
Wildfire Risk Reduction Pile Construction and Burning Guidance

June 2023

Disclaimer

This document contains material to assist a person in determining their pre-burn and implementation requirements. This is intended as a guidance document. Users must refer to the [Wildfire Act, Regulations](#), and [OBSCR](#) for further detailed language in relation to their statutory obligations.

Warranty

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Introduction

A person who targets vegetative debris for open burning must, before the open burning is carried on by that person or another person, ensure that every reasonable alternative for reducing, reusing, or recycling the vegetative debris is used in order to minimize the amount of the vegetative debris to be open burned as per the Open Burning Smoke Control Regulation (OBSCR) Sec. 10. Piling and burning debris on site can be an efficient and economical method of debris disposal. Piling and burning must be planned for well ahead of time to ensure this method of abatement is both achievable and acceptable in the location of the treatment area.

Audience

The intent of this document is to help guide provincial resource agencies, forest practitioners, forest Industry, and other practitioners who engage in the planning and implementation of forest fuel management across B.C. This document is intended for use by practitioners planning Wildfire Risk Reduction (WRR) fuel management treatments on Crown, Municipal, First Nations or privately-owned lands.

Purpose

The purpose of this document is to provide guidance to ensure that pile construction and burning occurs in a manner that:

- Reduces risk to surrounding structures and community.
- Minimizes smoke emissions to decrease negative impact to the public.
- Avoids or limits damage to standing trees and other land management values.
- Meets contract obligations for treatment unit specifications outlined in the prescription, (coarse woody debris requirements, surface fuel reduction targets, etc.).
- Avoids and/or limits invasive species propagation.
- Complies with legal requirements under the Wildfire Act and the Environmental Management Act.

Prescription Considerations (Pre-Burn):

Hazard Assessment and Abatement Legislation: Wildfire Risk Reduction work must comply with the [Wildfire Act](#) and [Wildfire Regulation](#). Detailed language pertaining to the timing of hazard assessment and abatement can be found within the [Wildfire Regulation Part 2, Div. 2 Sec. 11](#) through [Sec. 12](#).

Timing: The size, construction, and number of piles on a site directly affects the opportunities to burn the piles. Prescription and contract developers should consider the legislative requirements that apply to Category 2 and 3 open fires as well as the OBSCR, to allow for the best possible burning opportunities. For example, if operating within a High Smoke Sensitivity Zone, ventilation condition requirements are more restrictive and prohibitions on category 3 open burning typically go on sooner in the year and last later than category 2 open burning prohibitions.

If challenges prevent piles from being burned, consider delaying project start-up and/or follow the direction of a pre-established contingency plan. If there is a chance that the fire hazard may not be abated within the legislated period, an exemption (extension) request should be provided to the local Fire Centre Manager. NOTE* Not all exemption requests will be approved.

Soil: Pile burning creates isolated occurrences of potentially high burn severity which can create areas where soils become hydrophobic. Hydrophobic soil inhibits water infiltration and reduces soil function. Two recommendations for limiting the burn severity are: limiting the amount of large woody debris added to a pile, and/or burning mid-winter when the soil is saturated.

Invasive Species: Pile burning creates soil disturbance, opening space for plants to take root and spread which can lead to the introduction of invasive species. The [Prescribed fire and Invasive Plants BMP](#) in Appendix 1 outlines best practices to reduce the amount of, or risk of invasive species propagating in the pile burn area. Consider completing a pre-burn inventory of invasive plants currently present in the area, up to a 100-metre radius around the burn pile location(s). Review the [Seeding of Areas by Wildfires](#) document in Appendix 1 for acceptable seeding recommendations for various objectives post pile burning. Seed mixes (with a seed analysis certificate) used for revegetation post burn should be locally adapted, relatively short-lived, and non-invasive. Generally speaking, seed mixes with these characteristics will fill-in the plant-able area.

Measures may be taken to reduce the potential of invasive species being transported to and from a site such as: limiting the amount of equipment used; ensuring the equipment is sanitized from potential invasive plant seeds prior to operation. Additionally, cleaning work boots and clothing prior to entering and exiting the work site is an effective preventative measure to the unwanted spread of seed. Consult with a local Range Officer or Wildfire Rehabilitation Officer for further invasive plant questions and considerations.

Pile Construction:

The applicable burning setbacks in the OBSCR (from residences, businesses, schools, hospitals, and continuing care facilities) must be considered as piles are constructed to ensure they can be legally burnt. Piles should not be constructed directly adjacent to shared boundaries such as fences, parks, private land etc., to avoid scorching of trees or damaging values outside of the treatment area. All fine fuels should be piled at the ground surface (not elevated), to promote easy ignition (Figure 1).

Minimize burning of large diameter material as it will extend the burning cycle, increase the amount of smoke produced and increase the potential for soil impacts at the site. If burning of larger material is required, they should be stacked on top of fine fuels or leaned onto the outside of the pile to form a pyramid structure for optimal heat transfer (Figure 2). Do not pile or stack in a manner that does not allow for airflow between pieces (Figure 3). Create a stable 'haystack' like structure that does not have long sloping pile shoulders/sides. To minimize the unburned 'ring' left from the pile after burning, pile tending is recommended to push outside material into the burning centre to be consumed.



Figure 1. An example of good and poor pile construction. The good construction pile is stacked vertically with fine fuels at the bottom, covered with larger logs, for ease of ignition and optimal heat transfer. The poor construction pile is horizontal and has mixed fuel sizes at the base of the pile, leading to poor heat transfer.



Figure 2. Example of larger diameter wood stacked on fines to form pyramid structure.



Figure 3. Example of a pile that was not constructed correctly and will not have good airflow between pieces. There is no pyramid structure and the large wood pieces are on the ground below the fine fuels. The fine fuels should be on the bottom with larger material on top.

Pile Construction Continued:

- Do not include stumps, rocks, or dirt in the pile. This will not result in a timely, clean burn.
- Coarse Woody Debris (CWD) should not be piled for burning unless specified in the prescription. Do not remove CWD that is decaying or partially buried (Figure 4). The [Chief Forester's Guidance on Coarse Woody Debris Management](#) has further information on this topic.
- To avoid scorching on surrounding trees, use larger openings when possible and burn when conditions will reduce intensity/flame length (Figure 5). In areas of dense canopy or lack of larger openings, feeder piles can also be constructed a safe distance away from the designated burn pile. This may also be addressed with concurrent burning and feeding the piles at a speed such that crowns are not scorched (controlling fuel and subsequent flame length).
- Do not construct or burn piles within or adjacent to riparian features or areas (stream, lake, wetland etc.) and avoid scorching of trees along the riparian feature. Use professional guidance to minimize the impact on the ecosystem(s) (Figure 6).
- Removal/cutting of shrubs, other plants and duff must not occur to create a burnable spot(s) unless specified in the prescription.
- If leaving piles to cure or to burn during the shoulder season (generally October to April), consider tarping with plastic (remove for environmental reasons pre-burn), or clean burn slash pile paper/butcher paper (Figure 7 and 8). Tarping and seasoned debris will ignite and burn quicker with less smoke, making burn times less and worth the effort of tarping. Depending on which division of OBSCR you are following and which sensitivity zone you are in there may be a legal requirement to season debris before burning.
- Build piles on top of any invasive species located on site when safe and appropriate do to so, such as when this practice doesn't result in seed propagation.



Figure 4. Example of decaying CWD being added to pile.

Pile Construction Continued:

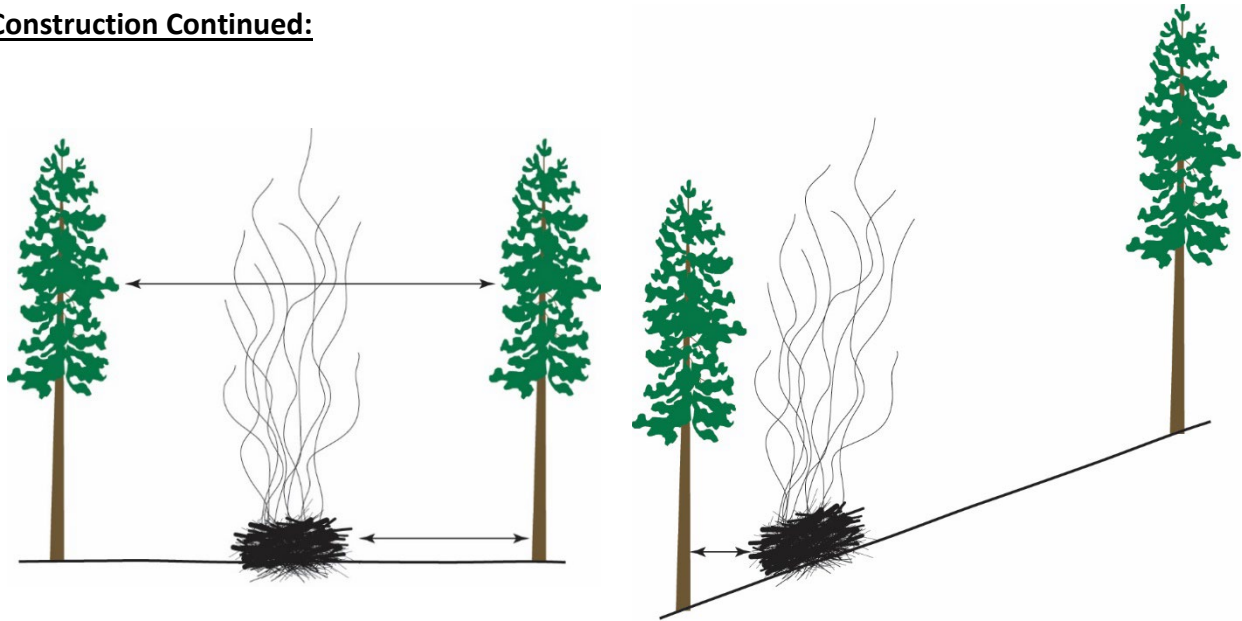


Figure 5. Two examples of pile construction. The left example has a good distance between the burning pile and canopy, reducing the scorch impact to the surrounding trees. The right example is NOT a good example as the tree next to the pile will likely die from residual heat and bark scorch. Try to evenly space piles between the tree trunks and canopy and use feeder piles to feed a smaller main pile if the spacing is tight.



Figure 6. Example of poor pile placement in riparian area, and riparian shrub removal.

Pile Construction Continued:

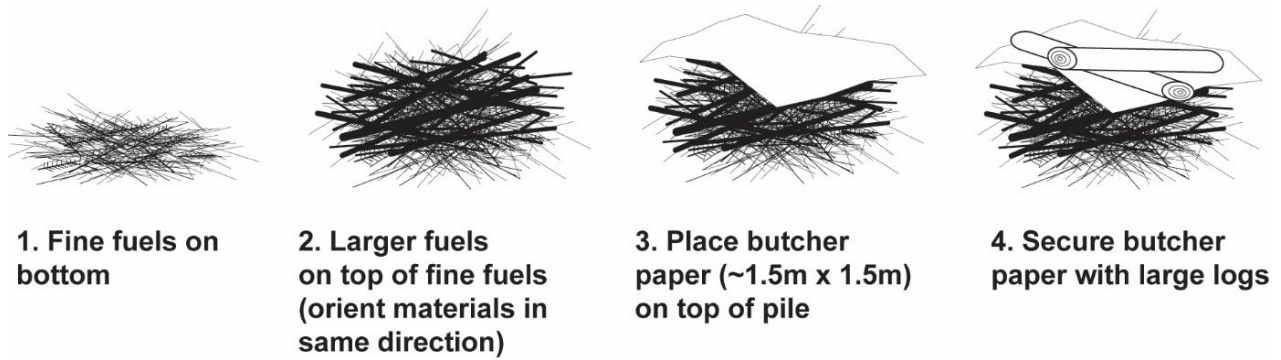


Figure 7. An example of how to correctly pile material with butcher paper on top to keep the fuels dry.



Figure 8. An example of covering a pile with clean burn slash pile paper/butcher paper to keep the pile dry. Some material is placed on top of the slash pile paper to keep it from blowing away. Notice the correct pile construction with fine fuels on the bottom and larger material above and covered.

Pile Construction Continued:

Steep Slope Techniques: Construct piles so that all piled slash is perpendicular to the contour of the slope. When burning on steep slopes, consider using wire mesh and steel bars that are driven into the ground to build a barrier below the pile to prevent rolling burning debris (Figure 9). A fallers axe may be used as a tool to drive the bars into the ground. This technique allows for good airflow, keeping the fire hot and reducing smoke from poor combustion. It also keeps the coals confined in their pile area thereby increasing consumptive energy (Figure 10). The technique is also safer for workers, reduces workload, and likely reduces pile scar size. Once the pile has burned, the bars and mesh can be moved and re-used.



Figure 9. Example of steel bars with wire mesh for steep slope burning.



Figure 10. Steel bars with wire mesh keeping coals and burning logs from rolling downslope.

Communication Plan:

Ensure a communication plan is completed well in advance (at least one week), prior to ignition so that notifications to surrounding community, local government, First Nations, etc. can be performed at least 24 hours before the start of burning. Consider use of newspaper, radio, and social media to communicate messaging.

Burn Registration:

Anyone lighting a Category 3 open fire must obtain a burn registration number by calling 1-888-797-1717, or by emailing hpr.1800@gov.bc.ca. The information required to obtain a burn registration number can be found within the [Wildfire Regulation Part 4, Sec. 24 \(1\)](#). The registered burn is then tracked within the Open Fire Tracking System (OFTS).

Smoke Management:

The Open Burning Smoke Control Regulation sets out requirements for the generation and control of smoke during a pile burn. The two main ways to manage smoke from an open burn are to control smoke generation and smoke direction. Smoke generation is reduced through good pile construction, curing, and drying of fuels. Control of the smoke direction can include locating piles away from values, and by conducting burns under favorable wind and venting conditions to ensure smoke moves up into the atmosphere.

Open Burning Smoke Control Regulation: [OBSCR](#) was updated on September 15, 2019. Parts 1 and 2 of the updated regulation (sections 1-16) apply to all burning of vegetative debris unless specifically exempted in another section. Part 3 of OBSCR (sections 17-28) consists of five divisions (sets of regulatory requirements). For this part of OBSCR, burners must comply with section 17 and all the regulatory provisions of the applicable divisions.

Community Wildfire Risk Reduction (CWRR): The updated OBSCR includes a division that enables certain burning for wildfire risk reduction in the Wildland-Urban Interface (WUI). Burning under a plan for Community Wildfire Risk Reduction (CWRR) may take place under regulatory provisions for: [Division 2 \(Plans for Community Wildfire Risk Reduction\)](#); Division 1 (High, Medium and Low Smoke Sensitivity Zones); or Division 5 (Air Curtain Incinerators). Burning that occurs within one of these applicable divisions must comply with all the requirements of that division. Burning will not be in compliance if provisions are “mixed and matched” from the other divisions.

(Division 1) General Pile Burns: Regular pile burns not part of a community wildfire risk reduction plan follow the requirements for [High](#), [Medium](#) or [Low](#) smoke sensitivity zones.

(Division 5) Air Curtain Incinerators: Use of an air curtain incinerator may allow for more favourable days to conduct an open burn as it can be utilized in high and medium smoke sensitivity zones under “fair” atmospheric conditions, (if the provision for distances and operational requirements are followed under this division).

Venting: A venting forecast must be obtained on the day of burning, prior to ignition. One available option is the [Ventilation Index](#); which changes daily based on the location in the province and the atmospheric conditions. It is a forecast released daily (updated at 7am), by Environment and Climate Change Canada and estimates how well the atmosphere disperses smoke on any given day.

Custom venting forecasts are another available option for fuel management projects. These forecasts are location specific and may increase the number of days that are available to burn.

(Custom venting) External Users:

- For a custom venting forecast to be valid under OBSCR, it must be provided by a custom ventilation forecaster, and submitted to the Ministry of Environment and Climate Change via OBSCRCVF@gov.bc.ca.
- Custom ventilation forecasters are available to assist with obtaining a forecast, and can be found on the [Ventilation Index page](#).
- The turnaround time for a request can take 2-3 business days.

(Custom venting) Internal Government Staff:

- Custom Venting Forecasts will be written Monday through Friday that will be valid for burning Tuesday through Saturday. If a forecast is needed for burning outside these timelines, please access the [MoE Venting Index map](#) or contact an approved private sector forecaster who will charge for their services.
- Contact your local Fire Weather Forecaster at least five (5) days prior to the start of the burning process so they can arrange when the forecasts will start, and other forecasters may be involved.
- Information needed includes latitude and longitude coordinates, elevation, and an email distribution list of the recipients of the forecast.
- Custom Venting Forecasts can be arranged through the winter but not during the winter holidays (December 15th – January 2nd).

Curing Fuels: Heavy smoke can be reduced if the material is cured before burning, meaning the material should have been piled for 4 months to dry out, or contain less than 30% fuel moisture content. Be aware that Fire Hazard Assessment and Abatement timelines must be followed. NOTE* Providing that all requirements set out in Division 2 of OBSCR are met, burning under a CWRR plan is exempted from seasoning requirements.

- If the material is not fully cured, or there are issues with ignition creating heavy smoke, consider using a leaf blower to accelerate the process and create a hotter burning fire.
- Fire accelerant material like gasoline, kerosene, or accelerants in the form of gels like Flash 21 can be used to increase the heat release rate, meaning the fire burns hotter, resulting in a cleaner burning fire. This is similar to the effect that a leaf blower has as suggested above. Use this with an ignition source at the base of the pile to preheat the fuel above.
- If the atmospheric conditions change and the smoke drift or venting becomes an issue, no more vegetative debris can be ignited or added to the burn. Cease operations and re-assess.

Timing of Pile Burns and Risk:

Division 2 (CWRR), of OBSCR allows for a maximum burn time of less than one day. To start burning, the afternoon ventilation forecast must be GOOD or FAIR for the day of the burn. You may not start the burn earlier than one hour after sunrise. It must end by 4 p.m., or at least two hours before sunset (whichever is later). If you need a longer burn time, consider burning under Division 1 or Division 5.

- During project planning, consider smoke drift and how it could negatively impact values. Examples: Public, highways, airports, etc. If smoke impacting traffic is a concern, consider developing a traffic safety plan with signage, flaggers, and pilot vehicles in the event that smoke impedes driver visibility.
- Adequate crew capacity and fire suppression equipment must always be in place to effectively respond to escapes as per [Wildfire Regulation 21.5 and 21.6](#).
- To minimize the risk of unplanned ignition, piles can be burned concurrently with pruning and thinning activities.
- Monitor weather to identify potential trends and concerns (potential wind events, etc.).

- Depending on fuel type/condition, current and forecasted weather, and BEC Zone, a hand guard to mineral soil and/or control line must be used around pile perimeters if there is a risk of spread to adjacent surface fuels.
- Appropriate action must be taken to extinguish the fire if there is a risk of escape, or if an escape occurs. If the fire escapes, it must be reported.
- Personnel must have a monitoring plan in place to return to wildfire risk reduction project sites for patrol and cold trailing of ignited areas.
- Avoid burning on the last day of a work shift or work week (ie. Friday) unless a monitoring plan has been established over that period to ensure patrol obligations have been adhered to.
- The end point of a fire for the OBSCR is when the pile has ceased flaming and only 10% of the burnt surface area is emitting smoke. For Community Wildfire Risk Reduction projects, burning can not occur over night and needs to 'end' each day by 4pm, or two hours before sunset, whichever is later.

Ignition Techniques:

These guidelines and ignition techniques apply regardless of the type of ignition device used:

- A pile should be ignited at the base of the pile, where the fine fuels are located and dry.
- Light the pile on its upwind side, allowing the wind to assist in carrying the fire through the pile (Figure 12).
- If the winds are light, it may be advantageous to light the entire pile perimeter to ensure the fire carries through it. When this technique is used during light wind conditions, a pile should be lit on the downwind side and worked around the pile to the upwind side to stay out of the smoke generated (Figure 13).
- When burning multiple piles, consider pile order, wind direction, sequence of ignition prior to lighting the piles, so workers are not working in the smoke from previously lit piles (Figure 14).
- Revisit burn area post-ignition to ensure fire is safe and will continue to be safe.

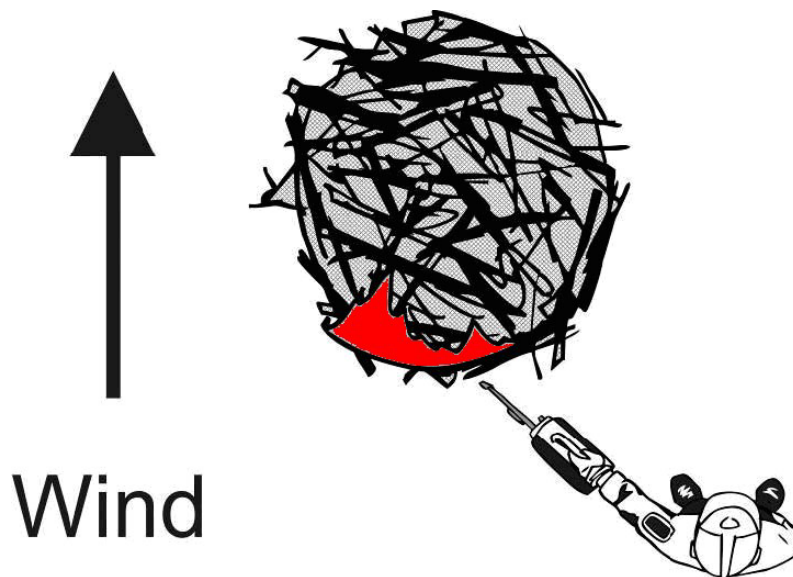


Figure 12. Lighting and burning a pile from the upwind side.

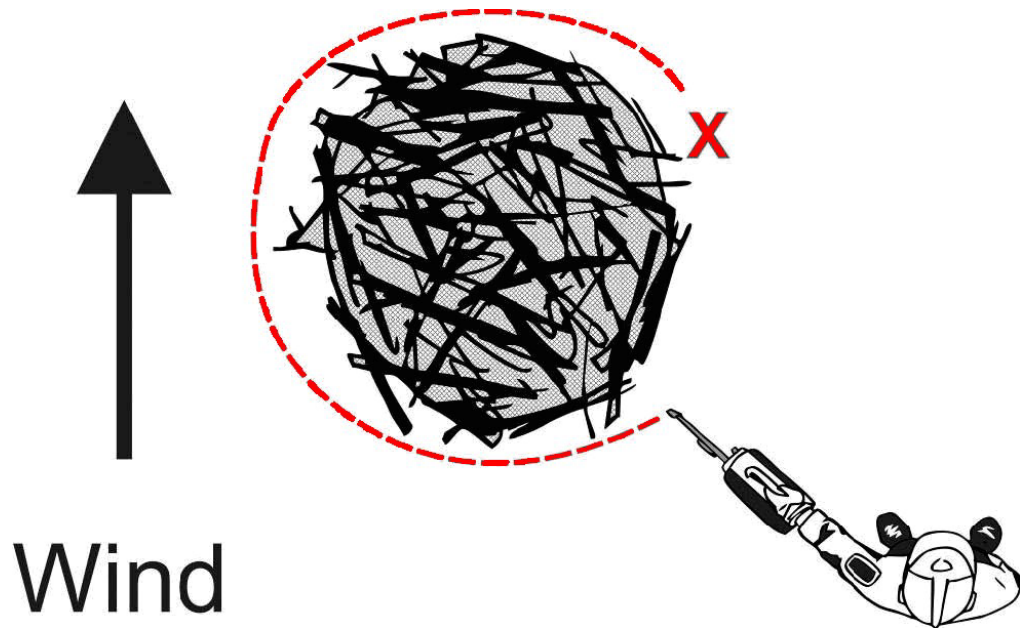


Figure 13. Lighting the perimeter of a pile during light wind conditions. The worker started on the downwind side to reduce their exposure to smoke.

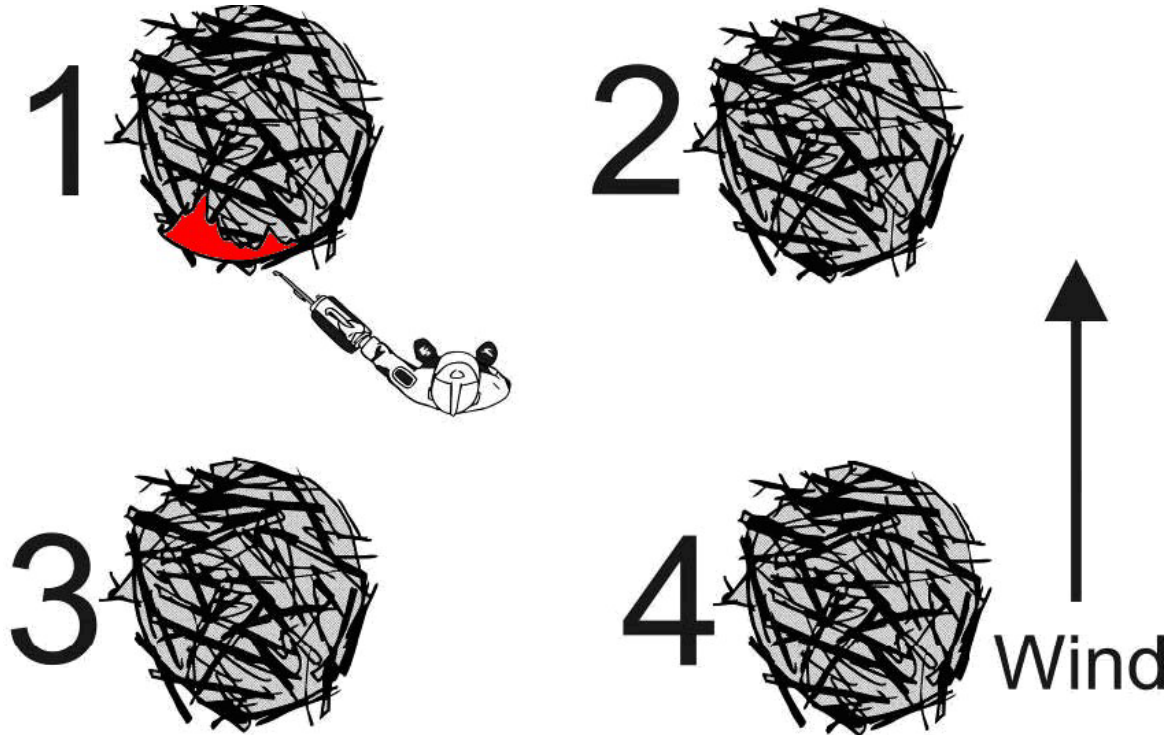


Figure 14. Demonstrating pile sequence for pile ignition with wind considerations.

A variety of ignition devices may be used for pile burning, dependant on resources and site conditions. Figure 15. provides several available options, a brief description of each, and relative intensity of heat they may generate:

Ignition Method	Description	Intensity
Drip Torch	Hand-held dispenser using diesel/gasoline mix 4:1	Low
Small Propane	Propane (or MPS gas) cylinder of 16 oz or less	Low
Fire Logs	Mixture of sawdust and paraffin typically 5 lbs	Low
Medium Propane	Propane 10–20 lbs with hose and valve system	Moderate to High
Gelled Gasoline	Gelling agent used in gasoline to control volatility and heat release	High
Heli Drip Torch	Most often used with gelled gasoline (as above)	High
Liquid Propane	Truck mounted tank, hose valve system	Very High

Figure 15. Various ignition devices, description, and intensity of each. (Referenced from Coastal Fire Centre Woody Debris Management Info Flip).

Safety:

Before any ignition, ensure the operational burn crew:

- Has received appropriate training for the task.
- Is wearing the appropriate Personal Protective Equipment (PPE), including fire resistant, non-flammable clothing, (cotton, wool, leather, nomex, proban, etc.).
- Is familiar with the ignition materials, and any mixing and handling procedures. (Review applicable Material Safety Data Sheets (MSDS) prior to handling).
- Understands the importance of minimizing smoke inhalation from accelerants as they typically contain high quantities of Polycyclic Aromatic Hydrocarbons (PAH) which are known carcinogens.
- Reviews site specific safety issues that should be pre-identified and addressed within the prescription such as presence of powerlines, gas lines or anything that may pose a safety issue associated with pile burns.
- Has read, understood, and signed off the applicable safe work procedures.
- Reviews a daily Field Safety Plan. One example of an effective Field Safety Plan can be found in *Appendix 2*. (BCWS Field Safety Plan Template).

Appendix 1. – Regulations and Reference Materials

Open Burning Smoke Control Regulation

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-pollution/smoke-burning/regulations/openburningregulation>

Open Burning Smoke Control Regulation – Community Wildfire Risk Reduction

https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/factsheets/community_wildfire_risk_reduction.pdf

Smoke Sensitivity Zones

<https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-pollution/smoke-burning/regulations/openburningregulation/smoke-sensitivity-zone-maps>

Ventilation Index – Interactive Map

<https://governmentofbc.maps.arcgis.com/apps/webappviewer/index.html?id=6d288bc667b24528a5c1e3b4c0373d07>

Venting Index – Text Format

<https://www.env.gov.bc.ca/epd/epdpa/venting/>

Assessing/Forecasting Wind Direction, Smoke, and Meteorological Information

windy.com
<https://firesmoke.ca/>
<https://tools.airfire.org/playground/v3.5/emissionsinputs.php>

Industrial Burning

https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/fire-bans-and-restrictions/bcws_backyardburning.pdf

https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/wildfire-status/fire-bans-and-restrictions/7271_flnro_cat3_burning_brochure_web.pdf

Burn Registration

<https://www2.gov.bc.ca/gov/content/safety/wildfire-status/fire-bans-and-restrictions/ofts-burn-registration>

Chief Forester’s Guidance on Coarse Woody Debris Management

https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/conservation-habitat-management/wildlife-conservation/wildlife-tree-committee/chief_forester_short_cwd.pdf

<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-habitats/wildlife-tree-committee/wildlife-tree-guidance-policies>

Wildfire Regulation

http://www.bclaws.ca/civix/document/id/complete/statreg/11_38_2005

Prescribed Fire and Invasive Plants – A Reference Guide and Manual of Best Practices

https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/invasive-species/publications/prescribed_fire_and_invasive_plants_manual.pdf

Seeding of Areas Burned by Wildfires

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/rangelands/postfire_wildfire_seeding_revised_2017.pdf


British Columbia Rangeland Seeding Manual

Post-Wildfire Rehabilitation starts on page 58.

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/rangelands/bc_rl_seeding_manual_web_single_150dpi0904.pdf

Appendix 2. – BCWS Field Safety Plan Template

Select the image and double click to open the fillable Field Safety Plan in Acrobat.

 Ministry of Forests, Land, Natural Resources Operations and Rural Development		FIELD SAFETY PLAN				BRIEFING BC WILDFIRE SERVICE	
INCIDENT #/PROJECT:				DATE:			
1. Site Detail		Work Area GPS Coordinate		Lat:		Long:	
		<input type="checkbox"/> Staging <input type="checkbox"/> Helipad <input type="checkbox"/> GPS Coord		Lat:		Long:	
Worksite Geographic:			Road Directions from Closest Town:				
2. Crew Detail						Call Sign	Frequency
Supervisor/IC		Name:		Phone:			
Alternate		Name:		Phone:			
Resource:		Assignment:					
Resource:		Assignment:					
Resource:		Assignment:					
Resource:		Assignment:					
Medevac Helicopter:		Type:	Grounding Time:			Total # of Workers	
3. Weather							
Forecast		Temp	RH	FFMC	Wind Speed/Direction	Precipitation/Fog	
Current							
Forecast							
4. Fire Behaviour				Not Applicable <input type="checkbox"/> Behaviour Forecast Briefing Delivered <input type="checkbox"/>			
Fuel:	Weather:	Topo:	Wind:	Predicted Fire Behaviour:			
5. Operations							
Detailed Description of Overall Objectives (consider task, purpose, end state)							
						Trigger Points Discussed: <input type="checkbox"/> Contingency Plan in Place: <input type="checkbox"/>	
Flagging Colour used				Special Markings			
Access/Escape		No Work Zones		Describe:			
Trail		Assessed					
Danger Tree		Other					
Lookout				Not Applicable: <input type="checkbox"/>		Call Sign	Check-in Frequency
Geographic							
GPS	Lat:			Long:			
Anchor point				Not Applicable: <input type="checkbox"/>			
Describe:							
Communications							
Ground		Repeater		Secondary		Air	
Check in Site:	<input type="checkbox"/>	Radio:	<input type="checkbox"/>	Other:	<input type="checkbox"/>	Check-in intervals: (30 mins/2hrs)	
Road Channels		1:	2:		Equipment Channel:		
Escape Routes							
Escape Route 1:							
Escape Route 2:							
Safe Zone							
Geographic:				Lat:		Long:	

FS1411/ Updated 2020