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The effect of compost on carbon cycling in soil

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The effect of compost carbon cycling in soil

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DISCLAIMER:

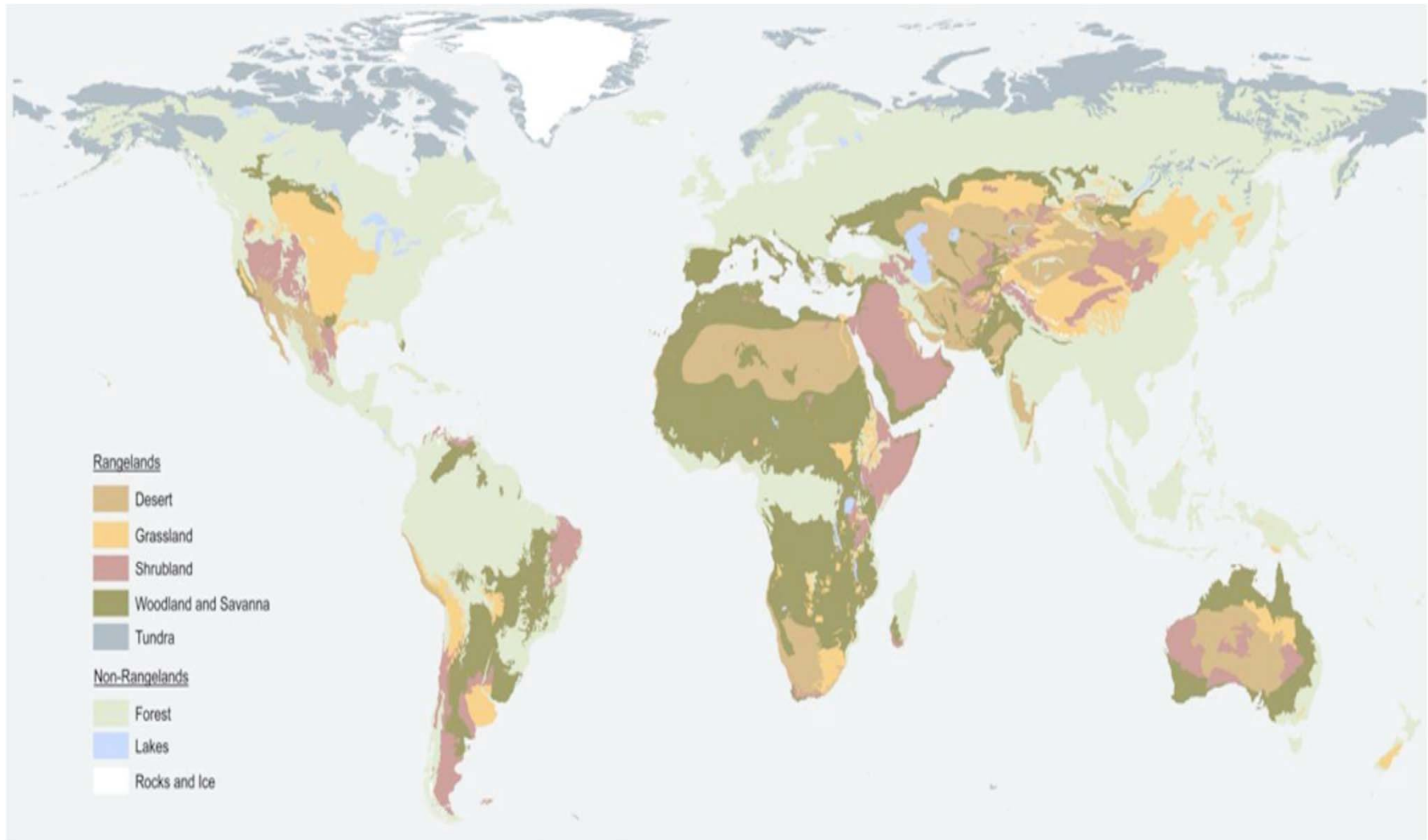
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Global Rangelands



Mediterranean Grassland



4 replicates
0-10cm

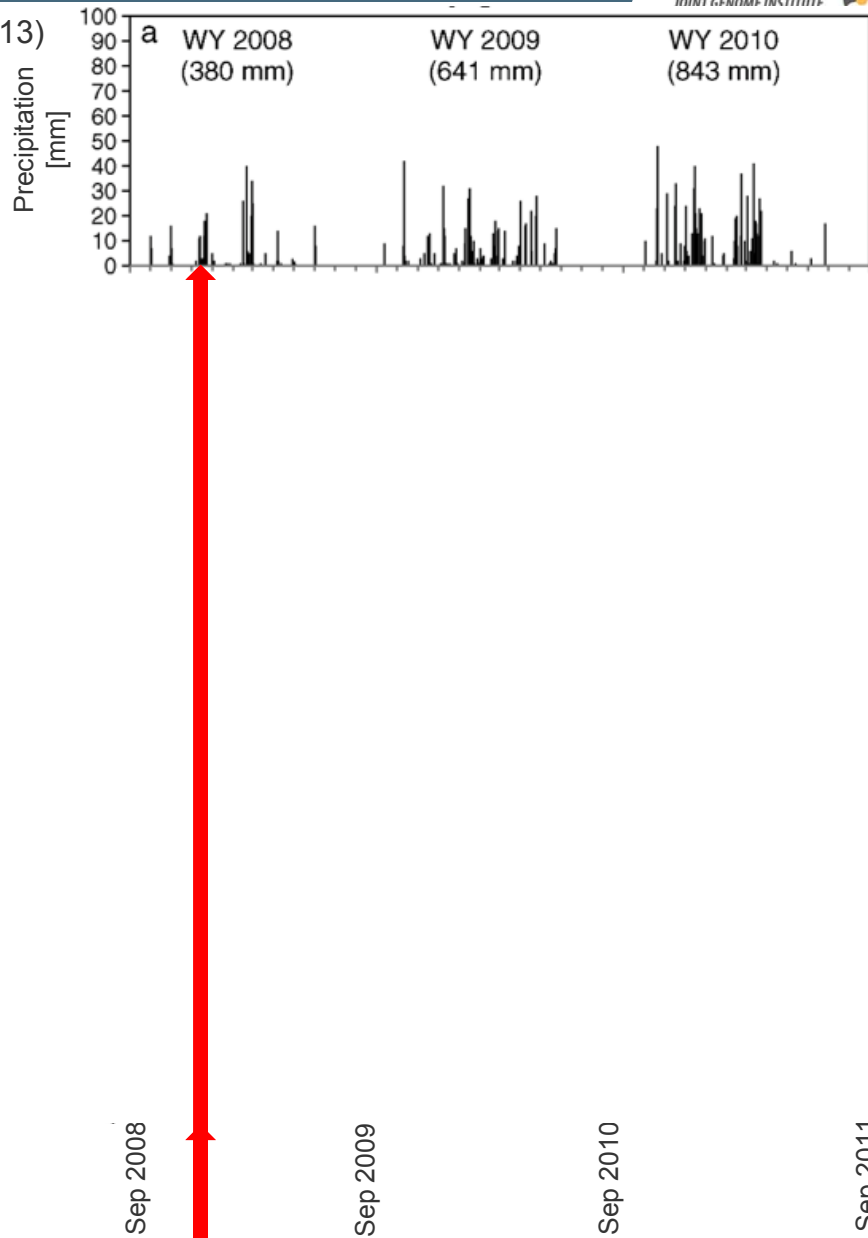
Compost
(2008)
C:N:P=
1:0.1:1

Control
(2013)
C:N:P=
445:45:1

Climate at Sierra Foothills



Ryals *et al.* (2013)

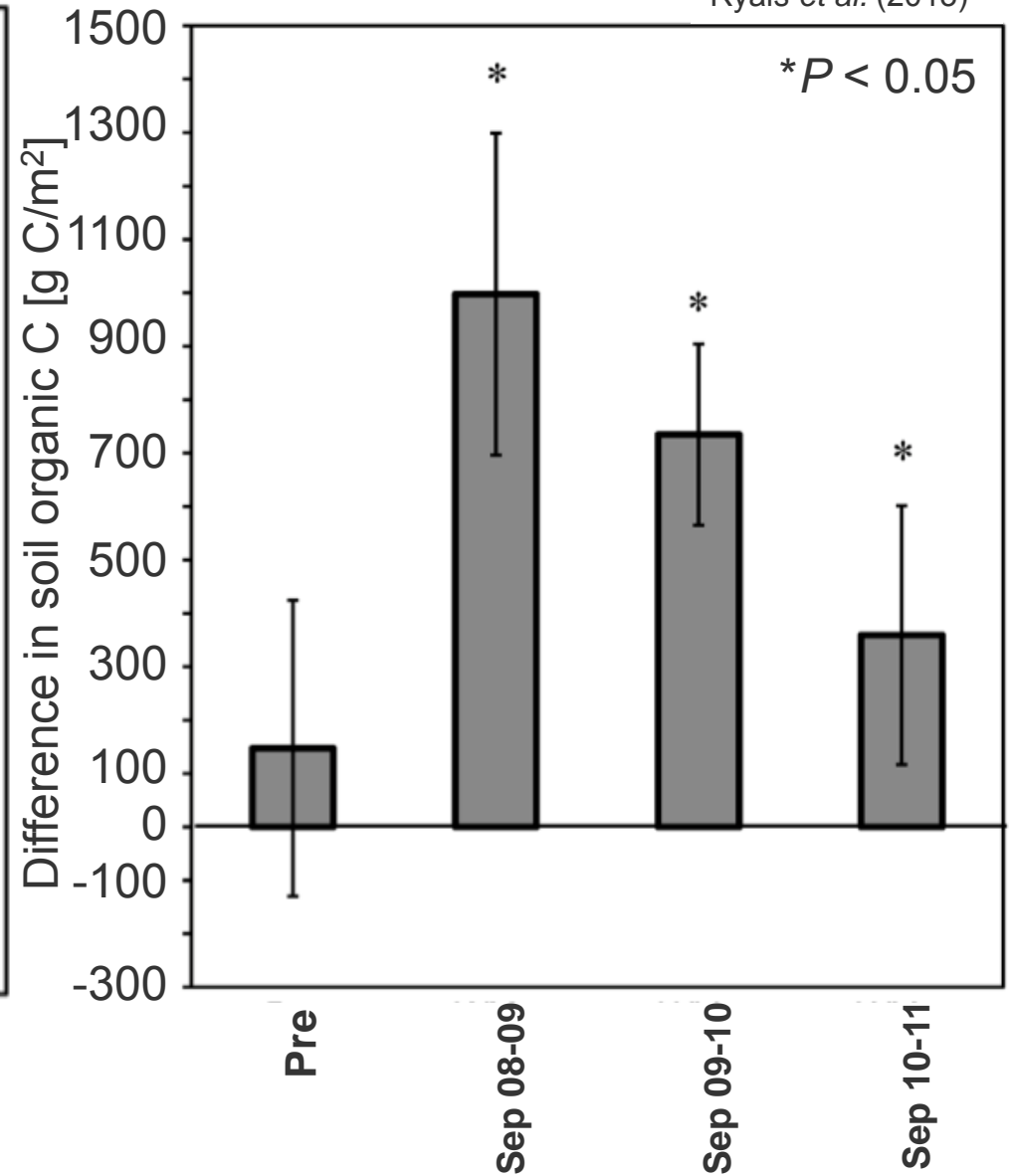
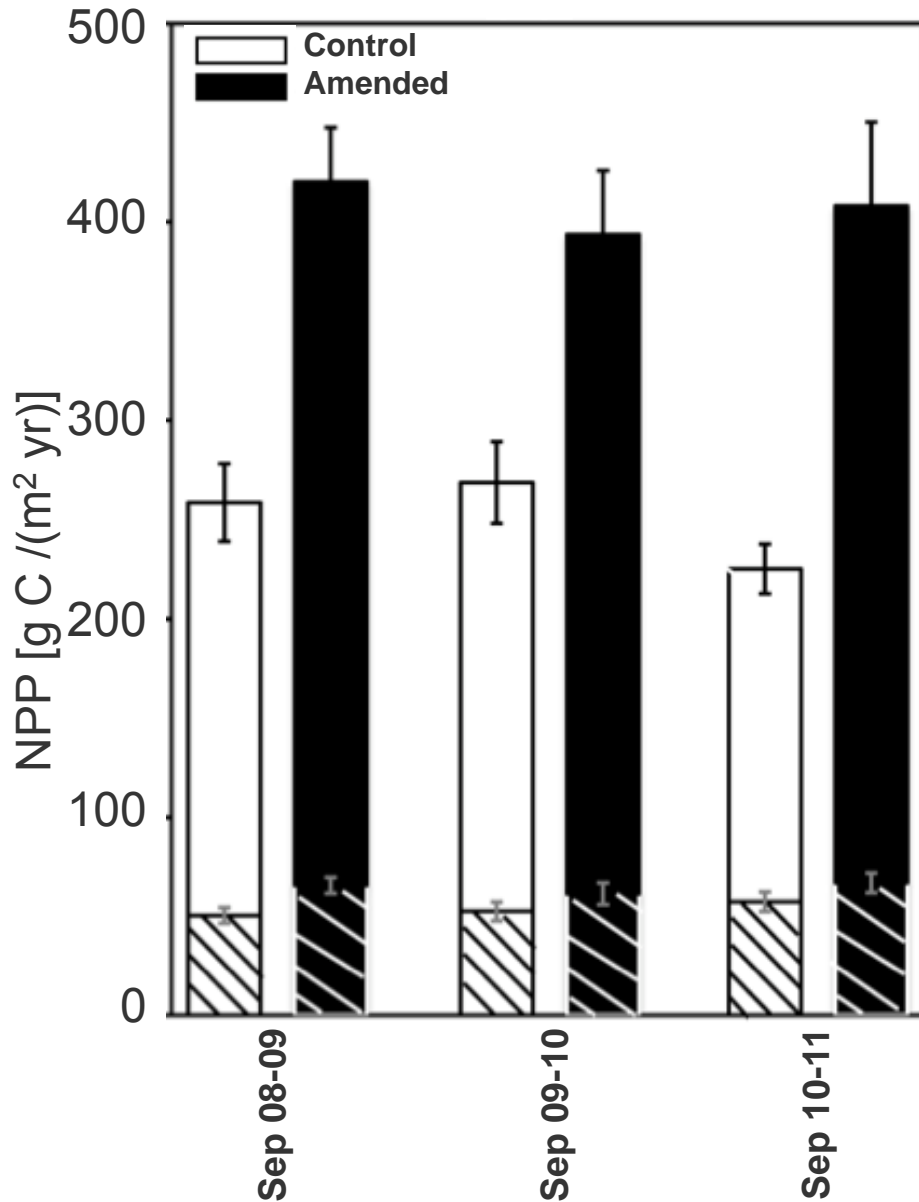


- Relatively consistent climate across years and plots for three years after the compost event
- Mediterranean air temperature
- Compost increases soil moisture
- Compost increases soil respiration

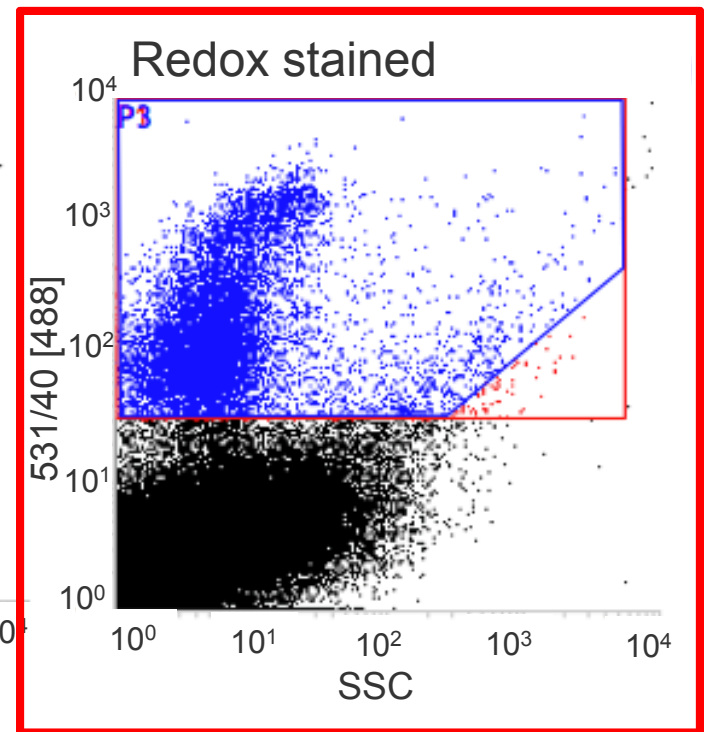
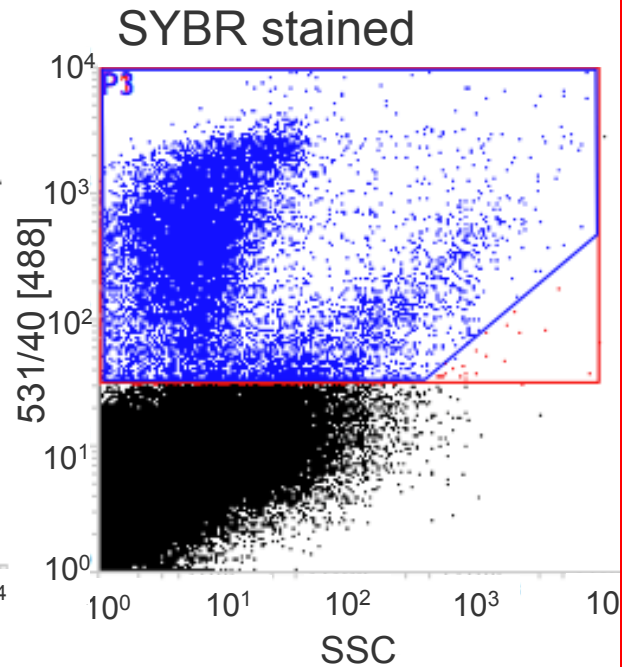
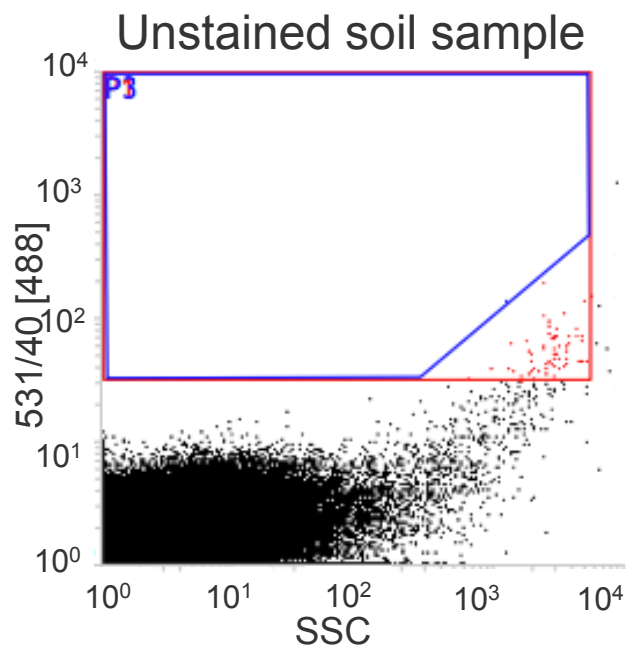
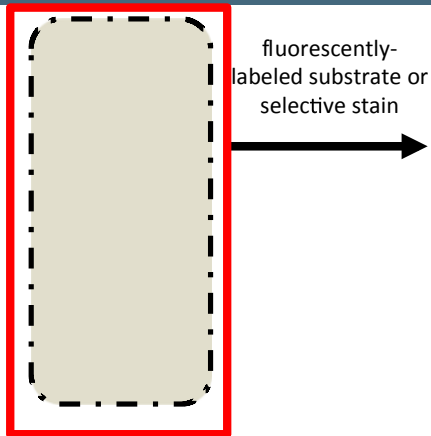
Increase in NPP & SOC



Ryals et al. (2013)

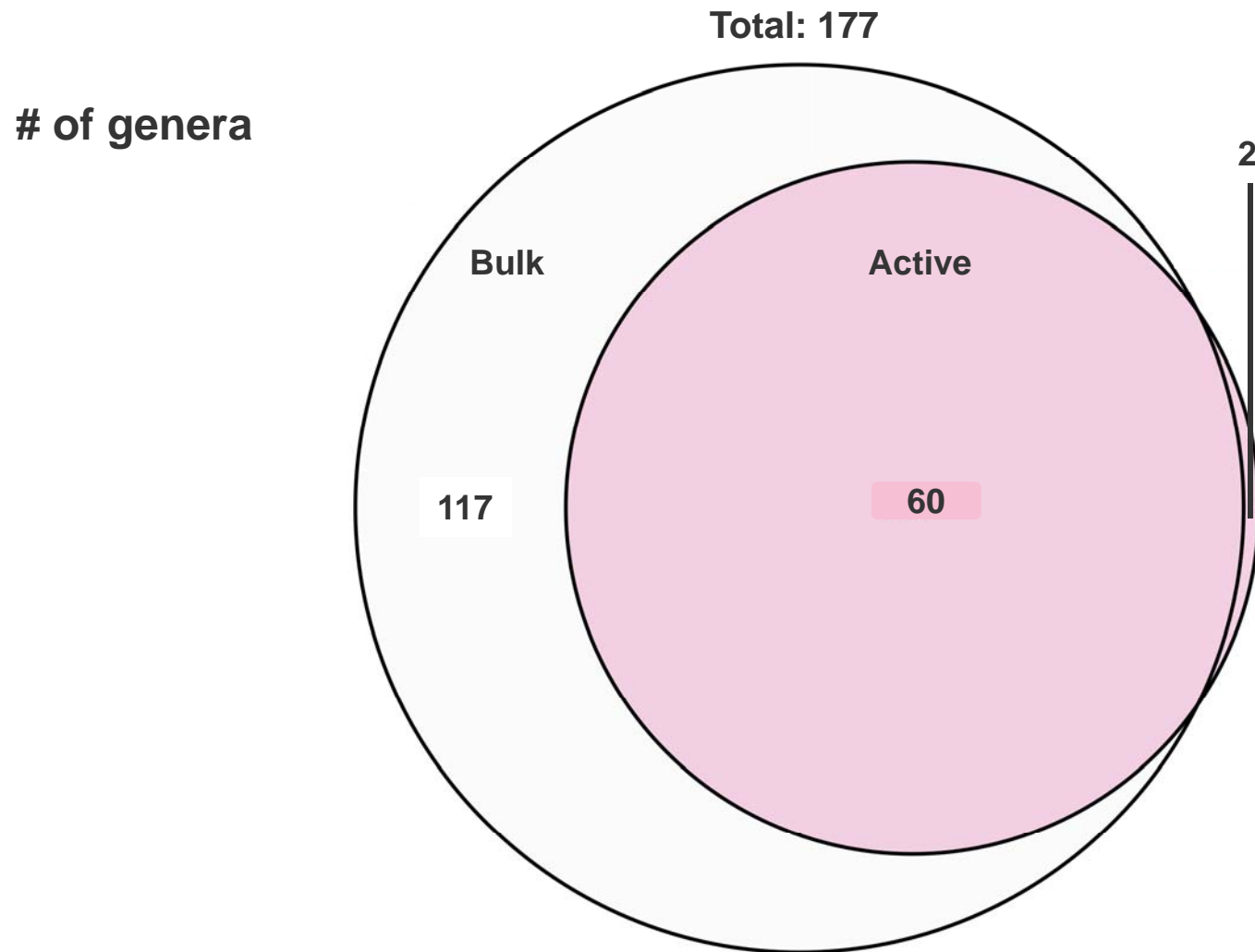


Fluorescence Activated Cell Sorting

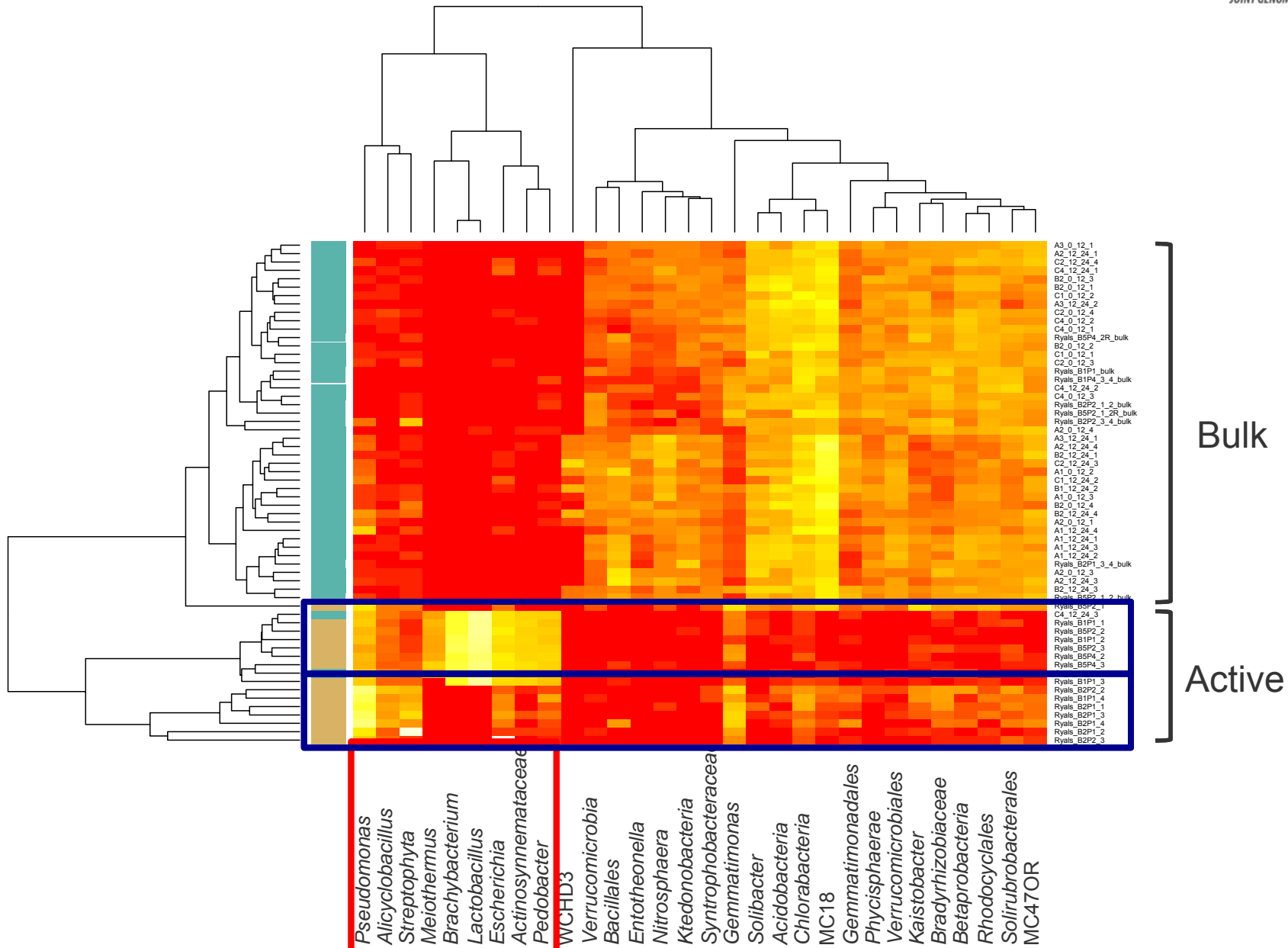


Reduced community complexity

Total of ~3.4 Mio reads clustered and classified

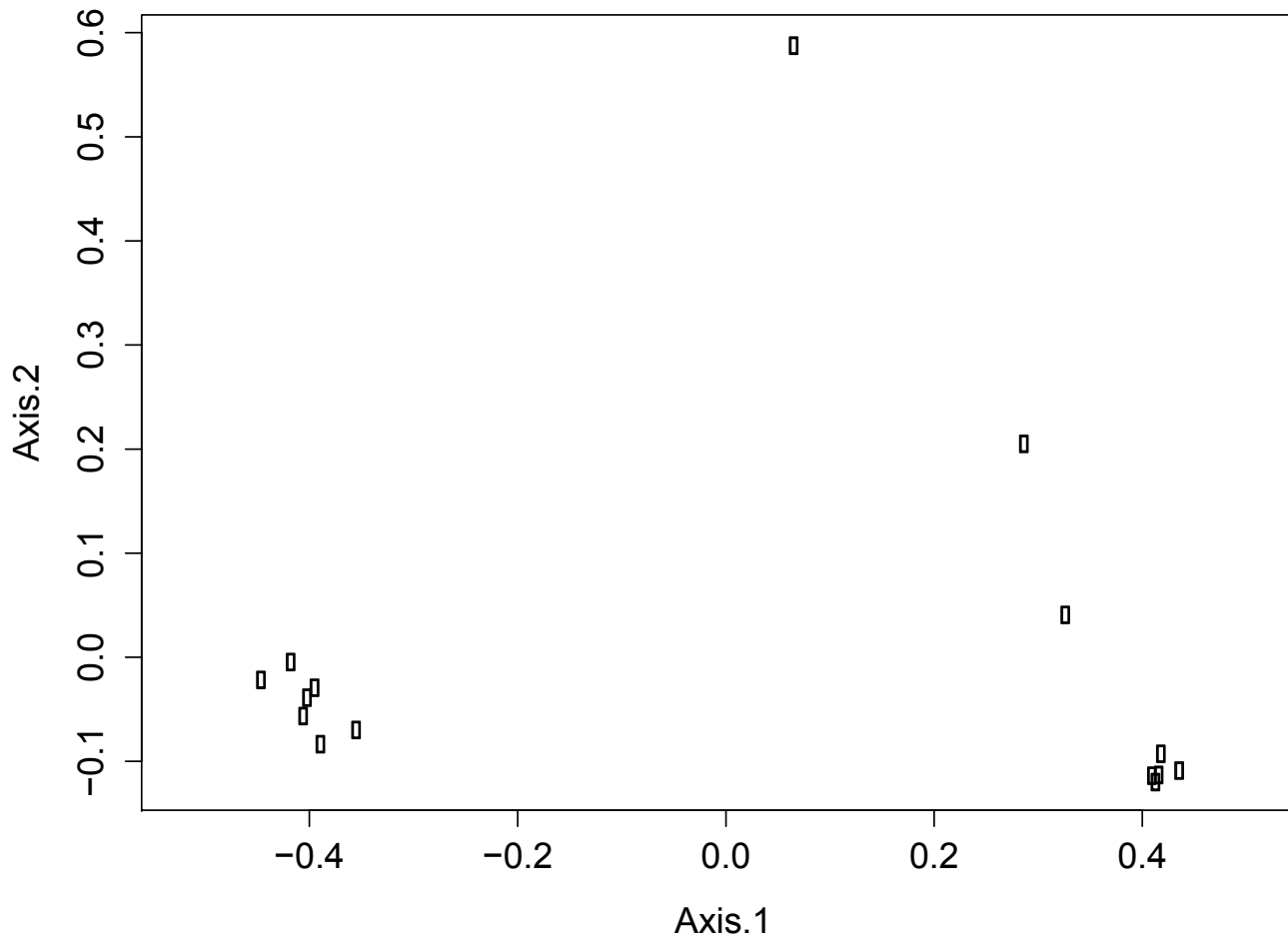


Heat map of bulk vs. active population



Community Structure: Compost vs. Control

—□— compost
—□— control



Indicator Genera: Compost vs. Control



	P-value	Group	Indicator Value
Ralstonia	0.038	compost	0.70
Pedobacter	0.379	compost	0.58
Actinosynnemataceae (FA)	0.242	compost	0.52
Brachybacterium	0.275	compost	0.50
Staphylococcus	0.814	compost	0.45
Lactobacillus	0.222	compost	0.43
Actinomycetales (OR)	0.221	compost	0.43
Streptomyces	0.794	compost	0.43
Meiothermus	0.45	compost	0.36
Sphingobacteriales (OR)	0.06	control	0.75
Gemmatimonadaceae (FA)	0.042	control	0.71
Gemmatimonas	0.116	control	0.70
Ramlibacter	0.167	control	0.69
Acidobacteriales (OR)	0.086	control	0.67
Hydrocarboniphaga	0.092	control	0.66
Sphingomonas	0.167	control	0.65
Solibacillus	0.322	control	0.64
Klebsiella	0.275	control	0.64

Ralstonia:

includes many soil/water bacteria, some are plant pathogens

Gemmatimonadaceae:

G. aurantiaca T27T:

polyphosphate-accumulating bacterium, aerobic/anaerobic

Conclusions



- **FACS helps reduce complexity of soil microbial communities**
- **Compost changes the microclimate in surface soil for years after the composting event**
 - Long-term effects on soil organic carbon content and microbial community structure and activity
- **Compost treated plots generally cluster together:**
 - Community richness
 - Dominant microbial groups
- **Metagenomics**

Thank You



- **Joint Genome Institute**
 - Danielle Goudeau, Leong Chen, Rex Malmstrom
 - Scott Clingenpeel, Janey Lee
 - Devin Colemann-Derr, Susannah Tringe
 - Kanwar Singh, Jean Zhao
 - Tanja Woyke
- **UC Berkeley**
 - Rebecca Ryals, Whendee Silver
- **Sierra Foothills Research & Extension Center team**

