Planting the Rain
to grow regenerative abundance

by Brad Lancaster

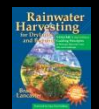
arvestingRainwater.com


Rainwater
Harvesting

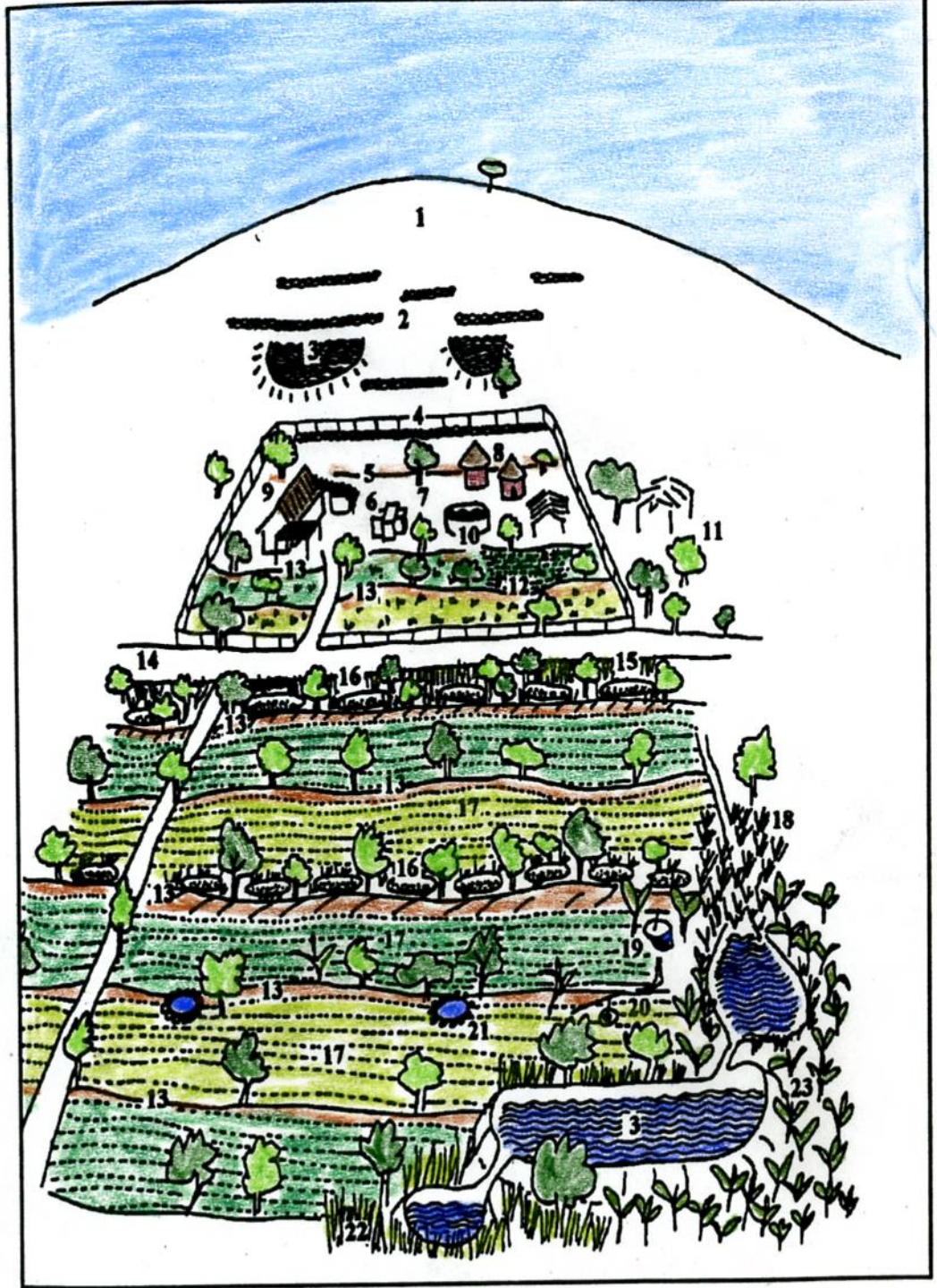
1. Long and thoughtful observation

Zvishavane, Zimbabwe annual precipitation 22 inches (559 mm)

Latitude 20˚ S, altitude 2950 feet (900 meters)



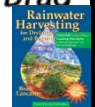
2.Start at the top of the watershed and work your way down



"As Mr. Phiri explains, 'I am digging fruition pits and swales to plant the water so that it can germinate elsewhere.'"

1. *Granite dome*
2. *Unmortared stone walls*
3. *Reservoir*
4. *Fence with unmortared stone wall*
5. *Swale/terrace*
6. *Outdoor wash basin*
7. *Chickens and turkeys run freely in courtyard*
8. *Traditional round houses with thatched roofs*
9. *Main house with vine-covered cistern and ramada*
10. *Open ferro-cement cistern*
11. *Kraal—cattle and goats*
12. *Courtyard garden*
13. *Swale*
14. *Dirt road*
15. *Thatch grass and thick vegetation*
16. *Fruition pit in large swale*
17. *Crops*
18. *Dense grasses*
19. *Well with hand pump*
20. *Donkey pump*
21. *Open unmortared wells*
22. *Reeds and sugar cane*
23. *Dense banana grove*

(illustration by Silvia Rayces from a drawing by Brad Lancaster)




Rainwater
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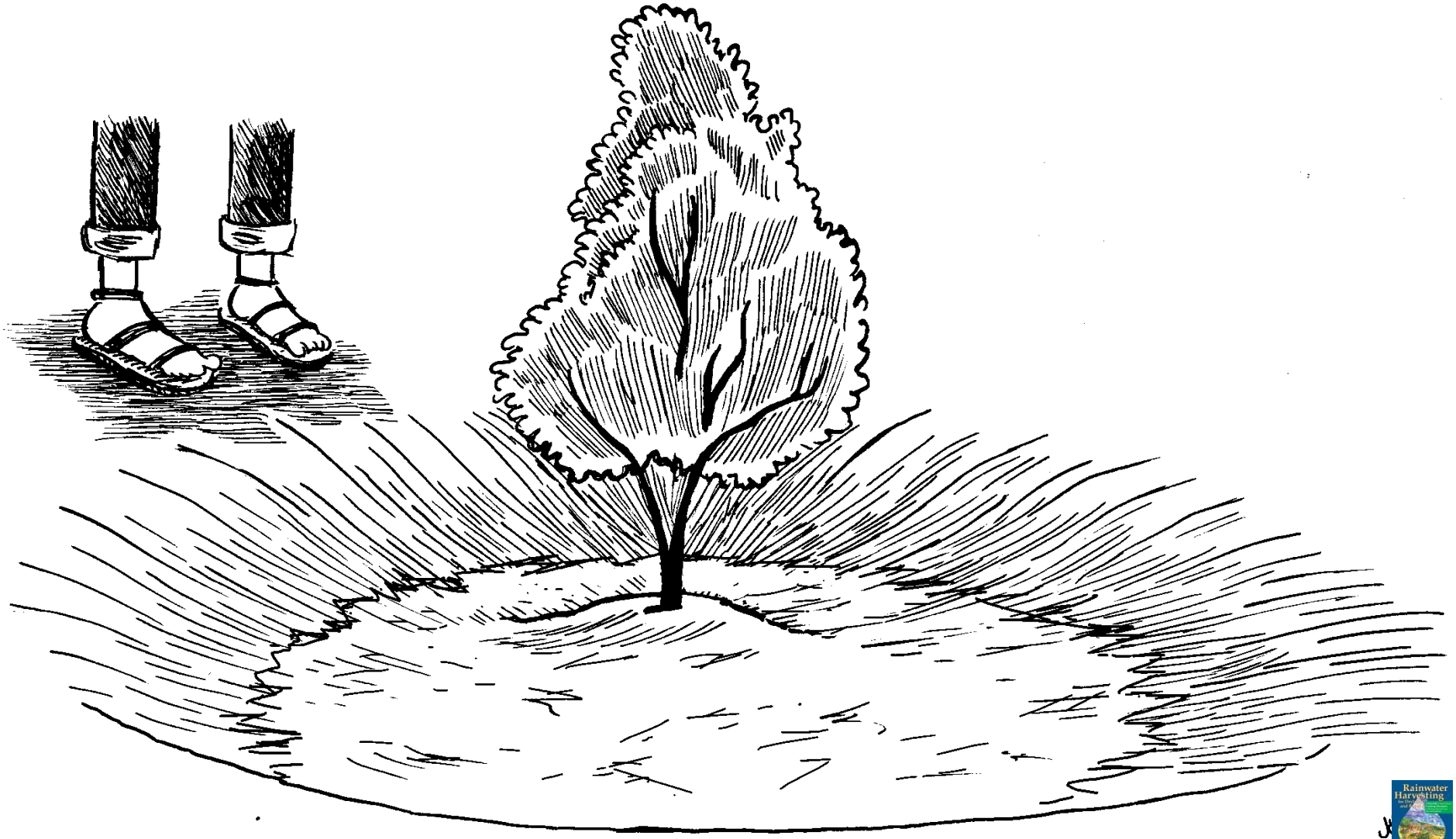
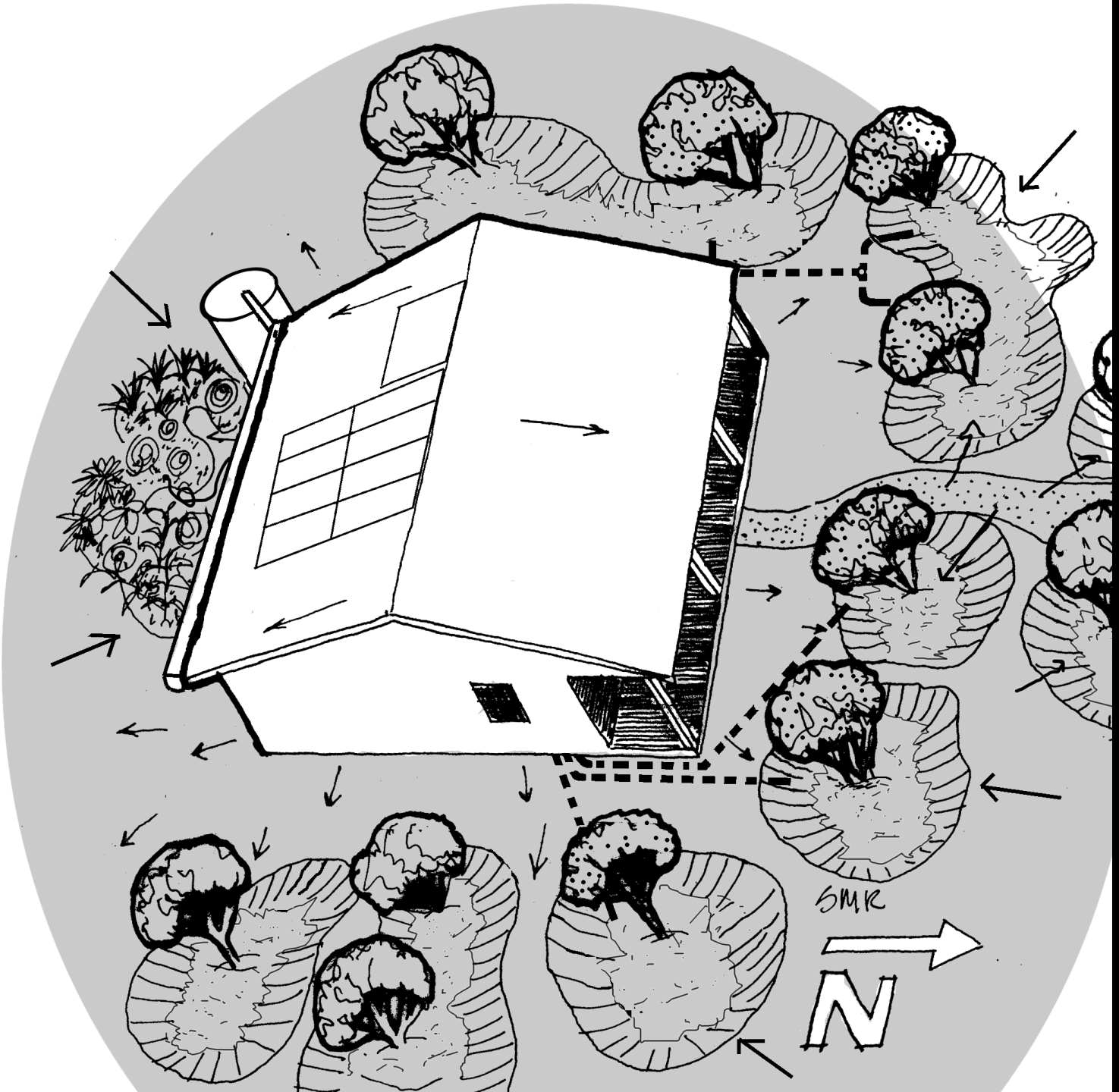
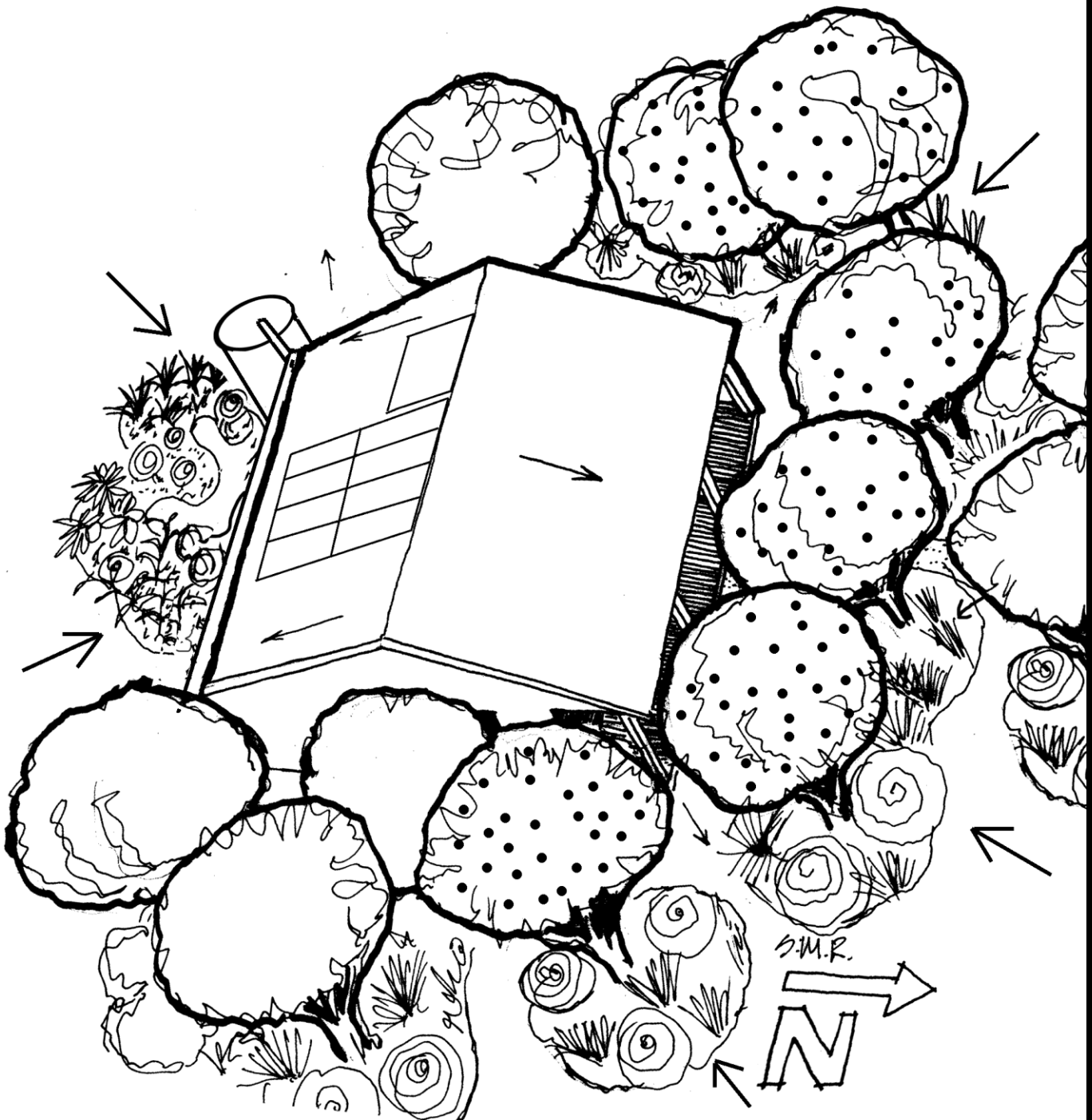
3. Start small and simple




SMR
N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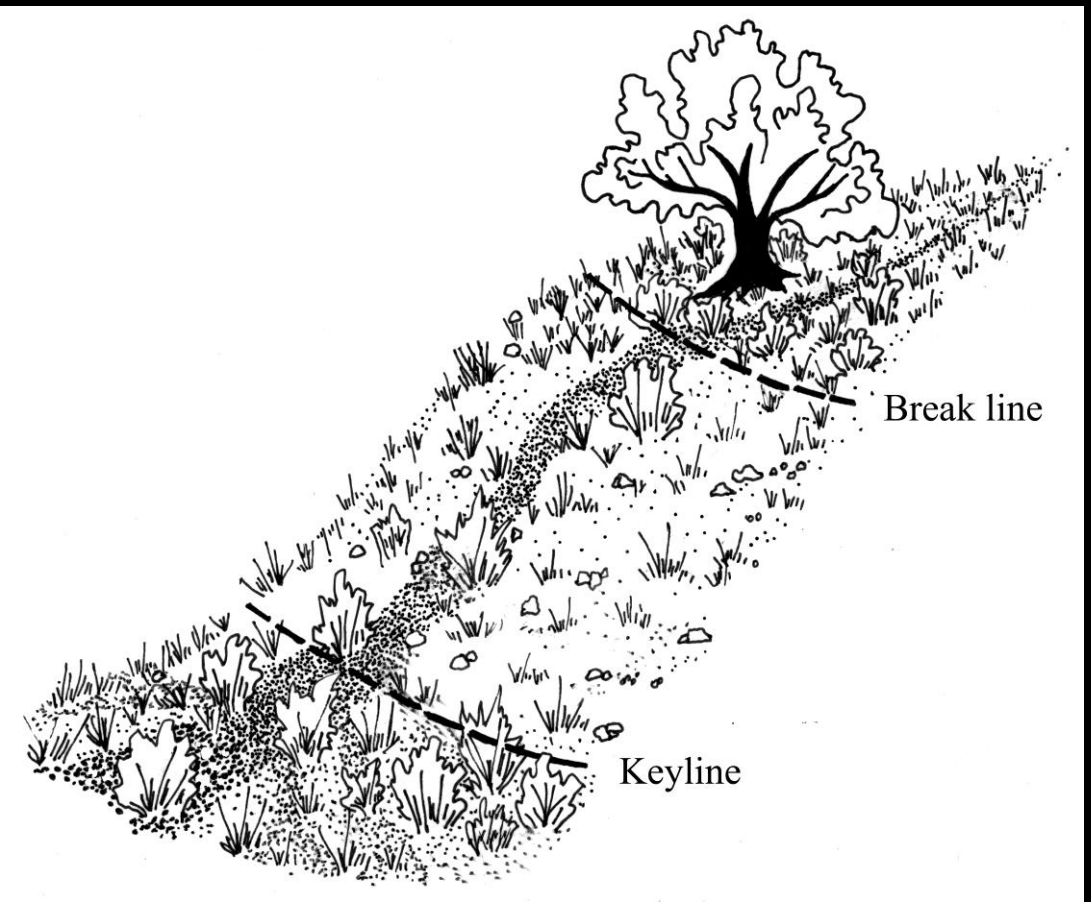
Rainwater
Harvesting

Erosion Triangle

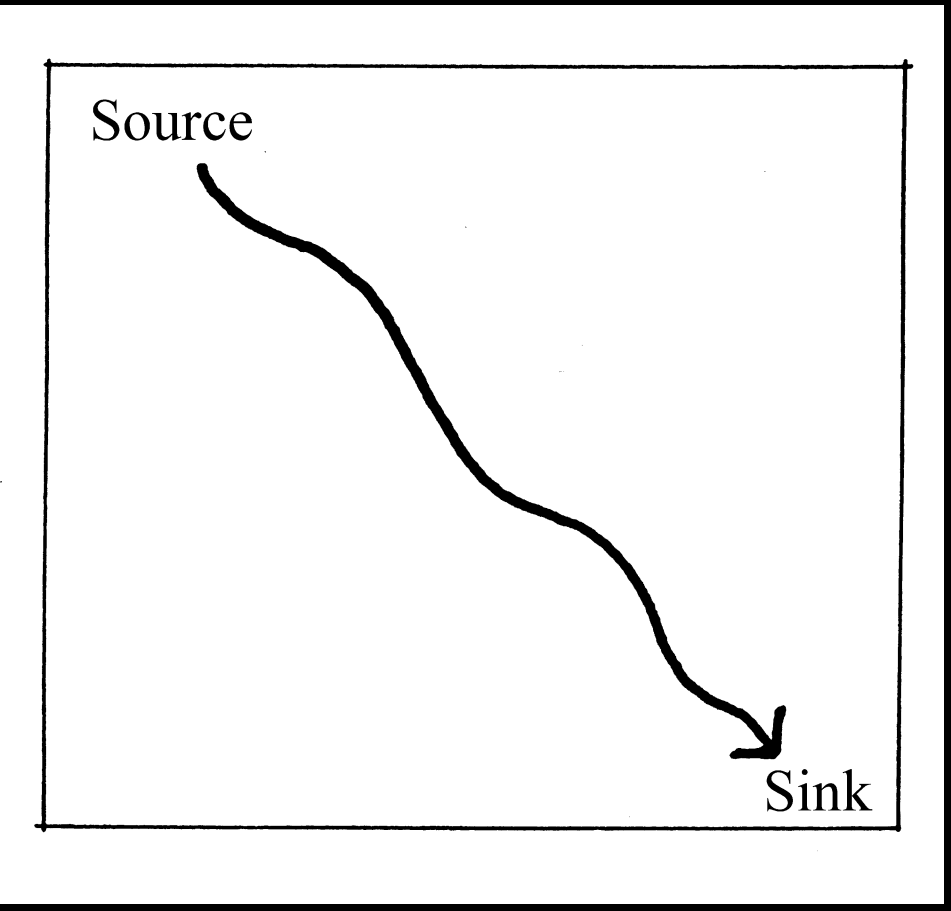
Speed

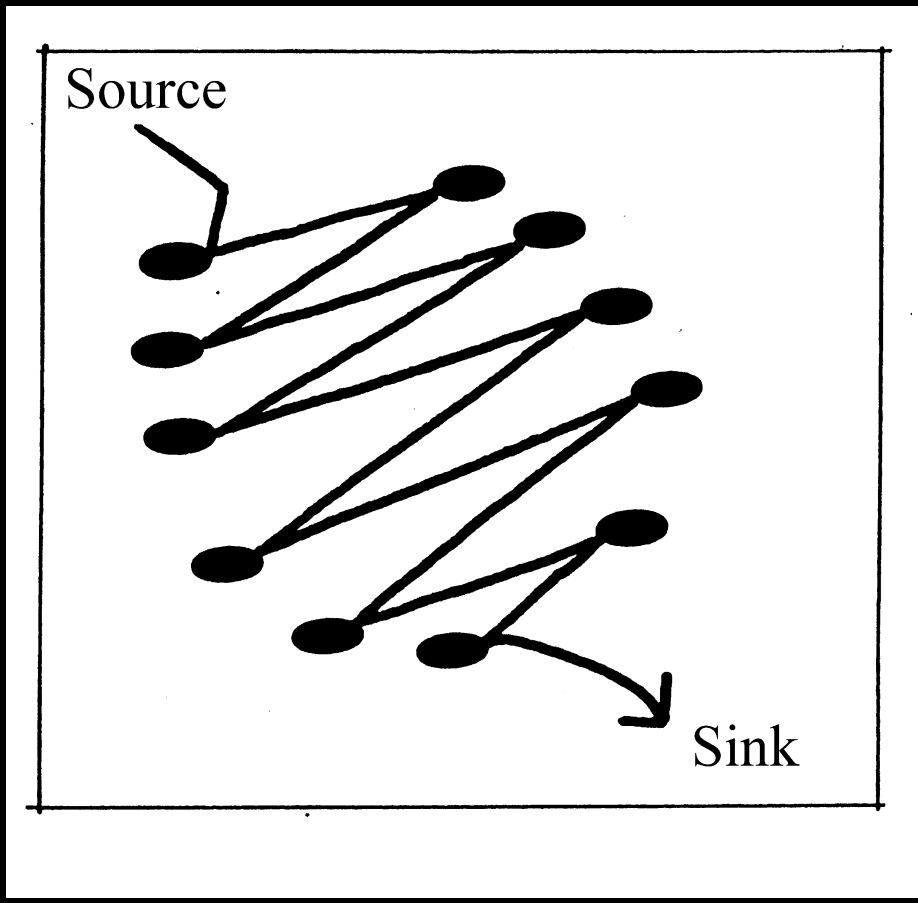
/ \

Depth — Volume



4. Slow spread and infiltrate



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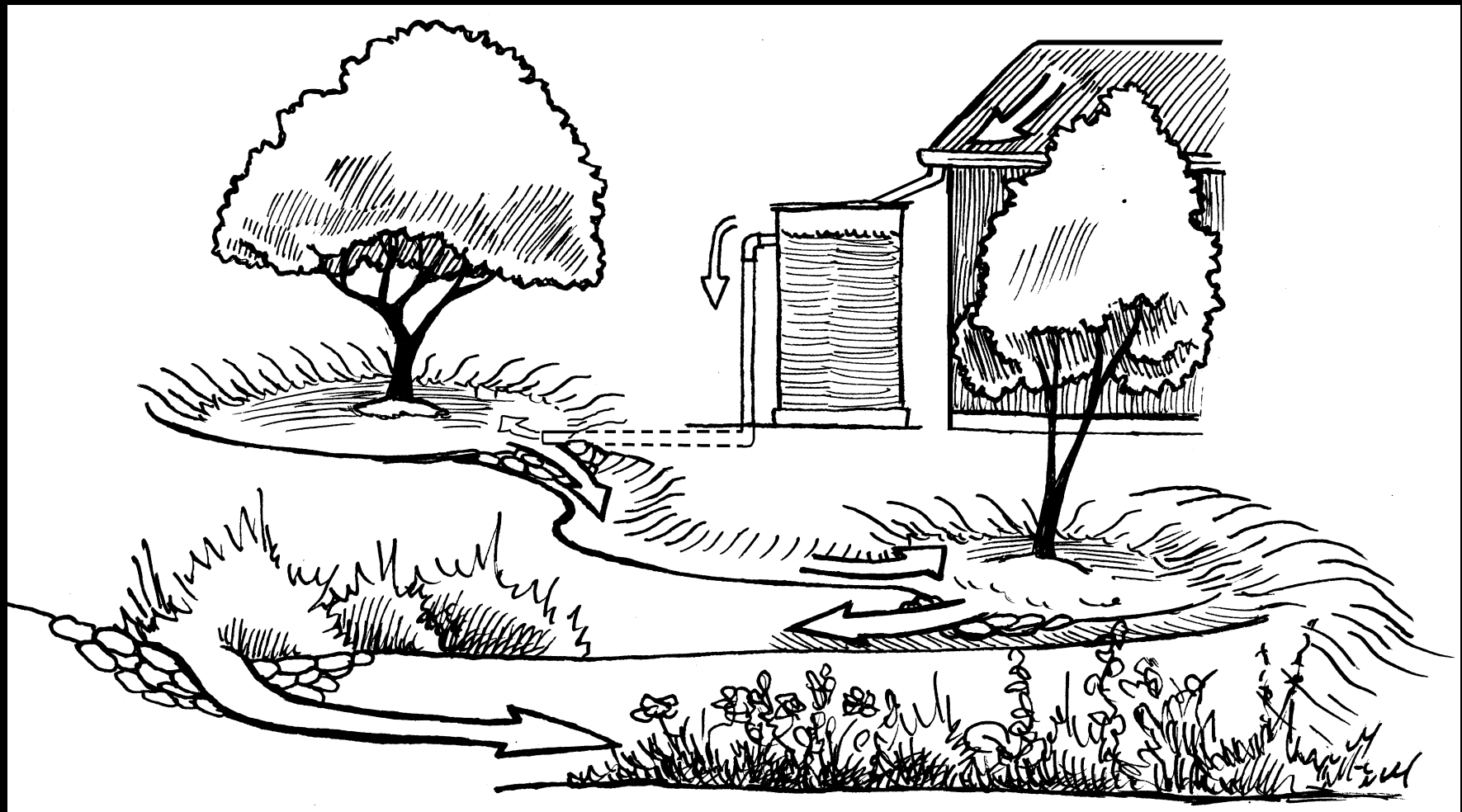
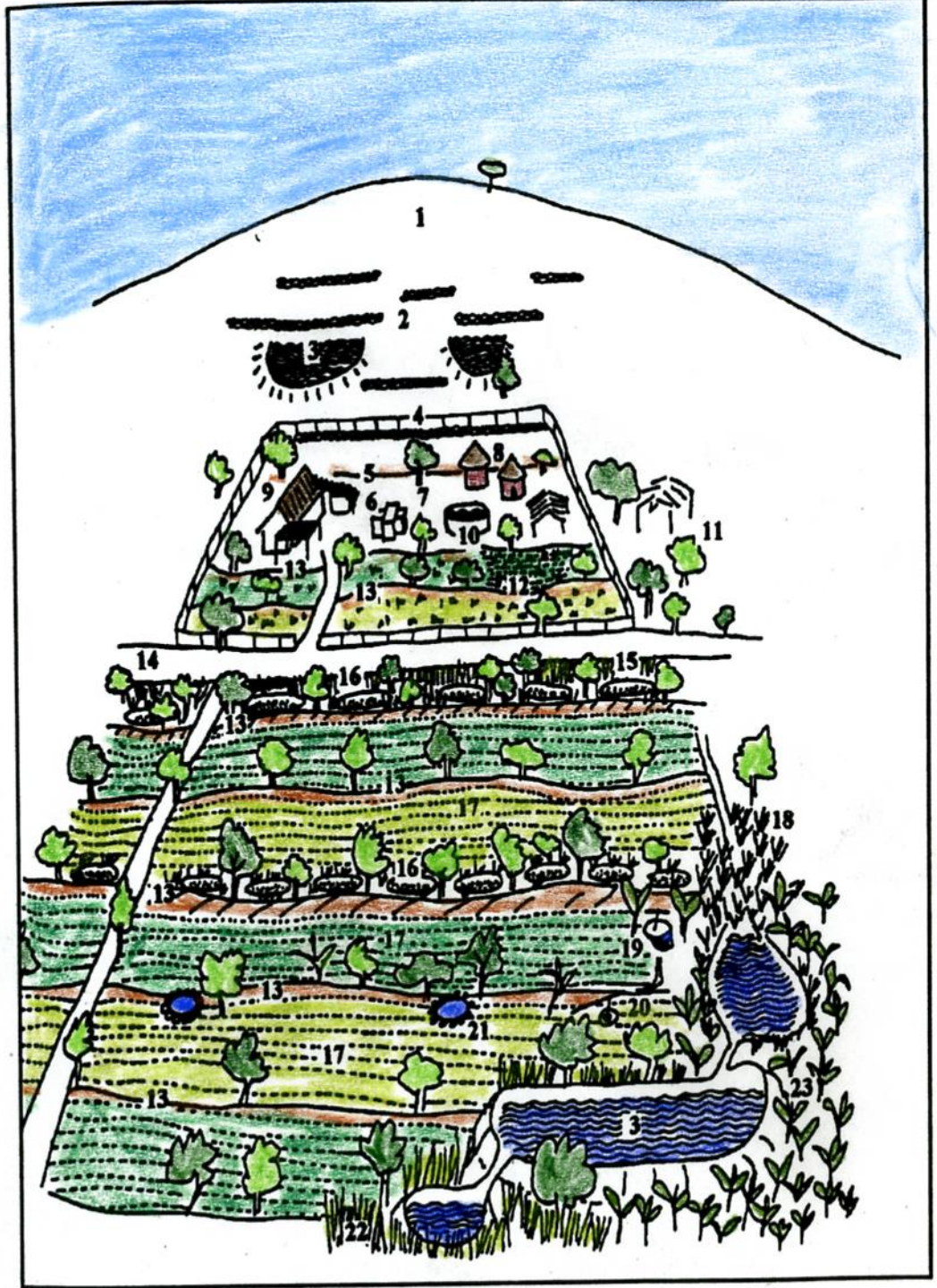
5. Always have an overflow and use it as a resource



1995 (winter dry season)

2014 (summer wet season)



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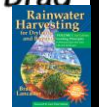
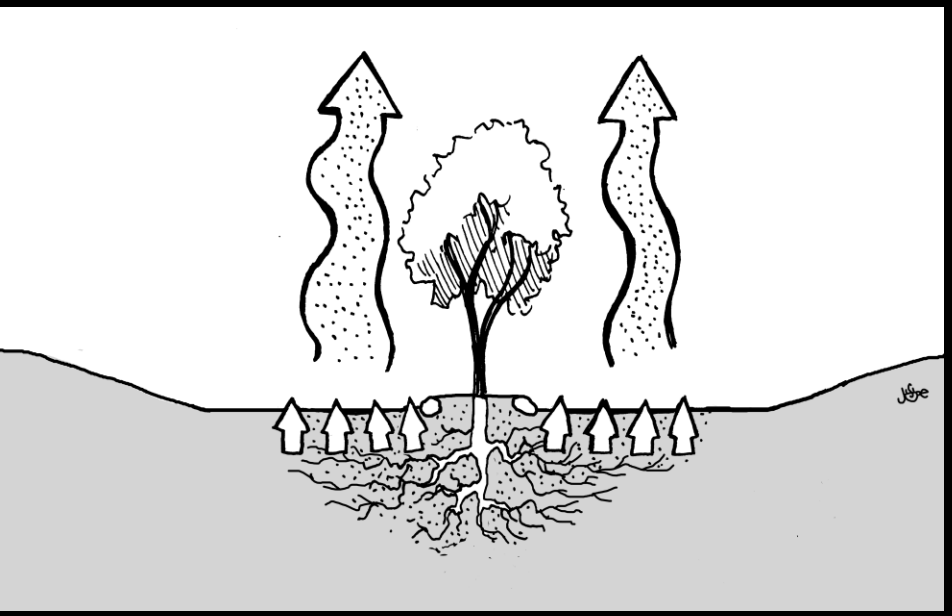
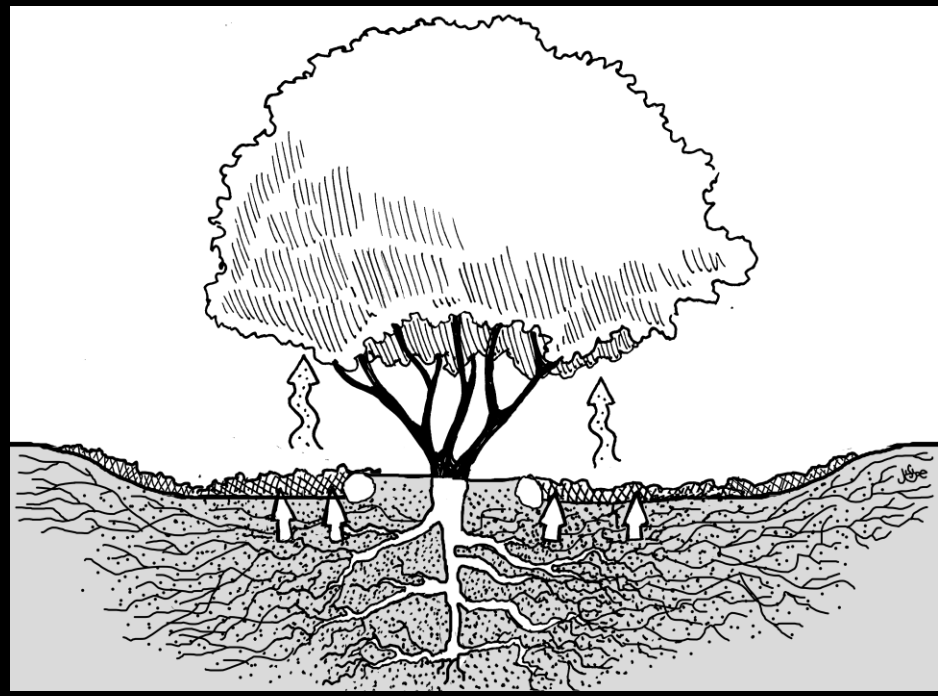


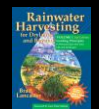
6. Maximize living and organic groundcover



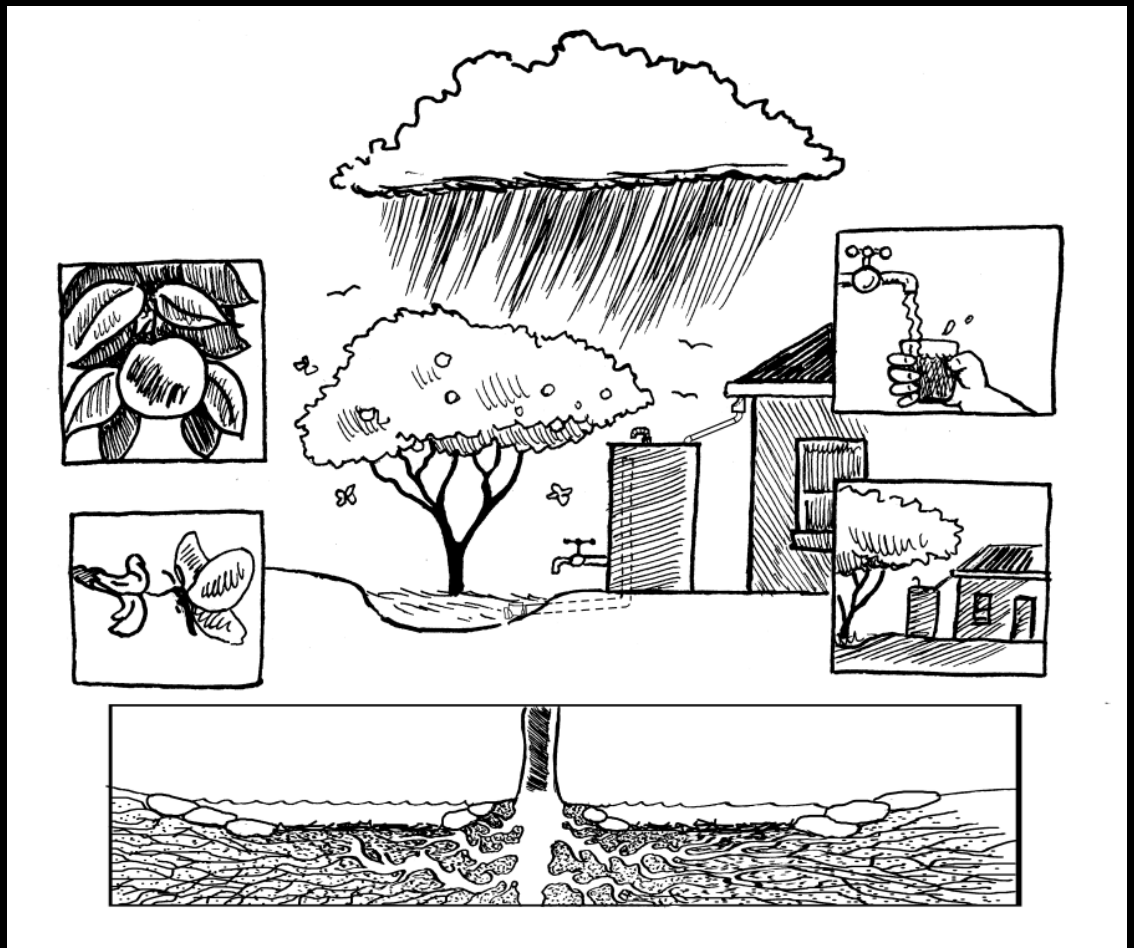
Without mulch



With mulch



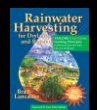
7. Maximize beneficial relationships and efficiency by "stacking functions"



1995

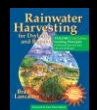
2014

1995



2014

1995




Rainwater
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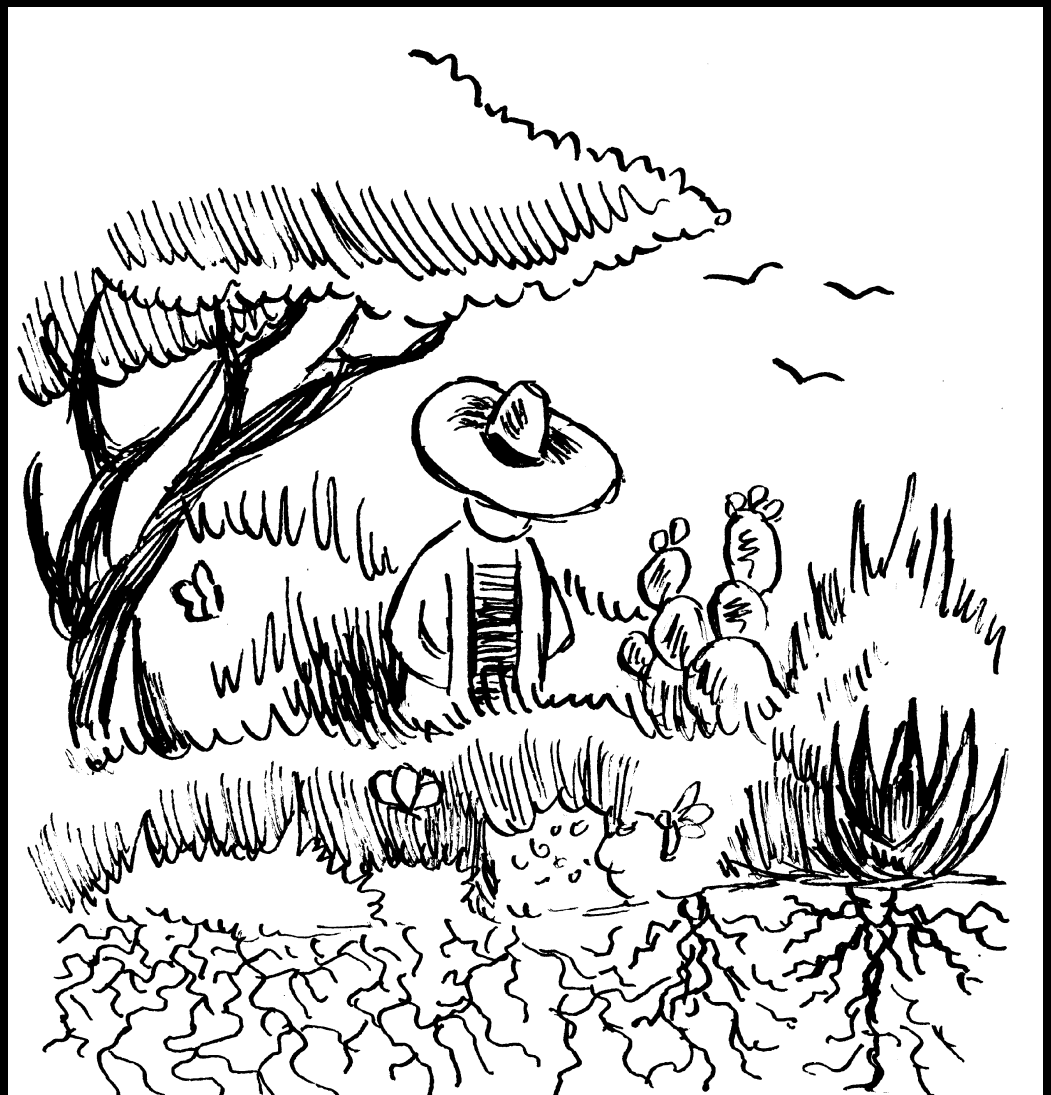
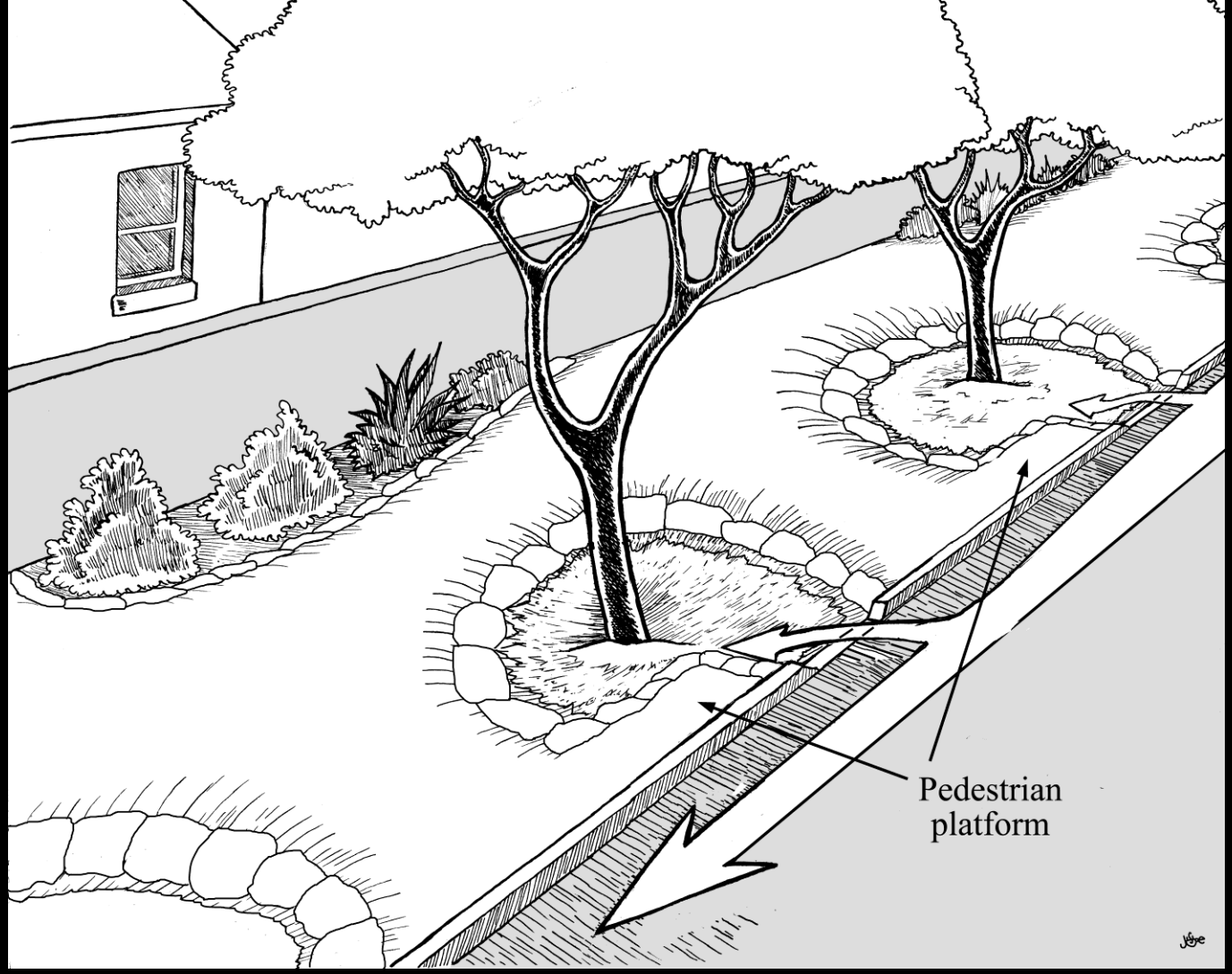
8. The feedback loop: long and thoughtful observation



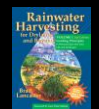


My neighborhood street receives over 3 million liters of rainwater per kilometer

That is enough rain to passively irrigate trees spaced every 8 meters on both sides of the street

For every *100 mm* of rainfall…

- A 3-m wide paved street will drain 300,000 liters of rainfall per 1 km
- A 6-m wide paved street will drain 600,000 liters of rainfall per 1 km
- A 9-m wide paved street will drain 900,000 liters of rainfall per 1 km

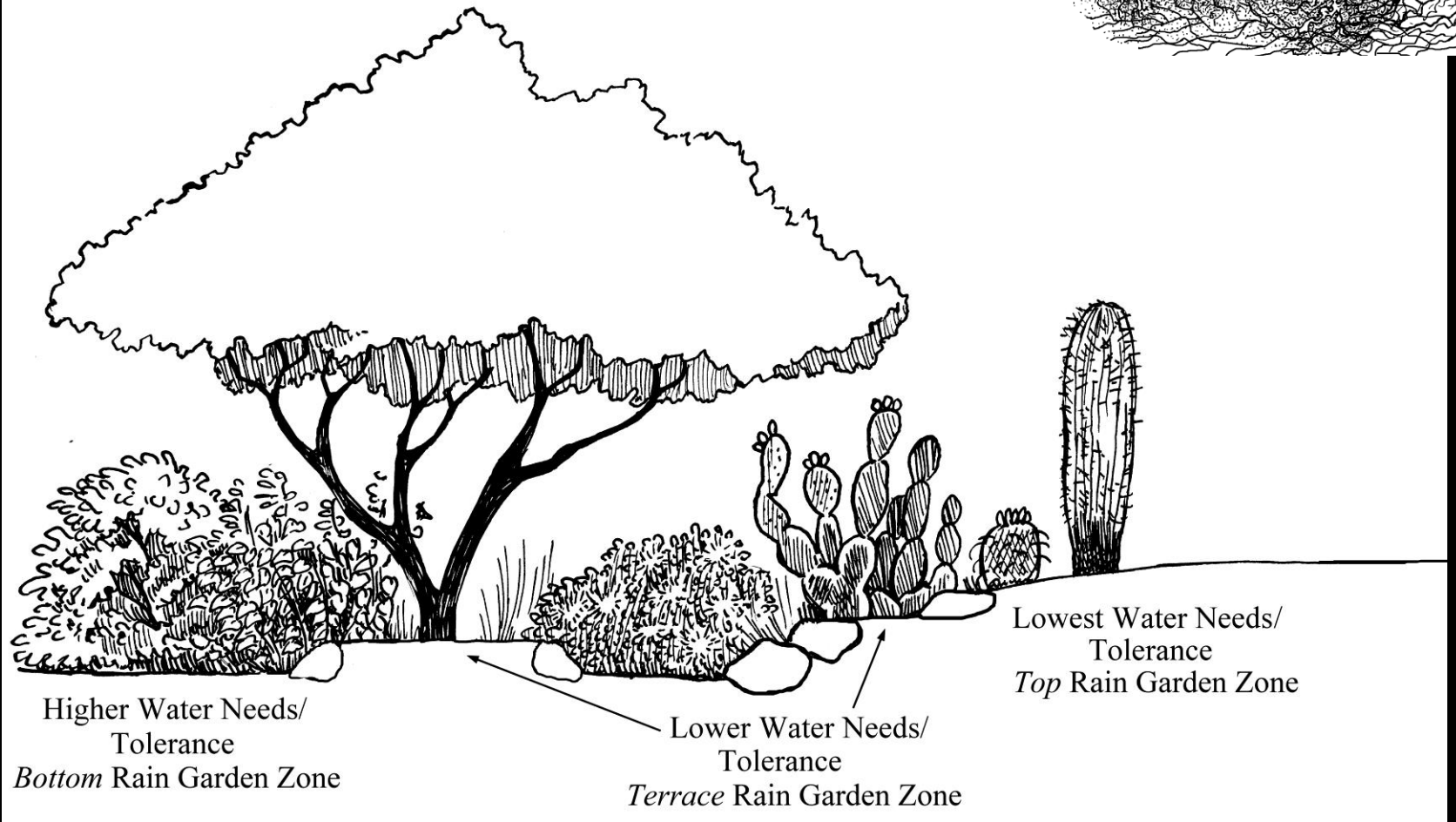


^ 1994

2006 >

Rain Garden Zones

Bottom, Terrace, & Top



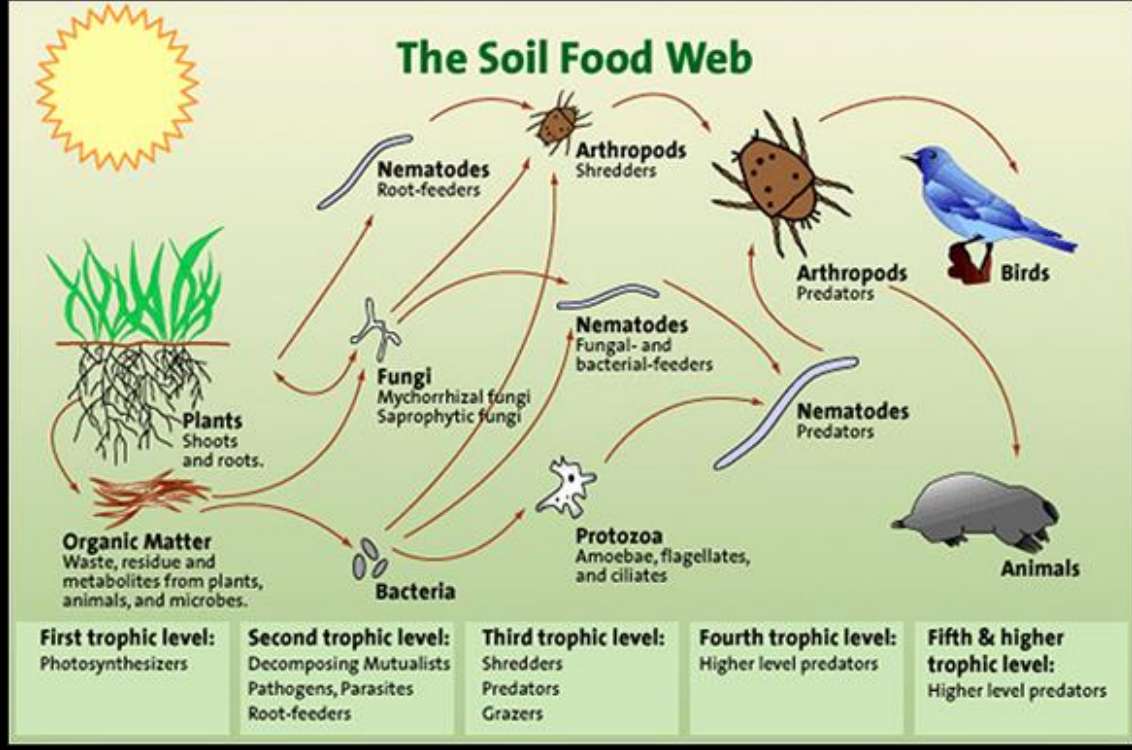
- Trees associated with mulched water-harvesting earthworks are able to grow 33% larger than those without.

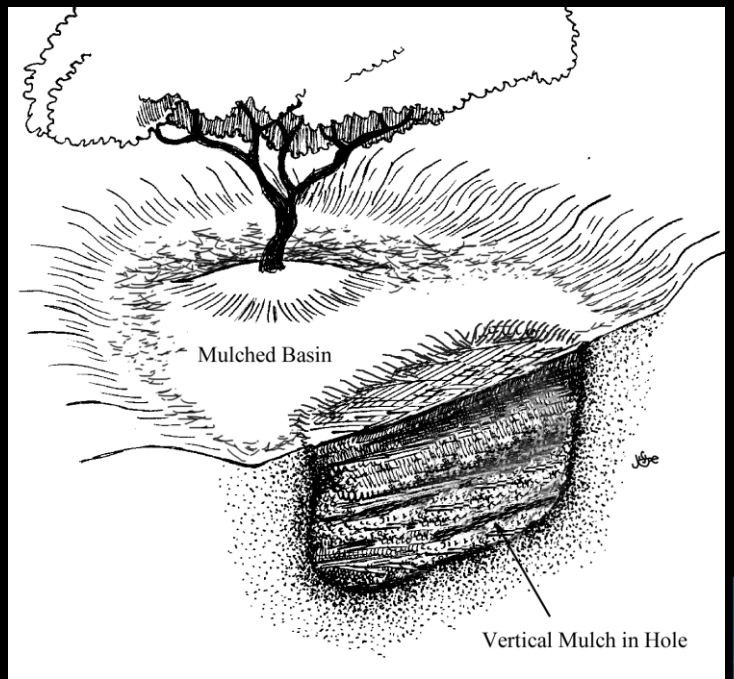
This more than doubles the trees' potential sequestration of atmospheric carbon, passive cooling, and food production

- The presence of more organic matter in the soil enables the soil itself to sequester additional carbon

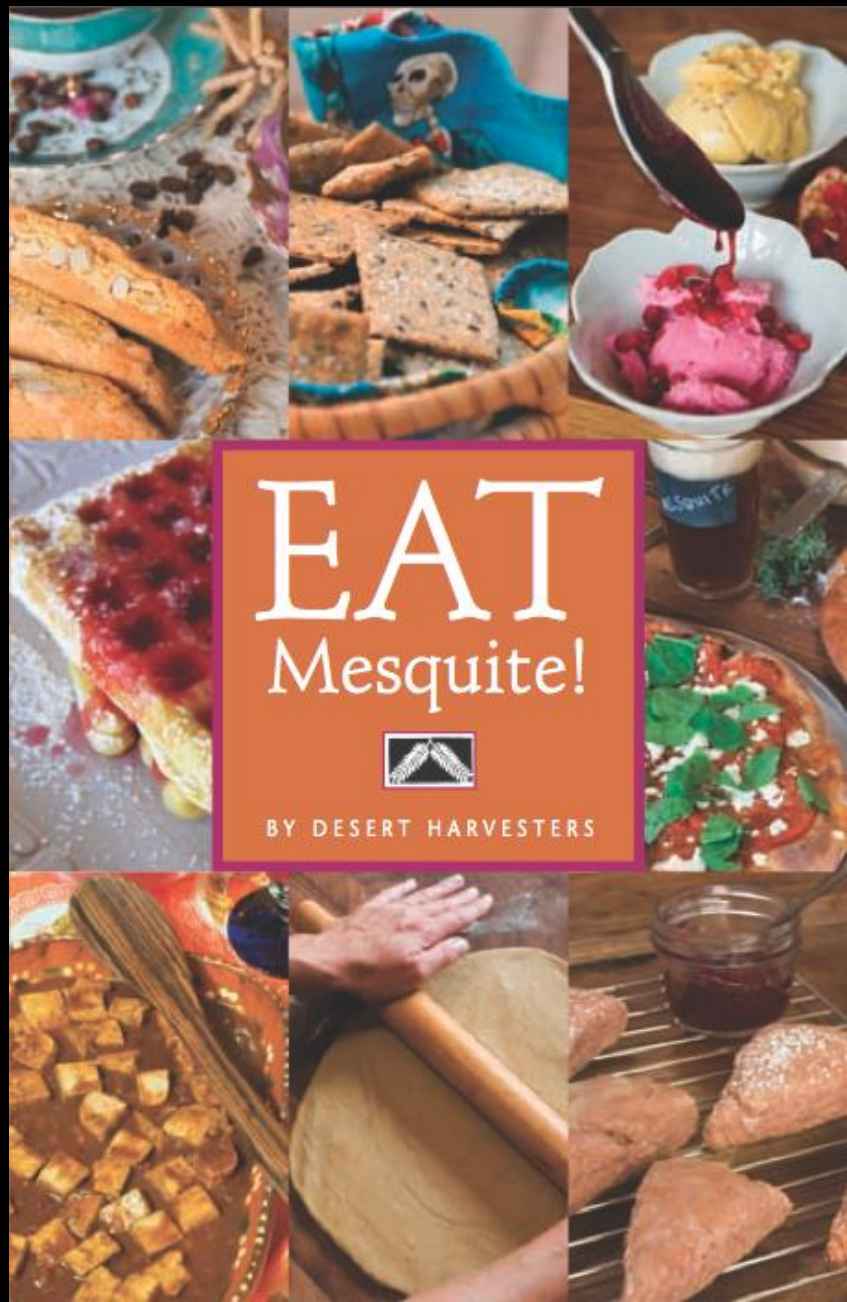
- The natural pollutant-filtering/bioremediation ability of the soil mulched with organic material was ten times greater than that of rock- or gravel-mulched soil

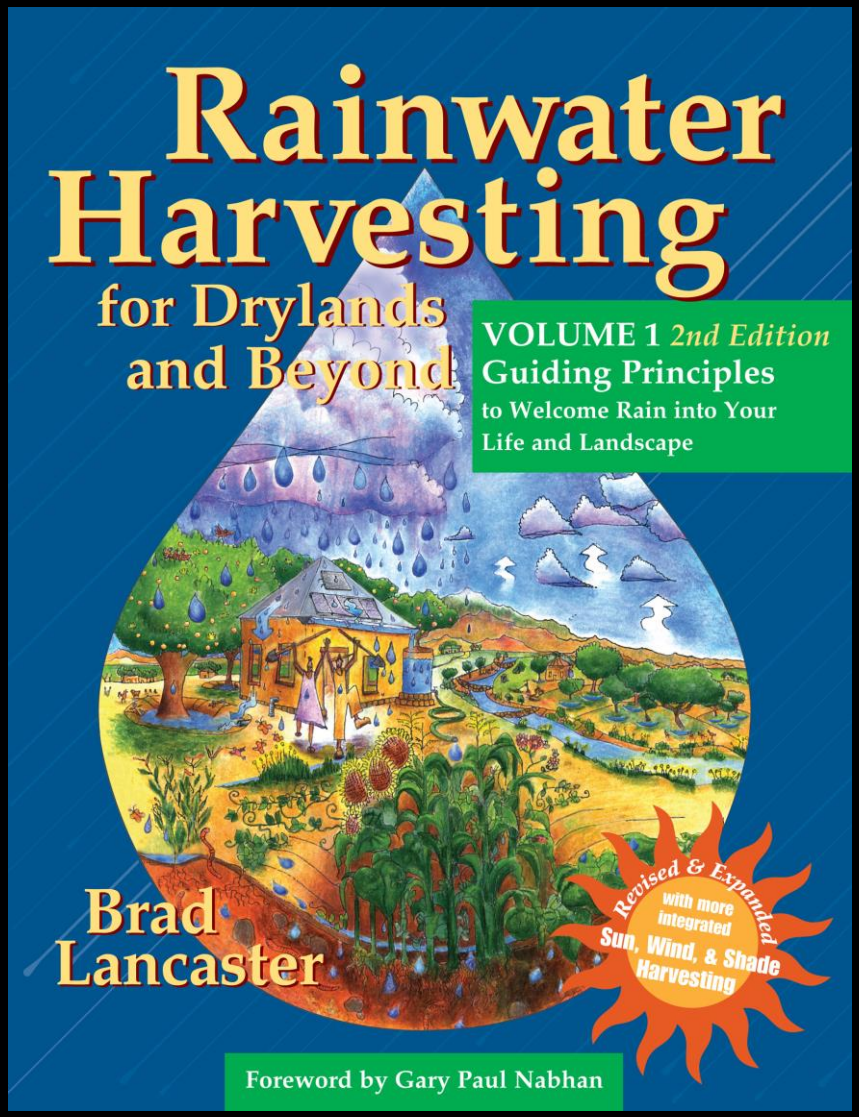
Mitchell Pavao-Zuckerman, PhD
Biosphere 2 & School of Natural Resources and Environment
University of Arizona mzuckerman@arizona.edu

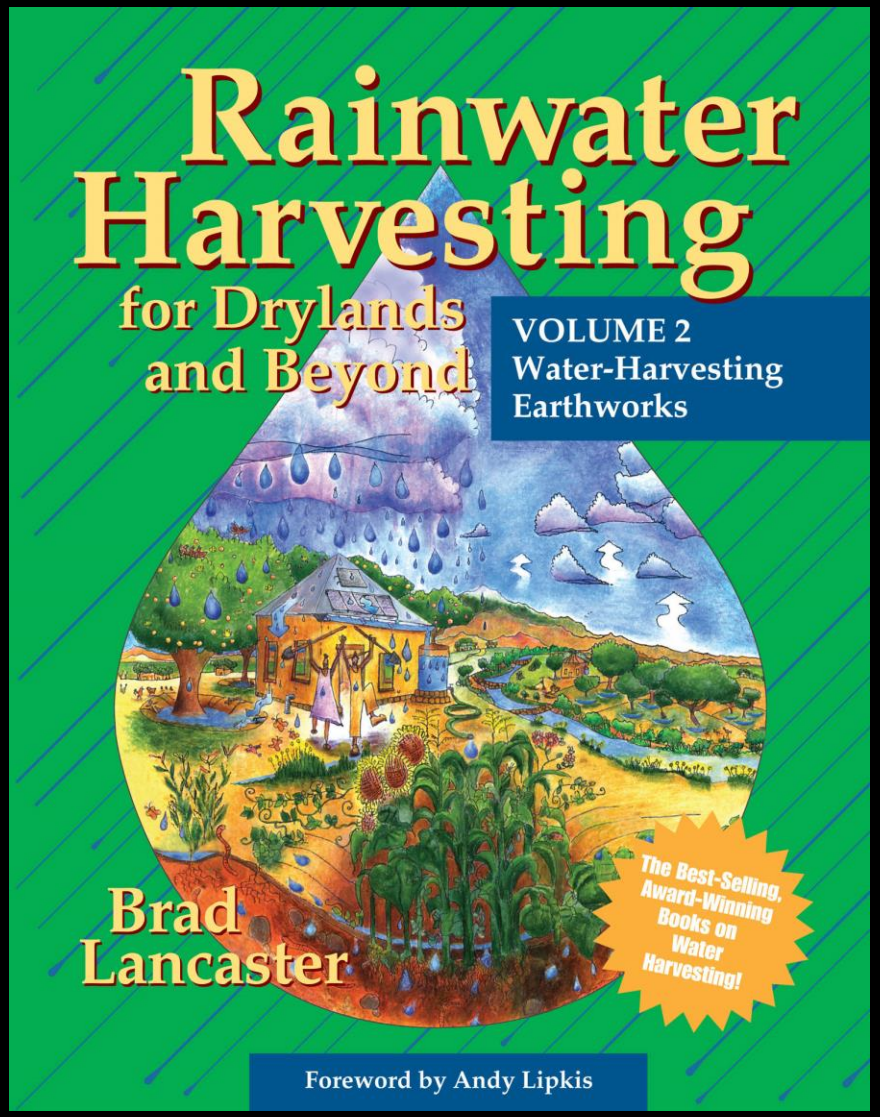




www.DesertHarvesters.org







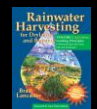
www.HarvestingRainwater.com
Muonde Trust in Zimbabwe

Occidental, California, USA
60 inches (1,500 mm) average annual rainfall

Contour mulch swales

Tijeras, New Mexico

Tijeras, New Mexico, USA
10 inches (250 mm) average annual rainfall


Rainwater
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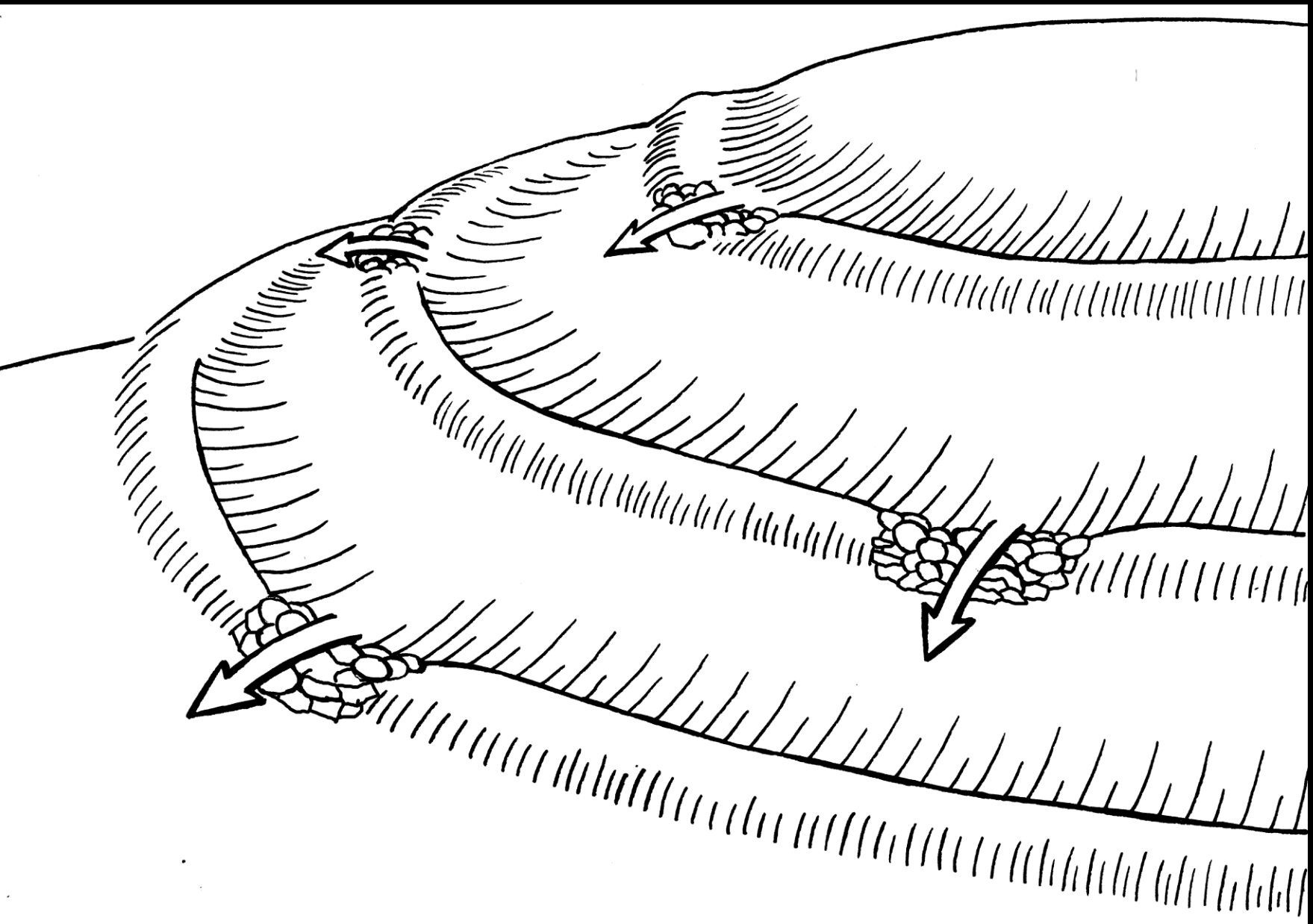
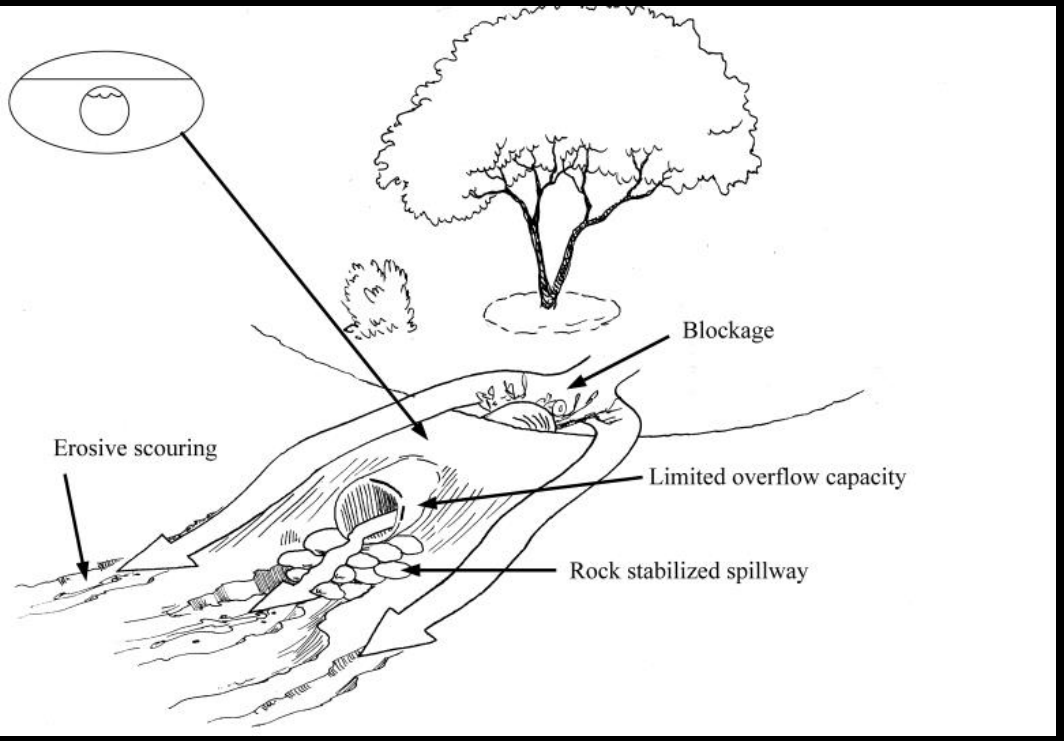
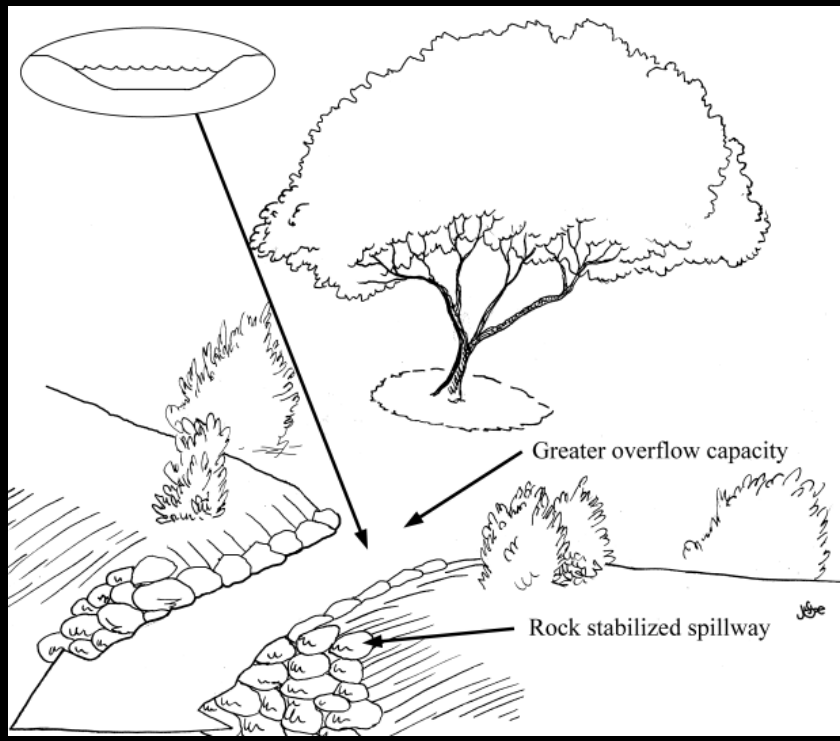
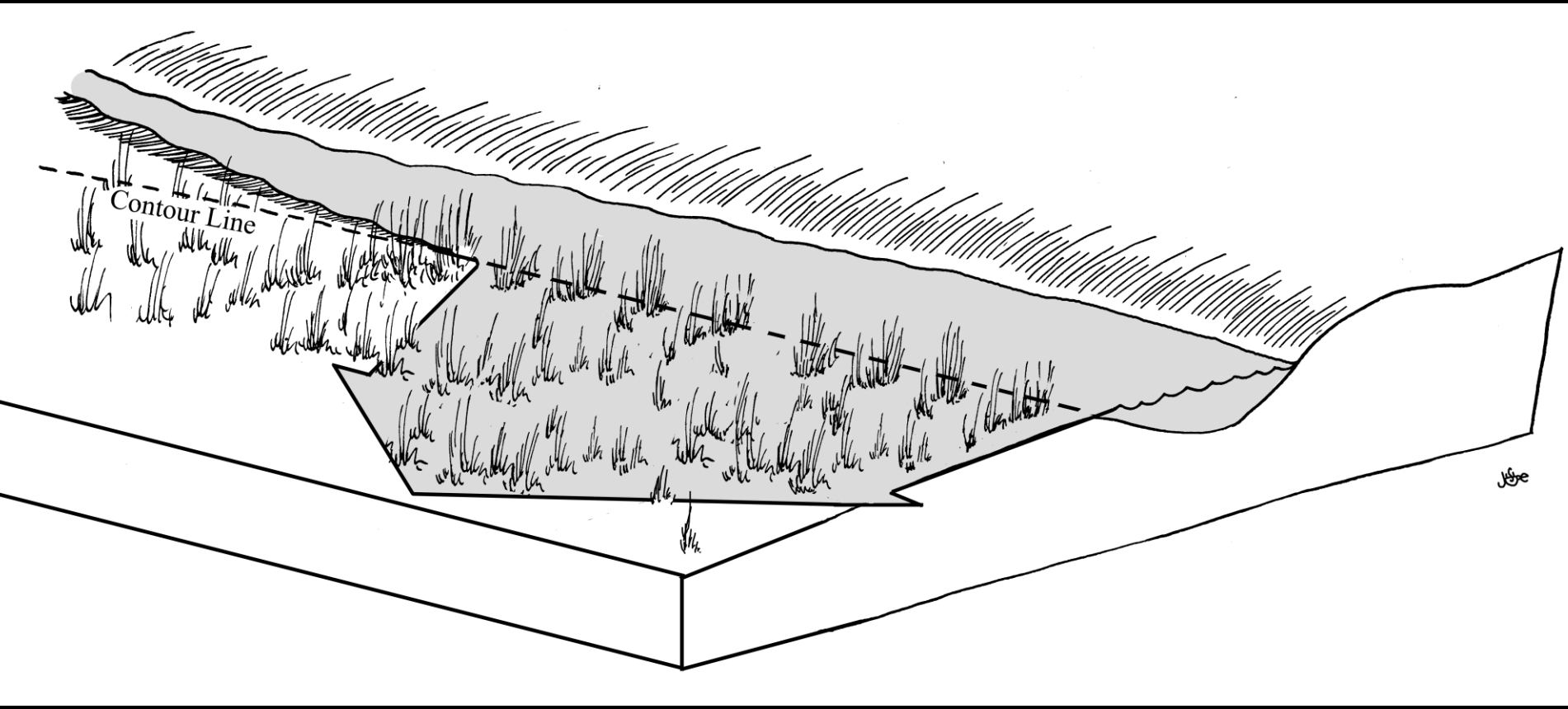
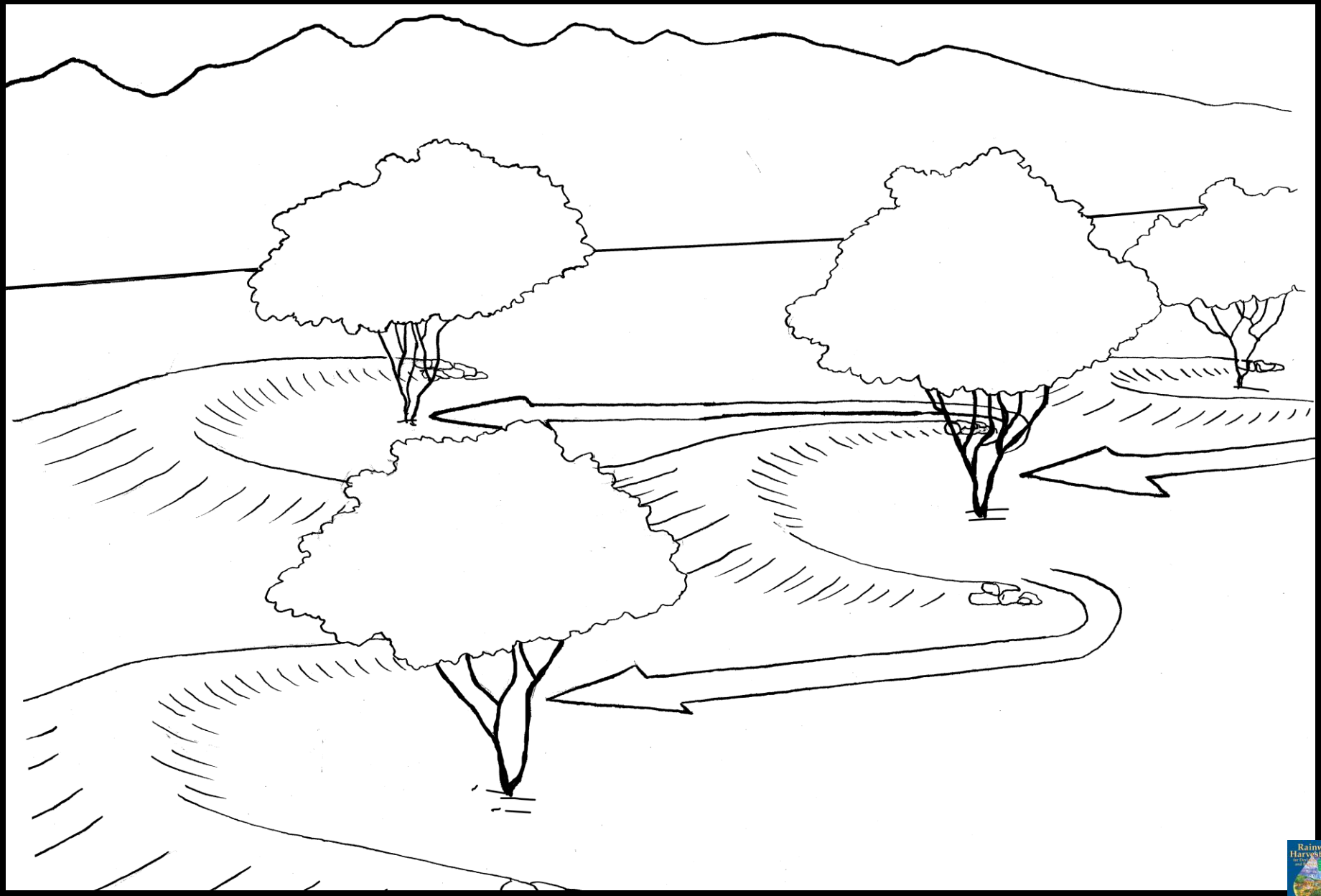


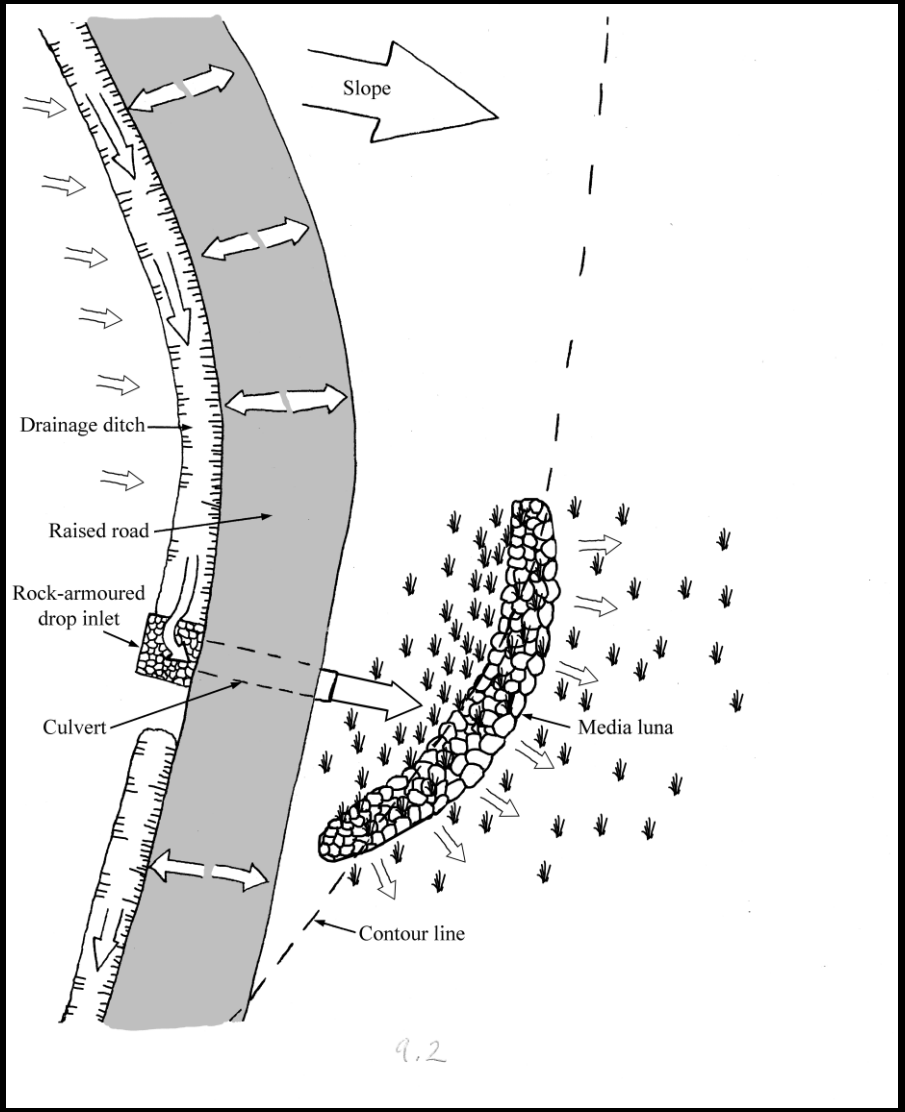
Surface flow is better than piped flow

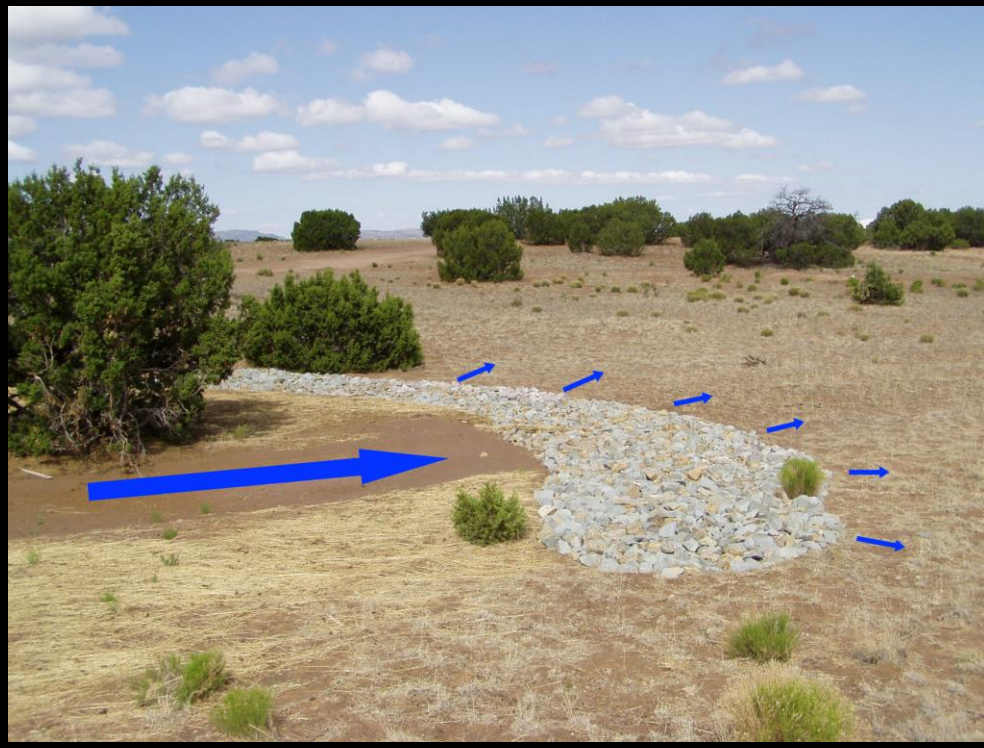


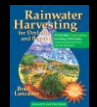


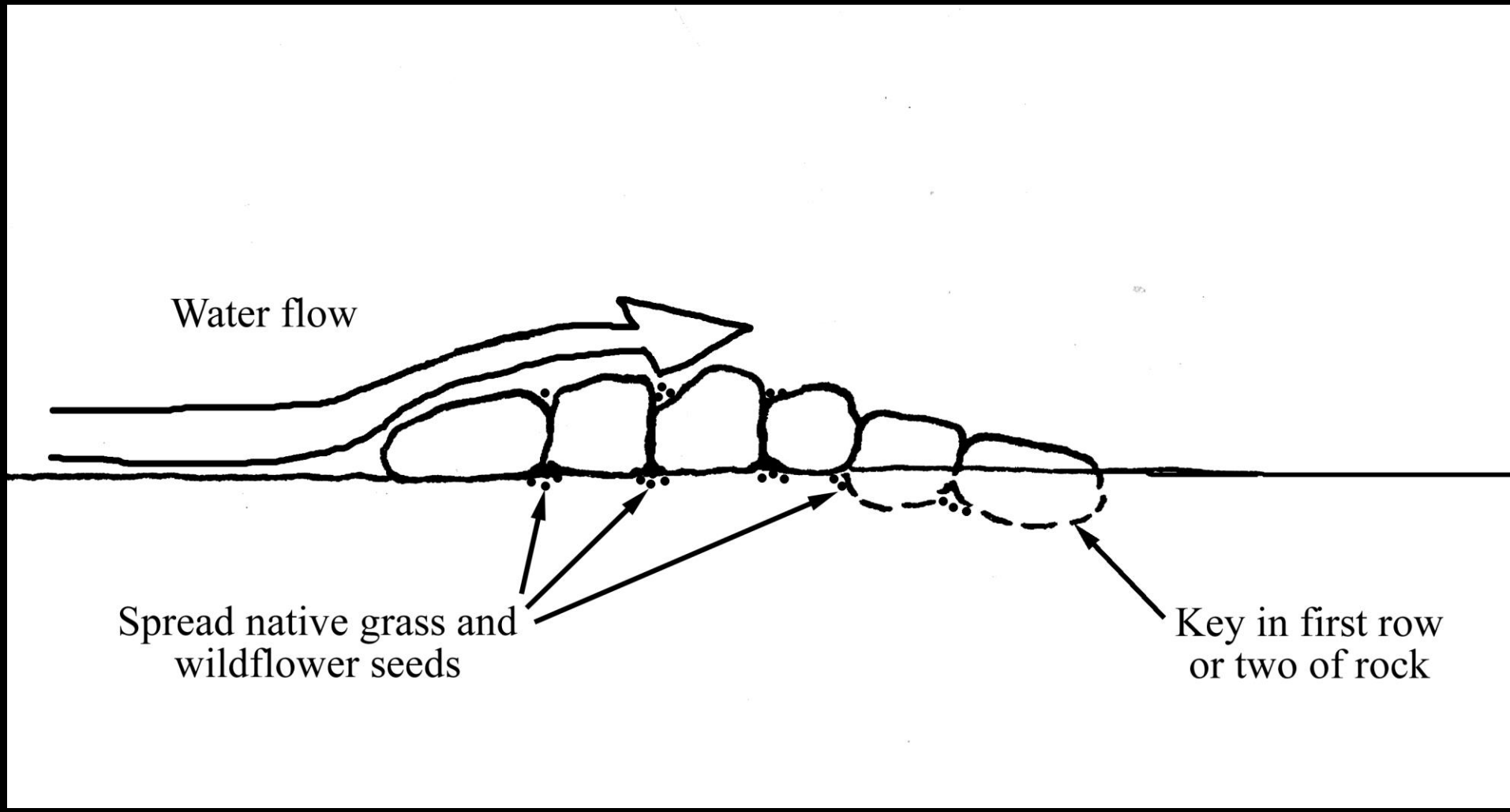

Contour Line




Slope
Drainage ditch
Raised road
Rock-armoured drop inlet
Culvert
Media luna
Contour line
9.2




Rainwater
Harvesting


Water flow
Spread native grass and wildflower seeds
Key in first row or two of rock

Self-cleaning drainage ditches and the road surface need to have a slope equal to or greater than the contributing source of sediment.

Road grade ranging from 4 to 10% is ideal, with frequent grade reversals or drains (minimum every 200 to 300 feet).

A road that climbs 5 feet elevation in 100 feet length has a 5% slope.

Water Harvesting from Low-Standard Rural Roads

by Bill Zeedyk
www.QuiviraCoalition.org

Path to Scarcity

Path to Abundance

Rainhead screen to screen out leaves, critters, and insects

45° bend prevents direct light entry into tank via downspout

Light-, critter-, and insect-proof vent

Tree

Cistern cover or access hatch is lockable or screwed shut to prevent accidental entry

Light-proof tank

Tank inlet is on *opposite* side of tank from distribution pipe/valve, so more of the micro debris can settle into sludge layer, rather than exit via the pipe and valve

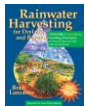
Distribution pipe inlet and full-port valve placed *above* the sludge layer, but not so high that access to stored water is significantly reduced

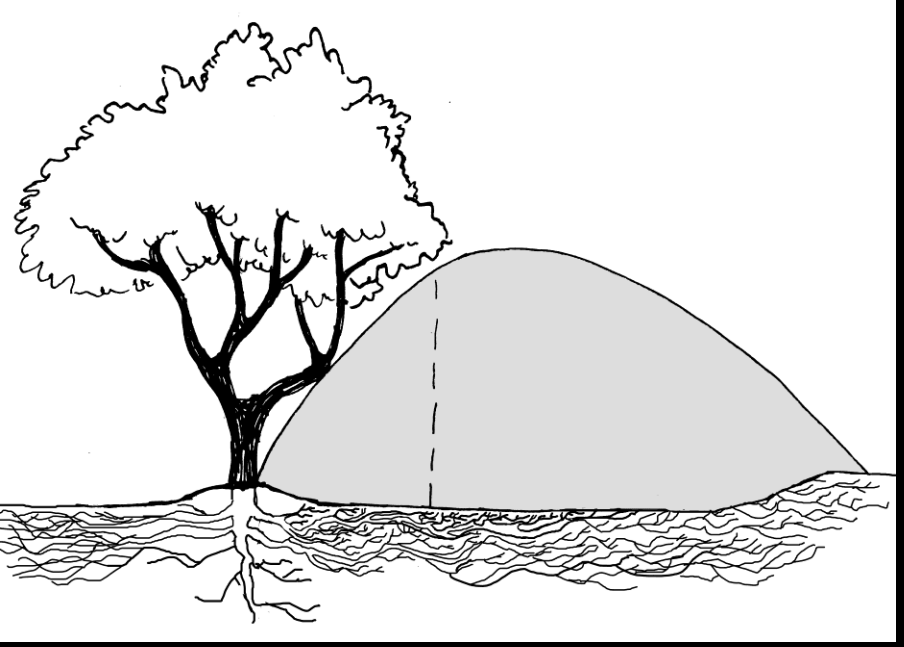
Critter-, insect-, and light-proof backwater valve on overflow pipe—outletting *above* mulch to prevent root entry and clogging

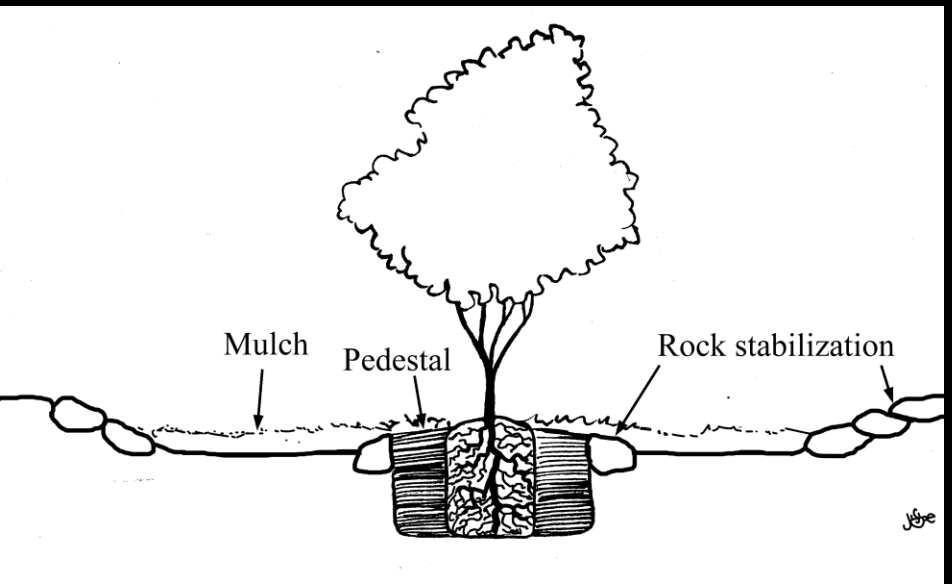
Rock stabilizing sides of basin

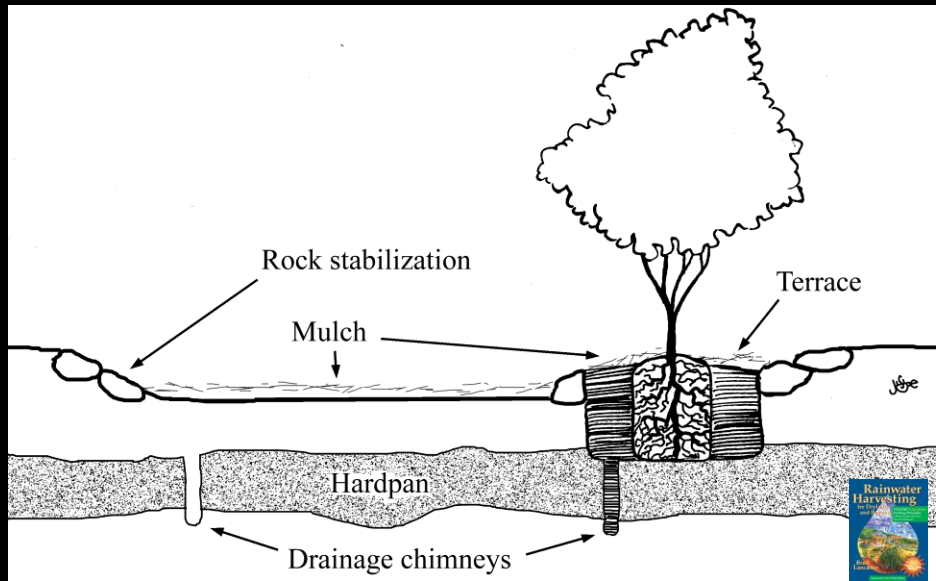
"Rainhead" downspout screen

Full-port valve on left

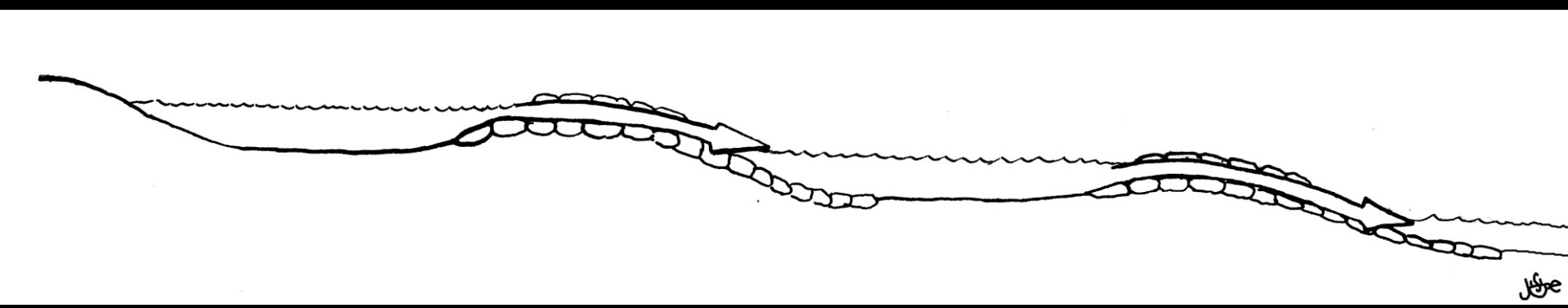


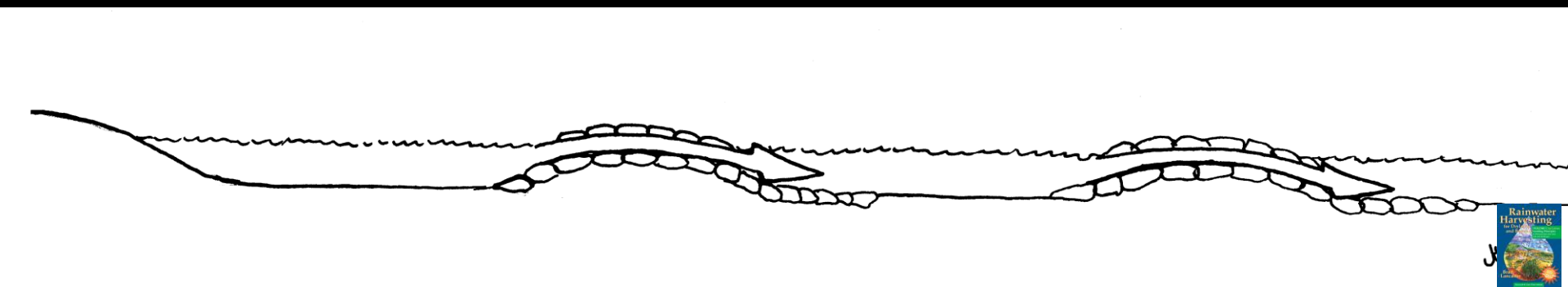



Mulch
Pedestal
Rock stabilization


Rock stabilization
Terrace
Mulch
Hardpan
Drainage chimneys

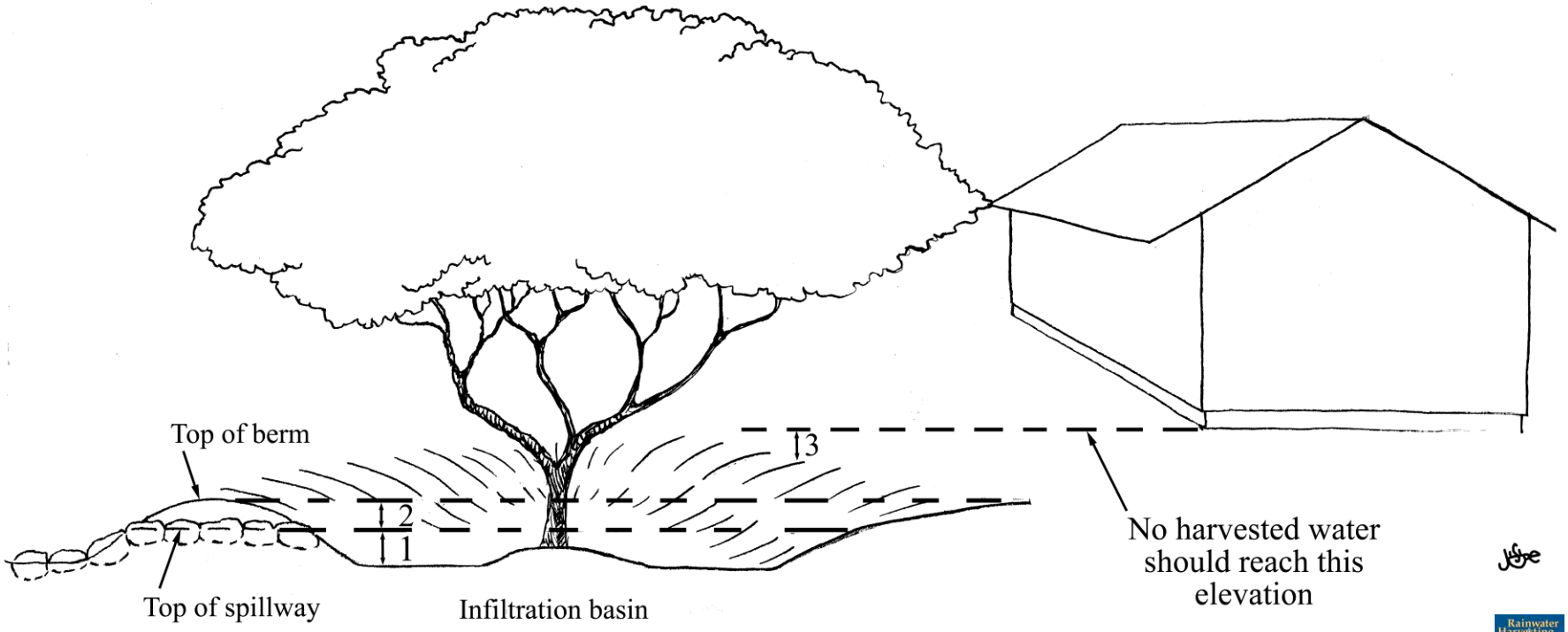
Overflow spillway elevations

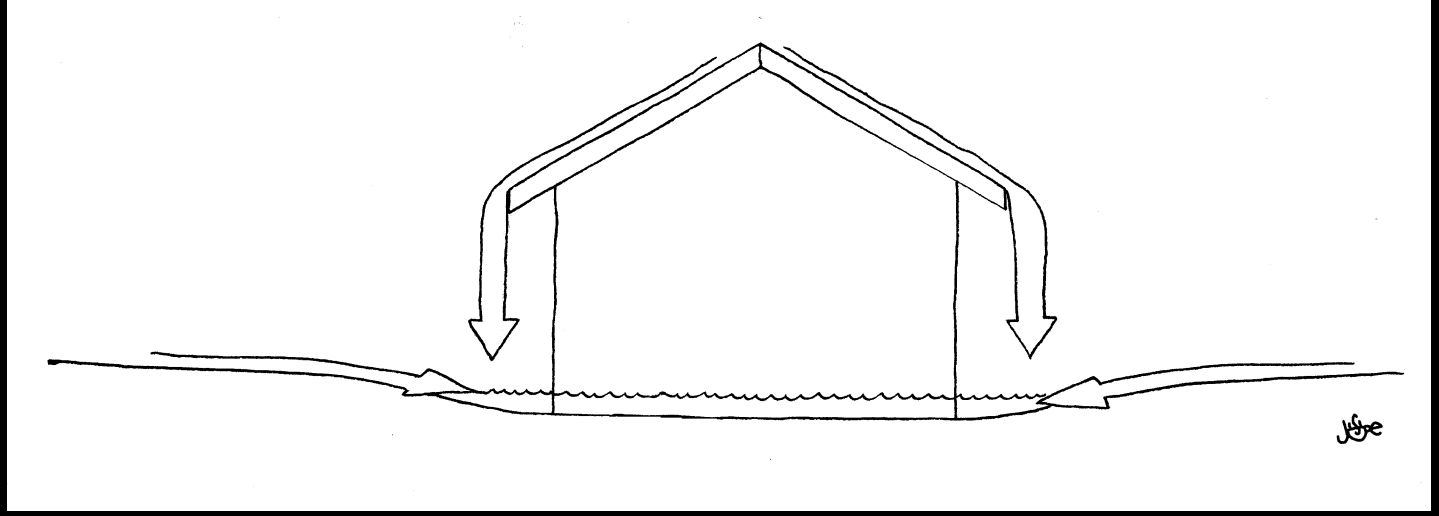


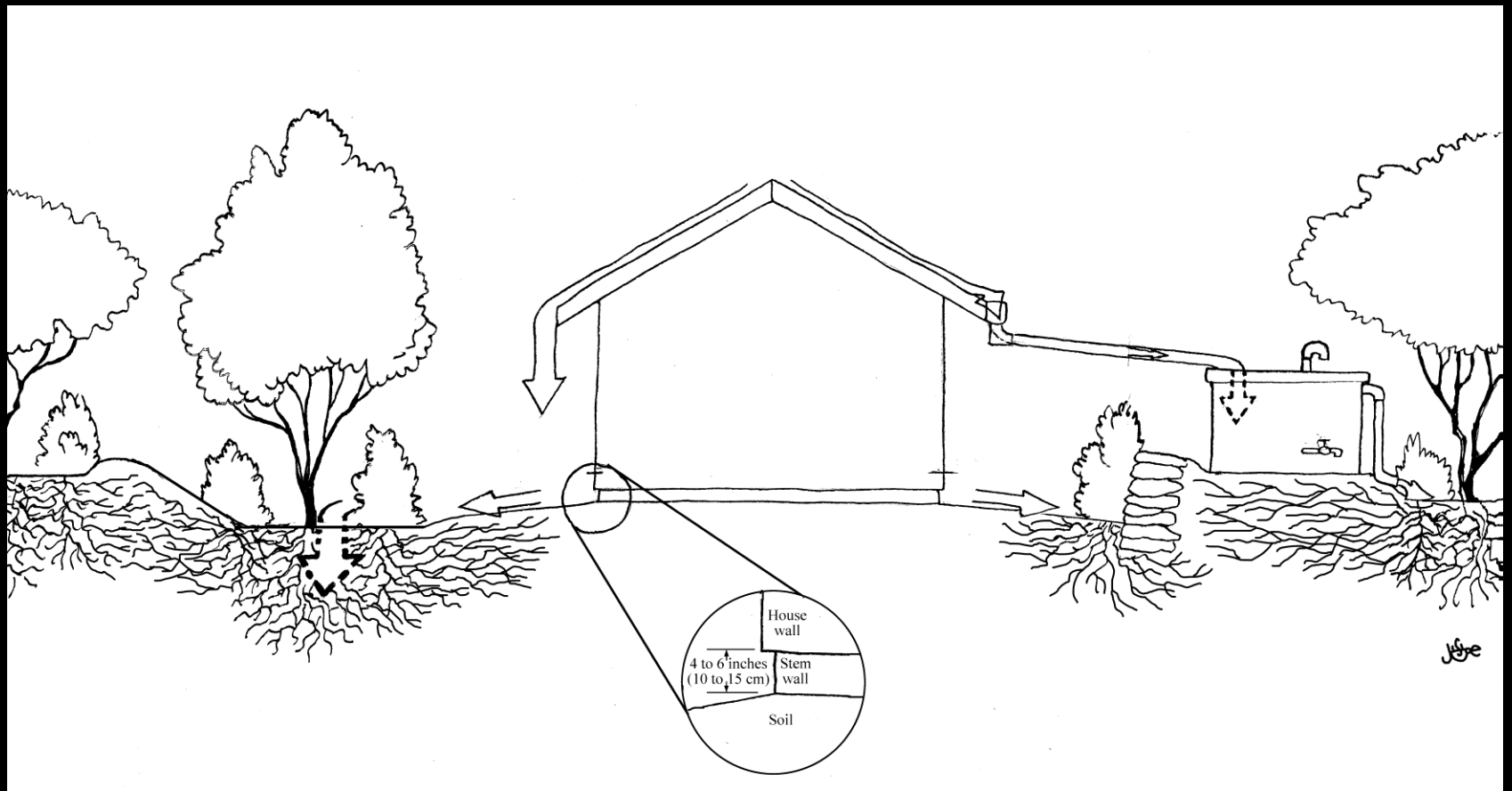


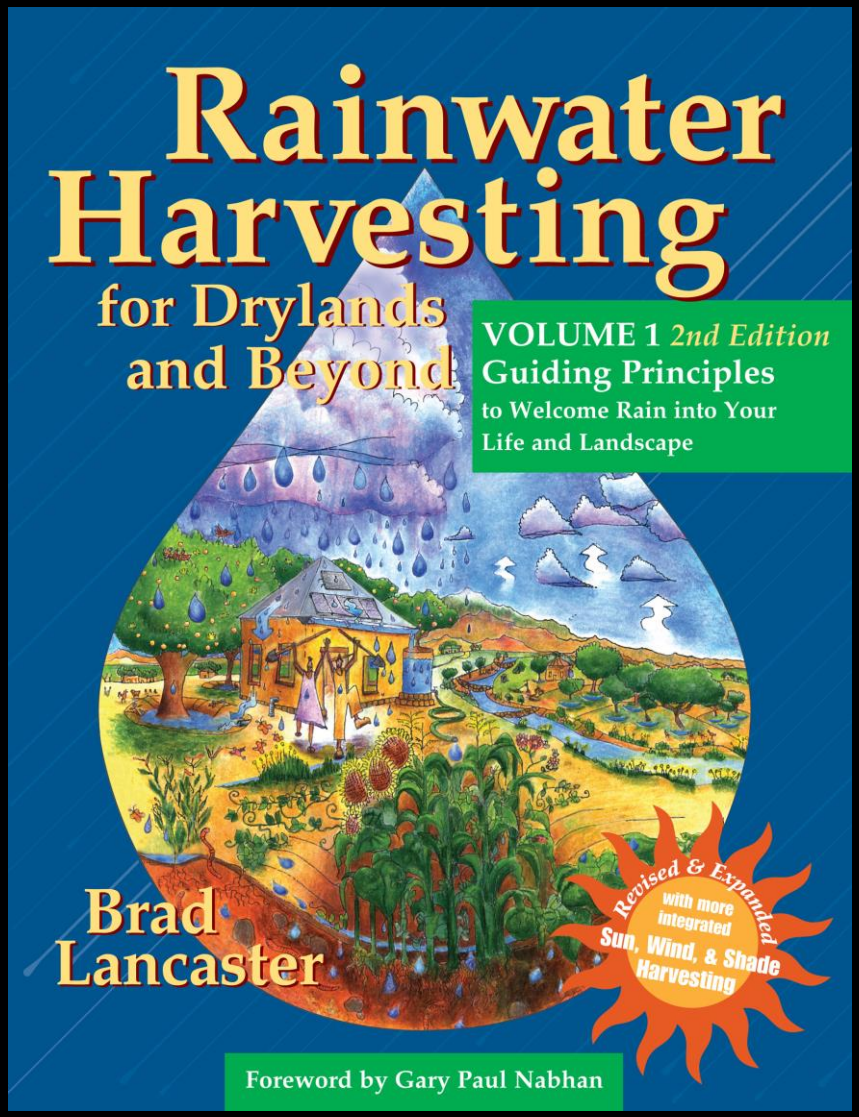
Key elevation relationships of earthworks

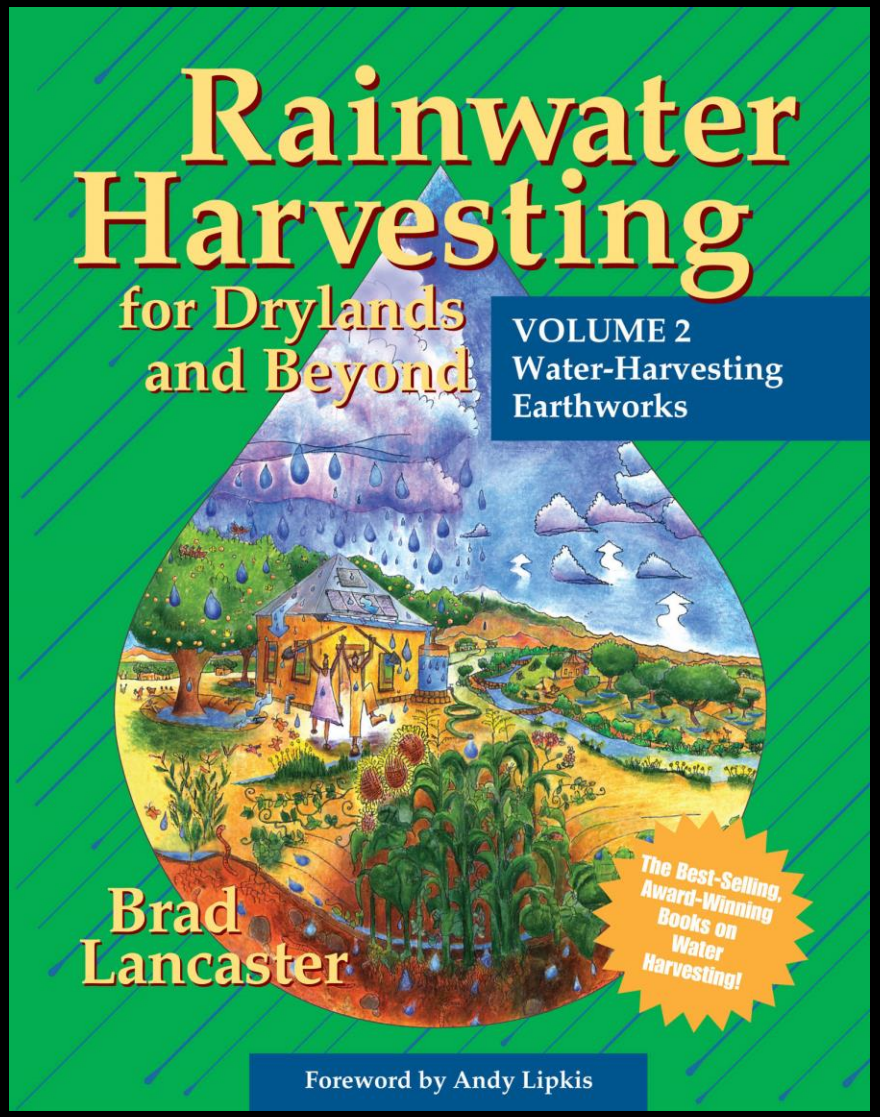
1. Bottom of earthwork to top of overflow spillway
2. Top of overflow spillway to top of earthwork
3. Top of earthwork to precious things






House wall
4 to 6 inches (10 to 15 cm)
Stem wall
Soil



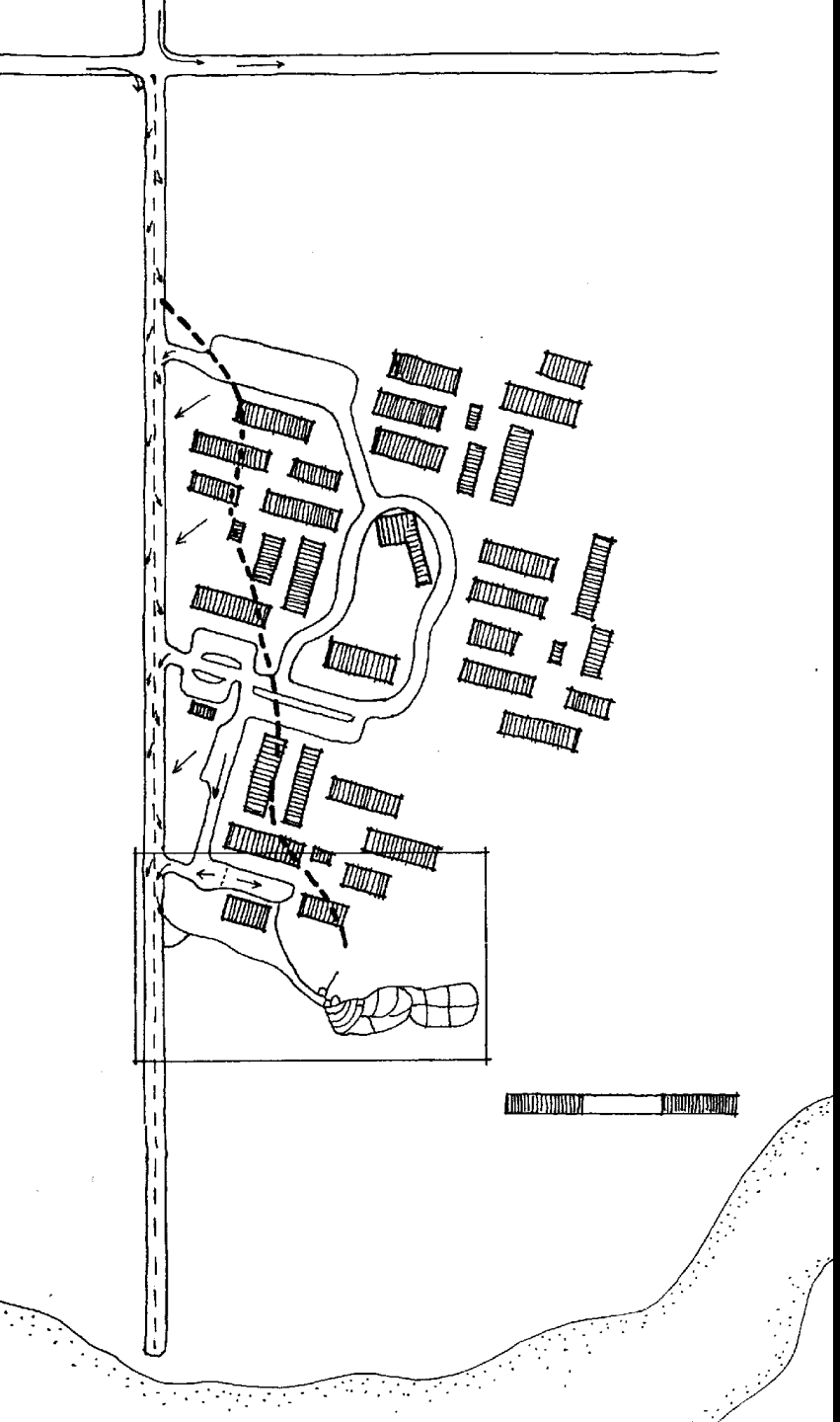


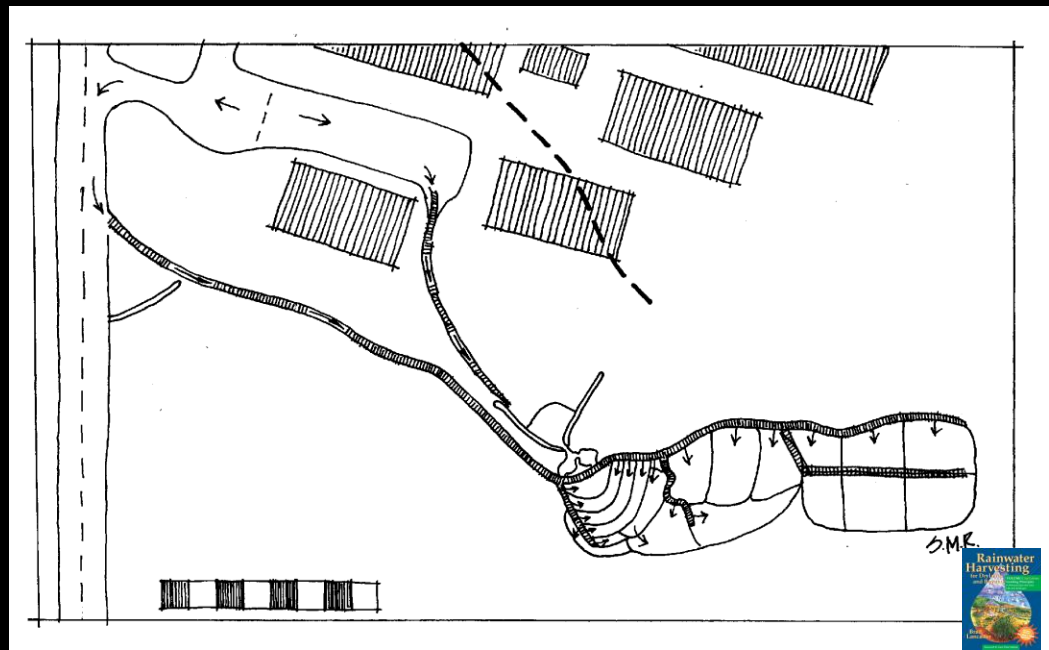
www.HarvestingRainwater.com

Russ Buhrow, Columbus Blvd runoff farm, Tucson, AZ

Average annual precipitation 12 inches (305 mm)

see Drop in a Bucket Blog at www.HarvestingRainwater.com for full story



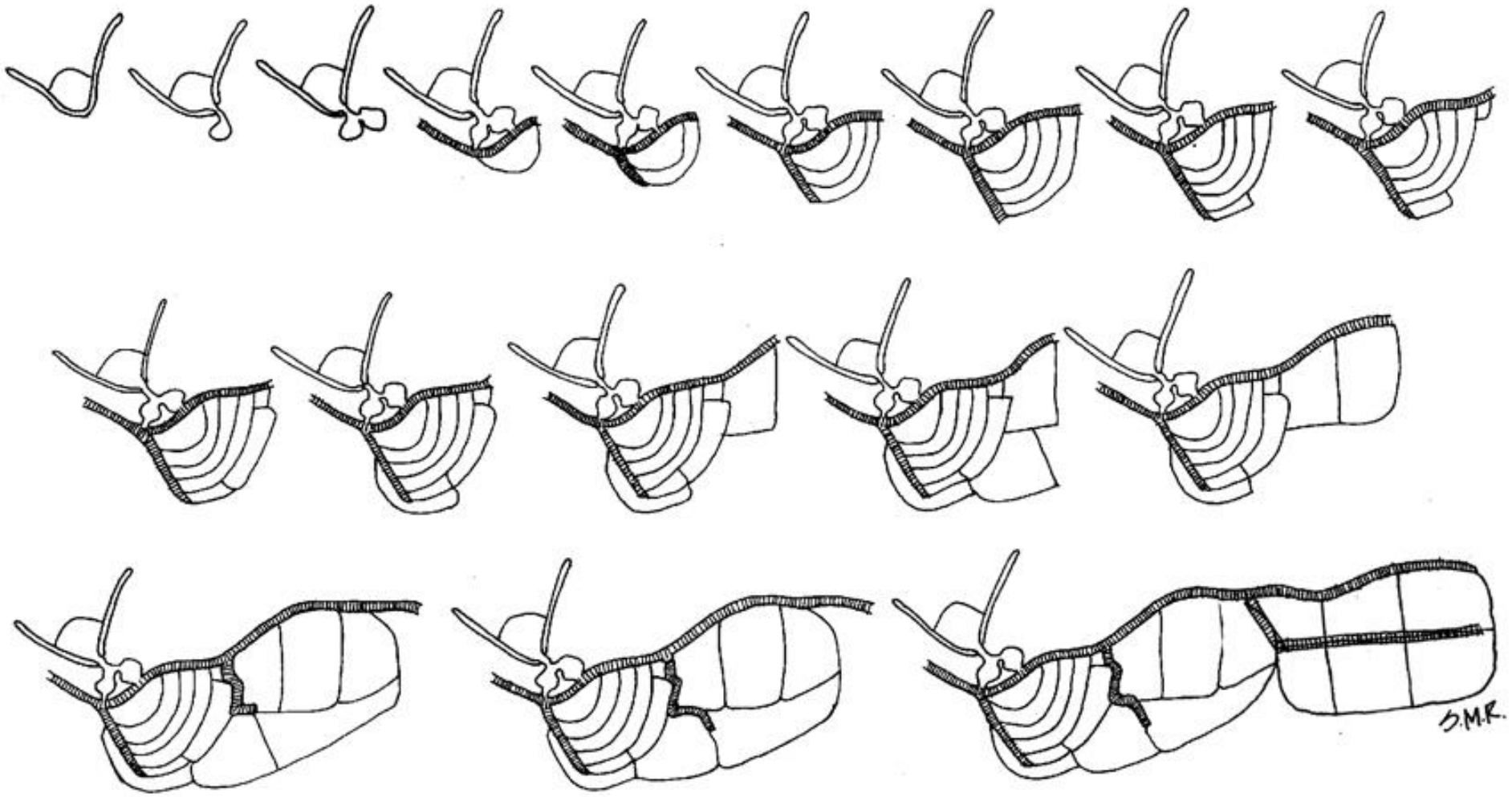

S.M.R.

Rainwater
Harvesting

Spring plantings spaced further apart than summer plantings, to survive on residual soil moisture until the summer monsoons.

Tepary beans planted in groups of 5 seed, each group 4 feet (1.2 m) apart.

Squash seeds planted in clumps of three seeds, clumps spaced 8 feet (2.4 m) apart, or just 4 feet (1.2 m) apart if planted late in the growing season, since they wouldn't get as big before frost hit).


S.M.R.

Once in 5 years crops failed, but in a good year 2 tons of squash, 1 ton of calabacitas, and 17,000 devils claw were harvested

Vertical mulching

In semi-arid India vertical mulch of sorghum stubble
in trenches 12 inches (30 cm) deep and 6.5 feet (2 m) apart
produced 25 times more grain yield and *2 times more straw yield*
than the areas without vertical mulches in a very dry year

- David Cleveland and Daniela Soleri, Food from Dryland Gardens (Tucson, AZ: Center for People, Food, and Environment, 1991)