Use of yardwaste composts to improve revegetation growth on drastically disturbed substrates

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Compost utilization for improved revegetation growth:

1. **improved surface protection (mulches)**
2. **improved infiltration (design storm event)**
3. **improved water holding capacity (coarse soils)**
4. **improved microbial activity (aggregates)**
5. **improved plant nitrogen availability (long term)**
6. **improved plant nutrients (content and rooting)**
7. **improved rooting and microbial activity (magic?)**

In general, improved plant growth!

In general, improved plant growth, BUT....

there is a potential for:

1. **salt, mulch effects (mulch effect, slight rains)**
2. **less mineral soil contact (moderate rains)**
3. **N loss to watershed**
   (short term cold flush; long term insuff pl growth)
4. **weed invasion**
   (short term, excess N; long term insuff moisture)
5. **short term N depletions (common)**

Soil Resource Evaluation (Caltrans project)

SRE STEP:

1. **reference site monitoring**
2. **infiltration**
3. **plant available water**
4. **soil organic matter (carbon and nitrogen)**
5. **non-N nutrients**
6. **site appropriate plants and microbes**
7. **monitoring and response triggers**

Soil Resource Evaluation

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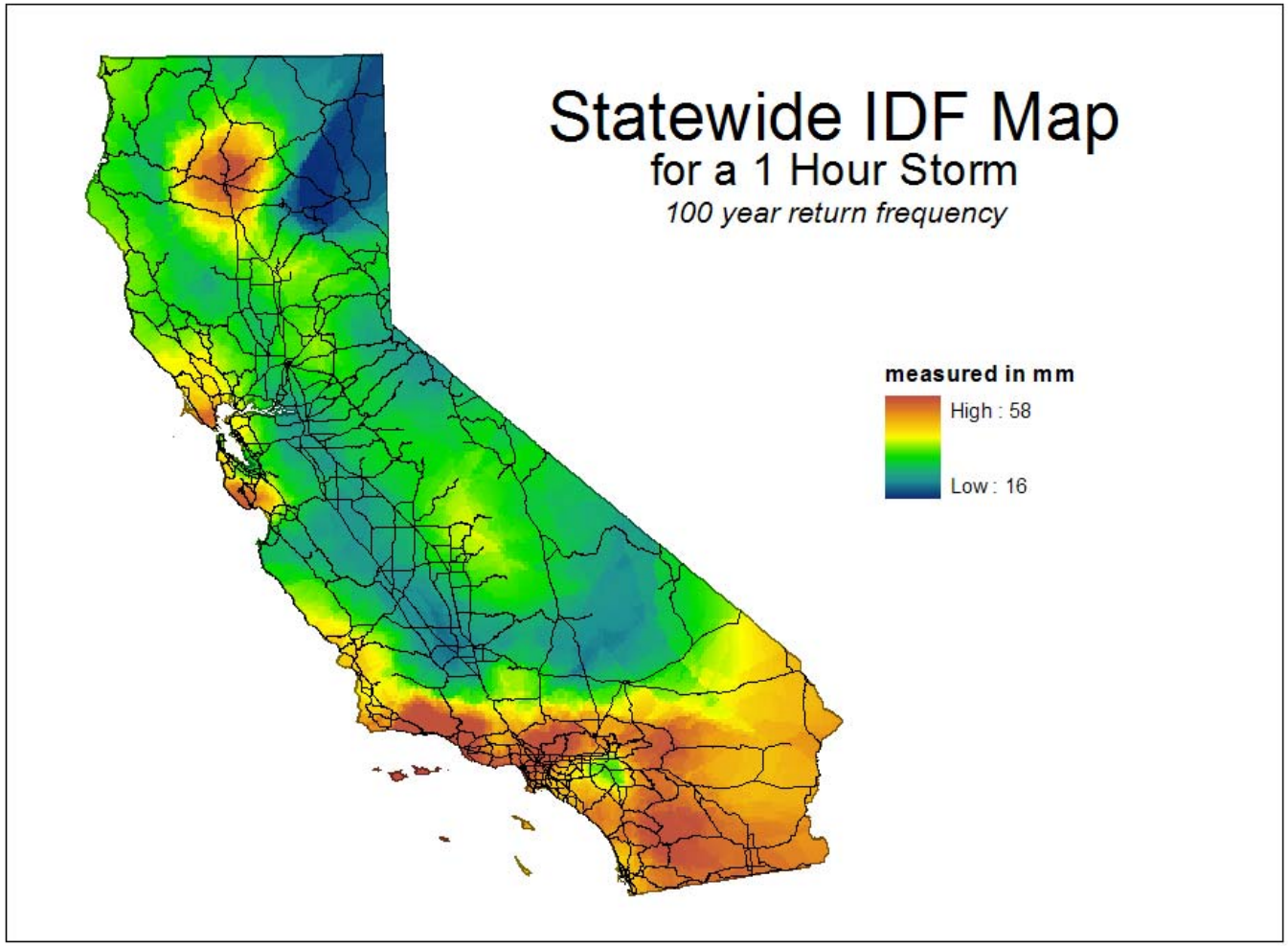
What does compost have to do with any of these?

SRE Step 2. Infiltration

+ natural soils generally have high infiltration
+ degraded soils generally have low infiltration
+ low infiltration generates overland flow, sediment
+ compost can increase infiltration
+ infiltration capacity involves rate of infiltration
  as well as amount of infiltration

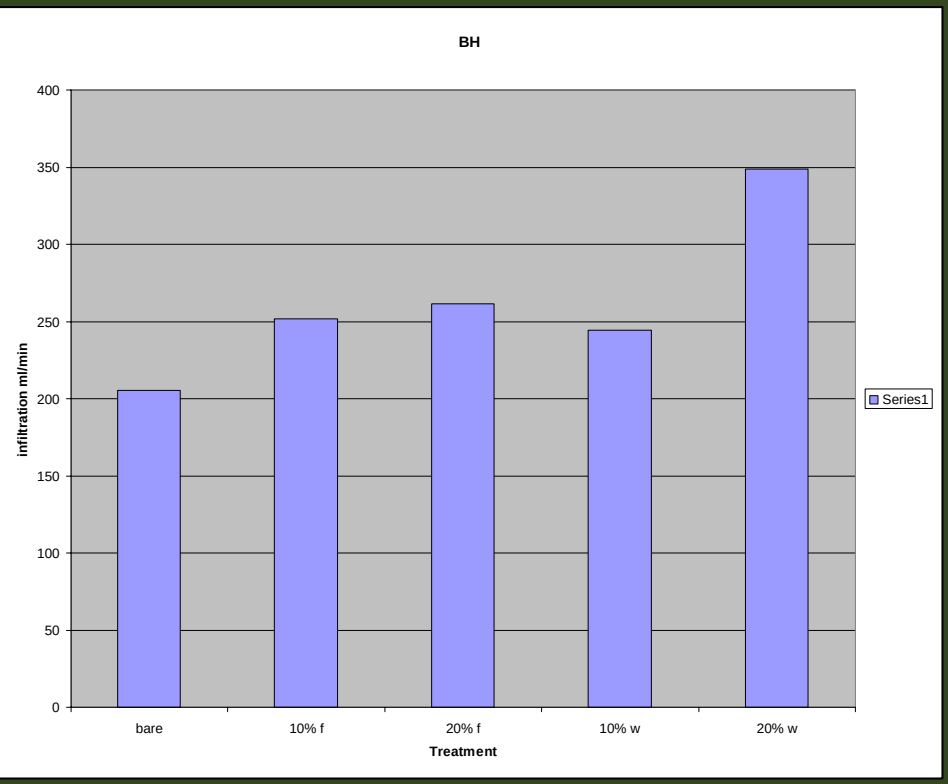
Rainfall must infiltrate to avoid surface erosion and:

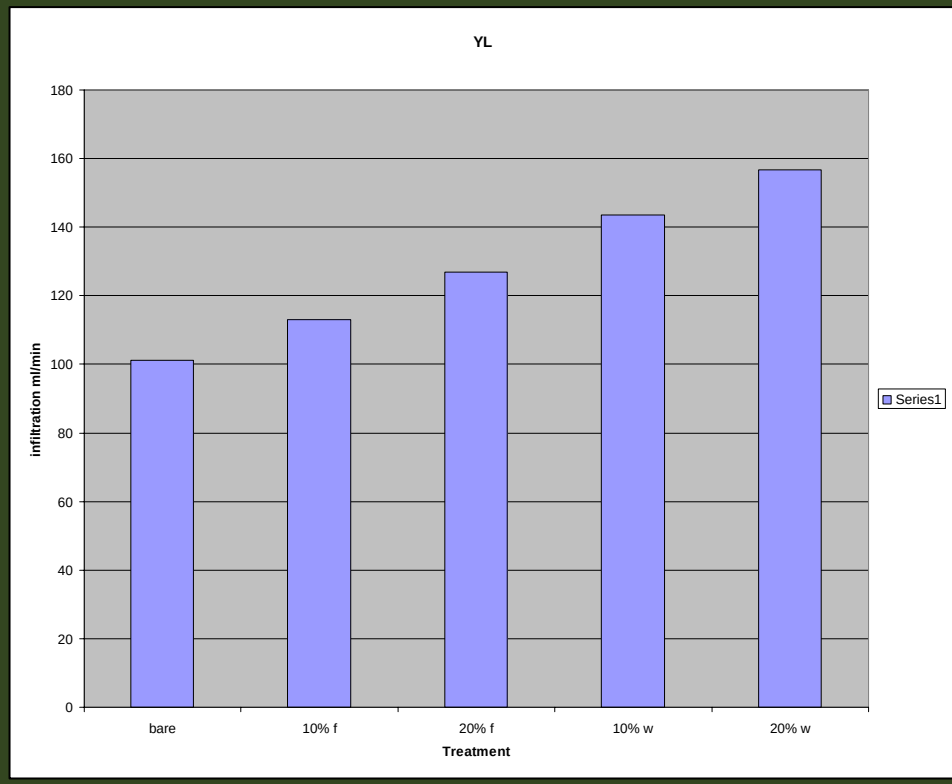
1. loss of moisture
2. loss of mulch cover
3. loss of nutrient-rich duff
4. increase in sediment



coarse DG

silt loam soil





bare fine coarse bare fine coarse

yard waste compost fractions

Short term infiltration: rip and incorporate organics

SRE Step 3. Plant available water

+ plants generally need no irrigation
  with adequate rooting volume
+ rooting depths should reach ± 1 m (3 to 4 feet)
+ soil available water contents < 10 %
  can generally be improved with compost
+ excess soil water needs to be percolated safely

How much moisture is required?

moisture demand for summer growth
(general estimates and literature values)

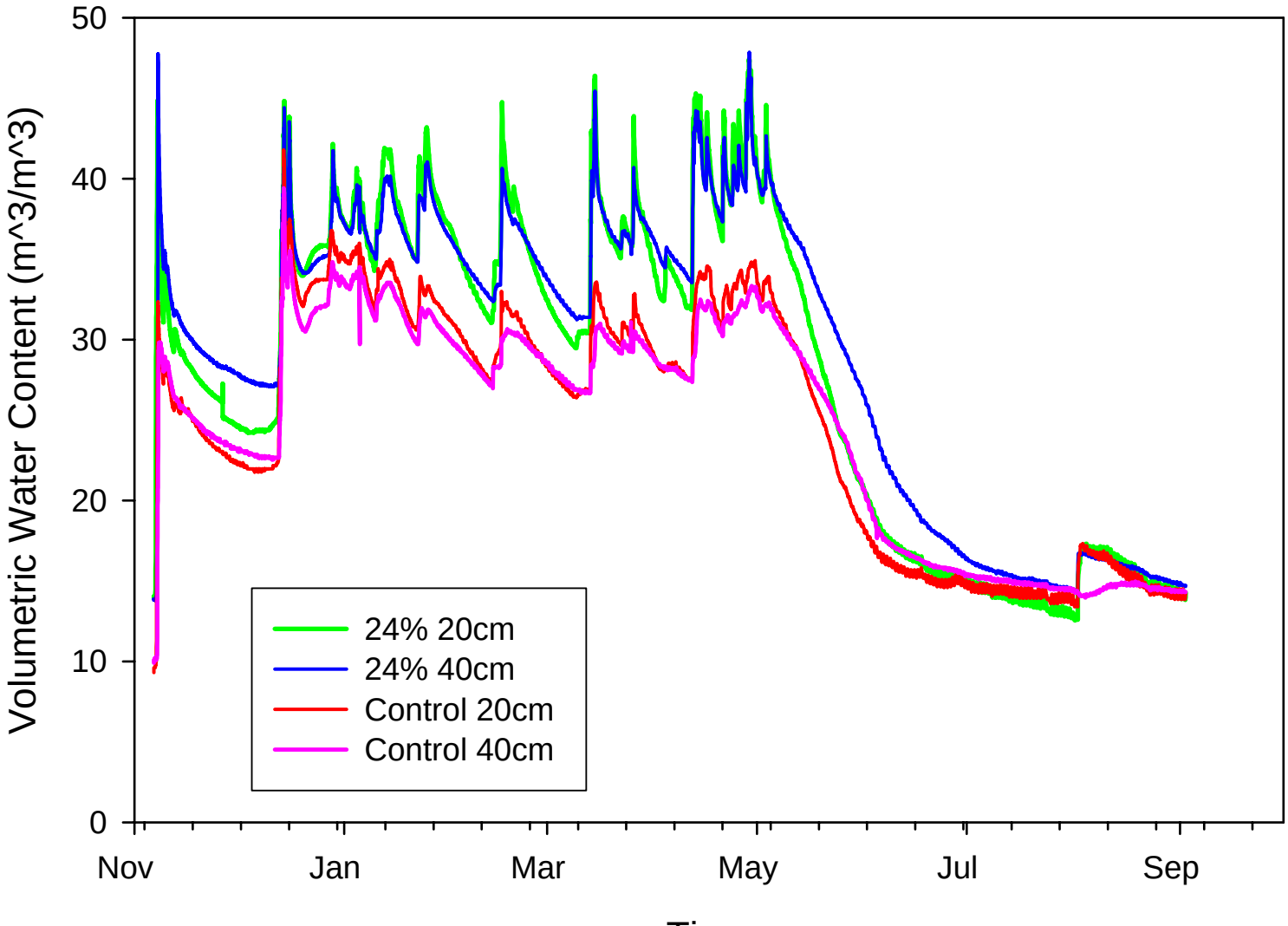
plant water requirement for summer season	**annuals**	**30 - 40 mm**
	perennial grasses	**100 - 200**
	shrubs	**200 - 400**
	trees	**400 +**

But, what is the actual field use of water through the summer?

Estimate plant water use by soil water depletion

Change in volumetric water content of control and amended plots (two depths) at Buckhorn Summit (DG soil) during the first year after construction

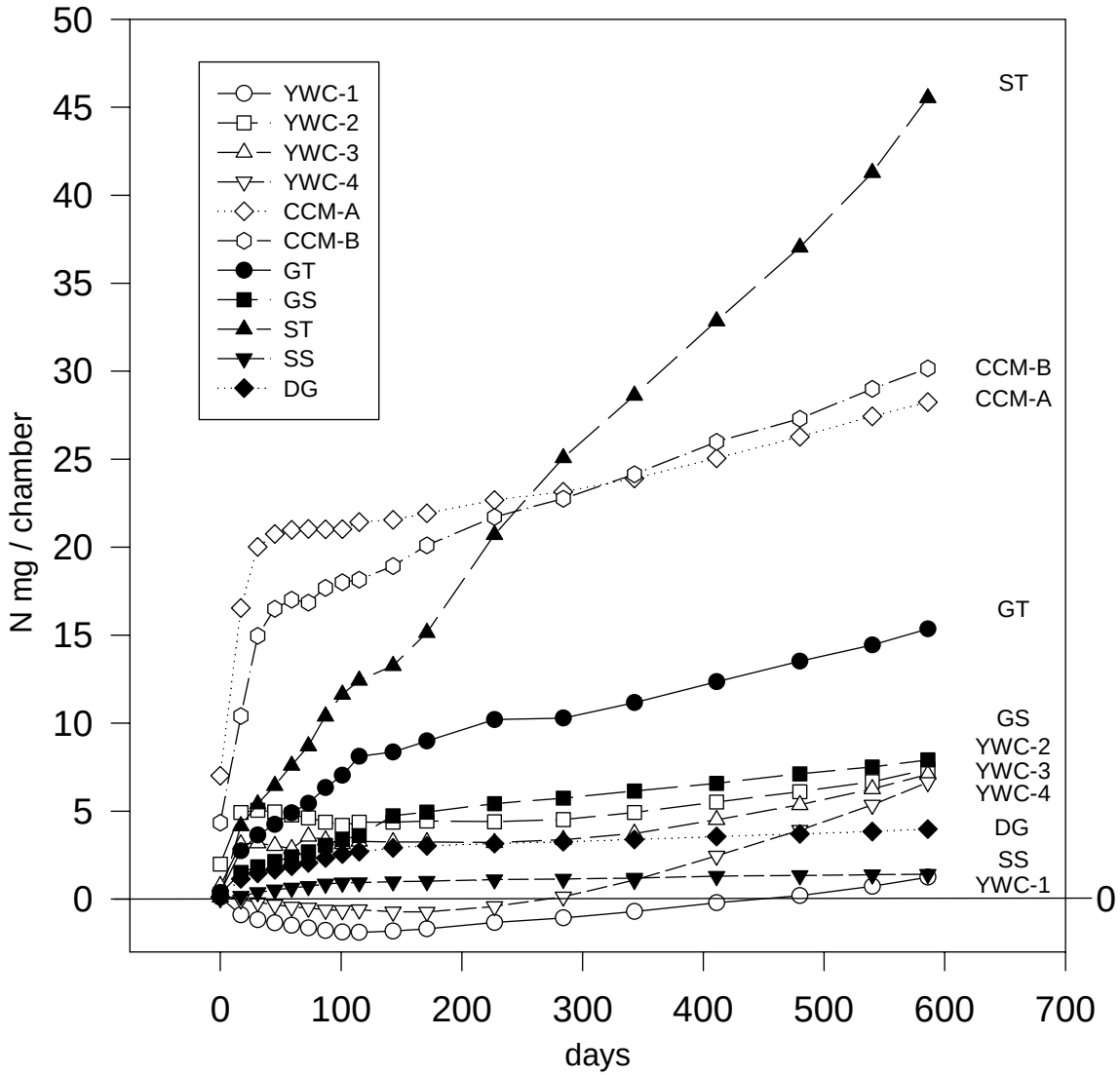
Values determined using TDR probes. Each line represents the average of four replicate plots



SRE Step 4. Soil organic matter (carbon and nitrogen)

+ degraded soils are often dispersed and compacted
+ composts add pore structure for infiltration
+ composts add in decomposable carbon
+ composts can add in mineralizable nitrogen

+ composts are a short term (3 to 5 year) substitute for soil organic matter


YWC-1
YWC-2
YWC-3
YWC-4
CCM-A
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CCM-B
CCM-A
GT
GS
YWC-2
YWC-3
YWC-4
DG
SS
YWC-1
0

Yardwaste compost application:
(generic recommendation)

20 to 50 mm layer, tilled to 300 mm,
with ± 1 m rooting depth
and 50 mm mulch of coarse wood shreds

1 to 2 inche layer, tilled to 1 foot,
with about 3 feet of rooting depth
and a 2 inch mulch of coarse wood shreds

if the compost is little cured, add slow release N
if the compost is very well cured, add no N

SRE Step 5. non-N nutrients

+ P, K, S, Ca, Mg, micros, CEC, pH, EC

+ composts from plant materials have nutrients similar to plant materials

SRE Step 6. site appropriate plants or microbes

+ sites may require specific biological materials

+ compost amended sites appear to transition back to natural microbial populations

SRE Step 7. Site monitoring and response

Observed Effect	Potential Response
off-site sediment production	increase infiltration, then consider mulches
soil compacted, hardsetting	increase soil organics
low perennial plant cover	increase water, rooting depth increase long term N
N loss off-site	incorporate organics, increase infiltration, seed

Field site implementation:

Decomposed granites
SHA 299 0.01 (25 mi west of Redding)
1.5:1 south facing slope
200 – 300 cu yd sediment / year

Field site construction: compost in DG