

# Rainfall Simulator Guidebook

*“A cloak of loose, soft material, held to the Earth’s hard surface by gravity, is all that lies between life and lifelessness.”*

- Wallace H. Fuller

Soil texture, organic matter, root and vegetative systems affect soil and forage quality. Retaining rainwater for plant health and mitigating erosion through good grazing practices and selection of cover crops are goals for the producer. Demonstrating the effect of rainfall on various farming management soil samples help the producer better understand his land and its potential.

# SC Forage and Grazing Lands Coalition

Version 1.1 of Rainfall Simulator Guidebook  
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# Overview

There are three rainfall simulator trailers -- one each in Laurens, Columbia and Florence. Each should contain equipment for a large free-standing rainfall simulation demonstration with up to five samples; a table-top unit; tools for collecting samples and clean-up materials.

Groups requesting a demonstration can go to [SCrainSim.org](http://SCrainSim.org) to fill out a request form. There is also a link on the [scforage.org](http://scforage.org) website.



Except for the soil samples, the trailer has everything needed for a demonstration:

**Water** - can be provided at the site via hose from a host water source or from an onboard tank that can be filled prior to the demonstration.

**Power** - Used to run the sprayer, and onboard pumps if onboard water tank is needed. Can be provided by the host site via 120V supply or can run off onboard deep-cycle battery that is charged when hooked to a tow vehicle. A solar panel on top is used to trickle charge the battery.

## General RFS trailer layout

Water runoff bottles are hung from ceiling. Buckets that can be used in sample preparation and disposal beneath

Trashcan and long-handle tool storage in bottom

Deep cycle battery behind door at bottom

Exterior 12VDC outlet for pump power if not using AC

FRONT

Storage for template used for cutting soil sample

Tabletop RFS unit components.

Water tank

Dual pumps for use with water tank

Water hose storage

Interior 12VDC outlet

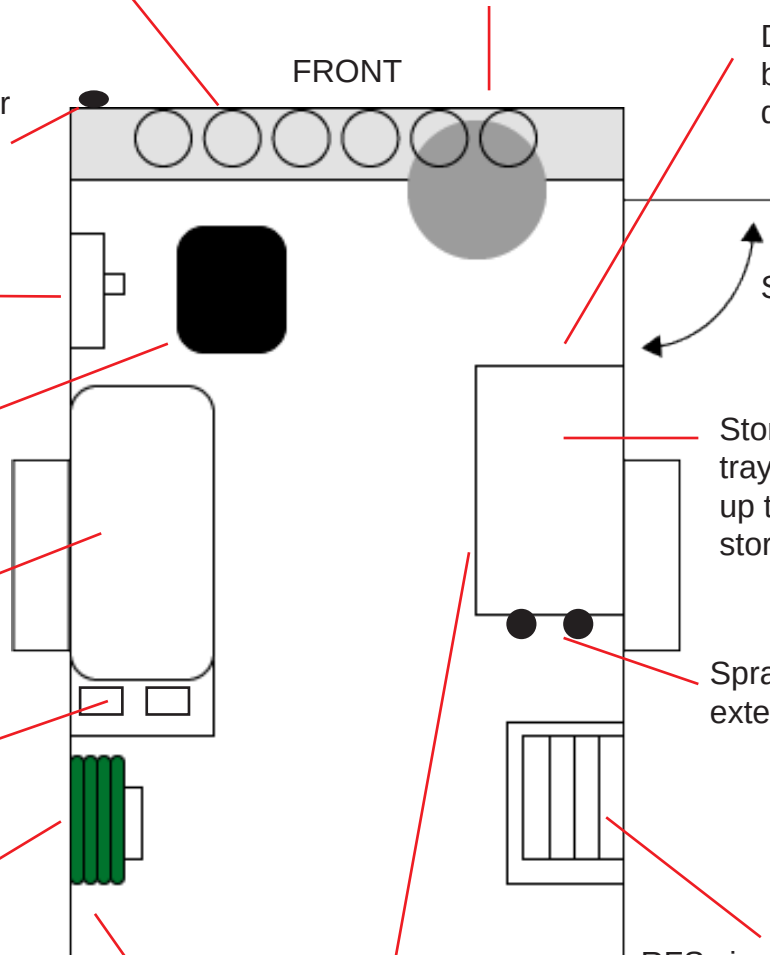
Sawzall in bag may be stored in shelf or on floor

RFS simulator frame and whiteboard storage

Storage for sample trays and accessories up top, general storage below

Spray nozzle and extension storage

Side door



Important: Make note of items that are secured by strap during travel and be sure they are secured when the trailer is cleaned up after demonstration. Also, the shelf at the front of the trailer under the water runoff bottles is for stationary use only. There should be no items stored there during transport.



# *Summary of RFS demonstration steps*

## **Prior to demonstration**

1. Communicate with requestor to confirm time and details of demonstration, including availability of water and power. If no water is available at site, fill tank beforehand.
2. Confirm with RFS trailer owner that it is available and arrange time for pickup. Get keys from owner.
3. Confirm that tow vehicle and owner have insurance that cover trailer towing accidents and that the driver is experienced in towing trailers.
4. Confirm that all equipment and supplies are on the trailer. Make sure the Sawzall is charged.
5. Connect the trailer to a properly installed hitch, connect the safety chains (criss-cross them) and connect the trailer lights cable. Check operation of trailer brake lights and turn signals.
6. Collect samples if this is not going to be done on-site. Sometimes samples may be re-used, depending on the event and desired demonstration purpose.

## **At the demonstration site**

1. Locate the trailer and vehicle in an area optimal for demonstration purposes -- in shade if available, near water, near power, etc.
2. Assemble the demonstration table and load sample trays, collecting samples if needed.
3. Hook up water supply, either from tank or local water supply. Make sure valve to feed nozzle is off. If using onboard water, turn on one or both pumps by tank, as needed.
4. Hook up power for nozzle motor, either from onboard DC power supply or local AC power. Be careful to not place power cords where they can get wet, causing a safety issue.
5. Apply power to test operation of nozzle before opening water valve to keep from spraying yourself and others.
6. Clear the area and open water valve. Apply power for a test run.
7. Make sure the spray covers all the sample trays fully.
8. Check runoff and water coverage. Adjust parts, water flow as needed.
9. Place rain gauges in two trays.
10. Make sure the demonstration area is neat and clean before the demo.

## Gathering samples

A soil sample cutter template is provided on each RFS trailer so samples can be cut for the exact size and depth to fit the soil trays.

To demonstrate the effect of rainfall on loose soil without groundcover, samples can also simply be gathered by shovel.

It's ideal to have at least two people collect samples because of the weight of the template and soil.

To use the template cutter, place it over the desired area and press down until there is no play in the plate at the top.

This may be difficult in dense soils. If so, use one of the spades from the trailer to cut the earth around the edge of the template cutter.

To get the sample out of the ground, use the spade to dig around and beneath the template so there will be some excess when the template is removed. (See next page for an illustration).

With a partner's help, place the template and sample upside down in one of the buckets from the RFS trailer.

For dense samples, a handsaw or Sawzall on the RFS trailer can be used to slice the sample off with the edge of the overturned template cutter.





## *Gathering a sample - getting it in the pan*

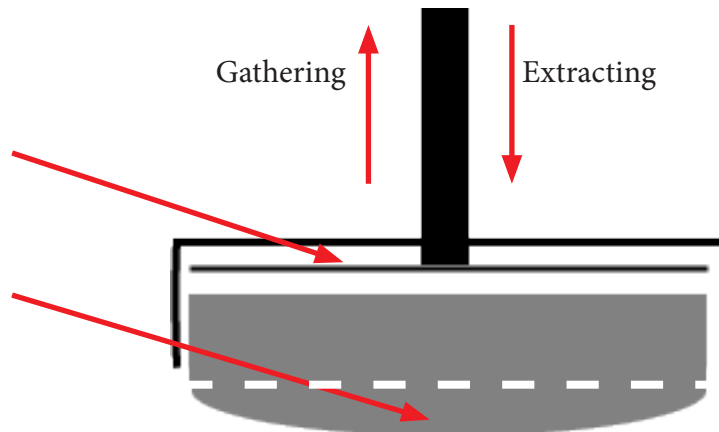
A side view of how the cutting template works.

Note that the inside plate should snug against the top when at the proper depth.

Note the rounded bottom produced by digging beneath with the spade. This is trimmed flat to the template when it is turned over.

The sample pan is then positioned over the sample, the template is flipped over, and the center post is used to push it out into the tray.

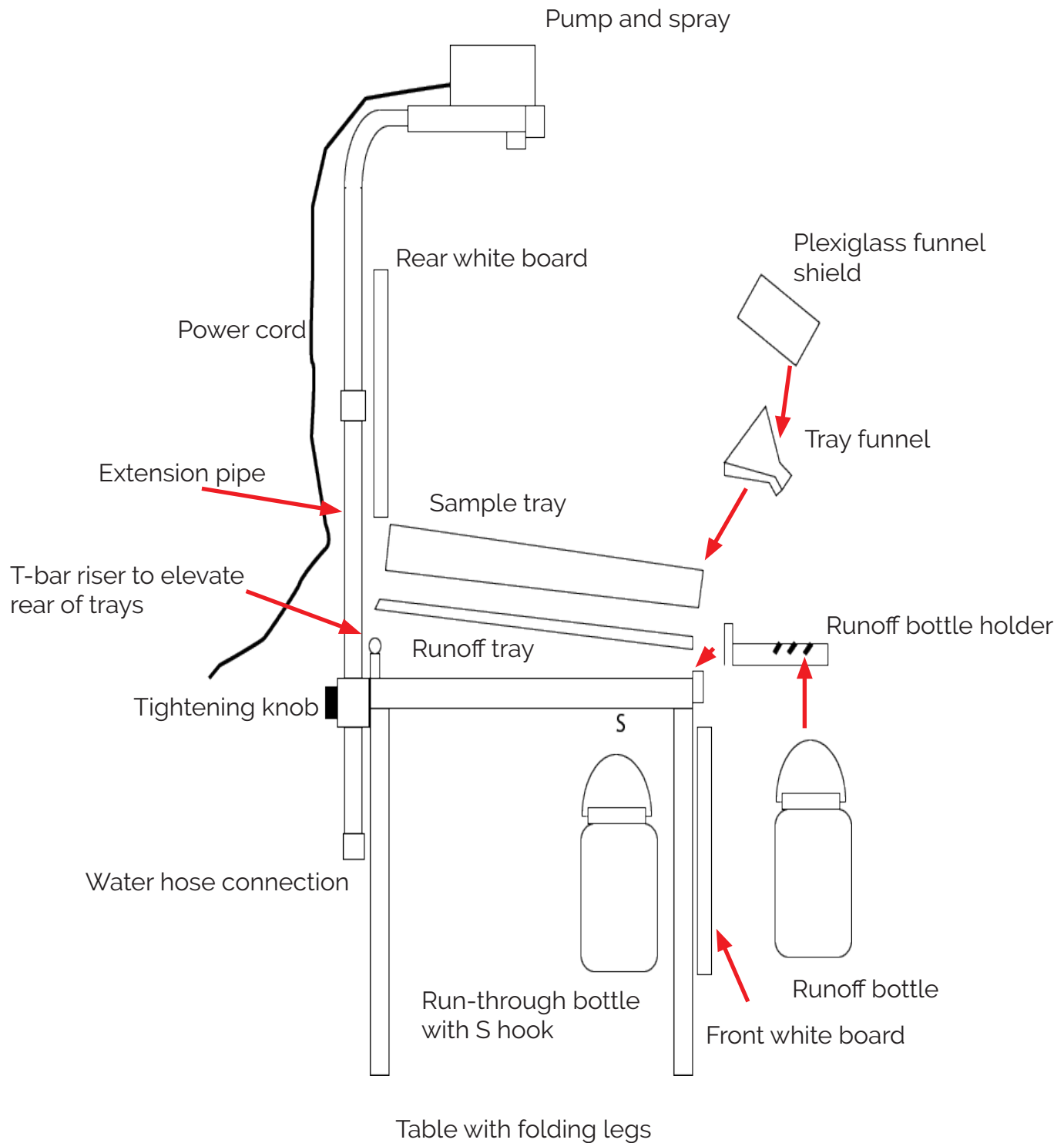
For demonstration purposes, loose soil or soil with some organic matter may be simply dug with spade and placed in tray.



Placing organic matter like pine straw, dried grass, leaves, etc. on loose soil can make a dramatic demonstration of the effects of rainfall on it versus uncovered soil.



## *Simulator table parts*





## *Setting up the simulator - the frame*

The table, whiteboards and spray pump and pipes are stored at the right rear of the trailer. The top whiteboard helps make the table more sturdy and the lower whiteboard conceals how much water is retained or running through the soil until it is revealed at the end.

Pump head and extension pipe.

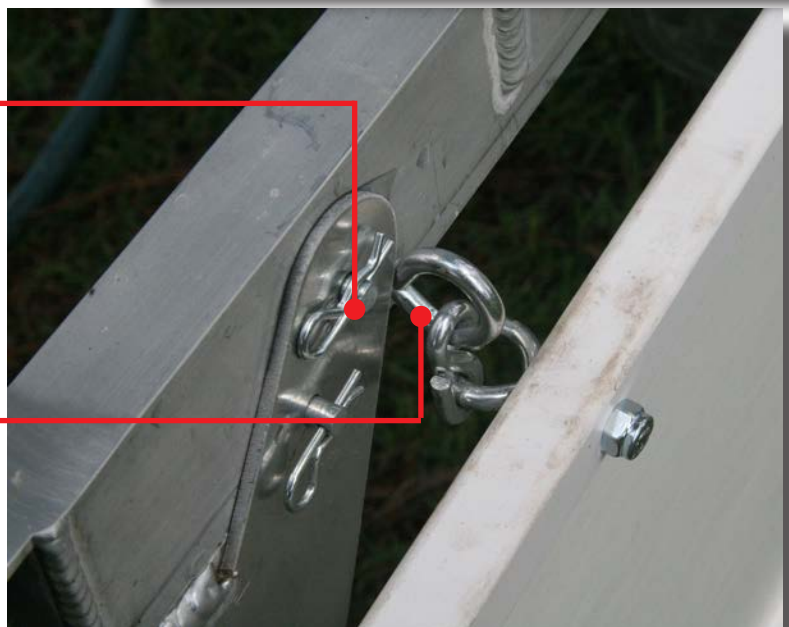
**NOTE:** Be careful not to damage the power wire on the pump unit when fastening and unfastening from the trailer wall.

Folding table in front, whiteboards stored behind.



To set up table, remove pin and clip, rotate leg into position and re-insert pin and clip. Repeat for each corner.

Front whiteboard attaches with eyebolt pushed through hole in table frame and fastened with a nut.



## *Setting up the simulator - spray head*

Connect the pump unit and the extension pipe together. Be careful not to strip the threads on the connector.

Position the unit at the desired height. You can adjust later if needed. Tighten knob to secure.

Attach water hose to water supply.

Route power cable away from water and areas where it might be damaged.



## *Setting up the simulator - water supply*

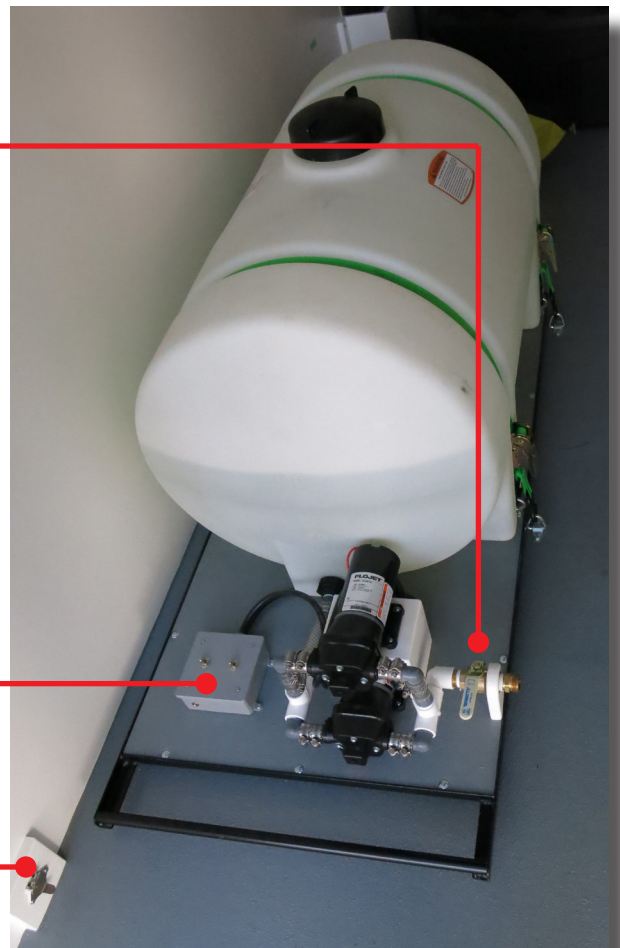


To be able to control water flow, attach one hose to the RFS pipe, the other to the water tank or local water supply and connect the two with the control valve.

If using the onboard water tank, connect the feed hose and use the lever valve to turn on the water supply from the tank.

There are two pumps for the tank. One or both can be used. When you're ready, turn on. The pumps will start up as needed to provide water pressure.

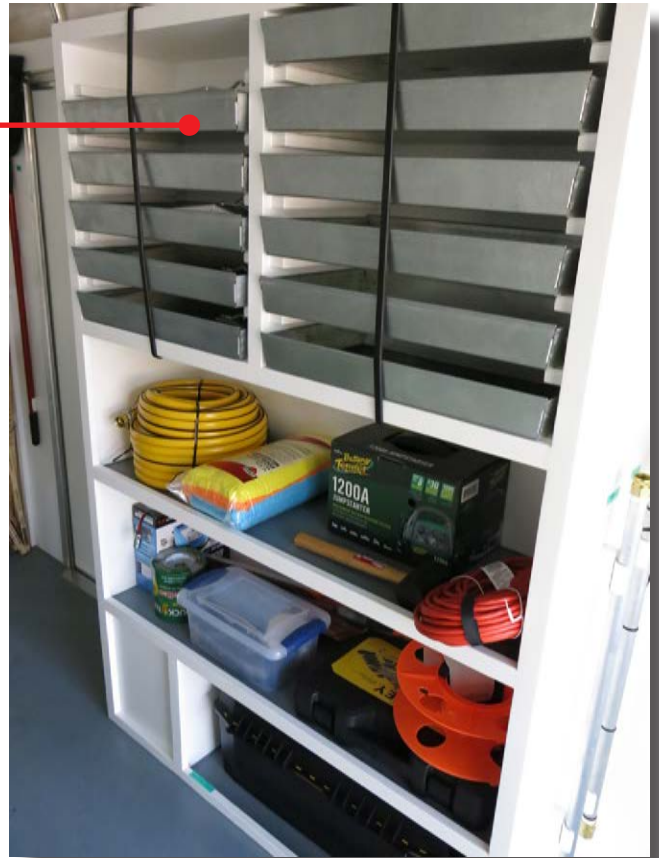
DC 12V outlet for RFS sprayer if not using local AC power. There is also one on the same side of the trailer exterior front.





## *Setting up the simulator - trays*

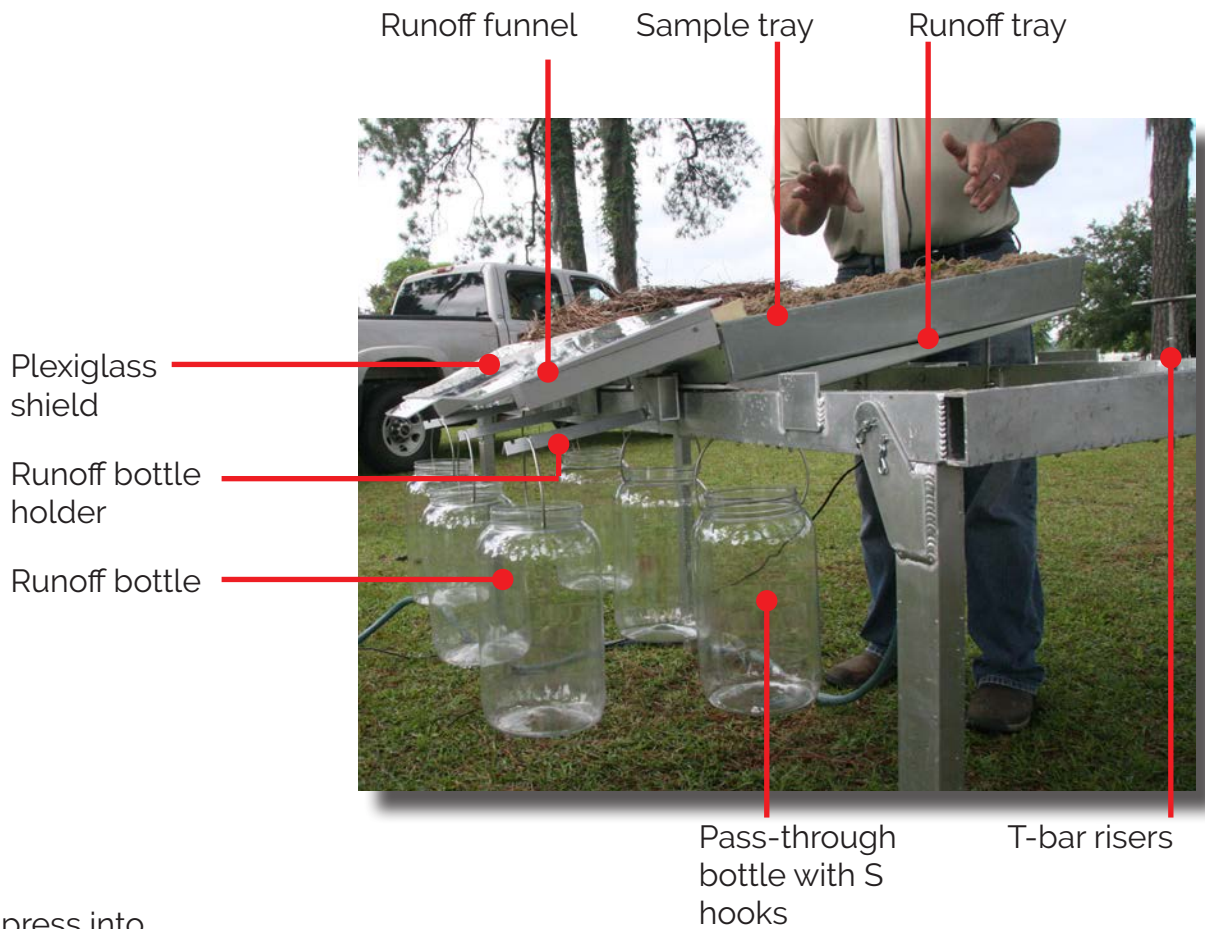
The sample trays, runoff trays, runoff funnels and plexiglass shields are stored in the cabinet on the right side of the trailer. The sample trays usually contain the other components, sometimes in felt bags.



Runoff trays being removed from storage from within sample trays. These will go on the frame, one beneath each sample tray.



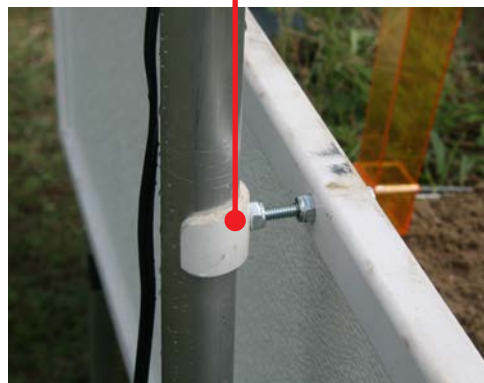
## *Setting up the simulator - the assembly*



Funnels press into sample trays



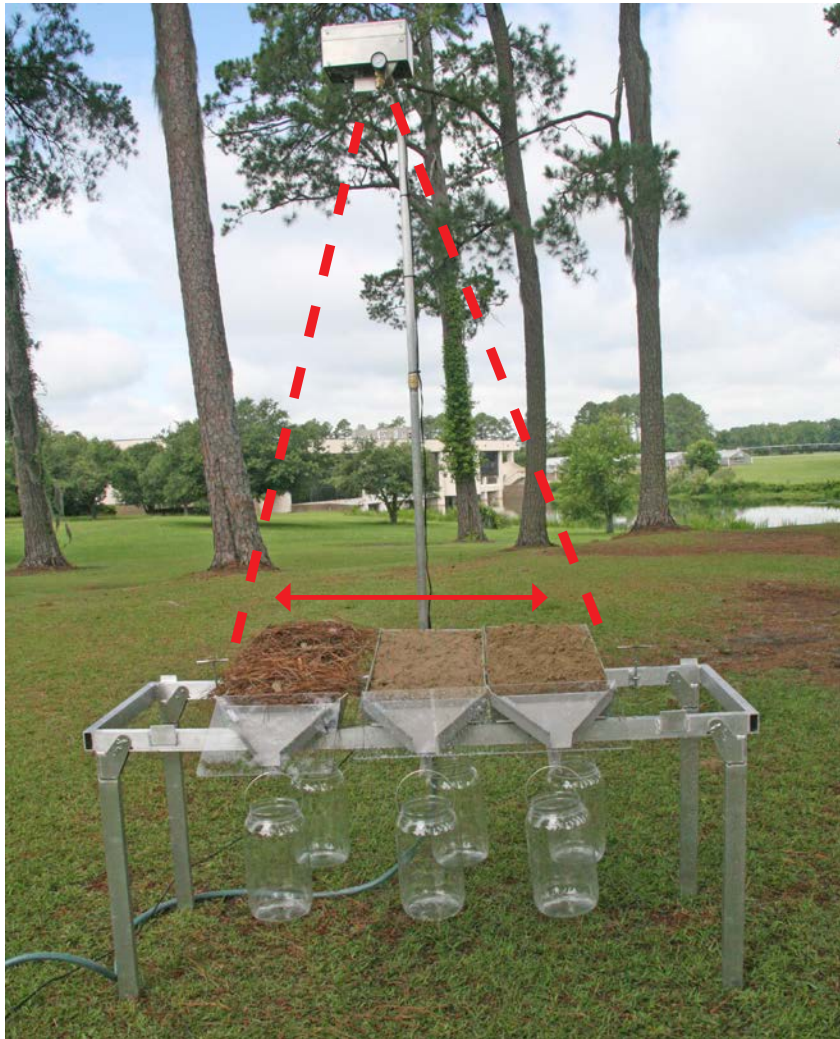
Top whiteboard has plastic clamp that fastens to water pipe.





## *Setting up the simulator - spray radius*

Test your setup before the demonstration and make sure the spray pattern covers the sample trays edge-to-edge so the results will be accurate. Here, three samples are being shown. Up to five can be loaded on the frame.



Remember to place the rain gauges in two sample trays - equidistant apart.



## *Setting up the simulator - accessories*



Each RFS trailer should have two water hoses, a shutoff valve, a spray nozzle for cleanup and rain gauges.



The power equipment is used to run the spray head on the demonstration table. The spray head pump runs on DC current. The power kit contains cables to supply the AC/DC converter with power from a local source.

If there is no AC current, DC current can be used by plugging the power unit into a DC outlet on the front of the trailer exterior or in an outlet between the water tank pumps and the rear door inside the trailer.

There should also be clamps that can be connected directly to a vehicle battery and a cigarette lighter plug that can be plugged into a vehicle outlet.

**WARNING: USE EXTRA CAUTION WHEN CONNECTING TO AC POWER. KEEP THE CABLES DRY AND OFF THE METAL OF THE RFS TABLE.**



The deep cycle battery that powers the pumps and spray head when not on AC power is behind a door in this cabinet.

## *Taking down the simulator*

Please keep in mind that your audience will have more respect for your demonstration if your equipment and presentation areas are kept neat and clean.

Your fellow RFS users will respect you if you carefully clean the equipment when done and return it to its proper storage area.

Use the supplied spray nozzle to rinse soil off the equipment before storage.

Take special care with the plexiglass shields and bottles because they can easily scratch. Fiber cloths are provided with the equipment to wipe them.

Return all equipment to its correct storage area.

Don't leave anything on the shelf at the front of the trailer. It can fall off and become damaged during transit.

Make sure the sample trays and accessories, the table frame and whiteboards are secured by the rubber straps.

Empty the trash can and sweep the floor when done.

A checklist is provided on the next page to help you finish up.

## *Checklist for end of demo*

- ☐ Wash soil off all equipment.
  - ☐ Dry collection bottles with fiber cloths being careful not to scratch.
  - ☐ Dry plexiglass shields with fiber cloths and store in felt bags, if available, inside sample pans.
  - ☐ Store collector bottle hangers, runoff pans inside sample pans or store them in the accessory shelves in an organized way so they won't shift during transit.
  - ☐ Snap the spray head pipe into position at the end of the cabinet. Be careful not to damage the power wire.
  - ☐ Snap the extension pipe into place beside spray head pipe.
  - ☐ Place the whiteboards, then the folded table frame into its storage area by the rear door and secure with rubber strap.
  - ☐ Place the template cutter in the wall box near the front left of the trailer.
  - ☐ Make sure the Sawzall is stored in its bag on the floor.
  - ☐ Hang the collection bottles from the ceiling at the front of the trailer.
  - ☐ In the winter, if the tank has water remaining, run the pumps to empty it to avoid freeze damage.
  - ☐ Neatly store the power source and cords in their plastic box and place on lower accessory shelf under pan storage.
  - ☐ Roll up any power cords used and store in same area.
  - ☐ Store any hand tools by trash can.
  - ☐ Replace sample buckets on shelf at front, secured by rubber strap.
  - ☐ Empty trash can.
  - ☐ Sweep floor. Store broom by front door.
  - ☐ Clean up or store anything else remaining.
  - ☐ Check trailer contents to make sure nothing can fall and be damaged.
  - ☐ Close and secure trailer doors, make sure you have the keys and lock the doors.
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If there are any broken or missing parts or any other issues, e-mail [info@scforage.org](mailto:info@scforage.org) with the details.



## *Trailer storage reference*

Bottle storage



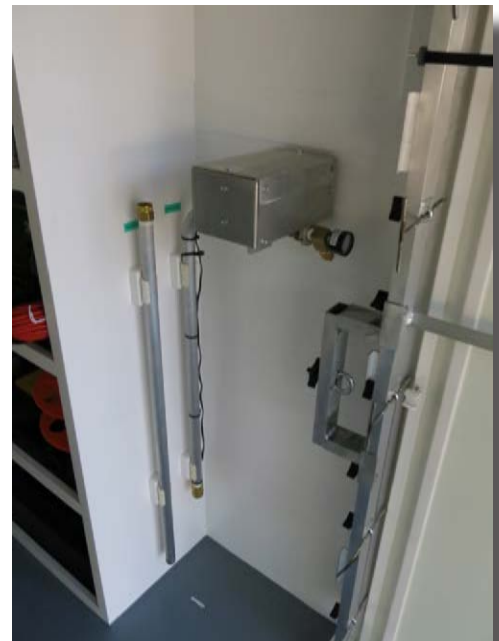
Trays and accessories, other items



Cutter, Sawzall, trashcan, tools



Spray head and extension



Water hoses



## *Trailer storage reference*

Template cutter, buckets, Sawzall



Table and whiteboards

