

Instructor Presentation Plan

Course: Florida’s Certified Pile Burn Manager Program

Unit Number: 2

Presentation Title: Smoke Management

Presentation Time: 1.0 hour

Presentation Objectives:

Upon completion of this presentation, the participants will:

1. List major pollutants associated with pile burning.
2. Identify Smoke Sensitive Areas.
3. List the current legal requirements for managing smoke produced during pile burns.
4. Identify weather situations that can lead to smoke related problems.
5. Identify fuel conditions that can lead to smoke related problems.
6. Describe and implement the smoke screening system taught in this course.

Handouts:

02-01-CPBM-HO - CPBM_02_Smoke Management HO1_5 Step Smoke Screening

Presentation Outline	Aids and Cues
<p>Blank Slide-</p> <p>Title Slide</p> <p>Smoke stacks showing managing smoke is not easy.</p> <p>Presentation Objectives</p> <p>Upon completion of this presentation, the participants will:</p> <ol style="list-style-type: none"> 1. List major pollutants associated with pile burning. 2. Identify Smoke Sensitive Areas. 3. List the current legal requirements for managing smoke produced during pile burns. 4. Identify weather situations that can lead to smoke related problems. 5. Identify fuel conditions that can lead to smoke related problems. 6. Describe and implement the smoke screening system taught in this course. <p>Front end loader Photo -</p>	<p>02-01-CPBM-PPT</p> <p>02-02-CPBM-PPT</p> <p>02-03-CPBM-PPT</p>

Presentation Outline	Aids and Cues
<p>Introduction</p> <p>Of the smoke complaints that the Division receives, smoke from pile burns is frequently the cause. Smoke and ashes do have a negative impact on local residents. Smoke from pile burns have also resulted in serious personal injury and even death by limiting visibility for motorists.</p> <p>Pile burners must be cognizant of the ever present potential for smoke from their burn to cause problems. They must be knowledgeable of <u>weather</u> and <u>fuel conditions</u> and their impact on smoke production and behavior, and be able to reduce the possibility of problems due to smoke, through application of that knowledge.</p> <p>Smoke Management Definition</p> <p>“A plan of action where prescribed burning is conducted in such a way that smoke produced is minimized and/or directed in a direction that keeps any impacts within acceptable limits.”</p> <p>Why Do Smoke Management?</p> <p><u>Smoke Management Costs:</u> <i>Doing smoke management does make things more difficult and costly for burners.</i></p> <ul style="list-style-type: none"> Reduced number of burning days – wind restrictions -dispersion Constraints on tonnage consumed – numbers of piles Constraints on type of burns – ACI required Increased processing of piles – cleaner, drier False Starts Extra cost of mop-up Monitoring costs <p>Clearly it is more difficult and costly to practice good smoke management. It may take more days of burning, waiting longer from when material is uprooted until burned and other costs. So why expend these costs?</p> <p><u>Smoke Management Benefits:</u></p> <ul style="list-style-type: none"> - The continued use of prescribed fire as an operational tool - Improved air quality through fewer smoke intrusions - Fewer public complaints 	<p>02-04CPBM-PPT</p> <p>02-05 CPBM-PPT def.</p> <p>02-06-CPBM-PPT costs</p> <p>02-07-CPBM-PPT benefits</p>

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<p>- Reduction of litigation and liability costs</p> <p>Paramount to why someone should use good smoke management practices is the need to maintain the use of fire to dispose of debris. It would be relatively easy for a constitutional amendment to get put on a ballot calling for the banning of pile burning, like indoor smoking, large fishing nets, and nursing pig crates.</p> <p>This is also aided by the fewer complaints that result from better smoke management.</p> <p>We must be and act professional when conducting our burns. We need to be able to demonstrate that we are taking people’s safety and welfare into consideration as we conduct our daily business. And that we are using the best information available to make decisions. This includes daily weather, and training.</p> <p>Definitions:</p> <p>It is important for all of us to be using the same terminology and meanings. It is important for each of us to understand the meaning of many words and concepts that deal with smoke and smoke management.</p> <p>SMOKE SENSITIVE AREA (SSA) FAC Rules 5I-2 Defines “Smoke Sensitive Areas” as areas designated by the Division of Forestry within which for reasons of visibility, health or human welfare, smoke could unduly adversely impact public safety e.g. interstates, urban areas, airports, and hospitals.</p> <p>CRITICAL SMOKE SENSITIVE AREA (CSSA) – DISTANCE to the burn makes the smoke sensitive area CRITICAL.</p> <p>MIXING HEIGHT –Mixing height is the height below which vigorous mixing is found in the environment. Good smoke management is found with mixing heights of greater than 500 meters (1,640’)</p> <p>TRANSPORT WINDS – The “Transport Wind” is the average wind from the surface to the mixing height (average of the wind speeds and directions for all levels). Transport winds should be not be less than 9 mph during burns.</p>	<p></p> <p>02-08-CPBM-PPT Def.</p> <p>02-9-CPBM-PPT SSA</p> <p>02-10-CPBM-PPT CSSA</p> <p>02-11-CPBM-PPT Mixing Ht.</p> <p>02-12-CPBM-PPT Tran.Wind</p>
<p>Major Products of Rx Fire</p>	

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<p>The major products (not pollutants) for wood combustion are Water and carbon dioxide (gas found in carbonated drinks). These are not harmful at normal levels. (CO2 is a greenhouse gas)</p> <p>Major Pollutants of Rx Fire The most important pollutants given off during pile burning are particulate matter (visible smoke) and carbon monoxide.</p> <p>Particulate Matter Particles can be hazardous to human health and safety by: <ul style="list-style-type: none"> Being Inhaled Reducing Visibility Inhalation of particles is a serious health matter for people with pre-existing health issues such as asthma, emphysema or other breathing difficulties. Reduced visibility on roads is of course of critical importance. There have been many serious motor vehicle accidents due to smoke on the highway from pile burns.</p> <p>Residual Smoke Defined as “Smoke produced from smoldering combustion and NOT contained in the convection column.” This means the smoke is not carried up and away from our targets or diluted by winds and indrafts.</p> <p>Scope of Smoke Management When discussing smoke management we should briefly touch on the two scales (size) of management.</p> <p>Local Viewpoint – This is the scale the local manager has to manage the project from. This includes the direct affects in the local area around the burning, such as smoke across a near by road or ash falling in a nearby neighborhood.</p> <p>Broad Viewpoint - There may be an impact from your burn that is part of the larger viewpoint. Air quality and Fire Agencies will be looking at “area-wide” concerns and conditions (fire and air quality) as it relates to burning in an area. Your authorization may be affected by conditions not immediately seen at the local level. If there is a large number of other burns in the area the number of piles might need to be limited or wind restrictions put on due to those other concerns.</p>	<p>02-13-CPBM-PPT Smoke Product</p> <p>02-14-CPBM-PPT Pollutants</p> <p>02-15-CPBM-PPT Vis, and breathing</p> <p>02-16-CPBM-PPT Residual Smoke</p> <p>02-17-CPBM-PPT pile smoldering</p> <p>02-18PBM-PPT</p> <p>02-19 PBM-PPT</p>

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<p>Smoke Sensitive Areas (SSA) We defined SSA earlier, now we will look at it with more specificity. Areas where smoke could have an ADVERSE impact.</p> <p>Examples of SSA's</p> <ul style="list-style-type: none"> Hospital Airports Schools Recreation Areas Class 1 Areas Populated Areas Special Cases Highways <p>Then talk a little about each</p>	<p>02-20-CPBM-PPT</p>
<p>Hospitals – Hospitals, nursing homes, assisted living facilities and other facilities with residents that have a low tolerance for smoke.</p>	<p>02-21-CPBM-PPT</p>
<p>Airports – It is a violation of 5I-2.004(c) Open Burning Not Allowed states that it is a violation to reduce visibility at public airports unless the airport has agreed to control air traffic during burning activities.</p>	<p>02-22-CPBM-PPT</p>
<p>Schools – Society takes extra precautions with their children. Parents and teachers will not hesitate to protect their students from real or perceived threats. You may need to make a special effort to avoid schools (weekends, summer, wind direction).</p>	<p>02-23-CPBM-PPT</p>
<p>Recreation Areas – When people come to the outdoors to recreate they have an expectation of “clean fresh air”. They usually have peak use on weekends and holidays.</p>	<p>02-24-CPBM-PPT</p>
<p>Class 1 Areas – Designated federal lands where no degradation of air quality is permitted. Managers must consider the impacts of smoke.</p> <ul style="list-style-type: none"> Wilderness Areas National Parks over 5,000 acres St. Marks, Chassahowitzka, Everglades, Bradwell Bay 	<p>02-25-CPBM-PPT</p>
<p>Populated Areas – More people mean more chance of people being sensitive to smoke, and potential impact to their property.</p>	<p>02-26-CPBM-PPT</p>
<p>Special Cases – Zoos, Horse Farms, Prisons – ask class if they have</p>	<p>02-27-CPBM-PPT</p>

Presentation Outline	Aids and Cues
<p>had any issues where smoke was a concern of reasons other than covered here so far.</p>	02-28-CPBM-PPT
<p>Highways 5I-2.004(f) says you may not reduce the visibility on paved public highways to under 1,000 feet unless the regulating authorities have agreed to control traffic, or delegated the authority to control traffic.</p>	02-29-CPBM-PPT
<p>Smoke on the highway is so serious that it bears some further discussion.</p> <p>Headline of car wreck</p>	
<p>Guide for Prescribed Fire in Southern Forests says that a LARGE MAJORITY of all smoke related incidents are caused by Pile and Windrow burning.</p>	02-30- CPBM-PPT
<p>Chart of Smoke/Fog wrecks by month. Fog varies more than smoke, which is more consistent throughout the year, with the most in Jan-May.</p>	02-31- CPBM-PPT
<p>Chart of Smoke related accidents by time of day. Note there is no “rush hour” effect in the afternoon because this is caused by morning stable conditions.</p>	02-32- CPBM-PPT
<p>Chart of Smoke related accidents by hour, compared to total accidents (note the different scales for regular accidents and smoke related). It is clear that it is the AM conditions that are most significant for smoke. This is why we do not allow burning before 9:00 AM, and why mop-up to control residual smoke is crucial.</p>	02-33- CPBM-PPT
<p>Because of this we should be sure we understand dispersion index and LVORI. This information can be found at the Division of Forestry webpage and on the National Weather Service pages.</p>	02-34- CPBM-PPT
<p>DOF webpage DOF Dispersion Map</p>	02-35- CPBM-PPT
<p>LVORI – based on data of accident reports - It is a combination of humidity and dispersion. The scale of 1-10 with 10 being a very, very good likelihood of fog/smoke. Special care should be taken if the LVORI is predicted to be 7 or above.</p>	02-36- CPBM-PPT
<p>NWS LVORI on forecast.</p>	02-37- CPBM-PPT
<p>FIRE LAWS THAT RELATE TO SMOKE MANAGEMENT</p>	02-38- CPBM-PPT

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<p>5I-2.004 says that smoke shall not reduce visibility at airports.</p> <p>Roads – must not reduce visibility under 1,000 feet</p> <p>Hours of burning 0900 to one hour before sunset for regular pile burners, one hour after sunset for certified pile burners. (In non-smoke sensitive areas)</p>	
<p>Smoke Management Basics</p> <p>The basic objective of smoke management is to</p> <ul style="list-style-type: none"> Avoid Smoke Sensitive Areas and Disperse and Dilute Smoke Reduce Emissions 	02-39- CPBM-PPT
<p>Lets talk about each of these in a little more detail –</p> <ul style="list-style-type: none"> Avoid smoke sensitive areas by using proper wind direction 	02-40- CPBM-PPT
<ul style="list-style-type: none"> Disperse and Dilute Smoke by having enough wind move smoke away, on a day with good dispersion, mixing height, and transport wind. 	02-41- CPBM-PPT
<ul style="list-style-type: none"> Reduce Emissions – with good fuel conditions, dry, good arrangement, good mop up to reduce smoldering 	02-42- CPBM-PPT
<p>IN ORDER TO DISCUSS THESE STRATIGIES WE NEED TO BETTER UNDERSTAND COMBUSTION.</p>	02-43- CPBM-PPT
<p>Fuel Characteristics Affecting the Volume of Smoke Produced</p> <ul style="list-style-type: none"> Type of Fuel – Oak vs pine vs palm Fuel Moisture – It is important to burn dry fuels – More intense, more efficient fires burn more cleanly. The effects of wet fuels is a “Double Effect”. Wet fuels take more heat to dry and then burn so they suck the heat out of your pile (heat sink), and wet fuels release less heat when they do burn. Fuel Size – A good mix of fuel sizes is important. It is difficult to get only large fuels to start burning. It is good to have a mix of finer fuels to keep the intensity up. Larger fuels will take longer to dry out. 	

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<p>Fuel Arrangement – Fuels and piles can be arranged from too loose to too compact. I would show a “bell curve” of intensity vs. compacting. When fuels are too loose there is not efficient heat transfer to the next piece of fuel (usually not a big problem on piles) but if piles are too dense there will be too little oxygen to fuel efficient burning.</p>	
<p>Amount of Fuel – More fuel burning will produce more smoke. Limit the size and number of piles to fit the conditions (fuel and weather and location).</p>	02-44- CPBM-PPT
<p>Conditions that Produce More Smoke – Recap the causes of more smoke. (compact, wet, larger, more fuel)</p>	
<p>Phases of Combustion - In order to understand where the smoke comes from let’s look at the phases of combustion.</p>	02-45- CPBM-PPT
<p>Pre-ignition – As temperatures increase the woody material decomposes and releases combustible gases and vapors (pyrolysis). Some of these materials are burned in the flaming phase and others are condensed out into particles that become visible smoke.</p>	02-46- CPBM-PPT
<p>Flaming Phase – The major products of flaming combustion are predominantly CARBON DIOXIDE and WATER VAPOR. Some of the organic compounds produced cool and condense into tar droplets and solid soot particles as they move away from the heat of the fire. These particles make up the visible smoke component we are most concerned with. The more inefficient the burning, the more soot and tar produced.</p>	02-47- CPBM-PPT
<p>Glowing Phase – This is generally a rapid but flameless combustion process. Those familiar with grilling with charcoal know this phase well. This is the phase when the charcoal briquettes are red hot. This phase is an efficient combustion process and produces virtually no smoke.</p>	02-48- CPBM-PPT
<p>Smoldering Phase – (Slow flameless combustion) NOTE: This phase of combustion is the MOST critical in terms of its potential for causing serious injuries, deaths and property damage. Emissions from a smoldering fire are at least twice that of the flaming fire. We define RESIDUAL SMOKE as smoke produced by smoldering combustion but not contained in the convective column.</p>	
	02-49- CPBM-PPT

Presentation Outline	Aids and Cues
<p>SMOKE SCREENING BASICS</p> <p>Locate smoke sensitive areas within 5 miles, also note any SSAs that are prone to fog.</p> <p>Locate areas that might contain peat, muck or large amounts of duff. Make sure the piles are not placed over muck soils.</p> <p>Manage your piles so they burn as efficiently as possible.</p> <p>SMOKE SCREENING – A 5 STEP PROCESS –</p> <ol style="list-style-type: none"> 1 – Plot Probable Smoke Impact Area 2 – Identify Smoke Sensitive Areas 3 – Identify Critical Smoke Sensitive Areas 4 – Apply Rules for Piles 5 – Minimize Risk Checklist <p>Step 1- Determine Area Affected by Smoke Plume</p> <p>Use the 30 degree smoke plotting tool to identify where on the map your smoke will have an affect. Look 5 miles out to see the big picture of where your smoke might have an affect.</p> <p>Map of 30 degree spread.</p> <p>Step 2 – Identify smoke sensitive areas 2 miles down wind</p> <p>Step 3 – Identify any critical smoke sensitive areas down wind 1/2 mile</p> <p>Step 4 – Ensure there are no major highways or other SSAs within 2 miles DOWN DRAINAGE. If RH is predicted to stay below 80% and surface winds above 4 MPH all night the distances in 2 above should be cut in half.</p> <p>Step 5 – Minimize the Risk – Guidelines for reduced smoke problems</p> <ul style="list-style-type: none"> The mixing height should be over 1,650 feet Transport winds should be at 9 MPH There should be at least 5 miles back ground Putting piles out 1 hour before sunset <p>DOF Smoke Screening On-line</p>	<p>02-50- CPBM-PPT 02-51- CPBM-PPT</p> <p>02-52-53- CPBM-PPT Hand out – Screening Steps 02-54-55 CPBM-PPT 02-56-57 CPBM-PPT</p> <p>02-58- CPBM-PPT</p> <p>02-59- CPBM-PPT</p> <p>02-60- CPBM-PPT</p> <p>02-61- CPBM-PPT</p>

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<p>www.fl-dof.com</p> <p>Info on the Screening program Shows areas that will have visibility reduced to 1,000' feet at the surface.</p> <p>Zoom into area of planned pile burn.</p> <p>Select piles vs. acres (broadcast burn)</p> <p>Add info on number of piles, height, and width. And the time and day the burn will start</p> <p>Add the point for the location of the burn</p> <p>Click "submit" and the smoke plume will be shown along with info on any smoke sensitive areas affected. Remember this only shows the area that would have the visibility reduced to less than 1,000'. Not the area that might be subject to ash fall, and smoke smell, or residual smoke problems.</p>	<p>02-62- CPBM-PPT</p> <p>02-63- CPBM-PPT</p> <p>02-64- CPBM-PPT</p> <p>02-65- CPBM-PPT</p> <p>02-66- CPBM-PPT</p> <p>02-67- CPBM-PPT</p>
<p>Review Presentation Objectives</p> <p>Upon completion of this presentation, the participants will:</p> <ol style="list-style-type: none"> 1. Describe The Florida Prescribed Burning Act. 2. Describe recent amendments to the Florida Prescribed Burning Act. 3. Describe the Hawkins Act. 4. Understand assessment of liability for prescribed burns. 5. Describe the issues related to working with cooperators. 6. Describe the importance of documentation. <p>Questions</p>	<p>02-68- CPBM-PPT</p>