The purpose of this module is to explain the capabilities of different firefighting equipment. The primary learning objectives are for you to be able to identify firefighting resources that arrive on scene and to better determine what firefighting equipment would work best for you on your property.

The following pieces of equipment will be covered:

- Fire Extinguishers
- Backpack Sprayer Pumps
- Wildland Engines
- Water Tenders
- UTVs
- Agricultural Equipment
- Hand Tools
- Disks and Dozers

The most basic piece of firefighting equipment is a fire extinguisher. ABC fire extinguishers work great for equipment or structure fires, but are not as effective on crop residue. The foam will smother the fuels, but still allow them to burn inside. Instead use a water charged fire extinguisher. Consider keeping both ABC and water charged extinguishers on farming equipment – use the ABC for equipment burning and water charged for crop residue. Keep them both in cabs and where they can be reached from the ground. Make sure that fire extinguishers are maintained and checked at the required interval that is listed on them.

Water can be a limited resource in many agricultural areas. Often when a fire first starts it does not require much water to stop it. Backpack sprayer pumps (Bladder bags or the Indian Traditional Steel Fire Pumps) are great to put on any piece of equipment or in the back of a truck to be available if needed. They hold 3 gallons with a hand operated spray nozzle. Straps on the back of the bladder allow it to be worn on the operators back. Also consider that herbicide backpack sprayers can be used if needed, but should only be used with water (not with herbicides / herbicide residues).

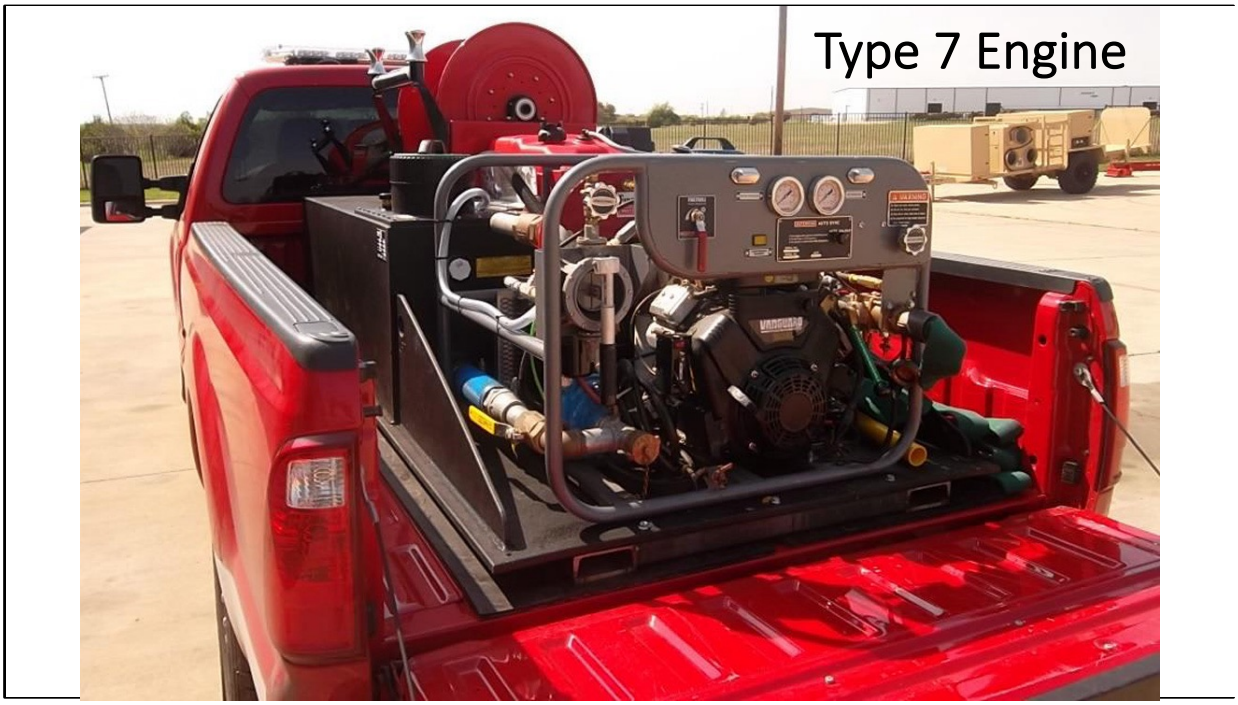
Bladder bags are great until you run out of water and then additional resources with more water are needed. Wildland firefighting engines range in their size and capabilities. Some engines are large, while others are small and more maneuverable. The NWCG (National Wildfire Coordinating Group) has set national standard typing for wildland firefighting engines categorized by how much water they carry and pumping capabilities. There are 5 main categories, type 3 through 7 engines. Type 1 and 2 engines are for structural fires.

Holds a minimum of 500 gallons. Has the greatest pumping capacity at a minimum of 150 gallons per minute (gpm) at 250 pressure per square inch (psi). It features a high-volume and high-pressure pump. It is the only engine type with a minimum pressure over 100 psi.

Holds the greatest amount of water with a minimum of 750 gallons, but pumps slower than a type 3 engine at a minimum of 50 gpm at 100 (psi).

This is a smaller engine for initial fire response – it is more mobile, but will run out of water sooner. It can hold a minimum of 400 gallons and pump at least 50 gpm at 100 psi. Often municipal fire departments use type 5 engines as their primary brush trucks to respond to grass fires.

This engine is even more mobile than a type 5 engine and more commonly used by federal firefighting resources. It is suited for initial fire response in rough terrain and holds a minimum of 150 gallons. It also pumps a minimum of 50 gpm at 100 psi.



This engine is the smallest, often with just a small tank and pump in the back of a pickup. Federal and state firefighting agencies often have type 7 engines set up in light duty vehicles driven by upper management for use if needed in an emergency. It only holds a small amount of water with a minimum of 50 gallons. Like all of the others, except for a type 3, it pumps at a minimum of 50 gpm at 100 psi. Though small, it can save the day if the engine is in the right place at the right time when a small fire starts.

Fire Engine Typing Requirements under NWCG (National Wildfire Coordinating Group)

Types 1 and 2 are structure; Types 3-7 are wildland

Requirements	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
Tank minimum capacity (gal)	300	300	500	750	400	150	50
Pump minimum flow (gal/min)	1,000	500	150	50	50	50	10
At rated pressure (psi)	150	150	250	100	100	100	100
Hose: 2½-inch	1,200	1,000	N/A	N/A	N/A	N/A	N/A
Hose: 1½-inch	500	500	1,000	300	300	300	N/A
Hose: 1-inch	N/A	N/A	500	300	300	300	200
Pump and roll	N/A	N/A	Yes	Yes	Yes	Yes	Yes
Maximum GVWR (lb)	N/A	N/A	N/A	N/A	26,000	19,500	14,000
Personnel (minimum)	4	3	3	2	2	2	2

In summary here are the qualifications for different engines. All wildland firefighting engines are capable of “pump and roll”, meaning that firefighters can have the pump operating and spraying water as they drive – either with firefighters spraying water from outside the truck or through nozzles operated from inside the cab.

Examples of engines using pump and roll firefighting tactics.

What type of engine is this? – Type 7

Slide in units for engines, typically type 6 or 7

You can turn your farm truck into a fire engine easily during the fire season by using a slide in unit that goes in the back of a pick up. However, if you use water for other purposes throughout the year you may just want to permanently attach your own tank and pump.

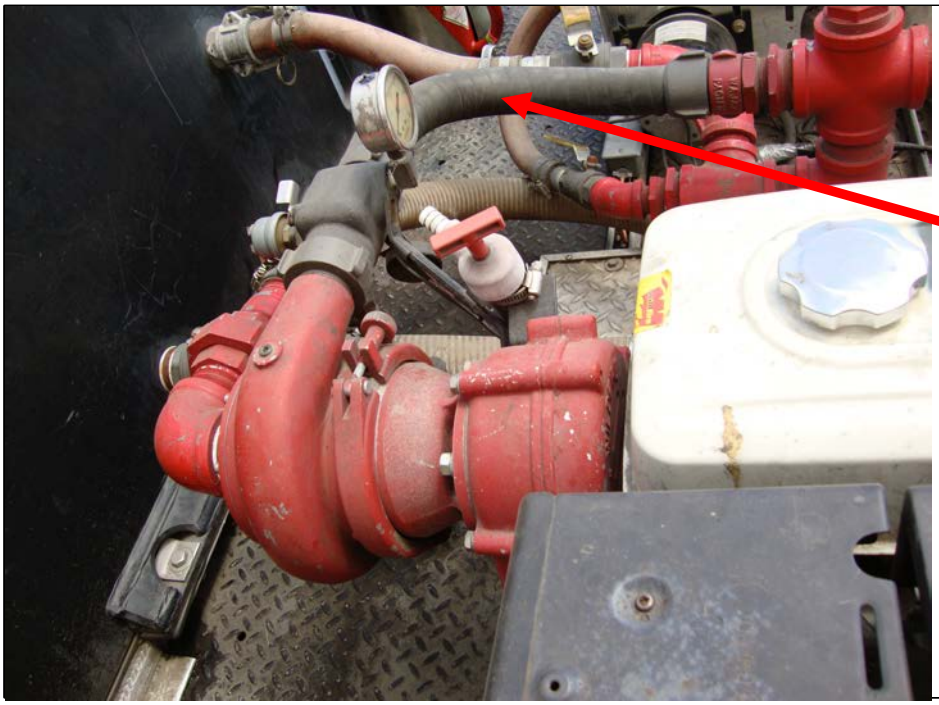
This is a good example of a Type 6 engine setup that may be worth considering for farmers. Most likely you will not use a standard firefighting engine, but there may be surplus ones to consider purchasing. Water tanks can also be used for holding water for livestock, spraying herbicides, or fertilizers throughout the year. Most agricultural fires are in rough terrain, but usually a type 6 engine can drive through crop fields safely if it is flat enough. This allows for water to be applied close to the fire with pump and roll tactics (assuming it is safe to do so). Pump and roll does require a good hose reel with preferably 50 ft of hose or an outside nozzle you can move as you drive.

This retrofitted jeep is used by a wheat producer and has the main characteristics to consider: reliable pump, water tank holding at least 150 gallons, and a hose reel with a good nozzle. There are lots of considerations for using different nozzles and will depend on what psi and gpm your pump is capable of. Consider nozzles that allow the use of both a fog pattern and straight stream.

Honda engine and pump on Type 6 Engine

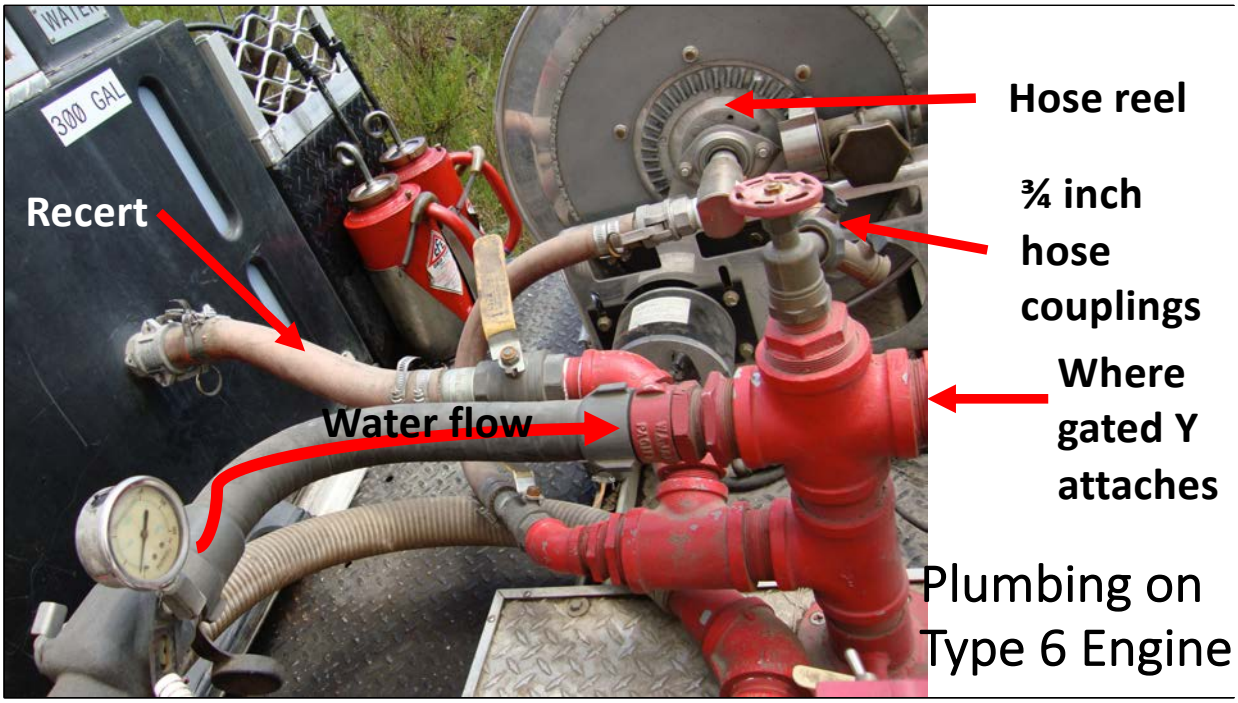
The pump is one of the most critical pieces and is more complex than simply the size of your water tank. Honda pumps and engines are some of the most reliable to consider on equipment you will actively use for fire suppression. Consider looking for pumps that can spray at least 25-50 gpm at 100 psi.

Consider if you want a pump that can draft or suction water back into the tank from creeks or stock water if those water sources are available. Under NWCG requirements all water tenders and engine types 3 through 6 must be able to prime and pump water from a source 10 feet below the pump. This photo is an example of an engine drafting out of a creek.



Honda pump on Type 6 Engine

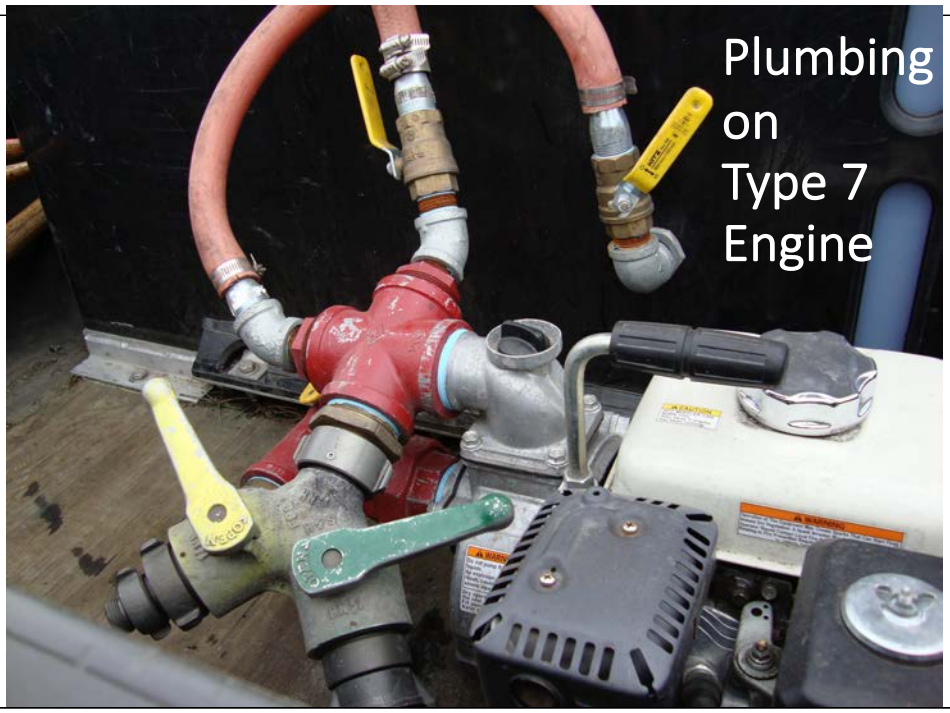
On this pump the black section of hose is a specially designed suction hose for the pump to suck water into the tank. Normal hoses often cannot hold up to the pressure. The plunger with the red handle is used to create the initial suction to bring water through the draft hoses into the pump. A foot valve is always used at the end of draft hoses – this allows water in while preventing it from flowing out.



The plumbing here shows that when the pump is pumping water out of the tank it goes through the black hose and then connects to the red plumbing with the red valve. From there the water splits to the hose reel, recerts back into the tank, and also goes to valves for smaller ¾ inch hoses on the red valve, and also to a gated Y for where additional 1" and 1.5" hoses can be connected.

It may be helpful to have a few small connections for ¾ inch hose, referred to as pencil line or toy hose in the wildland fire industry. Or consider fittings for common garden hose that may allow multiple people to apply water to different locations at once – assuming the pump can keep up. Even if you do not have 1" and 1.5" hoses consider at least having connections on your pump in the event that others might need to it.

Make sure that the threading on fittings will work for other first responders if needed. NH (National Hose) and NST (National Standard Thread) is what is used by fire departments and wildland firefighting agencies. The fittings should be stamped with NH / NST.



This water pump on a type 7 is not capable of drafting water into the tank. See the simpler plumbing set up with only a recert hose back into the tank, a hose reel above the tank, and connections with the gated Y with green and yellow handles. If you don't plan on needing to draft this setup should work fine.

Always have at least one full bladder bag on your truck or engine in case you start a small fire from your vehicle while driving through dry fields. In the event that your tank runs out of water or you have a mechanical breakdown it is important to have at least one back up.

Tenders are trucks used to move large amounts of water closer to the fire for firefighting engines to use and can carry any where from 1,000 to 4,000 gallons and can pump 200-300 gallons per minute. A large truck for just holding water can be a big asset in firefighting efforts to resupply more mobile fire engines.

Here is a tender used by an Rangeland Fire Protection Association (RFPA) in Oregon. A large tank like this can be vital for refilling smaller trucks working the fire. RFPAs in Oregon often have access to older pieces of equipment from Oregon Department of Forestry, such as engines and tenders.

Here is a retrofitted tender on what used to be a railroad truck.

This is a surplus army troop carrier that was converted into a firefighting tender by a wheat producer in Sherman County. The rear seats were removed and a low profile 1,600 gallon water tank installed. This total unit (truck, tank, pump, etc.) cost the wheat farmer only around $22,000 and a week of labor. The truck was purchased for $8,500 and the tank cost $2,100.

At the front of this truck is a monitor nozzle that can be controlled from the cab. These can be spendy and cost around $8,000.

Here is the plumbing going to the monitor on the front of the truck from the pump.

The farmer mounted a Honda pump onto the back of the truck. Notice that the bracket it sits on allows for easy operation for a standing operator without having to get up onto the bed of the truck. This set up cost around $2,500. There is also a hose reel at the back to use for spraying flames or filling up other tanks or engines.

Also consider simply using a water trailer to resupply water if you don’t have access to a large tender.

In some areas engines and larger trucks might not be able to access the fire. UTVs (Utility Traction Vehicles) are great ways to apply smaller amounts of fire in areas that are too steep or narrow to access with a truck. Consider using water tanks that are 50-70 gallons in size, the capability of the UTV will vary with the model. Smaller pumps tend to fit on these best with simply plumbing.

Here is another view of a UTV used in prescribed fire operations.

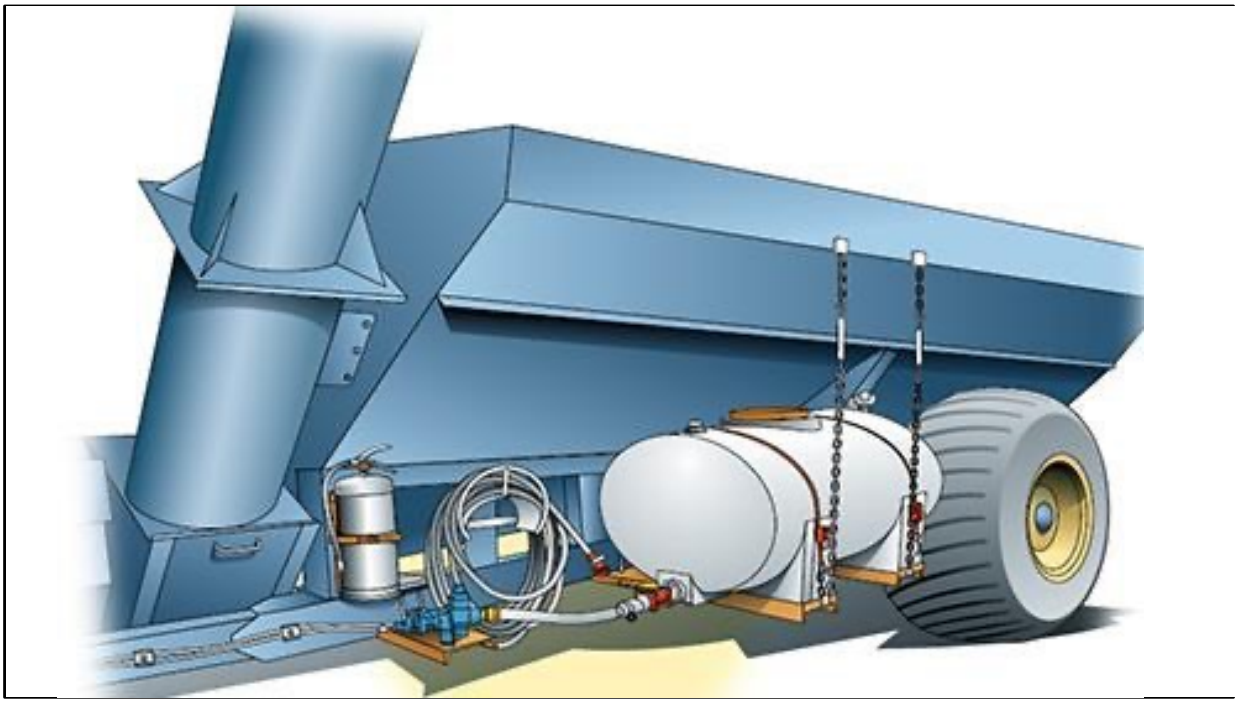
There also slide in units you can purchase for UTVs.

Be careful with four wheelers!

UTVs are safer than four wheelers that are more apt to be overturned, especially when being driven in rough terrain and where visibility is reduced from smoke.

Consider placing water on your tractor or other equipment in the event that a fire starts during farming operations. There are small skid units that can be mounted on the front of a tractor. The amount of water you can carry will vary with the size of the tractor and the weight of rear attachments.

Many farmers use saddle tanks on their tractors to hold additional water or fertilizers when seeding – if you already have these you might as well keep them full of water during the fire season.



Wheat producers use a bin out wagon pulled by tractors to carry grain from the combine in the field back to trucks waiting to take it to the local grain elevator. There are many convenient places to place small water tanks and pumps on these.

Multiple wheat producers in Oregon have reported stopping fires that are started during harvest with water sources mounted on bin out wagons as shown here.

Any amount of water will help, but consider at least 20-30 gallons and no more than 75 gallons to minimize additional wear and tear and the wagon and the tractor pulling it.

These tanks are both placed on the tongue of the wagon and use hydraulics pumps that are ran off the tractor engine. You can also run pumps off a separate small gas engine, but this is then an additional piece to maintain and ensure is kept in operating conditions with plenty of fuel through the fire season.

Tanks can also be placed at the back of the wagon.

Here are some other innovative places to put water sources on pieces of wheat harvesting equipment using recycled pesticide or fertilizer totes.

Household water pressure tanks are one easy way to mount just a tank of water that is ready to go. Wheat producers have put these with short hoses on tractors and even combines. They can be effective if kept pressurized at 60 psi.

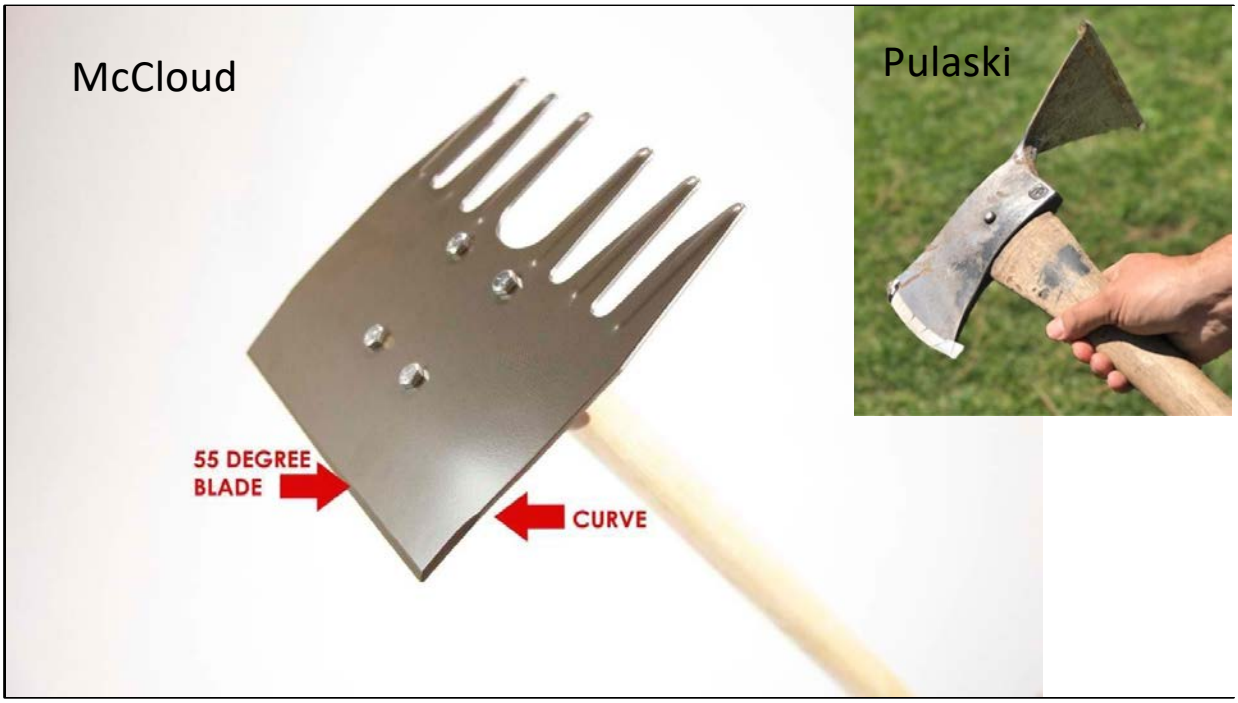
Flappers, or burlap bags used historically, are an effective tool for grass and duff fires

We have been focusing on fire suppression equipment utilizing water and now we will focus on tools used to help smother flames with dirt or remove fuel. Grass fires in the past were often put out through the use of burlap bags used to smother flames. These can still be effective, but hand tools referred to as flappers are the modern day equivalent.

Instead of smothering flames what about blowing them out?

Leaf blowers can be a good tool to blow flames and embers into the fire or remove litter off a fuel break. However, they do need to be used with caution as flames can flare up and send embers up at the operator or across the fire break.

Short metal rakes can be effective to remove fuel from the edge of the fire, especially in areas with loose harvested hay material or crop residue.



Other standard firefighting tools are better developed for forestry settings and will not help as much with putting out a fast moving crop or grassland fire, however these tools can help if digging a fire break by hand. Usually in agriculture the use of tractor pulled disks and heavy equipment is used.

Farmers bring a lot to a fire when they show up with a disk. Compared to digging a fire break by hand disks can create a lot of fire line relatively quickly. However, in many cases multiple passes may be required if crop residue is thick and tall. Having a tractor hooked up to a disk during the fire season can allow you to quickly put in a firebreak at a moments notice.

Make sure that only experienced operators use disks to put in a firebreak. It is extremely risky to get in front of the head of the fire where flames lengths and rate of fire spread is the greatest with a disk – rather focus on the heel and flanks of the fire where fire behavior is relatively calmer. If you need to get directly in front of the head of the fire work to reinforce existing control lines, such as a fallow field or road. The operator in this photo is getting dangerously close to the flames.

Bulldozers are another piece of equipment that can help put in firebreaks, but operators need to be experienced. Also remember the following when operating large equipment near a wildfire:

- Hard for operators to detect heat from inside an enclosed cab. In the past operators have used stickers with paint that would change color under high heat on the outside of the cab.
- Newer emission standards cause engines to run hotter. As a result, extra caution is needed when working close to flames. If the air intake gets too hot the engine can drop to an idle. Make sure you are close to your safety zone in the event that this happens so you are not stuck in a burn over situation.
- Turbo charger chips that enhance performance will also make the engine run hotter and increase the risk or an engine overheating or stalling out while you are in a precarious position.

Hopefully this module gave you some additional insights into fire equipment you may be interested in purchasing and using. In summary:

- Keep your equipment maintained and ready to use at a minutes notice during the fire season.
- Focus to put fires out when they are still small during initial response, i.e. 200 gallon tank on farm truck with Honda pump rather than a large and heavy tender.
- Think about using water tanks, especially on tractors that pull disks for use for use as self protection.
- Larger pieces of equipment and more elaborate water tank set ups may require more training.
- If you have it make sure you and others on your farm or ranch know how to use it safely and effectively!