Behavior on September 7, 2015

While many wildfires started in June and July, the most significant periods of elevated wildfire pollution and associated air quality impacts occurred during the months of August and September. As illustrated in Figure 4, 24-hour average concentrations at Valley sites reached between 50 and 60 µg/m^3 during elevated periods, much higher than typical summertime levels experienced in the Valley.

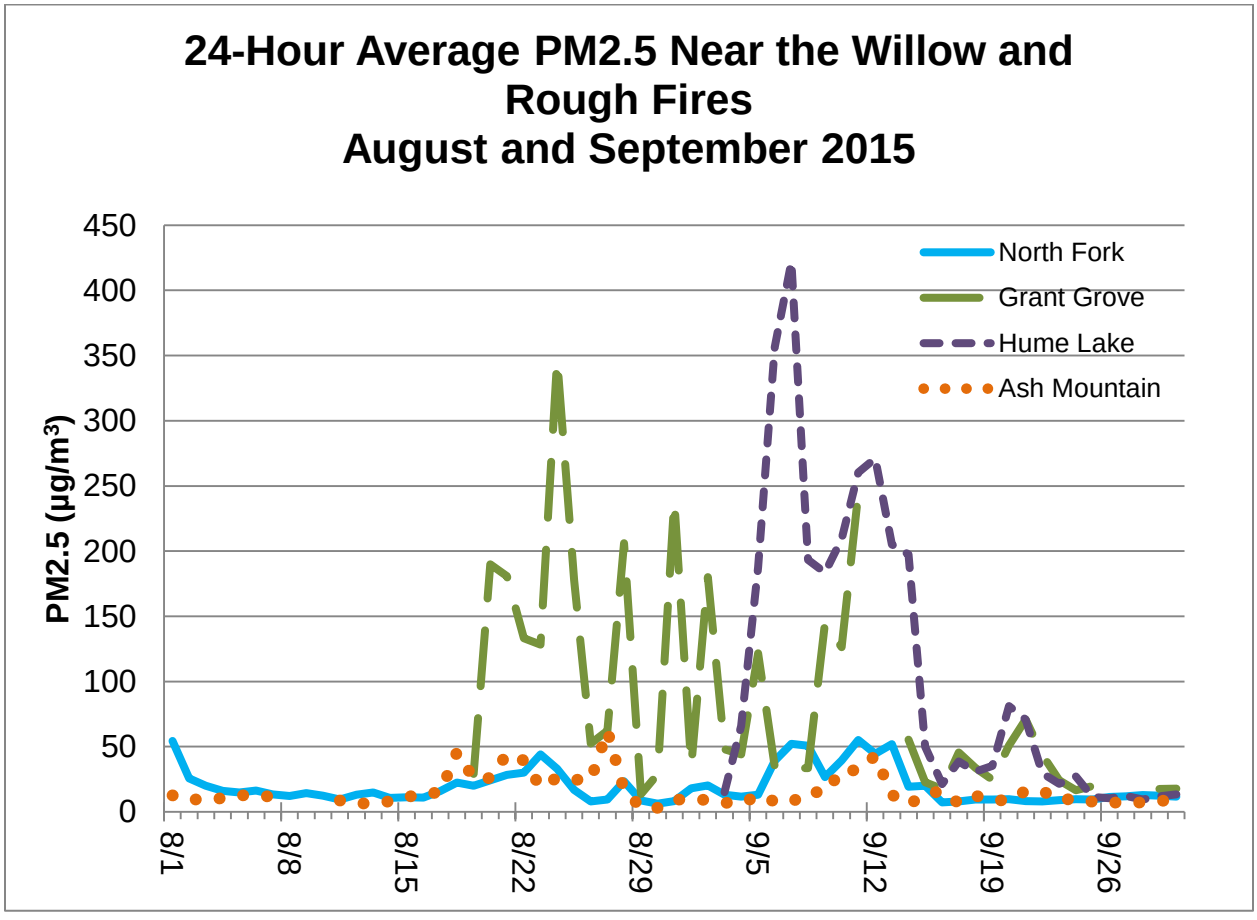
Figure 4 Valley Floor Wildfire Impacts in August and September 2015



During the Willow and Rough fire events, the need for more air quality information from smoke impacted areas near the fires became apparent. In response, the District worked closely with the California Air Resources Board's (ARB) Office of Emergency Response and the U.S. Forest Service in requesting the temporary placement of non-regulatory PM2.5 monitors in various communities near the fire, including North Fork, Grant Grove, and Hume Lake. In addition to these areas, the District worked with ARB and the U.S. Forest Service to establish and operate temporary PM2.5 monitoring at a large number of locations across the Sierra Nevada during the 2015 wildfire season, providing real-time air quality data to residents in those impacted areas.

As Figure 5 depicts, in the months of August and September, the Ash Mountain monitor and the temporary monitors at North Fork, Grant Grove, and Hume Lake all captured high PM2.5 levels indicative of wildfire smoke impacts at those locations, where extreme concentrations were recorded at the Grant Grove and Hume Lake monitors. As compared to the current federal 24-hour average PM2.5 standard of 35 µg/m^3, the Grant Grove and Hume Lake monitors recorded concentrations as high as 347 and 422 µg/m^3, respectively. These values represent concentrations over 10 times higher than the current federal standard, and fall within the Hazardous Air Quality Index category as defined by the U.S. Environmental Protection Agency (EPA).

Figure 5 Wildfire Impacts at Select Sierra Nevada sites in August and September



The following table shows the maximum 1-hour and 24-hour average PM2.5 values during the 2015 wildfire season at select Valley floor and temporary monitors. Very high 1-hour PM2.5 concentrations were observed at a number of Valley floor air monitoring sites during the Rough Fire, with the Visalia and Bakersfield monitors reaching nearly 200 µg/m^3. The temporary monitors placed at Grant Grove and Hume Lake communities near the Rough Fire recorded extremely high 1-hour PM2.5

concentrations, reaching over 900 and 800 µg/m^3, respectively. These high hourly PM2.5 values led to exceedingly high 24-hour average PM2.5 concentrations, creating hazardous air quality conditions in those areas.

Table 1 Maximum 1-hour and 24-hour Average PM2.5 Values from Select Permanent and Temporary Monitors during 2015 Wildfire Season

		1-hour Averages			24-hour Averages	
	Site	**Date**	**Hour**	**Value**	**Date**	**Value**
Valley Floor Sites	Bakersfield	8/17/2015	21:00	196	8/18/2015	53
	Visalia	9/8/2015	15:00	168	9/8/2015	58
	Clovis	9/8/2015	8:00	95	8/19/2015	32
	Madera	9/11/2015	16:00	69	9/13/2015	27
	Stockton	8/15/2015	22:00	86	8/16/2015	39
Mountain Sites	Ash Mountain	8/27/2015	6:00	156	8/27/2015	62
	North Fork*	8/2/2015	9:00	178	7/31/2015	65
	Grant Grove*	8/24/2015	8:00	926	8/24/2015	347
	Hume Lake*	9/7/2015	6:00	857	9/7/2015	422

*Temporary, Non-regulatory

In addition to high PM2.5 readings at various monitors, field observations played a critical role in assessing and responding to smoke impacts. Some areas in the District experienced a cloud of visible ash falling from the sky on September 11 (Figure 6).

Figure 6 Pictures from September 11, 2015. On left: view of smoke extending across Fresno County to the west side of the Valley. On right: ash on car in Fresno.

FUEL BUILDUP IS A KEY FACTOR IN CAUSING INCREASINGLY SEVERE WILDFIRES:

Since the turn of the twentieth century, national wildland policy has been to prevent, suppress, and extinguish forest fires. The last three decades, however, have seen a growing understanding of the role of fire in the forest ecosystem, and a significant change in fire management policy.

Naturally occurring fires, of high frequency and low intensity, were prevalent in the prehistory of the Sierra Nevada. Fires occurred naturally, approximately every 16 years on average in mixed conifer forests, every 23 to 75 years in the canyon live oak ranges, and approximately every 60 years in the shrub ranges. Many plant species evolved to either coexist with frequent fire or to depend upon it, and many animal species depend on fire-dependent plants, habitats, and ecosystems. Periodic fire episodes open the grasslands, woodlands, and forest canopies to sunlight, allowing light penetration to the soil surface. This increases nutrient cycling by fixing nitrogen and other minerals in the soil from burn debris, which promotes seed germination, seedling growth, seedling establishment and development.

With the settlement of European and American newcomers in California's wilderness areas, fire suppression began in the foothills and upland valleys to prevent loss of timber, cattle grazing lands, unharvested cereal crops, and structures. Organized fire suppression on federal and state lands began early in the twentieth century in an attempt to protect resources and property, as well as to maintain the beauty of wildlands. By the late twentieth century, the consequences of fire suppression became apparent: changes in ecosystem species population and loss of biodiversity, and an unprecedented accumulation of vegetative material resulting in catastrophic, uncontrollable wildfires. To restore more natural conditions in wildland ecosystems and reduce the potential for catastrophic loss of resources and property, federal and state land management agencies and private landowners now implement prescribed burning policies and practices. Additionally, federal policies have evolved to allow certain wildfires, once ignited, to provide the same restorative and risk-mitigation functions as prescribed burns.

While there are many factors that need to be evaluated and addressed in the pursuit of minimizing fuel buildup, more effective use of prescribed burning is an area where the District has direct regulatory authority and can take action. The District has long been supportive of fuel reduction efforts including prescribed burns, advocating that reducing fuels in a responsible way will improve the health of the forests and improve future air quality by lessening the severity of wildfires. Despite these efforts, the forest fuel buildup has continued to increase at an alarming rate over the years due to multiple causes, including the recent catastrophic tree mortality from the drought and pest infestation. This long-term buildup of forest fuel poses a significant risk of large-scale

wildfires with potential devastating impacts on air quality and public health. This has increased the need and urgency for greater forest fuel reductions.

DEVELOP POTENTIAL CHANGES TO DISTRICT'S RULES, POLICIES, AND PROCEDURES TO FACILITATE MORE EFFECTIVE USE OF PRESCRIBED BURNING AS A MEANS TO REDUCE THE NUMBER AND SEVERITY OF FUTURE WILDFIRES:

Prescribed burning is regulated by the District under Title 17 of the California Code of Regulations and District Rule 4106 (Prescribed Burning and Hazard Reduction Burning). Most prescribed burning is conducted by state and federal land managers on public lands, with additional prescribed burning conducted by a variety of local entities, including utilities and private land owners. Upon receipt of prescribed burn requests from land managers, District staff review meteorological data, emissions associated with proposed burns based on the type and quantity of fuel, and potential smoke impacts to downwind receptors. To minimize public health impact, the District curtails or restricts burning if meteorological conditions are adverse to adequate dispersion. The District may also restrict the size of burns by limiting the acreage or requiring land managers to segment proposed burn projects into smaller burns over multiple days.

District staff works closely with land managers and as an important component of the ongoing communication between the District and land managers, District staff participates in daily conference calls with land management agencies, ARB staff, fire weather meteorologists, and neighboring air districts to discuss wildfires and prescribed burning. Once a prescribed burn is commenced, District staff conducts inspections as needed to ensure the burn is conducted properly and determine if smoke is impacting downwind receptors. If smoke impacts to the Valley are detected, District staff may order burning to cease or require that other mitigation measures be put in place.

The Board may want to consider implementing the following suggestions to promote more effective use of prescribed burns as a means to reduce fuel buildup:

Minimize or eliminate the current practice of requiring land managers to segment prescribed burns into smaller burns over multiple days: Land managers have often expressed frustration with this practice arguing that segmentation adds to the overall labor and cost, and leads to missed opportunities for proper utilization of prescribed burns. It may be appropriate to change the current practice if we can reduce the probability of intense wildfires in exchange for short term detriment to localized air quality. If the Board is open to this possibility, District staff working with land managers can develop appropriate criteria that would reduce the current practice of segmenting burns with adequate safeguards to ensure adverse air quality impact is

limited and proper notification is provided to affected residents so that they can take necessary precautions.

Allow small to medium sized prescribed burns that may be completed over one or two days to occur if detrimental impacts to air quality are limited to small geographical areas for short durations: Currently, the District prohibits prescribed burning during these circumstances. Once again, this is a practice that may result in missed opportunities which may serve to provide some short term protection while leading to catastrophic wildfires. If the Board is open to this possibility, District staff working with land managers can develop appropriate criteria that would allow these small to medium sized prescribed burns with adequate safeguards to ensure adverse air quality impact is limited and proper notification is provided to affected residents so that they can take necessary precautions.

Allow prescribed burning at remote locations for elevations up to 3,000 feet unless an affirmative finding can be made that the burn will lead to an exceedance of a particulate matter standard on the Valley floor: Currently, the District prohibits prescribed burning even in rural areas up to 3,000 feet when a residential no burn day is declared for the county. Once again, this is a practice that may result in missed opportunities which may serve to provide some short term protection while leading to catastrophic wildfires. If the Board is open to this possibility, District staff working with land managers can develop appropriate criteria that would allow these prescribed burns to take place if no significant impact to the Valley floor is anticipated.

Investigate if the fees charged by the District discourage land managers from pursuing prescribed burns: Currently, the District charges a per acre fee for administering prescribed burn requests. The District has received sporadic concerns from land managers regarding the fees charged for certain prescribed burns. Suggestions received by the District include eliminating the fees altogether, setting a fixed fee per burn request with a slight variation based on size, or charging fees based on emissions rather than acres. The total fees charged by the District have averaged approximately $60,000 per year over the past 10 years. If the Board is open to potential changes in the fees charged, District staff working with land managers will develop potential options for reducing the fees or the manner by which they are levied for your Board's consideration.

WORK WITH LOCAL, STATE, AND FEDERAL LAND MANAGERS AND FIRE SUPPRESSION AGENCIES IN AN ONGOING EFFORT TO IDENTIFY GAPS IN LAND MANAGEMENT AND FIRE SUPPRESSION POLICIES AND PRACTICES AND DEVELOP SOLUTIONS:

District staff has maintained a continued dialogue with the land managers and other stakeholders to craft and advance workable solutions. Historically, District staff has

been actively involved with prescribed burns, and to a lesser degree with wildfires. Every spring the District hosts the Annual Cooperators' Meeting which provides a forum for the District and land management agencies to review the Unified Guidelines and Procedures for Smoke Management document and discuss smoke management issues. The land management agencies assess year-in-review/lessons learned, provide an outlook for the upcoming fire season, and share presentations. In addition, the District actively participates in the Interagency Air and Smoke Council (IASC) and Air and Land Managers (ALM) annual meetings. The IASC meeting provides a forum for air regulators, land managers, and fire managers to discuss air quality and smoke management issues in California. The ALM meeting provides a forum for decision makers to gain a better perspective on federal, state and local issues associated with smoke management in California.

Given the complexity of this issue and the catastrophic nature of wildfires, further ongoing communication with all agencies is necessary. The District also has some questions and concerns regarding current federal land management practices. For instance, the District is concerned that federal land managers may overly use wildfires as a means to manage forests in lieu of expedited suppression. To address and resolve these concerns, and to develop further innovative solutions, we recommend that a workgroup comprised of policy makers from all land management agencies and the District be formed with regular meetings on a quarterly basis.

SUPPORT S. 235 (WILDFIRE DISASTER FUNDING ACT OF 2015) AND SIMILAR FEDERAL AND STATE LEGISLATION TO PRESERVE FUNDING FOR LAND AND FOREST MANAGEMENT:

One of the issues limiting prescribed burning and other fuel reduction projects is how the federal government funds their preventative and suppression fire budgets. When major wildfires occur, the federal government shifts money appropriated for wildfire preventative funds (prescribed burning and other fuel treatment practices) to fighting fires. The net effect of this accounting maneuver causes a drastic reduction in funding for fuel treatments that help reduce air quality impacts when wildfires occur. Federal government shut-downs have also been a barrier to prescribed burning programs, where a number of projects had to be placed on hold or canceled completely until funding became available again for land management agencies to resume their operations.

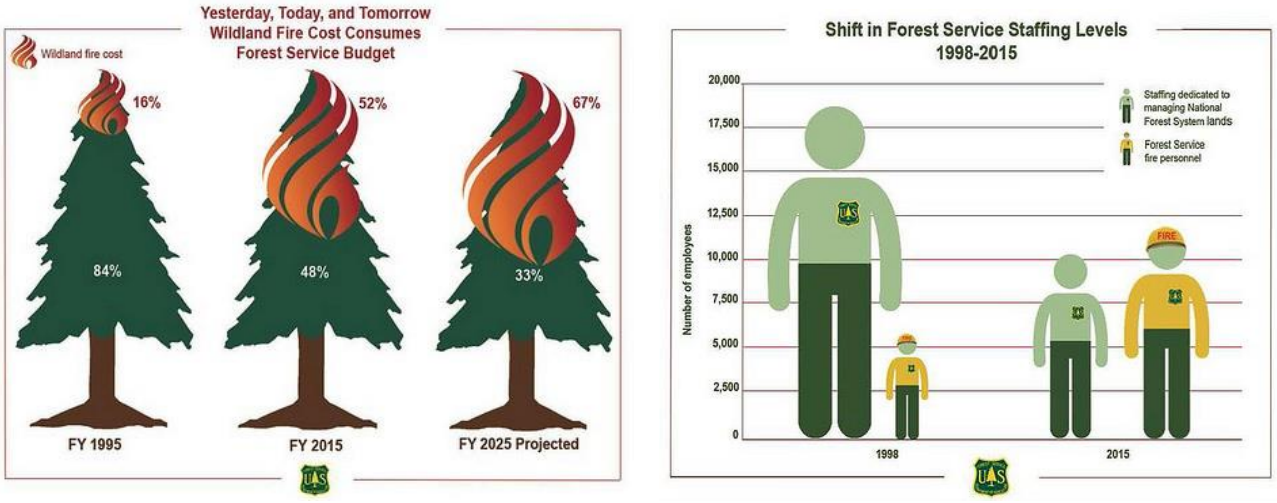
In an effort to curb this financial approach to funding the suppression of wildfires, recent efforts are being made through the proposed budget by the White House and recent federal legislation S. 235 (Wildfire Disaster Funding Act of 2015) to construct a new framework for covering the increasing costs of controlling wildfires. This new approach proposed in the 2016 budget and S. 235 would allow for wildfire suppression costs to be drawn from emergency accounts used for other natural disasters such as hurricanes,

earthquakes, and tornados. Through this framework, the normal operating budgets of federal land management agencies can stay intact and not be depleted through fire suppression activities. To address these issues, your Board may consider supporting these proposed actions from the executive and legislative branches of the government, and any other federal legislation that serves to preserve funding for land and forest management.

This needed change to the federal funding source for the suppression of wildfires will become even more important if the current drought affecting the western U.S. continues. In the year 2015, over 50 percent of the U.S. Forest Service's budget was expended on wildfire suppression, which was a first in the history of the agency. The following figure illustrates how the percentage of the U.S. Forest Service budget used to fight wildfires has increased over time, and how it is projected to increase into the future, translating to less funding available for other critical programs such as prescribed burning.

Additionally, the U.S. Forest Service staffing levels dedicated to non-wildfire suppression programs has decreased dramatically over time, while staffing resources have been heavily concentrated on wildfire programs in recent years, as the following figure illustrates.

Figure 7 Percentage of U.S. Forest Service Budget Spent on Wildfire Suppression and Change in Staffing Focus over Time



Source: USDA

SUPPORT AND PURSUE LEGISLATIVE OR ADMINISTRATIVE INITIATIVES TO ALLOW FOR MECHANICAL REMOVAL OF FOREST FUEL BUILDUP IN HIGH HAZARD ZONES:

Given the catastrophic nature of wildfires, contradictory environmental concerns that preclude the use of mechanized equipment to dispose of fuel supplies need further examination. On one hand there is concern that the transportation and operation of logging equipment can damage wildland ecosystems and impact endangered and threatened species, and that mechanical harvesting of vegetative fuel supplies could lead to overharvesting of the forests. On the other hand, if left unchecked, the fuel buildup can lead to large wildfires that cause the destruction of the very species that were intended to be protected by policies such as those under the federal Wilderness Act, and in turn result in devastating public health impacts due to air pollution. It is recommended that we work with federal land managers and environmental stakeholders to ascertain the wildland areas where ecosystem and species impacts are of less concern, and support mechanical fuel reduction methods as appropriate.

The District may also want to explore other avenues to encourage and support forest-specific biomass projects, such as the proposed North Fork CDC Biomass Plant project in Madera County. This proposed project involves a small 1 MW power plant that would gasify hazard-reduction forest prunings, where the gas is then burned in an exhaust controlled environment that produces very low levels of NOx. If this project comes to fruition, it will be an important demonstration of the technology as a potential viable alternative to the open burning of forest debris and for current old-technology biomass burning of agricultural waste. If directed by your Board, the District can pursue the use of state Cap and Trade funds to support this and other similar projects. These actions could complement the Governor's October 30, 2015 State of Emergency Proclamation that directs state agencies to implement a number of measures to accelerate the removal of fuel in the state's forests, and which includes extending and expediting power purchase agreements with biomass facilities, seeking additional funding for biomass facilities to help offset higher feedstock costs, and exempting projects under the proclamation from CEQA requirements.

DEVELOP A TARGETED PUBLIC EDUCATION CAMPAIGN TO INCREASE PUBLIC AWARENESS OF THE ENORMOUS DAMAGE TO PUBLIC HEALTH DUE TO WILDFIRES AND BUILD PUBLIC SUPPORT FOR INCREASED PRESCRIBED BURNING THAT MAY HELP REDUCE THE NUMBER AND SEVERITY OF FUTURE WILDFIRES:

Except for individuals in close proximity of wildfires, the general public may be less informed about the devastating impacts of wildfires on public health and the fact that wildfires negate all air pollution reduction measures instituted in the San Joaquin Valley. For example, one large fire in one day can emit up to 105 times more PM2.5 than the

Valley's daily combined emissions from industry, farming, and mobile sources. Fully educating the public regarding the health impacts associated with wildfires can be instrumental in urging the public to take precautionary measures to protect themselves during wildfires and to garner support for difficult public policy actions that may be necessary to reduce the number and severity of wildfires. Furthermore, if the District pursues initiatives that increase prescribed burns, outreach efforts informing the public that meaningful reductions in the number and intensity of wildfires can provide significant net benefit in air quality in exchange for short term and localized impacts will be necessary. If approved by your Board, District staff will develop an outreach strategy to accomplish the above-stated goals either as a separate campaign on its own or in concert with the District's current multilingual outreach strategy.

FISCAL IMPACT:

Based on today's action by your Board, District staff will return with specific recommendations including any associated fiscal impacts for Board consideration before final action.