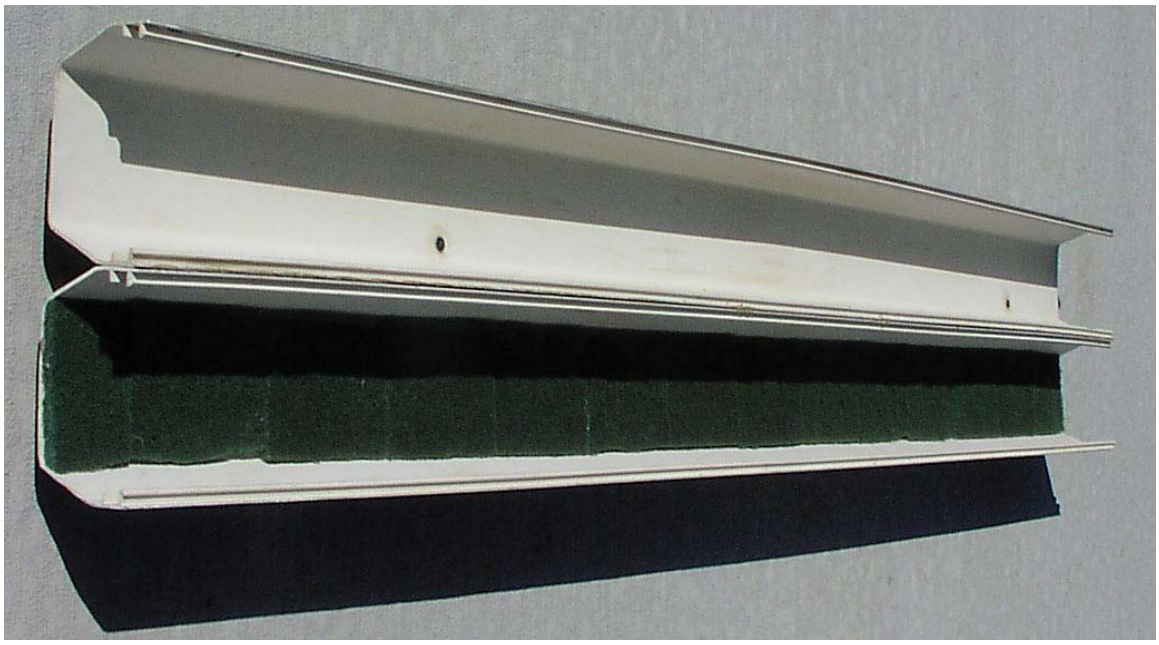
Gutters and Buckets

This paper looks at an inexpensive device that can help convey some of the basic concepts of land/water interactions and provide starting points for discussions.

White Valley/Green Valley

Capacitance is a difficult concept to communicate using words alone but it simplifies to the realm of common sense when accompanied by a visual demonstration.

The basics of this device are two troughs, one with no obstructions; the other lined with material to slow the flow of water through the trough. Comparisons are made between the way water flows through the troughs and healthy and unhealthy riparian systems. Most of the details of construction, discussed later in this paper, center around trying to confine the mess to as small an area as possible.



- Two equal lengths of trough [1-1.5 meters] (Short lengths of rain gutters work well for this.)
- Enough porous material to cover the bottom of one length of gutter [Scouring pad material (green) works well for this but several layers of cloth may be used as well. Sponges tend to expand and contract too much for this use.]
- Waterproof glue to secure the scouring pads (Hot glue works well.)
- A way to catch water at the bottom to the gutter (sink, bucket, etc.)
- Two equal volumes of water (1/2 liter water bottles work well.)

How it works

1. Introduce the two troughs as White Valley (bare gutter) and Green Valley (scour pad lined gutter).
2. Mention that the ranches (White Valley Ranch & Green Valley Ranch) that receive their water form these watersheds have head gates at the bottom of each valley.
3. Set the gutters down on an incline with something to catch water at both the upper and lower ends.
4. Pour one volume of water down the bare gutter (White Valley) and comment as to how quickly it runs off and goes past the imaginary head gate at the bottom of the trough, taking soil with it.
5. Pour an equal volume of water down the lined gutter (Green Valley) and comment on how it takes a longer time for the flow to make its way down to the bottom of Green Valley than it did White Valley. Also note that it does not go by in a big flush as it did with the bare gutter but comes on slow and continues to flow for a longer time.
6. Draw a connection between this behavior and the way natural systems with good and not so good riparian sponges act. Repeat the fact that all the water has flowed past the White Valley head gate and is no longer available for the rancher to use and that some of the best soil has left White Valley as well.
7. Throughout the remainder of your time in front of the class, return periodically to the Green Valley gutter and note that it is still wet or dripping and that this represents the way that a good riparian sponge provides late season water. (This can become a running gag that helps lighten the mood of the classroom.)

Other topics that could be brought up at the initiation of the demonstration or on return visits include but are not limited to:

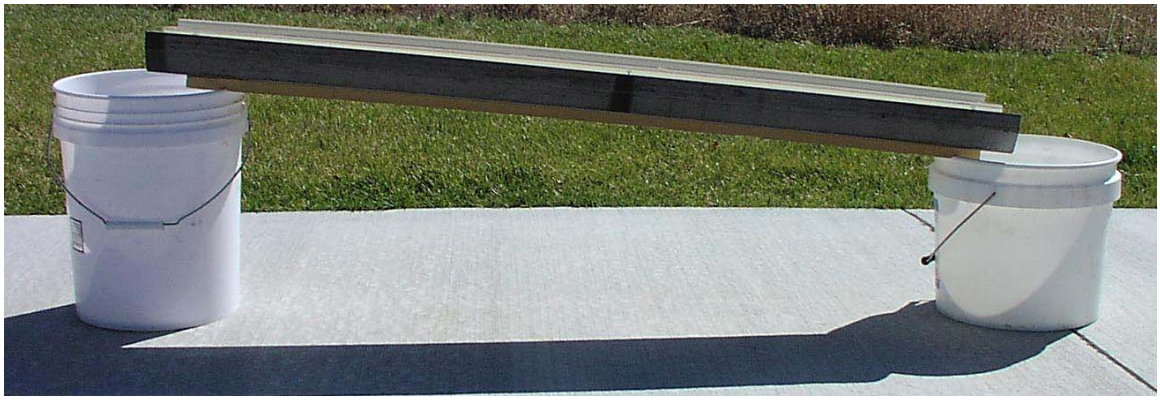
- The longer water remains on the land, the more productive the land will be.
- Once the water in the stream has flown past your head gate, you "ain't got it no more." Therefore you want your upstream neighbors to have good riparian conditions to hold the water for you. You also want your downstream neighbors to have good riparian conditions to prevent headcuts (drops in channel base levels) from forming and cutting upstream through your lands.
- Having late season water is generally better than high spring flows because it keeps vegetation growing providing both food and drink late in the season and helps reduce erosion.
- Rapid high flows remove productive soils and turn them into pollutants.
- Flows such as occur in Green Valley help build productive soils.
- Reservoirs may help retain some of the water but they require maintenance and the water that evaporates from them is lost but the water that transpires from self repairing riparian sponges results in forage.

Clean up

Cleanup consists mainly of tipping the Green Valley trough on end and letting it drain. This presents an opportunity to talk about how a stream with a slope that has been steepened through erosion can have a reduced soil sponge.

Examples

Two Buckets



This method produces a rugged free standing self-contained structure that is easy to set up but somewhat awkward to ship.

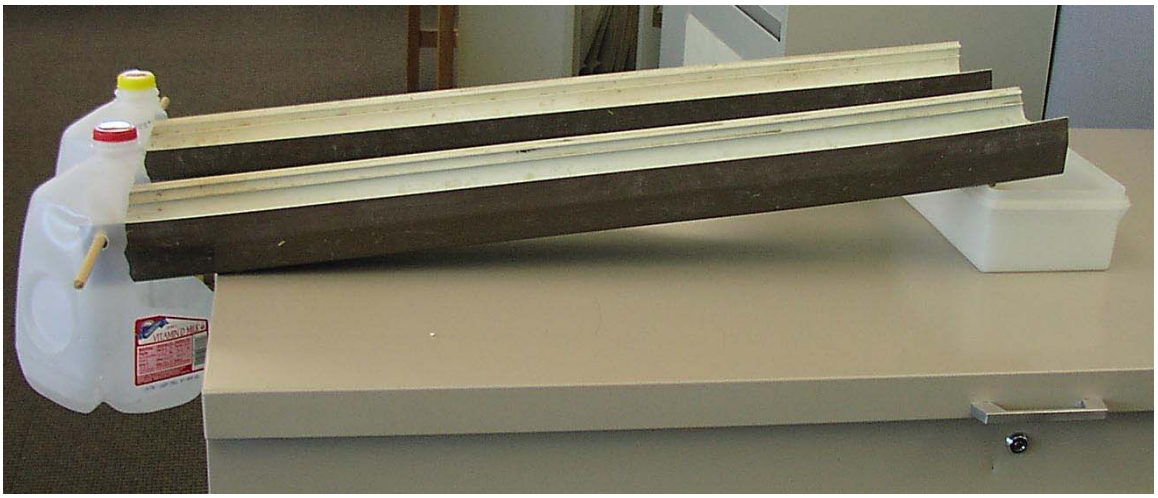
- Attach both troughs to a piece of wood (1 X 6 works well) about the same length as the troughs.
- Obtain two buckets of different heights (A 5 gallon and a 3 gallon plastic bucket work well for this.)
- About three inches in from each end of the board mark and carve out a notch curved to fit the lip of the buckets.

- When placed on top of the buckets with the notched engaged on the bucket lips, the ends of the troughs should extend no more than halfway across the diameter of the buckets.

Shippable units

It is sometimes necessary to transport the White Valley/Green Valley demonstration using commercial carriers. The two bucket design presents obstacles of size and weight. The following design is easier to ship but has some weaknesses in terms of ease of presentation and stability.

- Using individual troughs (one lined, the other unlined) attach catchment basins to the bottom end and hang that end over the end of a table.
- If a sink is available, consider using it in place of the catchment basins as this eliminates the problems of instability and having a projection out beyond the end of a table.
- With the exception of the troughs, most of the items used can be obtained from thrift and dollar stores or dumpster diving, making repairs easy.
- For shipping, the troughs can be inverted on each other
- It is useful to rest the upstream end on a catch basin of some sort. Water tends to spill out the upstream end if you pour too quickly.



Precautions

- The design of the shippable unit is less stable than the 2 bucket unit in that it has a protrusion beyond the end of a table and a smaller footprint.
- The weight of the water in the lower catchments makes the unit vulnerable to spilling.

There are many other devices that can be made from common materials that help to demonstrate the basic physical processes in nature. It is a temptation to invest more time, money, and effort into making these devices smoother and prettier but that takes away some of what draws people to them. The basic, Rube Goldberg nature of these devices is what draws people to them, gives them freedom to touch and play, and eliminates some of the mystique of, “Science,” that so many feel.