



# Fire Pre-Plan for the Ski Industry

*Sample Only. Updated March 2023*

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## Introduction

Jason Sawin is the owner of CHS Snowmakers; founded in 2002 with his wife Kelly and son Noah. He began in the ski industry in 1991, working at Steamboat Ski Area and Howelsen Hill Ski Area in Steamboat Springs, CO. Jason was the crew leader for 5 of 7 years at Howelsen Hill, in charge of snowmaking, lifts, grooming, and summer maintenance. He was a volunteer firefighter for Steamboat Springs from 1994 to 2001, fighting wildland and structure fires. In 2001, Jason was hired by West Metro Fire in Lakewood, CO, where he was a firefighter/paramedic for 15 years, fighting structure fires, wildland fires, and providing emergency medical treatment for patients. Jason is still an active firefighter as a water tender operator for Torch Fire and Security in Boise, ID.

## Scope

For years, ski areas have had incidents with fires, including wildland fires, structure fires, and arson. Many ski areas are remote, buildings are separated from municipal water systems, and access is difficult. Most ski areas have snowmaking systems, some are very large snowmaking systems. A few of these snowmaking systems have been used for fighting fires but very few ski areas have a good working pre-plan to use these systems and train with their local fire departments.

Our goal is to provide the ski industry with an actionable pre-plan, along with a list of the proper equipment to adapt from a snowmaking system to fire hoses. We will recommend ways to use snowmaking equipment to construct unmanned nozzles that will create a large water barrier in an attempt to protect buildings, lifts, and possibly even stop an advancing fire. This is all completed well in advance of a fire, months or even years. This is not intended to serve as a guide on how to directly attack fires.

# Contacts

It is essential that a *current* list of ski area personnel, local fire departments, and federal fire department personnel is in a central and accessible location for quick reference.

## Ski Area Personnel

### **Owner/Holding Company**

Name:

Address:

Contact:

Cell/home number:

### **General Manager**

Name:

Address:

Cell/home number:

### **Mountain Manager**

Name:

Address:

Cell/home number:

### **Slope Maintenance Manager**

Name:

Address:

Cell/home number:

## **Lift Manager**

Name:

Address:

Cell/home number:

## **Snowmaking Manager**

Name:

Address:

Cell/home number:

## **Security Manager**

Name:

Address:

Cell/home number:

## **Marketing/Public Relations Manager**

Name:

Address:

Cell/home number:

# **Fire Personnel**

## **Local Fire Department**

Emergency number:

Main phone number:

Address:

Fire Chief:

Battalion Chiefs:

How many full time members/volunteer:

Wildland fire trucks and types:

## **State Fire Departments (includes BLM)**

Emergency number:

Main phone number:

Address:

Fire Chief:

Battalion Chiefs:

How many full time members/volunteer:

Wildland fire trucks and types:

## **Federal Fire Department**

Emergency number:

Main phone number:

Address:

Fire Chief:

Battalion Chiefs:

How many full time members/volunteer:

Wildland fire trucks and types:

## **USFS (local staff)**

Emergency number:

Main phone number:

Address:

Fire Chief:

Battalion Chiefs:

How many full time members/volunteer:

Wildland fire trucks and types:

## **Air Support**

Emergency number:

Main phone number:

Address:

Fire Chief:

Battalion Chiefs:

How many full time members/volunteer:

# of SEATs:

# of helicopters:

# of air tankers:

# Maps

Accurate and up to date maps are extremely important for firefighting. Each agency should have a paper copy *and an electronic copy* of a USGS map of the ski area and surrounding terrain, a topo map of the ski area showing the lifts and snowmaking system layout, and escape routes with safe zones.

## **USGS Map**

Appendix A: USGS Map

## **Topo Map of Ski Area**

Include the lifts, buildings and the snowmaking system. For the snowmaking system, include pump stations with total GPM, reservoirs with capacity, snowmaking hydrant locations, snowgun type and locations, pressure zones with gravity feed, and water pump pressures using the color code system.

Appendix B: Topo Map

## **Escape Routes Map**

Escape Routes need to be well marked and lead away from the fire but not to a dead-end.

Appendix C: Escape Routes Map

## **Safe Zones Map**

Safe Zones are large clear areas where firefighters shouldn't have to deploy their shelters.

Appendix D: Safe Zones Map

## **Staging Area Map**

The Staging Area is for all fire resources to report to and standby until needed. This area should be near the ski area, could be the main parking lot but might be several miles away if the access to the ski area is a dead-end road. This area should have enough room for dozens of fire trucks, semi trucks hauling equipment, heavy equipment, a helicopter landing zone, and a camping area with showers and meals.

The main lodge or base area of a ski area may not be a good safe zone or staging area and the incident company will make the final decision.

Appendix E: Staging Area Map

# Staff Training

**Staff training is the most important aspect of this plan.** Firefighters have many years of training and experience and continually improve the incident command system and training to prevent injuries and deaths for wildland and structural firefighting. Some ski area staff have firefighting experience but the key personnel must have fire training and a Red Card to participate in federal fires at ski areas.

Red Cards are a certification by the USFS and it requires a yearly refresher with a “hike”. The first class is a 40 hour class with classroom and hands-on training. At the end each student must pass a written test, deploy a shelter and a **45 minute, 3 mile hike with a weight vest**. You then receive your Red Card and can fight federal forest fires. Equipment operators also have red cards but they are not required to complete the wildland hike. There are additional certifications firefighters can get and are encouraged to do. Every year thereafter, firefighters must take an 8 hour refresher, deploy a shelter, and do the hike.

## Firefighting Equipment & Resources

Fire Departments and federal fire crews arrive with typical fire fighting equipment, including safety gear, fire trucks, hose, portable pumps, aircraft, and bulldozers. Ski areas shouldn't be expected to provide much of the same gear but there is basic gear, equipment, and specialty equipment that can be ready.

Ski areas need to provide all key personnel with fireproof wildland fire approved clothing, helmets, gloves, boots, web gear with a fire shelter, goggles, and airway protection. Additional equipment includes hand line tools, water backpacks, two way radios (to communicate with local and federal fire departments), and a skid unit for a pickup truck.

New equipment for ski areas to fight fires includes cam lock-to-fire hose adapters, PRV adapters for snowmaking hydrants, and snowmaking guns. Some portions of snowmaking systems have 150 PSI or less, which allows for a small and lightweight specialty HTM adapter to go from a cam lock-to-NH fire hose thread. This will allow firefighters to use the large volume of water from a snowmaking system. Where the water pressure is 150 to 400 PSI, a PRV valve with adapters reduces the high water pressure for fire hoses. There is also another PRV valve adapter for 400 to 700 PSI, but these are very expensive.

With the wide range of pressures in a snowmaking system (as mentioned above) firefighters and ski area personnel need to know what the pressure is of a given hydrant without turning it on. We propose the following color coded system:

**Green – 0 to 150 PSI**

**Yellow – 150 to 400 PSI**

**Red – 400 PSI to 700 PSI**

**No color – use caution or not usable**

These colors should be determined in the pre-plan and the pressures should be included with the system operation for a fire. If the system can be gravity-fed, the pressures should be taken then. If the best option is with pumps turned on, then those pressures should be recorded.

Snowmaking guns can be extremely valuable for fire protection and don't have to be manned. Most snowguns can be used but some are better than others. In very high pressure areas (400 PSI or



higher), snowguns can be used to prevent accidents with the high pressure for firefighters. Fire hose is typically rated to 300 or 400 psi.

## **Fan Guns**

These guns require electricity and electricity may not always be available during a forest fire. The guns should be placed near buildings and lifts before fire conditions are present. Hoses should be attached to the gun with the hydrant and gun pointed in the correct position. If they can be turned on automatically, make sure the computer and communications system is operational. A backup generator may be needed to run fan guns.

## **Air/Water Guns**

Older style high energy snowguns will not throw water without air and can flow a very large amount of water. These guns are not a good option for fire protection.

## **Low Energy Air/Water Guns**

These guns have two types, a wet nucleator and a dry nucleator. Both will work but the wet nucleator will allow water to flow backwards down the air tube. Make sure the air hose is disconnected to prevent water from getting into an onboard compressor. The dry nucleators have a separate air nozzle from the water nozzle and they cross externally. Only use the water nozzle. Have the hose connected to the gun and the hydrant and have the tower up and pointed towards the structure you want to protect. Place smaller nozzles in these guns for light and lower level fuels. Place larger nozzles for heavy fuels and larger structures. This will allow for different water flows, depending on expected fire behavior. You can space these guns tighter near lodges and other structures, compared to typical spacing for snowmaking.

Note: Recent advances in low energy snowguns has made many external mix and other stick guns obsolete. Many resorts will recycle the metal. We suggest installing these old snowguns near fanguns solely for fire protection. They do not require power and can be the best option during a fire.

## **Reservoirs**

Keep them full and clear of debris. If possible, trim or cut trees around them for a clearer path for helicopters to scoop water with baskets.

## **Pump Stations**

Complete yearly maintenance in the spring with pumps and piping and have them ready to operate. There needs to be a backup generator to run pumps if the system can not be gravity-fed.

## **Piping**

If replacing pipe or adding pipe during the fire season, isolate the construction area and keep the rest of the piping charged with water. Make sure there is a way for water to go around the open pipe. This can be done with snowmaking hose running from one hydrant to the next, if lateral piping is not available. If the length of hose is more than 300', install "tees" with a valve and a connection point for fire hose or to go to snowguns.

## **Temp Water Storage**

Purchase IBC totes or other water storage options. Place them near the top or bottom of lifts and near buildings. The IBC totes hold either 275 or 325 gallons of water. Pipe several together for added

storage. Fill them with water well in advance of the fire season. Make sure the hose connection can be adapted for fire hose. If placed at a high point, hose can be run downhill and a pump is not required.

## **Snowmaking System Details**

Any size snowmaking system can be extremely helpful to firefighters with the correct pre-planning. Below are the general types of snowmaking systems, pick your type and focus on how to make it better for firefighting.

### **Types of Snowmaking Systems**

#### **Air/Water System**

As mentioned earlier, high energy air/water snowguns will not work well for firefighting but the system can still be used. You can use the PRV valve adapters to use fire hoses on snowmaking hydrants and use low energy guns near buildings or along ridges.

#### **Combination Air/Water and Fan System**

This system has the limitations of a typical air/water system but also has greater benefits with fan guns. As long as power is available, a fan gun can be very effective in fire protection. The fan throws water a long distance up in the air and if the gun has a swing or automatic oscillator, it should be turned on. This will spread the water out over a very large area. Only the first valve or minimum flow should be used unless extreme fire behavior is expected. With heavy fuels and extreme fire danger, flows over 100 gpm at each fan gun can be a very big fire break. This is important for large structure protection or making an unmanned stance to stop the fire on a ridgeline or other good fire break.

#### **Fan-Only System**

As mentioned in the combination system, there are a great deal of benefits with fans. The biggest downfall is the need for power. All fan guns can still run water through them without the fan and compressor operating, as long as the temperature is above freezing. The problem is very little water throw, so it is more comparable to setting up a garden sprinkler. This system needs to have a backup generator to run the fanguns in case the normal power service has been damaged by the fire or disconnected. Fanguns are not fireproof and may take severe damage from a fire. As mentioned above, consider installing an obsolete low energy stick gun at each fangun location.

## **Types of Pumping Systems**

#### **Gravity System**

This system is nearly 100% gravity-fed for the entire snowmaking system. This is the best case scenario but very few systems are like this. Gravity allows water to flow and build pressure in the pipes. An interruption of electrical service is not a big issue with this system. Some of these systems

can create extremely high pressures at the bottom and this makes it difficult for firefighters to use the snowmaking system. Extra measures need to be taken for firefighters.

## **Dual System - Gravity and Pump**

This is a combination of both gravity-fed out of a lake and pumps to move water uphill. Any structures below the level of the reservoir can easily be protected with gravity pressure. Structures above the reservoir need a pump to move the water uphill. A backup generator is needed to run this pump if electrical service is interrupted.

## **Pump System**

This system can create very high pressures near the base and also complicate operation of the pumps if there are booster stations on the mountain. Ski area personnel who have experience with the snowmaking system will be needed during the operation of this system. A backup generator is necessary to operate this system. The generator may need to be very large to run all of the pumps, including booster pumps. Ski area personnel will need to determine in the pre-plan how many pumps to run on the generator. Only key structures should be protected with this system.

# **Building Protection and Defensible Space**

Not all fires that threaten ski areas are wildland fires. Nearly every year there is a structure fire at a ski area. Main lodges have burned to the ground, arsonists have set buildings on fire in protest, and a small shed fire could easily cause a large wildland fire.

Many ski areas have buildings that are very old and have been “grandfathered” into new building and fire codes. Until these buildings are remodeled or replaced, they don't need to meet the new codes. The new codes are designed to protect the occupants of a building and prevent small fires from becoming large fires.

New codes typically include a fire detection system and a fire sprinkler system with a large water supply for larger buildings with several occupants. Older buildings can be retrofitted with these systems but typically the cost inhibits building owners from doing this. It is highly advised to install sprinkler systems.

Every large building at a ski area needs to have a large water supply for fire suppression. Some ski areas have installed storage tanks uphill from a building to gravity feed a fire hydrant. Tank sizes range from 10,000 to 50,000 gallons but may be fed by a 10 GPM well. Local fire authorities can determine how much water storage needs to be available for fire suppression.

Snowmaking systems can support these systems or even be these systems. One ski area had to tie in the snowmaking system to the fire protection system for their lodges because there was not enough potable water available. The snowmaking is tied in electronically, so snowmaking pumps will turn on and valves open to supply the water to the lodges. This is an extreme example but could be very cost effective if the ski area desires to build large on-mountain buildings.

All buildings in the wildland-urban interface should have defensible space around them. Defensible space completely surrounds a building and minimizes combustible materials including trees, bushes, grasses, and wood building materials. This can include the parking lot, irrigated lawns, pools, and cleared walkways. The outside of the building should be constructed of non-combustible materials including the siding, roof, eaves, and decks. The outside of the building needs to be sealed, no openings that would allow hot embers inside. If a small insect can get inside an eave then a hot ember

can also. Decks offer a great place for fires to start. Most often they are constructed of wood and have numerous spots for a hot ember to ignite a fire.

## **Planning for Ski Lift Protection**

This is similar to other structures but the structures can be over a mile long. This proves to be very difficult to deal with at larger ski areas. Manufacturers and certification boards may recommend the lift stay running if a fire is threatening it. This can be a structure fire near the lift, a lift shack fire, or a wildland fire.

The easiest protection for a lift is defensible space. Around all of the lift towers and the terminals, large vegetation and grasses should be removed. Normally the large vegetation like trees have already been removed for clearance. At the terminals, a much larger clearing needs to be maintained. A large wildland fire might pass the terminal without much damage but if the fire can creep along low grasses and under the building or deck, the entire terminal can be damaged.

At the base of the lift towers, all pads should be removed after ski season and grasses kept mowed or trimmed. Any heat exposure to a lift tower can damage it and make the tower twist, bend, or even weaken bolts, steel, or the concrete foundation.

Each lift that has a parallel snowmaking line can have a large fire break with snowguns. Snowguns can be placed at each terminal and near each tower.

Sipapu Ski Area in NM in May 2021 removed the chairs from one of their lifts when it was threatened by the Hermits Peak/Calf Canyon Fire. The fire never reached the ski area.

## **Planning for Forest Protection and Recent Incidents**

Many ski trails follow a ridgeline and, if the trail has a snowmaking line, it can offer a big fire break. In wildland fire prone areas like Southern California, fire breaks will be built with bulldozers along ridge lines. This will be done when fire danger is low and maintained every few years. These ridge lines offer a good location to stop or slow the spread of fire.

The largest and most destructive fire to a ski area was the Caldor Fire in August of 2021. It ripped through Sierra at Tahoe Resort, damaged most of the lifts, and burned their maintenance building. They had a fire pre plan in place and it helped in many ways. They have limited snowmaking but they set up the fanguns and ran water on their buildings. SAM Magazine has three podcast interviews with the GM, John Rice, and articles about the fire. It took them over a year to recover and fully open.

If a large fire front is advancing on a ski area, a ridge line with snowmaking may stop or direct the fire to another direction. Pajarito Ski Area in New Mexico was nearly lost when a controlled burn got out of control. The ski area didn't have snowmaking. The fire burned up the south side of the ridge that the top of the ski area is on. It moved east and towards Los Alamos instead of going down into the ski area on the north side of the ridge. If the fire had moved over and down the ridge, it could have destroyed every lift, all the lodges, and other buildings. This could have been the end of a great ski area.

In October 2007, a fire burned through Green Valley Lake and the Trinity Mountain Ski Area in Southern California. Trinity was in the process of getting approval for snowmaking but, due to a couple of bad snow years, this process was stalled. I had worked on a snowmaking plan for them and, if it had been installed, the chairlift would have been saved and possibly many of the nearby homes. The ski area has since been closed and everything removed. It is no longer a ski area.

In August 2008, Red Lodge Mountain, MT had a fire burn up the backside of the mountain and threaten the ski area. The fire started several miles away, so Red Lodge and fire crews had a couple of days to prepare. Red Lodge has a large gravity-fed fangun snowmaking system that was used to protect lifts, buildings, and supply water for fire suppression. Fanguns that were set up near buildings and lift terminals were turned on and ran nonstop until the threat was over. Spot fires were found within the ski area boundaries but were easily extinguished.

### **Other Incidents (news stories)**

Sierra at Tahoe, CA - August 2021 Caldor Fire

Sipapu, NM - May 2021 Calf Canyon Fire

Sun Valley, ID – In 2008 the snowmaking system was used to fight a fire.

Mt High, CA – The snowmaking system was used to fight a fire.

Beaver Creek, CO – The Bachelor Gulch side of the mountain has multi-million dollar homes where the gravity-fed snowmaking system is kept charged all summer for fire protection for those homes.

Soldier Mountain, ID – April 2009 the main lodge burned to the ground. The snowmaking system is not operational and it was an older lodge. In 2020, a wildfire burned through the lower half of the mountain, destroying a conveyor lift and other smaller buildings. The newer lodge had good defensible space around it.

Snowbasin, UT – Snowmaking system is tied into the fire suppression system for the lodges.

## **Yearly Training**

Every ski area, regardless how big or small or location, should conduct a yearly training in the spring. This is the off-season for most and the best time to fit it in. Prior to training, all maintenance on the snowmaking system should be performed, equipment inventoried and placed on the mountain, and the pre-plan updated.

All essential staff should conduct the wildland red card certification or refresher and an on-mountain interagency training should be conducted. All parties involved with a wildland fire or a structure fire need to be involved. On odd years, the wildland fire training can be conducted, and on even years, the structure fire training can be conducted.

All training must be documented with a roster of all parties involved. This roster should be easily available in the future for quick reference during an incident. All equipment must be inventoried, documented, and damaged fire equipment should be fixed or taken out of service. Weekly checks of the equipment should be performed during the fire season to identify theft or vandalism.

## **Insurance Review**

Insurance companies are very interested in minimizing their losses. Having a good fire pre-plan, the equipment and personnel to implement it, and the training documentation may drastically reduce the ski area premiums. In some cases, insurance companies may even pay for equipment.

Contact your insurance agent and ask them what type of discounts or other items they can offer for taking a proactive stance with fire pre-planning and protection. If they don't, shop around for other insurance companies that will.

## Conclusion

Use this Fire Pre-Plan as a guideline to start a detailed plan for you and your organization. Take this and make it your own, get others in your organization involved, and go out to your community. If you have any questions or suggestions, please let me know. I am offering this for free and would appreciate additional input or personal experiences from those who have dealt with wildfires threatening ski areas.

Sincerely,



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*Owner*

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**Attach copies of your appendices here:**

**APPENDIX A: USGS MAP**

**APPENDIX B: TOPO MAP**

**APPENDIX C: ESCAPE ROUTES MAP**

**APPENDIX D: SAFE ZONES MAP**

**APPENDIX E: STAGING AREA MAP**