

SPRINKLER DEPLOYMENT KEY MESSAGES AND BEST PRACTICES

AS IDENTIFIED THROUGH INTERVIEWS AND OBSERVATIONS

Ray Ault and Chad Gardeski

April 2019

This best practices document is not restricted.

This document contributes to the state-of-practice review of water delivery systems (sprinklers) in the wildland-urban interface (WUI). Funding for this review was provided by the Forest Resource Improvement Association of Alberta (FRIAA).

Sprinklers are used to protect structures from wildfire during wildland-urban interface events across Canada. Traditionally, standard forestry equipment has been used in conjunction with impact sprinklers. FPInnovations is reviewing common practices and equipment used during sprinkler deployments, in Canada, to determine if they are the most appropriate for community structure protection, or if alternative approaches should be considered.

In order to better understand the extent of equipment usage and some of the challenges associated with sprinkler deployments, FPInnovations interviewed fire managers after wildfire events, during active wildfires or wildland-urban interface deployments, and during deployment exercises. This report is a summary of the key messages and best practices identified by fire managers for the successful deployment of sprinklers.

301012735: FRIAA SPRINKLER PROJECT

BEST PRACTICES

ACKNOWLEDGEMENTS

FPInnovations would like to acknowledge the Forest Resource Improvement Association of Alberta (FRIAA) for funding this project, and the following agencies and individuals for their support.

- The Alberta Office of the Fire Commissioner
- B.C. Wildfire Service
- Clearwater County, Alberta
- Tallcree First Nation, Alberta
- Murray Heinrich - Palisade Consulting Ltd.
- Town of Jasper, Alberta
- Town of Canmore, Alberta
- Stew Walkinshaw – Montane Forest Management Ltd.

AUTHORS CONTACT INFORMATION

Ray Ault

Wilderness Fire Management Inc.

(780) 658-2282

Raymond.ault@gmail.com

CO-AUTHOR AND REVIEWER

Chad Gardeski

Manager – Wildfire Operations

(780) 817-1440

Chad.Gardeski@fpinnovations.ca

Follow us:   

INTERVIEWS

In order to better understand the extent of equipment usage and some of the challenges associated with sprinkler deployments, FPInnovations interviewed fire managers after wildfire events, during active wildfires or WUI deployments, and during deployment exercises. In addition, we reached out to various Alberta water delivery contractors to understand some of the larger equipment being used in the WUI. These interviews contributed to the conclusions and key messages identified in the executive summary. Fire Managers and water delivery contractors involved in the following wildfires, deployments, reviews, and deployment exercises were interviewed to identify some key messages and best practices for sprinkler deployments:

1. Nordegg, Alberta – Wildland-Urban Interface fire 2013

In May 2013, the hamlet of Nordegg was evacuated due to a wildfire that threatened the community. Alberta Agriculture and Forestry (AAF) and the Clearwater Regional Fire and Rescue Services (CRFRS) conducted several desktop emergency planning exercises in preparation for this type of event. As a result of these efforts, individual agencies were clear about their responsibilities for community protection, and resources were able to be deployed efficiently. The CRFRS used AAF sprinkler trailers and a contract water delivery service provider to deploy sprinklers to protect residential structures, community buildings, and the historic coal mine site. Effective communications between the two agencies and pre-planning significantly contributed to a successful deployment, which included the installation of 76 sprinklers that were supplied using a combination of high-volume and standard forestry equipment (20-mm to 100-mm hoses). Water sources included community hydrants, above ground community water tanks, water supplied using Mark III and BB4 forestry pumps, and water stored in portable water bladders.

Key message: The annual emergency planning exercises that were conducted in preparation for a wildfire event contributed to the rapid deployment and success of this operation.

2. Tallcree First Nation, Alberta – deployment 2015

The structure protection specialist for the 2015 deployment at Tallcree First Nation provided notes and, in an interview, explained the assessment process used to determine which structures needed sprinklers and how water supply lines and pumps were organized during the deployment. The use of a 38-mm (1.5-in.) main line may not have been sufficient to supply adequate volume to protect all the structures in the community. The fire did not impinge the community. After the deployment, a formal community protection plan was developed based on the learnings from the deployment and called for the use of larger 65-mm (2.5-in.) supply lines to improve the water volume supply in the event of a future deployment.

Key message: After-action reviews of community protection plans are important for identifying opportunities for improvement.

3. Robb, Alberta – deployment 2018

In July 2018, the community of Robb, was placed under an evacuation alert, but sprinklers were never deployed. Structure protection crews on site conducted a pre-deployment assessment. A sprinkler deployment plan was developed several years earlier, and a deployment exercise was never conducted to validate the effectiveness of the plan. During the assessment, it was determined that it would be advantageous to stage water-holding tanks around the community to supply enough volume to support the perimeter sprinklers due to the topographical differences from the main water supply (the creek) to the top of town. The assessment also revealed the advantages of using a 65-mm (2.5-in.) supply inch line rather than a 38-mm (1.5-in.) supply line to allow for more volume flow.

Key message: Plans need to be regularly updated to reflect current technologies and best practices. Plans benefit from test deployments.

4. Smithers Landing, British Columbia – deployment 2018

In August 2018, the lakeside unincorporated community of Smithers Landing was threatened by wildfire. Several residents used personal pumps and sprinklers to prepare their homes in the event of an evacuation. These simple private sprinkler systems relied on small pumps, garden hoses, and a variety of different sprinklers. Two of the cabins used the Bear Cat FP2126 fire pump kits. Some of these systems were in place and operational before wildfire and Structure Protection crews arrived. With an ample water supply, and the application of FireSmart guidelines, these structures were well protected

Key message: The actions taken by residents to protect their personal property reduced the strain on limited agency resources.

5. Jasper National Park, Alberta – deployment plan review

FPInnovations met with the Jasper Fire Department to discuss their Community Wildfire Protection Plan, which called for the use of perimeter sprinklers and structural apparatus (fire engines) within the interior of the community. A number of years ago, the town changed its source of community water from the Athabasca River to a well system located above town. Based on concerns regarding available volume and pressure from the well system, the fire department recognized that it could still tap into the old infrastructure and use water from the Athabasca River to boost the system's volume and pressure. Communities all have unique challenges that require different solutions.

In this case, re-assessing the deployment plan identified a need for more volume, and a solution was developed in advance of an actual wildfire event.

Key message: Each community has different water supply challenges that require unique solutions. It is critical that those challenges are identified and addressed in sprinkler deployment plans.

6. Town of Canmore, Alberta – deployment exercise

In September 2018, the town of Canmore conducted a sprinkler deployment exercise to validate the assumptions in the deployment plan. The exercise allowed the municipal fire department to set up planned perimeter lines to get a sense of the logistics behind the deployment and to ensure that any challenges could be addressed before an actual event. The exercise identified equipment and logistic challenges associated with using the municipal hydrants to provide enough water to supply the system, using a 38-mm (1.5-in.) supply line. Re-deployment of a 68-mm (2.5-in.) supply line provided the necessary volume for the system.

Key message: Deployment exercises give communities an opportunity to validate and improve their community protection plan.

7. Contractor interviews

FPIInnovations was able to interview six of the ten Alberta contract companies that AAF identified as having equipment that could be used for structure protection. These companies do not necessarily work on wildfires every summer. Only two of the companies are focused on providing specific wildfire services. The availability of high-volume water pumps was the focus of the interviews. Four contractors can supply high-volume pumps with capacities exceeding 750 gallons per minute (gpm) that can accommodate 100-mm (4-in.) water supply lines. One contractor commented that Alberta oil field water supply service providers could supply 70-75 water delivery systems that are capable of delivering between 750 and 1800 gpm.

Finally, FPIInnovations interviewed a duty officer with Wildfire Defence Systems in Bozeman, Montana. Wildfire Defence Systems is a contractor that supplies structure protection crews for Chubb insurance in 21 states. They have the largest private fleet of wildfire engines in the United States and a large inventory of wildfire suppression and structure protection equipment. Wildfire Defence Systems indicated that using sprinklers for structure protection in Montana is common and that deployment is often completed by private contractors. Wildfire Defence Systems uses water enhancing gel products with a gel induction system for ground based applications.

Key message: A small number of private companies are capable of providing specialized water delivery equipment. Many private companies that have the capacity to provide

these services do not have the opportunity to remain current with structure protection tactics; thus they are able to reliably provide this service to the agencies.

BEST PRACTICES – PRE-DEPLOYMENT

The following best practices have been identified in terms of preparing for a sprinkler deployment:

1. Have a structure protection plan for the community, in a format that can be easily shared with other fire agencies and first responders. Practice the plan with other organizations as part of training.
2. In the planning phase, determine priorities for the first 12 hours, 24 hours, and 48 hours based on the wildfire location and expected fire behaviour.
3. Sprinkler deployment plans start first with the sprinkler and then are reverse engineered to the water source; this will determine flow, pressure, and needs for the system.
4. A Reliable water supply is essential. Consider backup power for community water systems.
5. Plan to have a representative from the power and water utility on site during operations.

BEST PRACTICES - DEPLOYMENT

The following best practices have been identified during a sprinkler deployment:

1. Make the decision to request outside resources early. There is a lag in deployment because the dispatch and travel of fire crews can take several hours. Fire crews benefit from arriving at the incident and having time to become familiar with the situation.
2. The rapid return of firefighters once the wildfire has passed is critical. Structure protection using sprinklers relies on the follow-up of firefighters to suppress any spot fires ignited by firebrands or structural elements that might be burning.
3. The identification of safety zones for firefighters based on anticipated wildfire conditions, wind direction, crew experience, and training may need to be decided during the incident. A strategy of Prepare and Defend will rely on well-defined safety zones.
4. For responses in rural areas, accurate maps with structure locations are needed. County or regional district GIS departments often have the most up-to-date maps showing the location of critical infrastructure and residential dwellings. These maps can be important when vegetation obscures structure locations.
5. Once sprinklers are deployed, test the system and fine-tune the spray pattern of the sprinklers to ensure that:
 - a) the sprinklers are aimed to wet the Structure Ignition Zone (the area directly adjacent to the walls) and any decks or other attached structures; and

- b) the sprinklers will not cause water damage to the building. Avoid having sprinklers spray directly at windows and doorways. If sprinklers are located on the roof, cover vents and any other air circulation entry point where water and firebrands might access the attic.
- 6. Protect fire hose lines from catching fire by laying the hose on mineral soil and, where possible, configure the line so it stays wet during operation. When laying hose, stay close to the structure. Use percolating hose in situations where there is potential for more intense fire.
- 7. Tripods provide height to overcome vegetation and provide better casting distance than ground installed sprinklers.
- 8. Sprinklers do not need to be run for several hours in advance of the fire event. Activate the sprinklers a short time before the fire arrives (FPInnovations research has shown that as little as 10 minutes is needed). Sprinklers are most useful when applying water during fire impingement to keep combustible materials wet. It is critical that the water delivery system not run dry before fire arrival.
- 9. FPInnovations research has shown that operating sprinklers for long periods to produce a humidity bubble or humidity dome is ineffective during windy conditions. Water vapour is light and is easily transported downwind during wildfire events. Any water vapour (humidity) produced dissipates as it blows away.
- 10. Sprinklers need to be tested and adjusted to ensure that the Structure Ignition Zone will be wet. Once readied, the sprinklers do not need to be run for long periods.
- 11. When drawing water from a lake, pond, or relay tank, ensure that the end of the suction hose will not be clogged or plugged by debris. Two problems can be caused by conifer needles and other debris: (1) they can reduce pump suction when entering the foot valve, and (2) if they enter the hose, they can plug or constrict sprinkler nozzles. Sprinkler line patrols can help clean nozzles. Maintenance of sprinklers needs to be part of the operation.
- 12. Fire crews should determine what types of spare valves and connectors will be needed for their community. A box of adapters such as 7.6-cm (3-in.) camlocks for water tanks, swedges for 400 barrel tanks or other water storage tanks, and connectors with quick connect and municipal thread can be helpful.
- 13. Be prepared to deal with pets. Bring dog treats.
- 14. Recover equipment quickly and prepare for redeployment.



info@fpinnovations.ca
www.fpinnovations.ca

OUR OFFICES

Pointe-Claire
570 Saint-Jean Blvd.
Pointe-Claire, QC
Canada H9R 3J9
(514) 630-4100

Vancouver
2665 East Mall
Vancouver, BC
Canada V6T 1Z4
(604) 224-3221

Québec
1055 rue du P.E.P.S.
Québec, QC
Canada G1V 4C7
(418) 659-2647