

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

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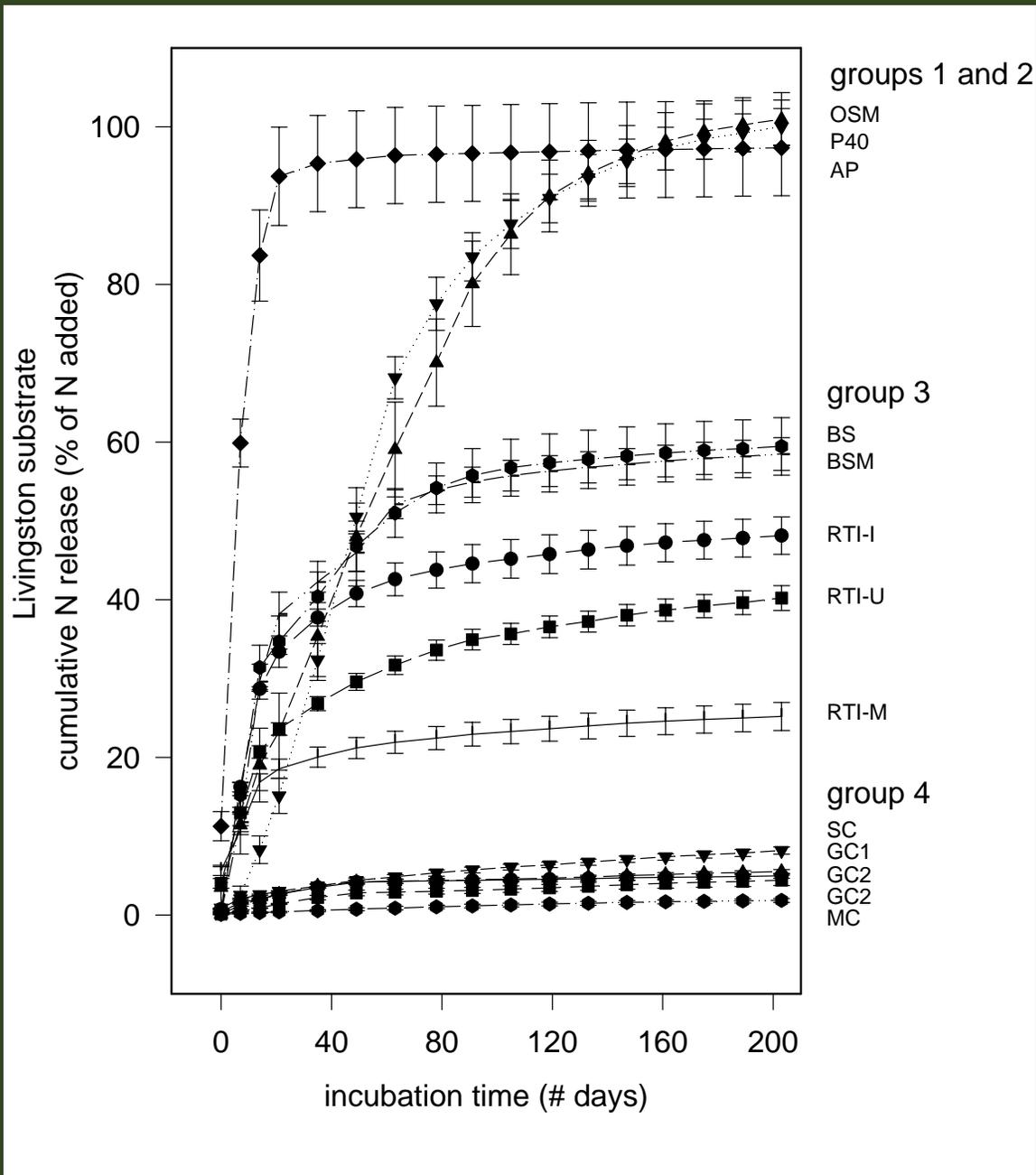
Compost amendment can improve revegetation through:

- + surface protection (insulating mulches)
- + infiltration (imbibe storm water)
- + water holding capacity (esp coarse soils)
- + microbial activity (aggregates; cohesion)
- + plant available nitrogen (short and long term)
- + plant nutrients (content plus rooting)
- + rooting and microbial activity (magic?)

In general, composts improve plant growth, BUT....

there is a potential for:

- 1. shade effects (mulch too thick)**
- 2. salt effects (heavy application, slight rains)**
- 3. insufficient root/soil contact (heavy load, low rains)**
- 4. weed invasion (excess N or long term deficiency)**
- 5. short term N depletions (common)**
- 6. N leaching loss to watershed
(short term cold flush; long term insuff pl growth)**



Soil Resource Evaluation (Caltrans)

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**

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what does compost have to do with any of this?

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**



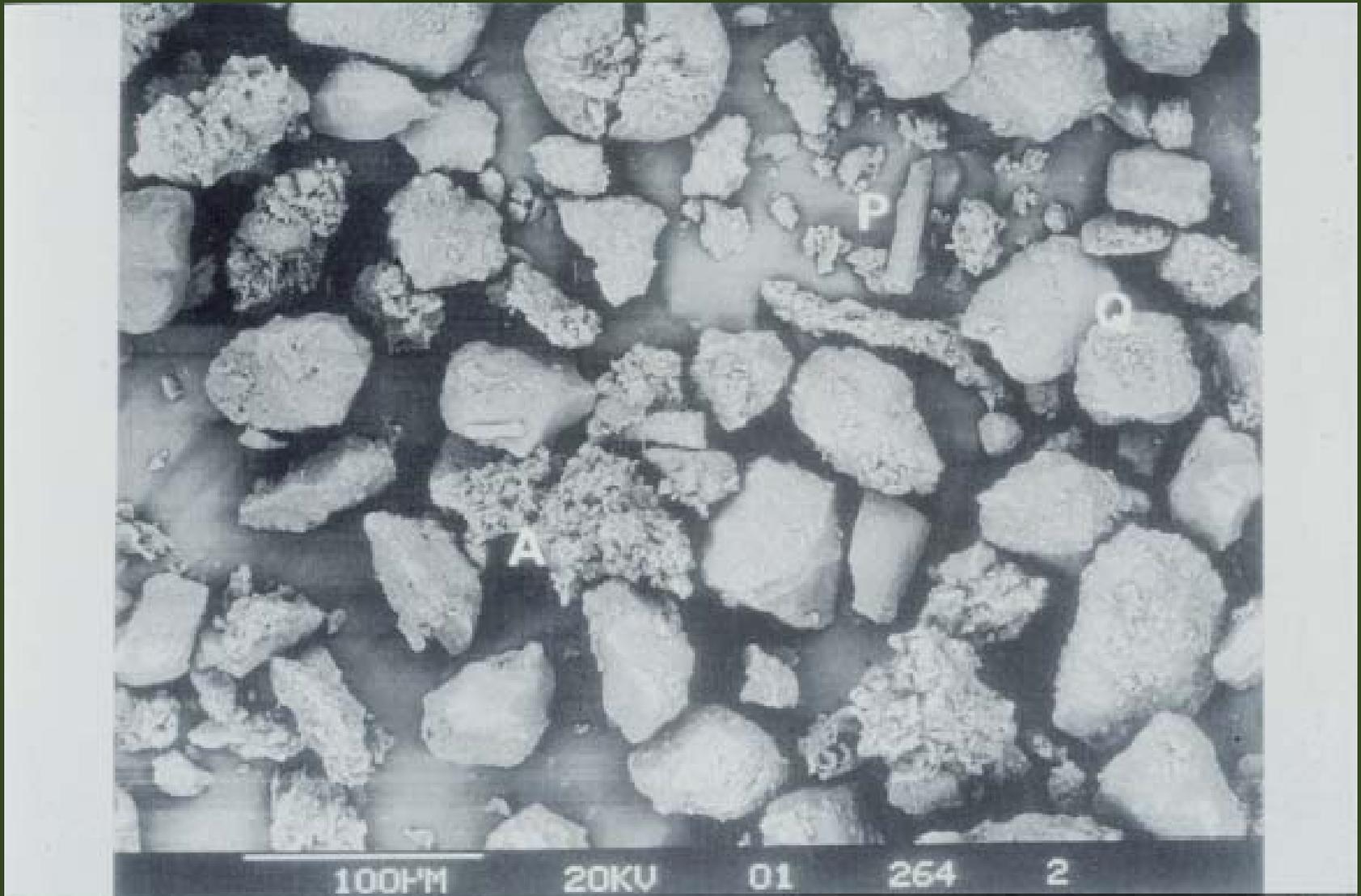












Water stable agg. vs organic coating and open packing

How much infiltration is needed?

+ enough to avoid:

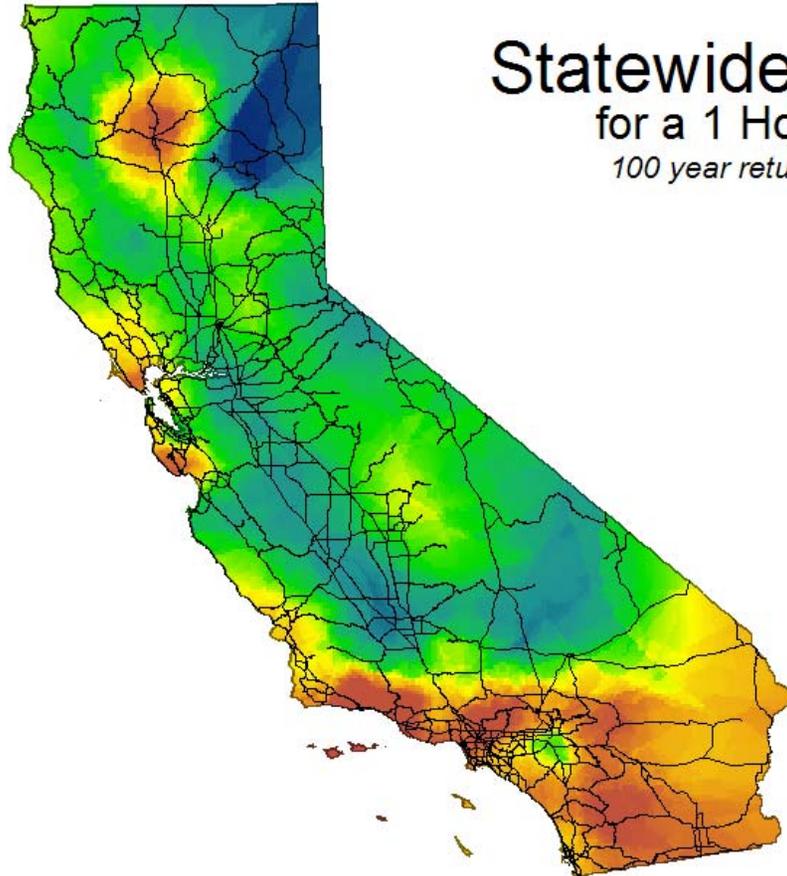
1. loss of moisture
2. loss of nutrient-rich duff
3. loss of mulch cover
4. export of sediment off site

How much infiltration is needed?

+ depends on:

1. soil texture
2. soil structure
3. design storm events

Statewide IDF Map for a 1 Hour Storm *100 year return frequency*



measured in mm



**SHA 299 0.06 Buckhorn Summit
35 km west of Redding, CA
decomposed granite substrates**



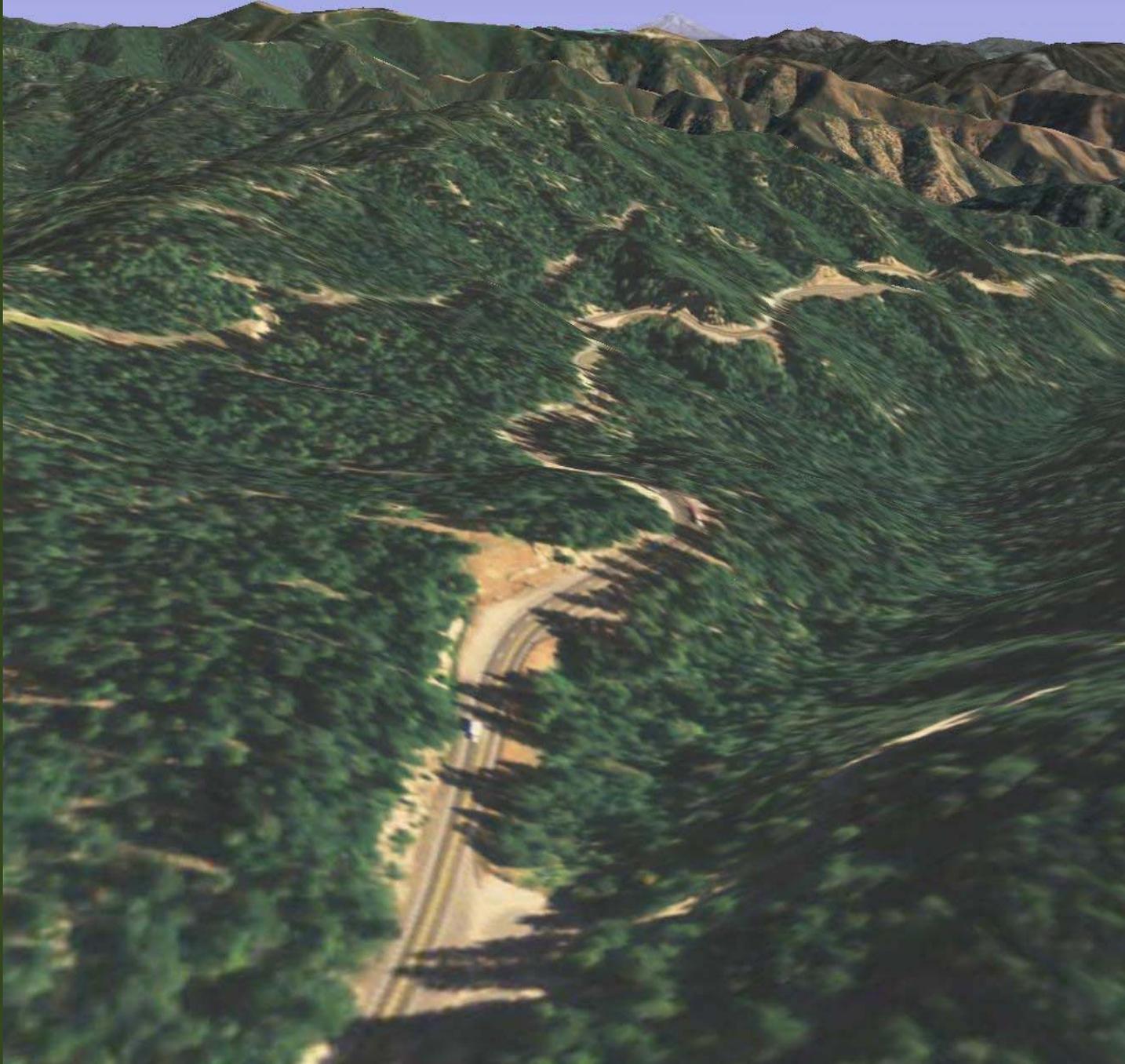


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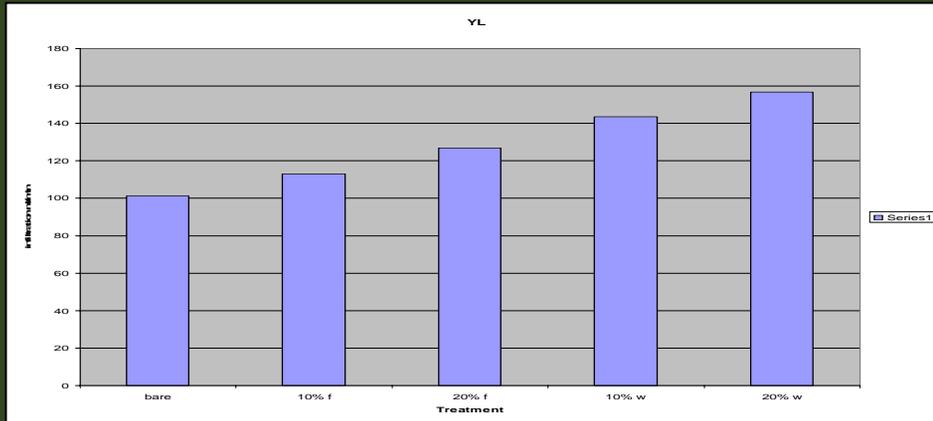
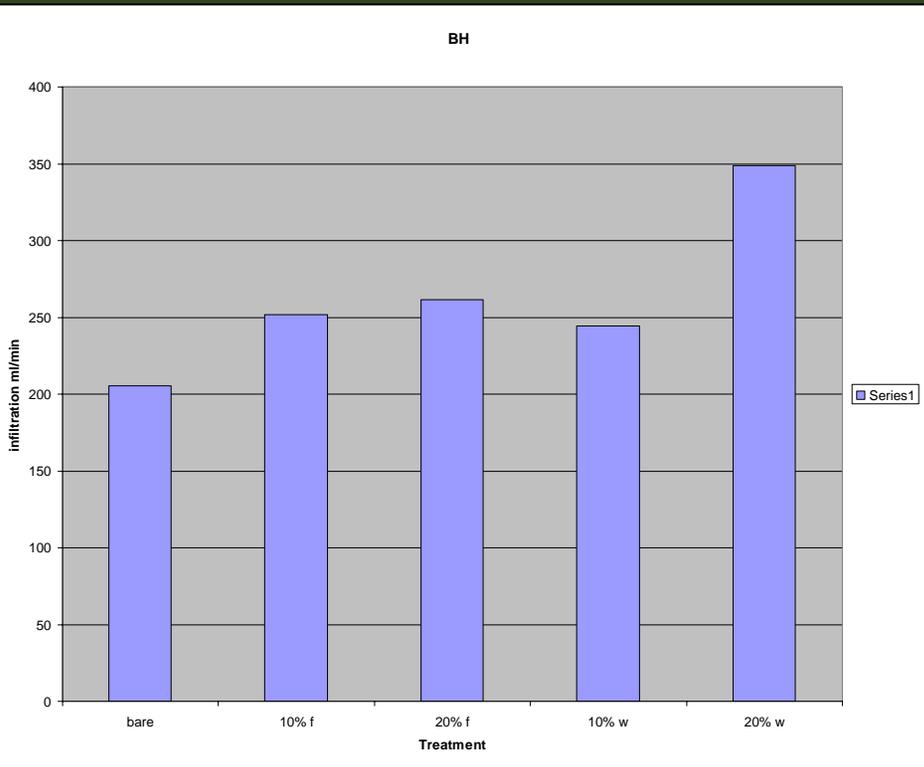




How much to add to attain target infiltration?

coarse DG

fine silt loam soil



bare fine coarse bare fine coarse
yard waste compost fractions

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SRE Step 3. Plant available water

- + native plants generally need no irrigation if they have 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?

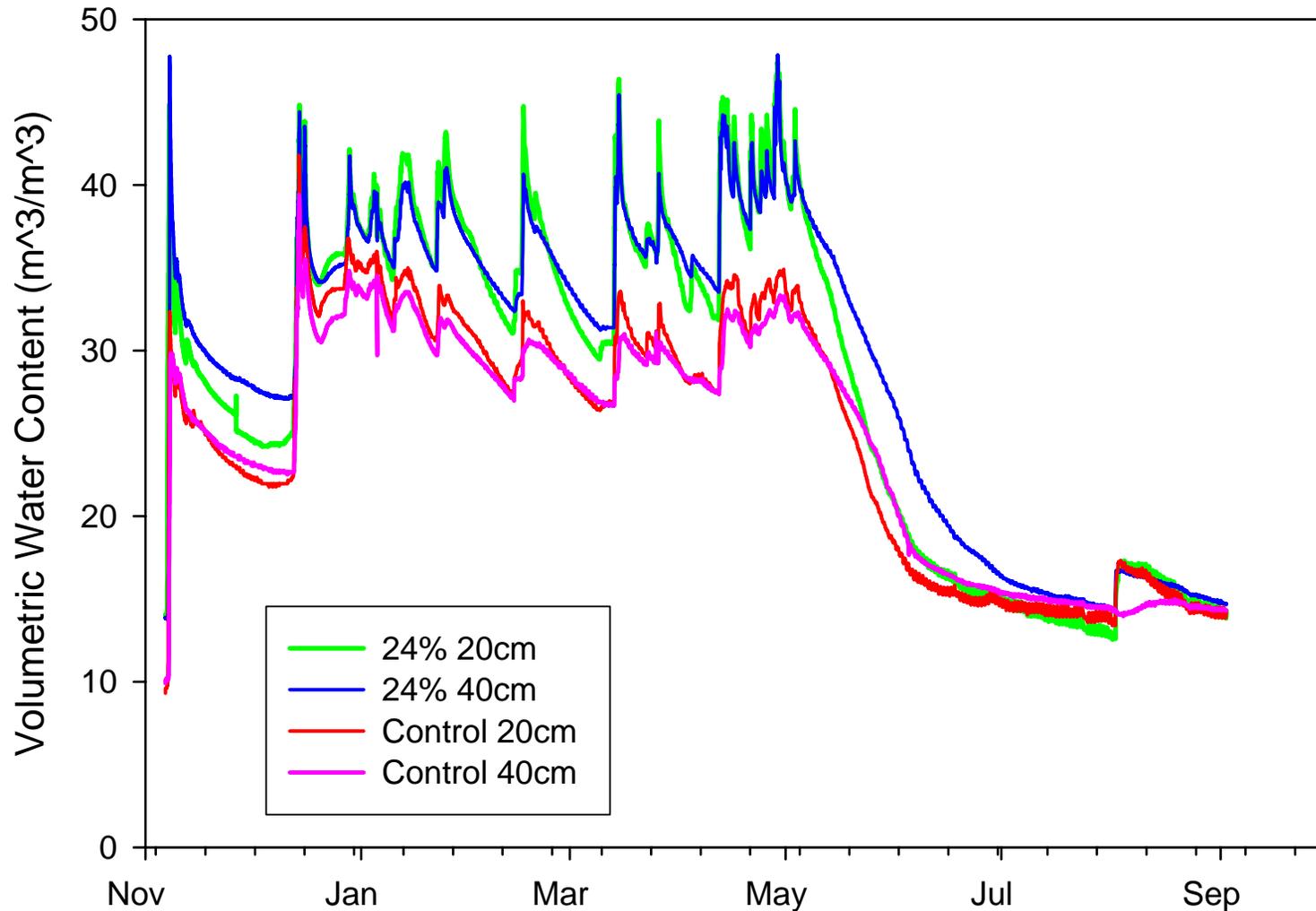


Estimate plant water use by soil water depletion



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







Increased available water will help close this canopy



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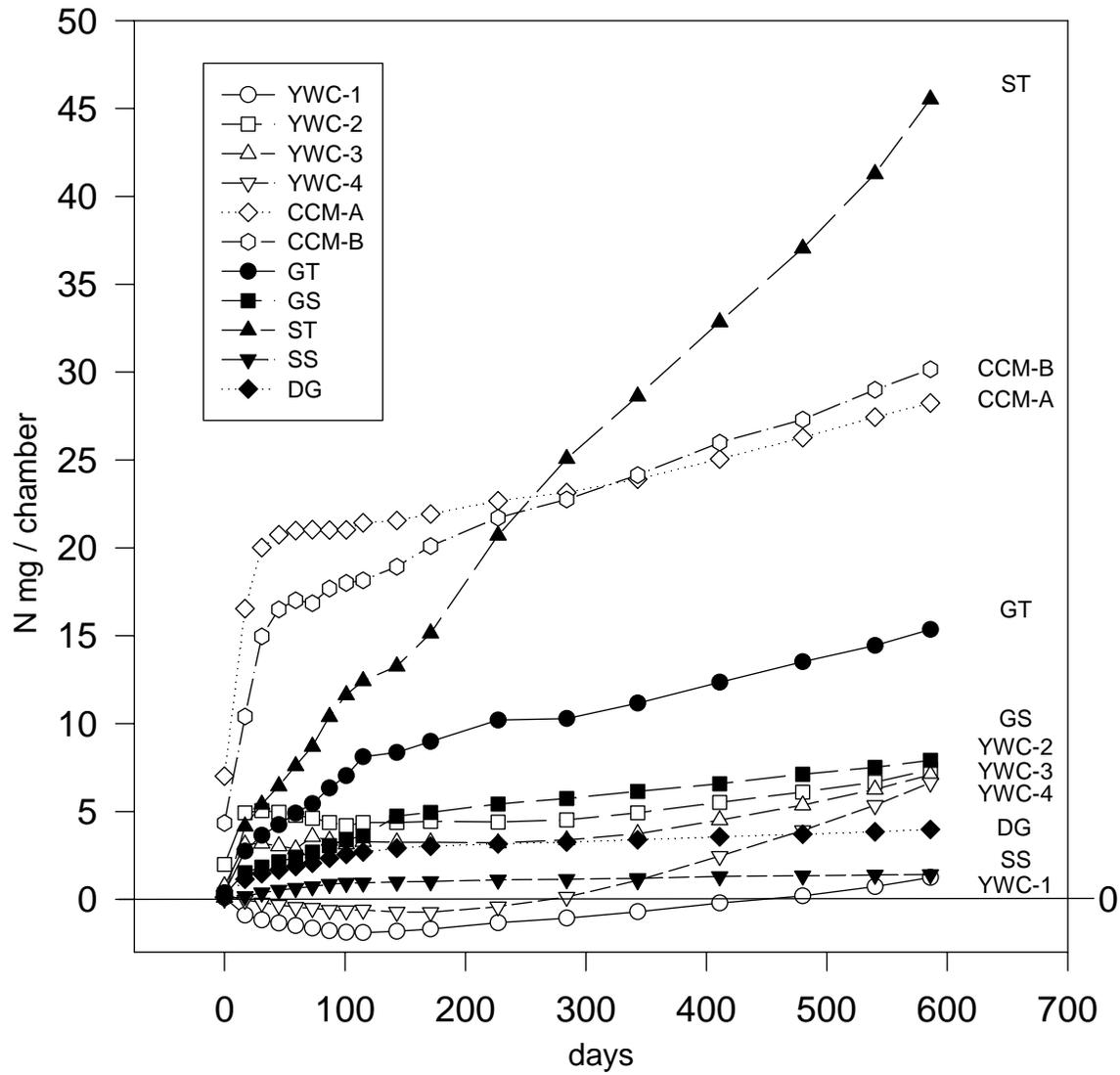
SRE Step 4. Soil organic matter (carbon and nitrogen)

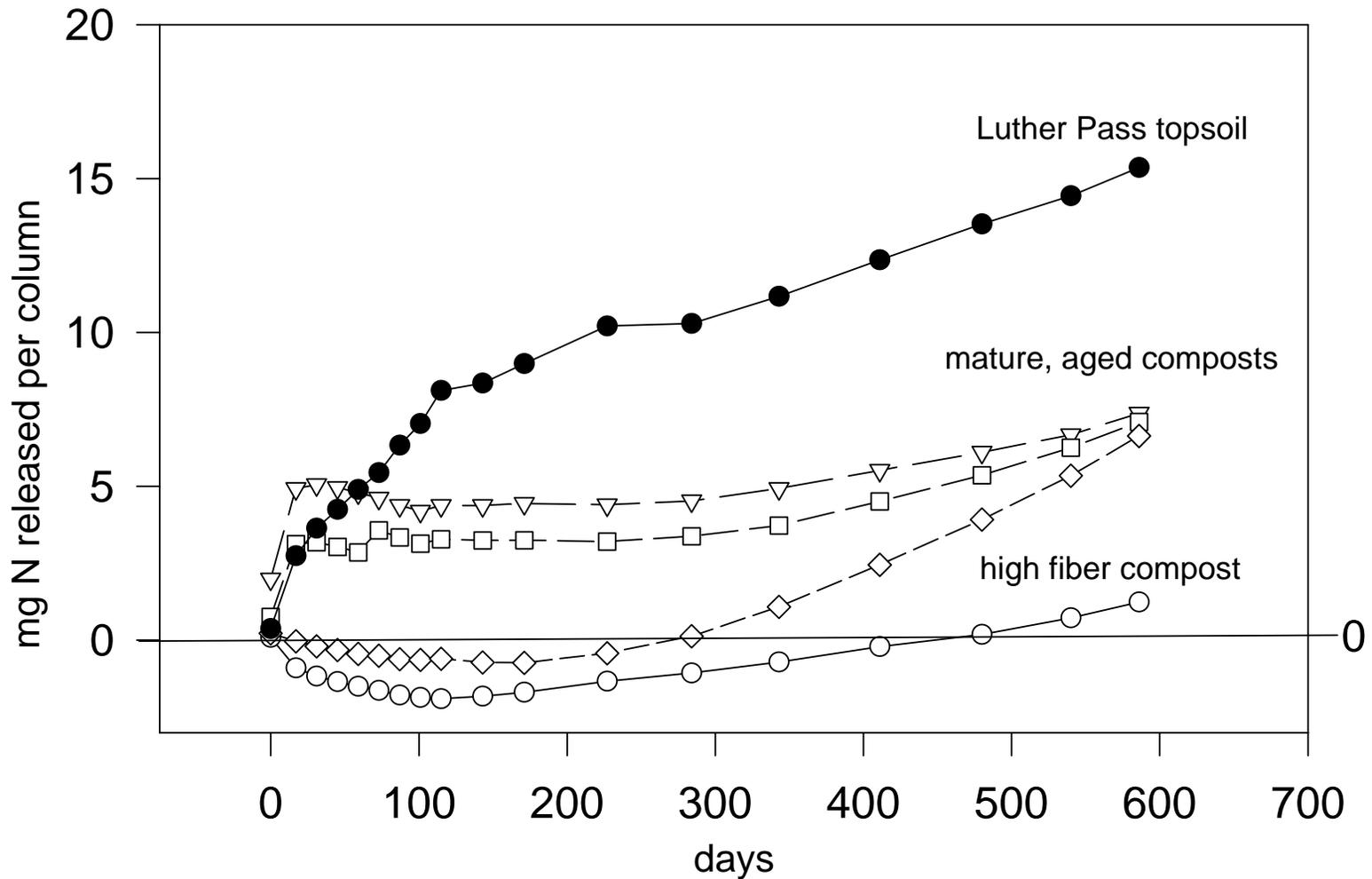
- + degraded soils are often dispersed and compacted**
- + composts add pore structure for infiltration**
- + composts add in decomposable carbon**
- + composts can add in mineralizable nitrogen**

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

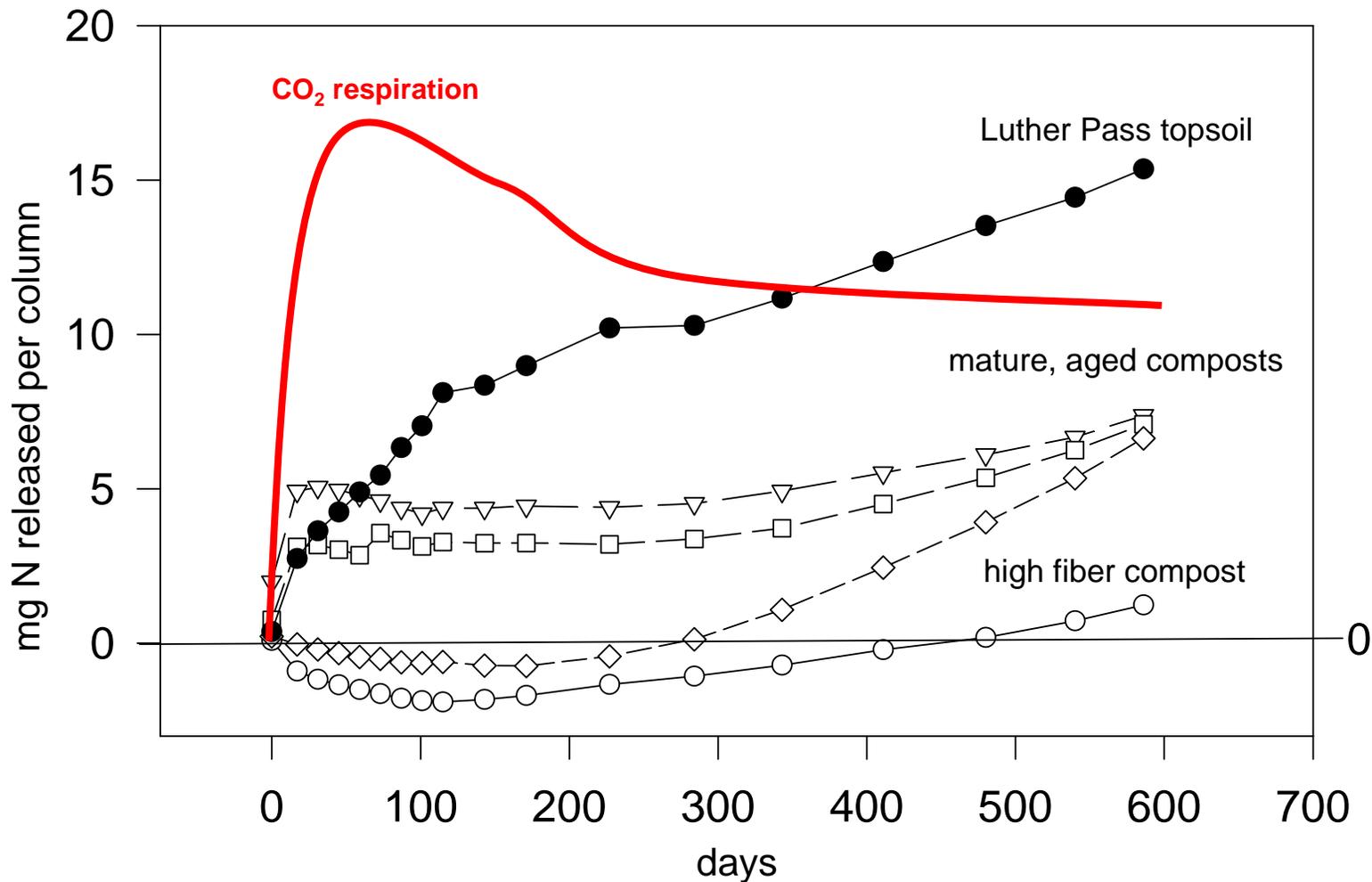






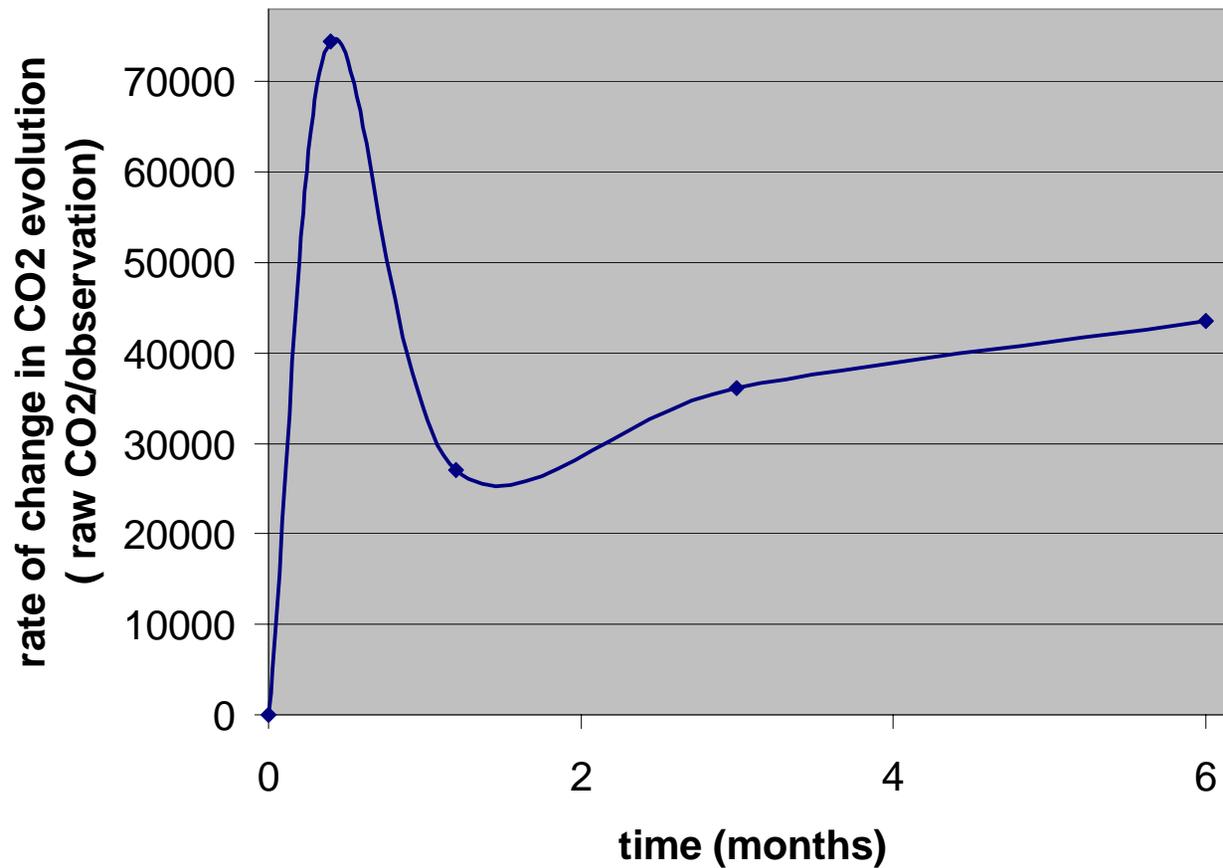


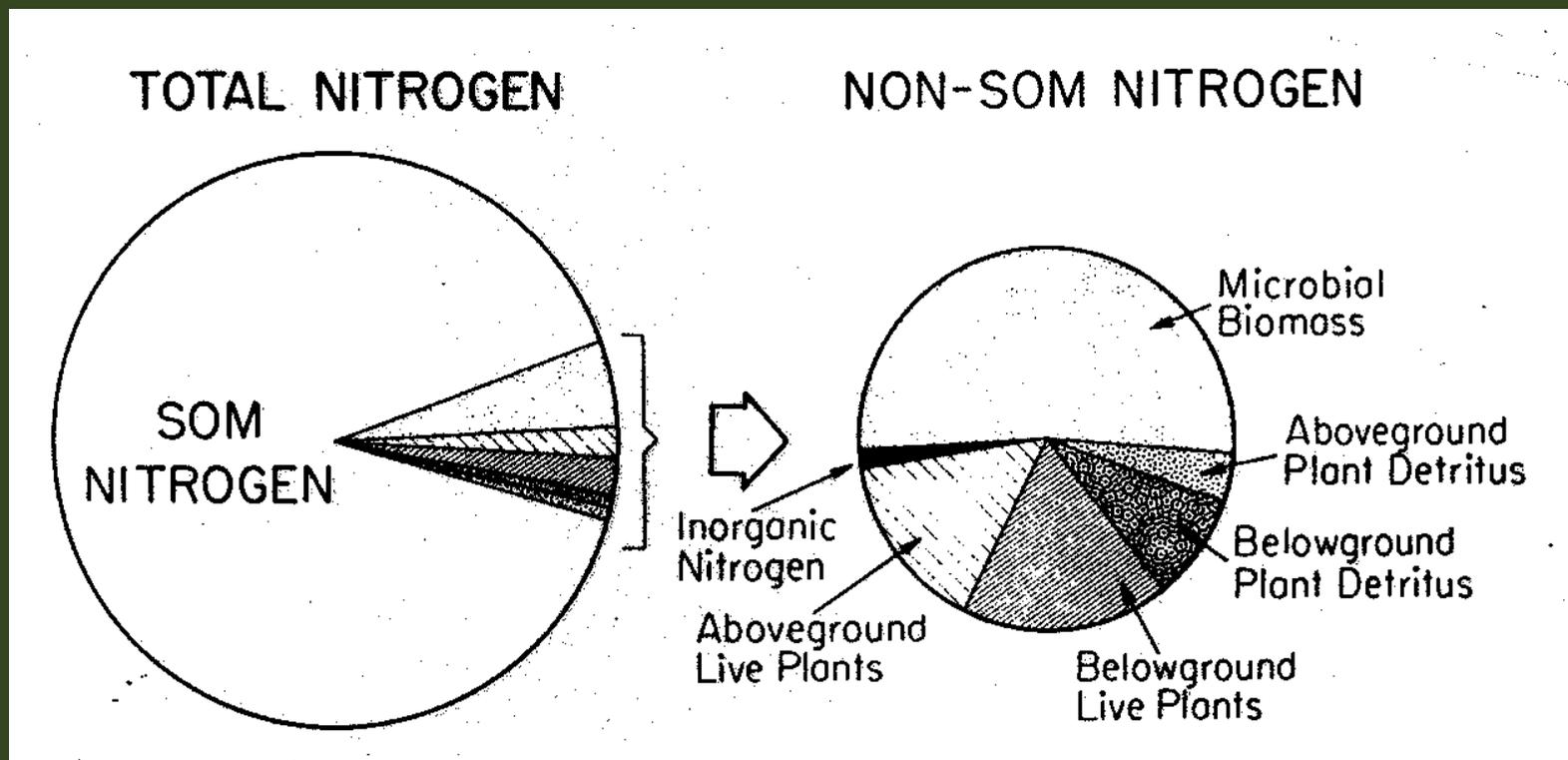
Nitrogen yield (mg N per column) during a 586 day aerobic incubation of topsoil from Luther Pass in the Tahoe Basin and decomposed granite sands receiving amendments (500 kg N/ha) of various composts.



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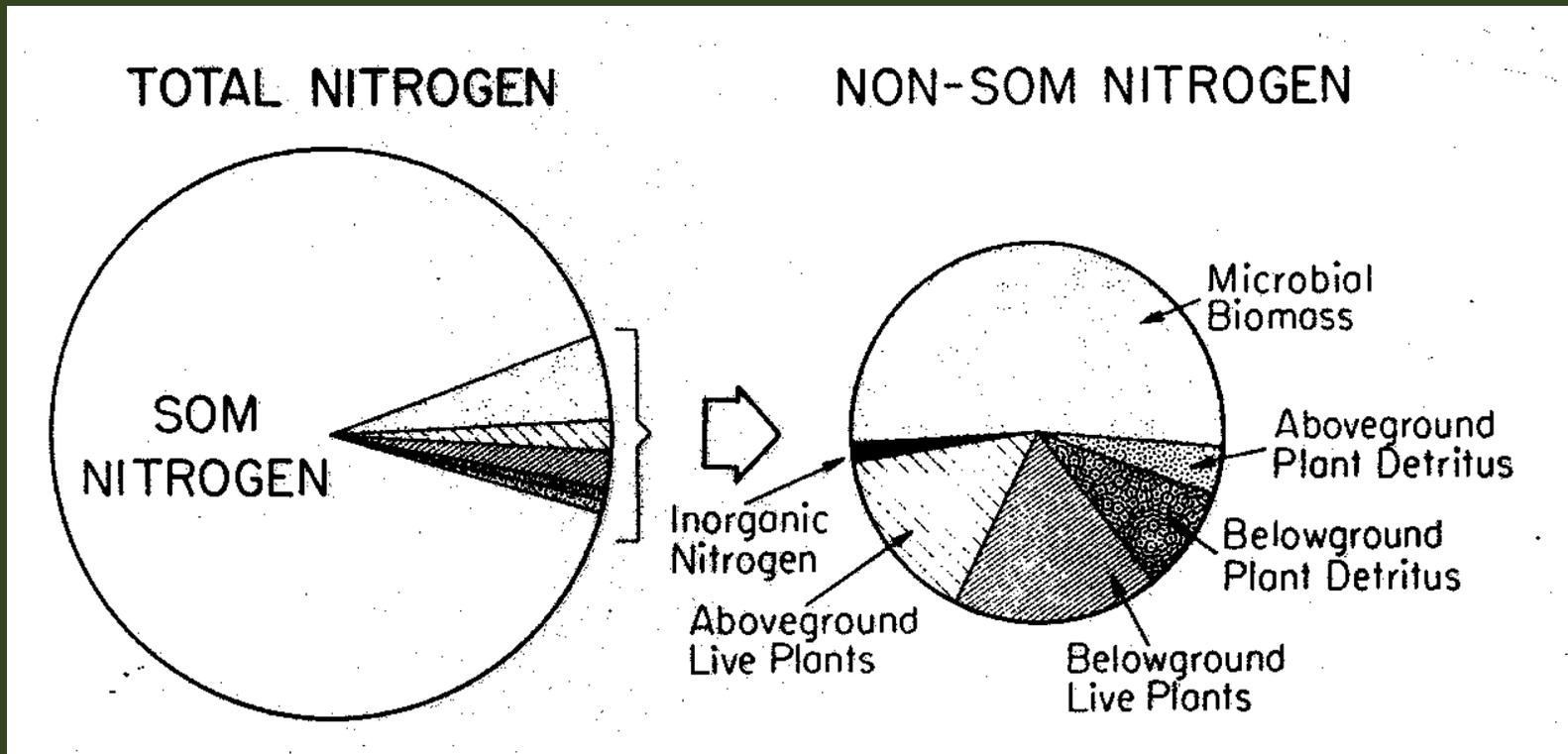
Compost Respiration Rate over time





Jackson et al., 1988

**Target levels: 1200 kg N/ha in Tahoe;
up to 3000 kg N/ha on more densely vegetated sites.**



Jackson et al., 1988

Equivalent to 1 to 3 inches of yard waste compost, tilled.

**Generic yardwaste compost application
recommendation for a degraded substrate:**

**20 to 50 mm layer, tilled to 300 mm (metric)
with \pm 1 m rooting depth
and 50 mm mulch of coarse wood shreds**

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

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- + if the compost is not well cured, add slow release N**
- + if the compost is very well cured, add no N**
- + if more organic volume is needed for infiltration,
but N inputs restricted, mix with wood shreds**

Conclusions:

1. Degraded soils can be regenerated

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- 2. Organics are a primary 'missing ingredient'**
- 3. Yardwaste composts work effectively**
- 4. First year N release is variable, but low**
- 5. Plant community development is a long term process, so soil amendments need to provide 3 to 10 years of benefits**

So, just what do you mean
by “soil amendment” ?!?!



Field site construction: compost in DG



Buckhorn summit: SHA299, west of Redding



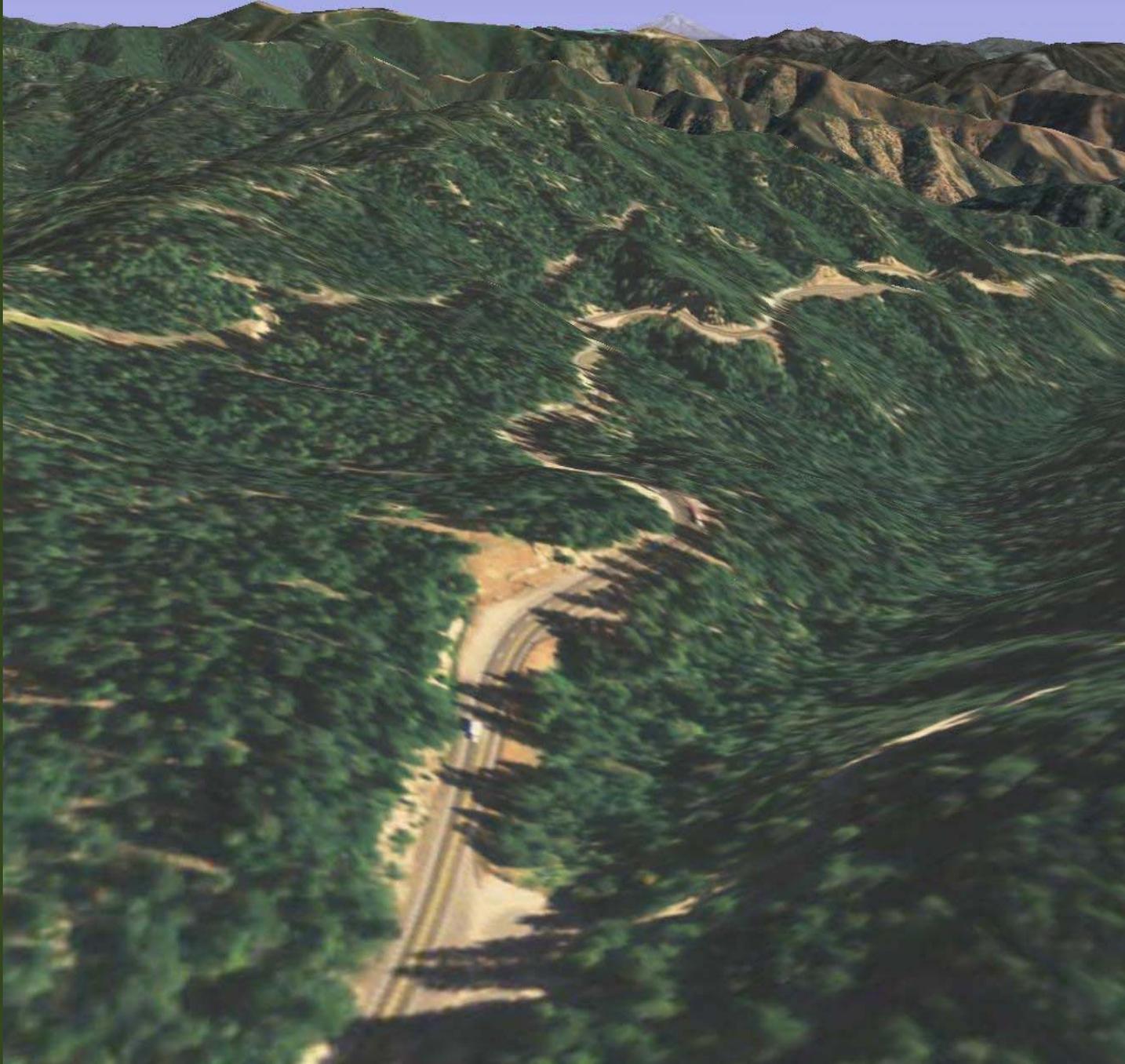


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revegetation reference site



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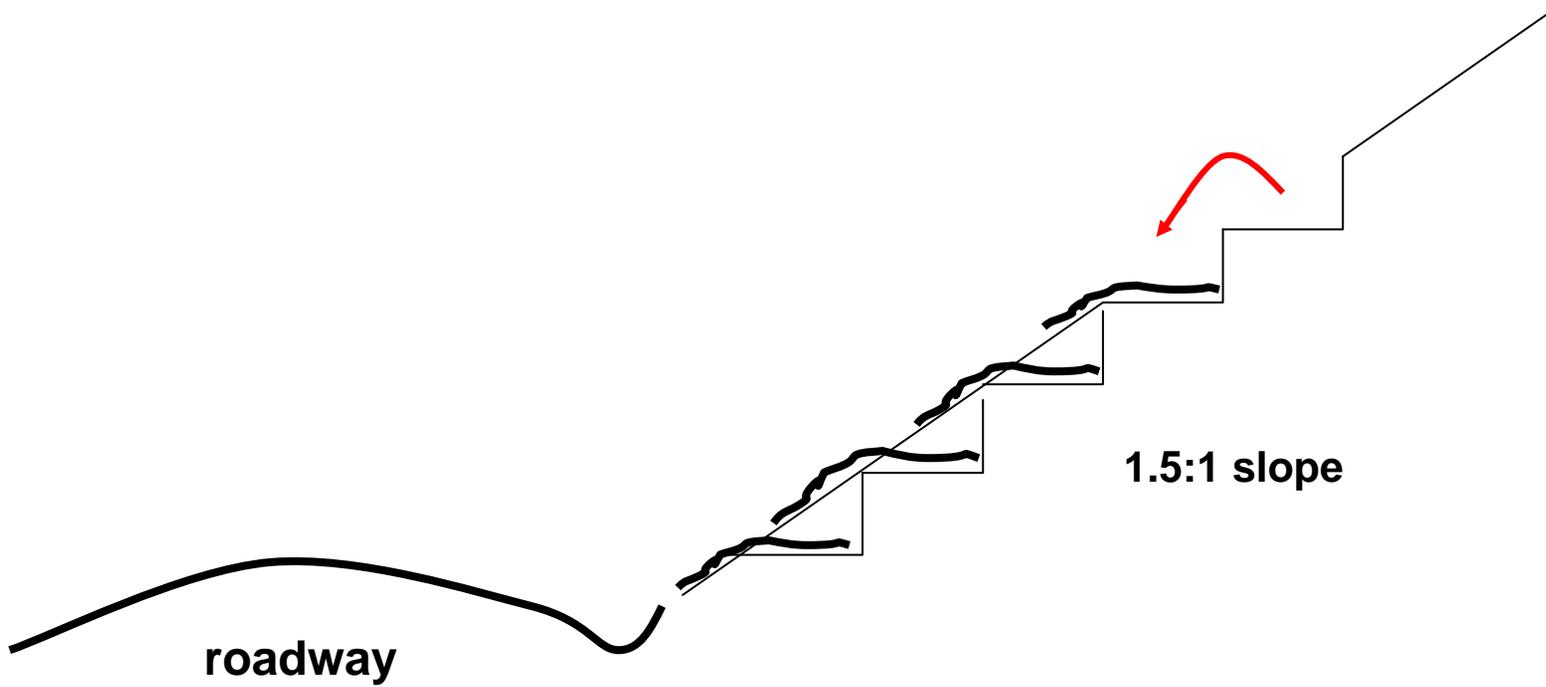
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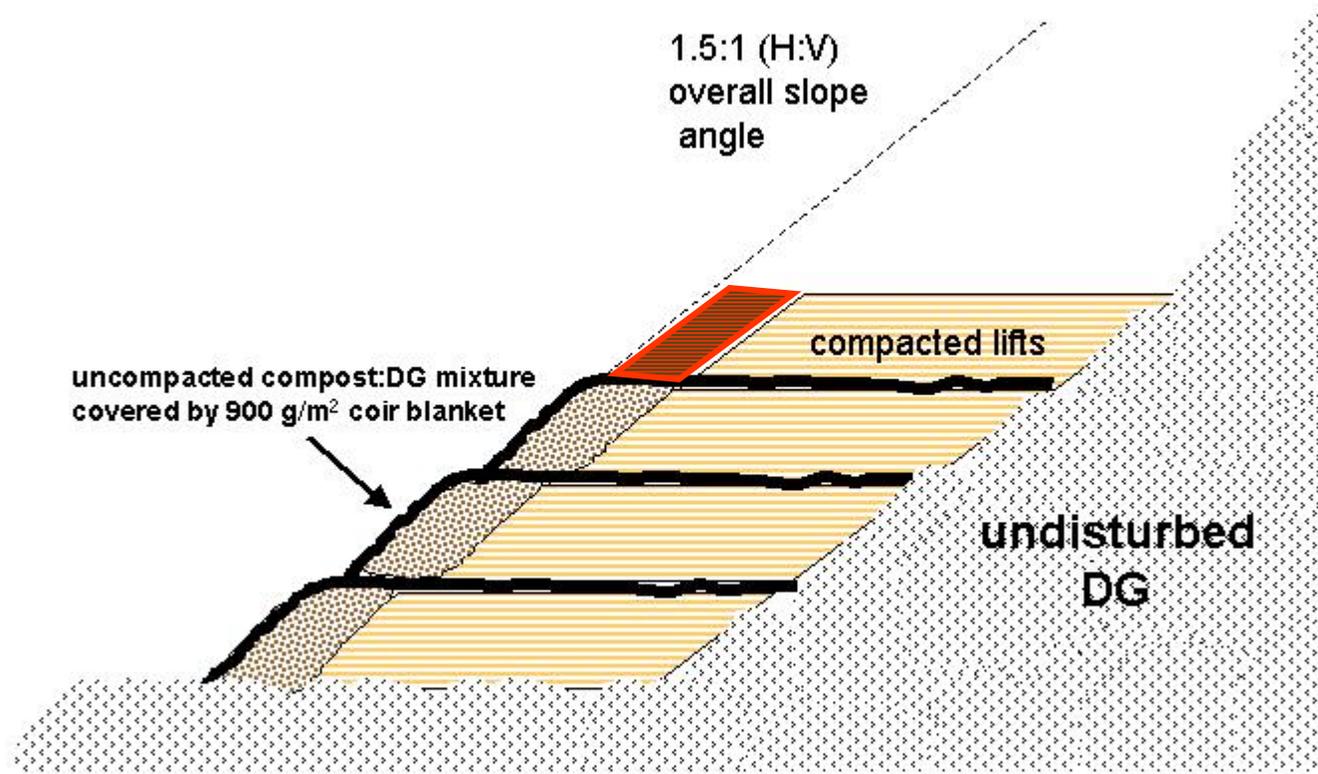






fill-cut slope treatment









Case
Country
Construction
623-6400

416
SERIES II















































