
Chapter 3

Water Drafting Methods

Suction and ejector drafting are methods for drafting water from streams or impoundments. Both methods use a direct hose lay or pump water to a holding tank. Suction drafting uses larger diameter hard hose lines to quickly draw water to fill tanks. Ejector drafting uses a smaller hose diameter and draws smaller amounts of water to higher elevations and over greater distances (USDA Forest Service 2002).

Select the appropriate water-drafting method to achieve identified resource needs and objectives.

Suction and ejector drafting are used to fill water tenders, USDA Forest Service fire engines, and portable tanks.

Suction Drafting

Fire engines and water tenders draft water from a static source to supply a pumper. Water tenders use hard-section hose with a 4- to 6-inch-diameter hose attached to the fire engine or water tender. Water tenders are designed to transport large quantities of water. General categories of equipment capability include tank capacity (gallons), pumping capacity (gallons per minute) off-load capacity (gallons per minute) and maximum refill time. Suction drafting can be located at a variety of sites both temporary and permanent. Minimal equipment set up is required.



Figure 4—A water tender is commonly used for road maintenance.



Figure 5—Hard-section hose is commonly used with pumps and water tenders.

Portable pumps supply water directly to a temporary holding tank or hose lay for fire suppression use. These pumps are portable and can minimize impacts to riparian areas when used correctly.



Figure 6—Portable pumps are routinely used for fire suppression needs.

Application

Suction drafting is for temporary and permanent water-source locations. Suction-drafting equipment is generally located within 30 feet of the stream or water source. Hard-section hose, which comes in 8-foot lengths, is typically used to draft from the stream. Vertical lift varies with equipment capability from 10 to 15 feet (National Wildfire Coordinating Group 2004).

Close proximity to the stream increases risk of erosion from water spilling when the hard-section hose is removed from the pumper. Often tanks can overflow and cause erosion from spilling. Chemical contamination risk is present from vehicles and pumps close to the channel.

Considerations

In situations where close proximity to the drafting source is necessary, there are ways to reduce impacts through design. Maintain a well-vegetated buffer strip between the drafting equipment and the water source by using longer hard-section hose lays to increase the buffer strip.

Change the access-road gradient to ensure that any spills move away from rather than toward the stream.



Figure 7—(Before) Road drains directly to stream, strawbales trap sediment within the annual scour zone.



Figure 8—(After) Road template modified to drain away from channel.

For permanent sites, harden sites with 8 to 12 inches of clean riprap and drain rock to prevent erosion on the access road. Use existing hardened facilities such as boat launches and campground access ramps for emergency, short-term use instead of native surfaced areas prone to erosion.

Reduce the size of the facility within the most sensitive portion of the riparian area by modifying vehicle access and turn-around areas. Use existing roads and bridges for drafting.



Figure 9— Identify suitable bridge locations for drafting.



Figure 10—Incorporate existing roads to avoid creating new access routes.

*Alternate and Complementary
Techniques*

Standpipes use suction drafting and can be located outside the riparian area to reduce adverse impacts of vehicles in the streamside-management zone. Standpipes are for both temporary and permanent locations.



Figure 11—Standpipes can be located outside of sensitive areas.

Portable tanks use suction drafting and can be located outside sensitive reaches. Provide a minidam-containment system for the pump and fuel required. Minidams capture any spill from the pump or fuel and prevent soil or water quality deterioration.



Figure 12—Use barriers and containment systems to prevent spills from affecting soil and water.

Permanent tanks are generally gravity fed and can be located outside of the riparian-influence zone. Some permanent tanks use passive flows from rainfall to fill tanks and are located outside of riparian areas as well.

Ejector Drafting

An ejector integrates a nozzle and a venturi (a narrowing of a piped waterway) to create suction. Pressurized water is supplied to the inlet of the ejector. Water flows thru the ejector inlet that directs a high-velocity stream of water through the venturi. The high-velocity stream provides the flow necessary to create suction in the area between the nozzle and venturi. The ejector is the best tool when vertical lift is a constraint (USDA Forest Service 2002)



Figure 13—An ejector nozzle.

Application

An ejector can draft water vertically to heights greater than 22 feet. Water is lifted from deep wells, bridge crossings, rivers, and lakes up to 300 feet from the road.

Considerations

The ejector supplies an estimated 2 gallons of water for every 1 gallon of water that goes through the venturi. The axiom “to get water you have to give water” is commonly used with the ejector. Slower tank-fill time results from the smaller intake hose. A 40-gallon minimum is necessary to prime the ejector and charge the ejector hose lay. A spring-loaded foot valve is recommended to prohibit loss of water once the hose lay is primed (USDA Forest Service 2002).

Alternate and Complementary Techniques

When vertical lift requirements are above 18 to 20 feet, there are few techniques aside from the ejector to draft water. Helicopter buckets and drafting provide short-term emergency response.



Figure 14—Preidentify helicopter drafting locations to reduce adverse impacts to aquatic species.

Screening Devices

Regardless of the type of drafting used, provide screening devices to protect aquatic species. There are many screening devices available commercially. Some considerations include the stream channel, flow conditions, pump requirements, and aquatic species present. Screen construction criteria include the following:

- Surface area.
- Screen mesh.
- Screen design.
- Screen structure.
- Screen cleaning.

(National Marine Fisheries Service, 1996; Washington Department of Fish and Wildlife 2000; ETTfire, Web site). Consult the Web sites on screening devices for more information.



Figure 15—Screening devices protect aquatic species.



Figure 16—Floating screen devices are placed in lakes for helicopter drafting.