

Creating low-cost *swales* on *small farms*

*Oregon Sustainable Agriculture Land Trust (OSALT) fact sheet
December 2009*

Contour swales can be used effectively by small farms to slow and capture surface runoff, and infiltrate rainfall into the soil. These swales are built on the contour, perpendicular to the direction of the runoff, and are designed for waterspread, not watershed. Water that might otherwise leave the property in large rainstorms is slowed and allowed to seep into the soil, storing it there for use by trees in drier seasons.

At Natural Harvest Farm in the Willamette Valley (south of Portland, Oregon), rain is abundant in the winter, but rare in the summer. Our deep clay soils can store large amounts of water in the winter months, but can become powder dry in July, August and September. To avoid the expense (and environmental impact) of summer irrigation, we have been looking for low-cost ways to store winter rainwater for our summer orchard trees.

In one of our fields, with a slight north-facing slope, we are experimenting with contour swales. On the swale berms (downhill side), we are planting fruit and nut trees to take advantage of the soil-stored swale water.

Our initial challenge was to find a simple way to create these swales, with a tractor and a basic set of implements. We sought advice from a permaculture consultant, spoke with other farmers and researched techniques developed in both Australia and the US. The purpose of this report is to detail a low cost way that small farms can build their own swales, using tools most farmers will have at hand.



Waterspread, not watershed

*A swale storing winter rain at Natural Harvest Farm near
Canby, Oregon*

Step-by-step: Creating low-cost swales

Small farms can create low-cost contour swales with variations on the following method:

- 1 **Plan:** We mapped a series of six swales in a field with a gentle north-facing slope. We planned for swales approximately 15 meters apart – to allow sufficient area for runoff collection to make sense, and also to leave room for intermixed rotational grazing paddocks.
- 2 **Mow:** We started with an area mowed and cleared of excess organic matter. The plowing in step #4 is much easier with less grass.
- 3 **Survey:** With survey equipment, we flagged six dead-level contours approximately 60 meters in length, separated by 15 meters. A bunyip water level can be used instead of survey equipment.
- 4 **Plow:** With a two-bottom moldboard plow, we plowed two passes in one direction on the uphill side, with sod laid downhill. We followed the line of flags we had surveyed. We then plowed one pass on the downhill side in the opposite direction, laying sod uphill. This process gave us a slight ridge between the uphill passes and the downhill pass.



A newly created swale after the first hard winter rain. The wheat cover crop is just emerging. Orchard trees will be planted on the swale ridge.

- 5 **Disc:** To break up the sod, we did a few passes at each swale with a disc harrow.
- 6 **Re-plow:** Using the same method as above, we re-plowed each swale, recreating the central ridge and also a trough on the uphill side.
- 7 **Blade:** We used a blade to scrape errant sod clumps on the downhill side back to the central ridge.
- 8 **Hand-shape by shovel:** We finished the swales with shovels – digging the uphill trough deeper and using the dirt to raise the central swale ridge.
- 9 **Create spillways:** A rock-lined spillway should be built on each swale at its lowest point to avoid erosion in heavy rains.
- 10 **Cover crop:** We built these swales in September, and added a cover crop of winter wheat and clover.
- 11 **Plant trees:** We are in the process of planting our swales with a mixture of fruit and nut trees. The trees can be planted on the swale ridge, as well as off the ridge on the downhill side (or in the basins in dry regions).

Our experience: *The swales we built work well to capture winter rain runoff. After larger rains, our swales fill with water, and this rainwater then infiltrates into the soil over the following three to five days. The downhill swales fill with water more quickly than uphill swales, suggesting that water initially captured in uphill swales is making its way to the lower swales. Although we haven't yet proven this, the area downhill of these swales should stay moister longer during the dry summer months, to the benefit of our growing orchard trees.*

Sources used:

- Feist D 2008, wheat farmer, personal interview.
Lancaster B 2006/2008, *Rainwater harvesting for drylands, vol 1 and 2*, Rainwater Press, Tuscon.
Mollison B 1988, *Permaculture, a designer's manual*, Tagari Publications, Tyalgum, Australia, pp 167-8.
Valley R 2008, permaculture consultant, personal interview.