

Recharging Groundwater with Vegetation



SOLANO
Resource
Conservation
District

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On-farm options for groundwater recharge:

- Winter flooding
- Detention basins
- Maximized vegetative cover

Vegetation offers a relatively low-cost way to keep storm water where it lands, attenuate downstream flooding, and recharge local aquifers



Nature (1997) 388: 517-518

Vegetation options:

- Cover crops
- Tree/shrub hedgerows
- Tree/shrub end caps
- Grassed swales, ditches, detention basins, roads
- Riparian buffer strips



What do we want in our vegetative cover to maximize infiltration?

Lots of
leaf/stem
surface area

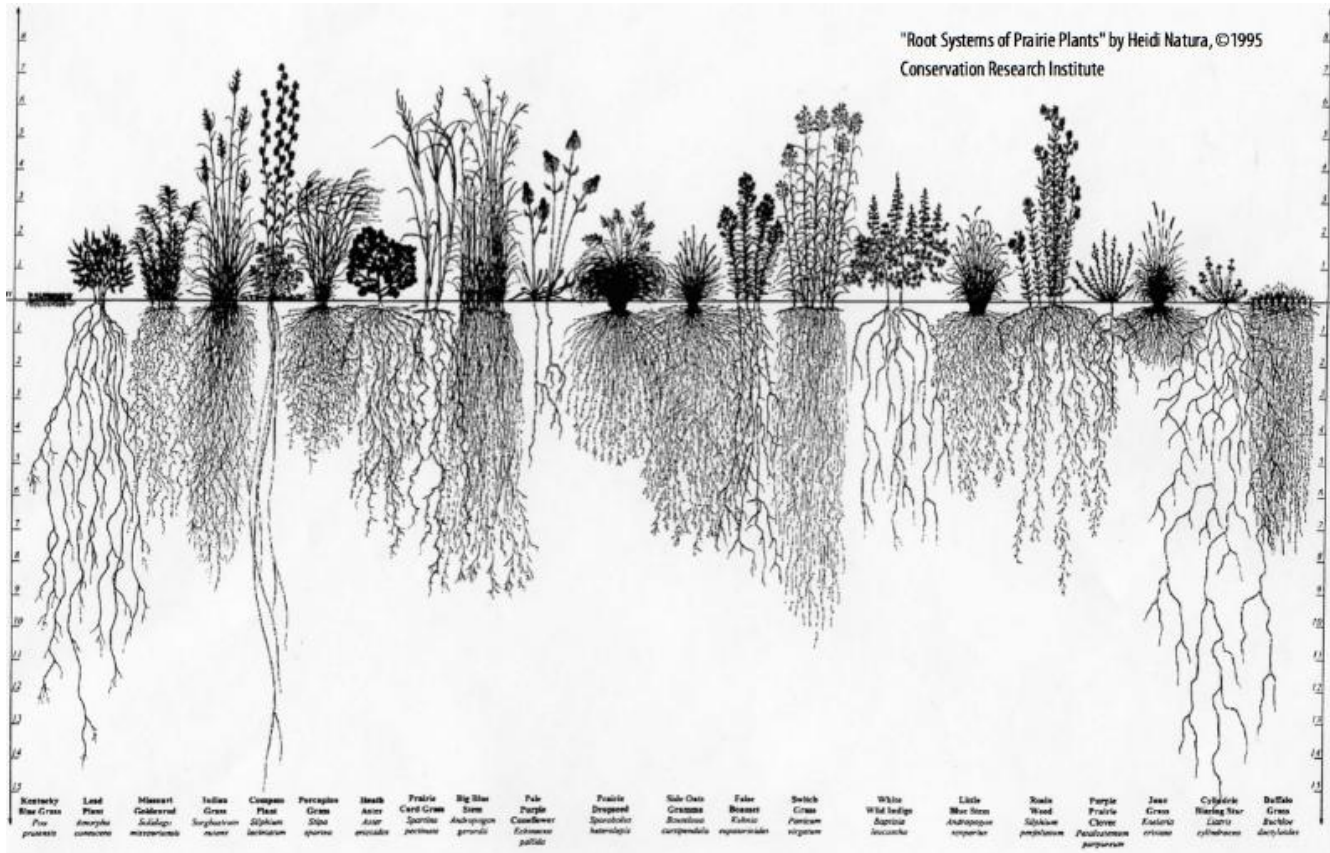


Lots of root
surface area

Deep roots

Probably we also want:

- A heterogeneous above-ground canopy
- A heterogeneous below-ground root structure



Benefits of a well-vegetated landscape:

- Surface runoff is decreased (reduced flooding and sediment input to downstream areas)
- Pollutants are filtered by the soil (they mostly feed microbes)
 - Highly soluble pollutants, like nitrate, can definitely move into the groundwater when we increase infiltration rates.
 - This means it is especially important to enter the storm season without excess N in the soil!



There are lots of co-benefits as well!

- Habitat for wildlife and pollinators
- Increased carbon sequestration
- Increased soil organic matter over time
- Shade



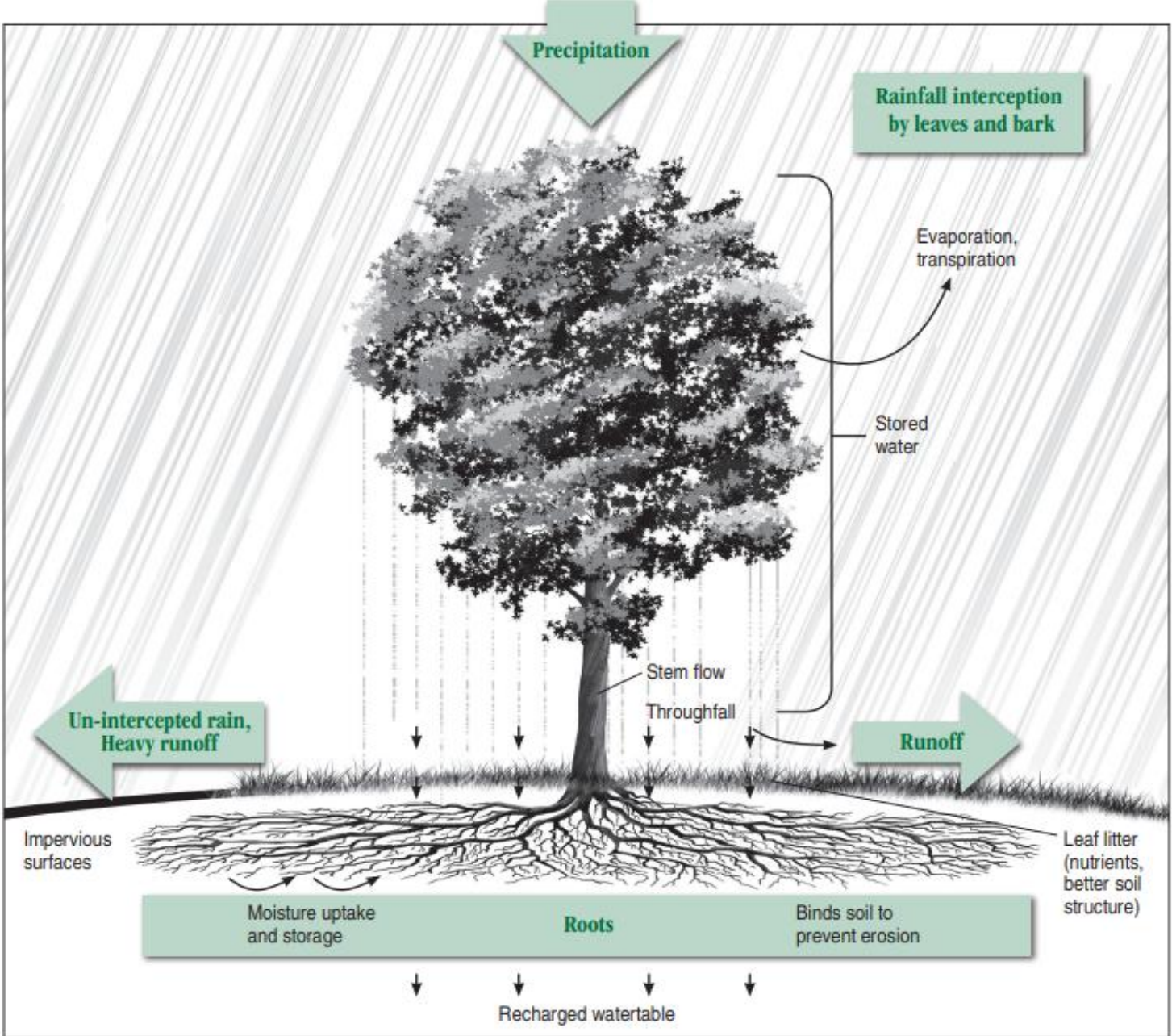
A word on trees:



- Can occupy farm edges, non-arable land, roadsides
- Create tremendous networks of sub-surface channels to improve soil water infiltration and groundwater recharge
- Pull CO₂ out of the air while so doing

Important Ways a Tree Helps with Stormwater Management

- 1. Intercept rain drops
- 2. Create a porous soil
- 3. Tap roots send water straight to the groundwater



The Rational Method for estimating runoff thinks trees are pretty effective at improving infiltration...

Table 3-2. Runoff Coefficient for 10-Year Return Frequency^(a)

Land Use	C ^(b)
Residential	
Apartments/condominiums	0.50 to 0.70
Single family (6 - 8 units per acre)	0.50 to 0.60
Single family (4 - 6 units per acre)	0.40 to 0.50
Single family (2 - 4 units per acre)	0.30 to 0.40
Single family (1 - 2 units per acre)	0.25 to 0.35
Commercial	
Downtown	0.70 to 0.95
Neighborhood	0.50 to 0.70
Industrial	
Light	0.50 to 0.80
Heavy	0.60 to 0.90
Parks, cemeteries	0.10 to 0.25
Playgrounds	0.20 to 0.35
Railroad yard	0.20 to 0.35
Unimproved urban areas	0.10 to 0.30
Agricultural/Open Space	
Cultivated	0.20 to 0.50
Pasture	0.15 to 0.45
Oak Timber & Brush	0.10 to 0.40
Surface Types	
Asphaltic and Concrete	0.70 to 0.95
Brick	0.70 to 0.85
Roofs	0.75 to 0.95
Lawns	0.15 to 0.35

From Hydrology Manual, Solano County Water Agency (1999)



All these non-crop plants also take up water from the rhizosphere! This is helpful in the winter, but potentially harmful in the growing season.

So some ideal situations would be....

- Some deeply rooted trees to help winter water infiltrate as deeply as possible
- CA native grasses that go dormant in the dry summer
- Big beefy winter annual cover crops (bell beans, triticale, etc.) that do a lot of growth during the storm season and then are terminated in the spring
 - They leave extensive root channels and a surface mulch



LeBallister Seed Co.

CALIFORNIA

Plant Rooting Depth Database



GSA pilot project ideas

- Cover cropped furrows on winter fallow fields
- Detention basins?
- Vegetated ditches, swales, roads?
- Native tree/shrub plantings?

How can we help?



- Hedgerows, riparian corridors, cover crops, vegetated ditches, etc.
- Irrigation evaluations, pump tests, water conservation
- Work closely with USDA-NRCS and the Healthy Soils/SWEEP programs
- Working with the GSA to pilot some BMPs for recharge

Get in touch if you have room for more vegetation on your farm and want to talk about possibilities!

We can work with you to plan projects and find funds to implement them!

To chat about water or dirt or plants, any time!

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