



Enzyme Activities and Soil Structure

The objectives were to investigate

- the relationship between **microbial community function** and **soil aggregate structure**
- the **enzyme activity** throughout the aggregate fractions across a soil chronosequence

Using 2 indicator enzymes

- β -glucosidase (cellulytic)
- N-acetyl- β -glucosaminidase (NAGase) (chitinolytic)

Fansler, S.J., J.L. Smith, H. Bolton, Jr., and V.L. Bailey. 2004.
Submitted to Biology and Fertility of Soils.



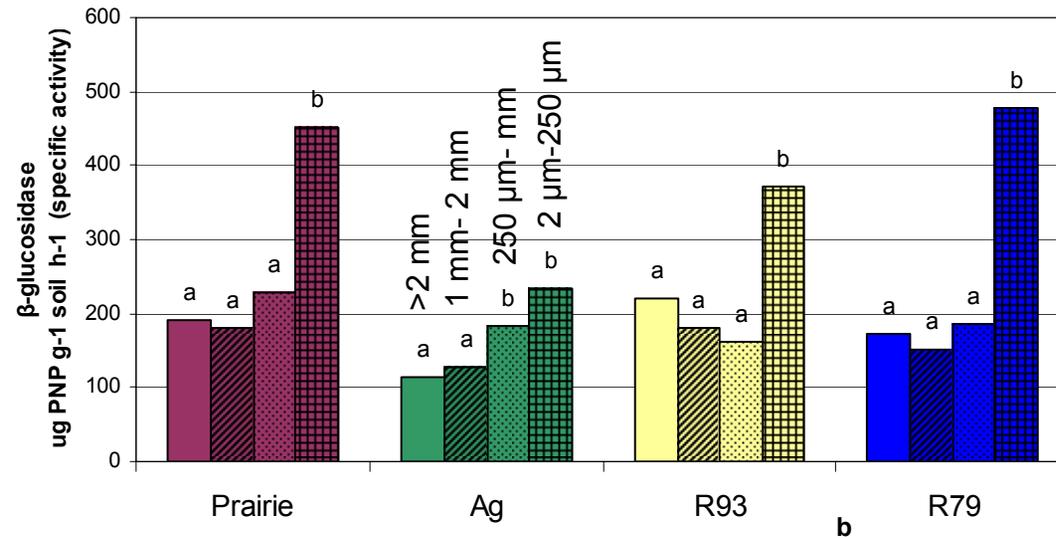
Hypotheses

- ⇒ **More enzyme activity in the largest size fraction**
- ⇒ **Enzyme activity within each fraction will increase with increasing age of the soil chronosequence**



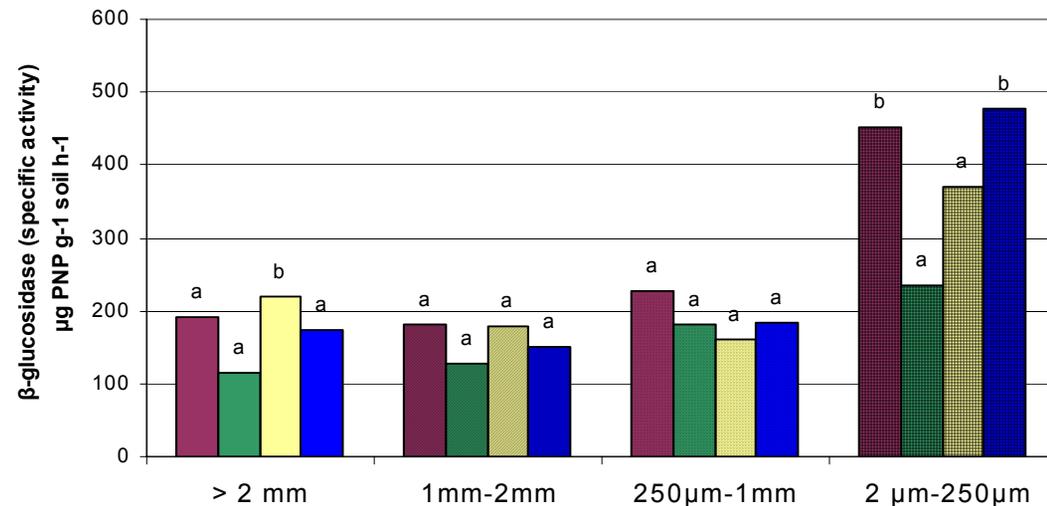
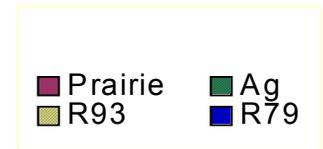
β -glucosidase activity

Specific Activity = activity per gram of soil in that fraction



⇒ Specific activity of each aggregate size fraction **within** each soil of the chronosequence

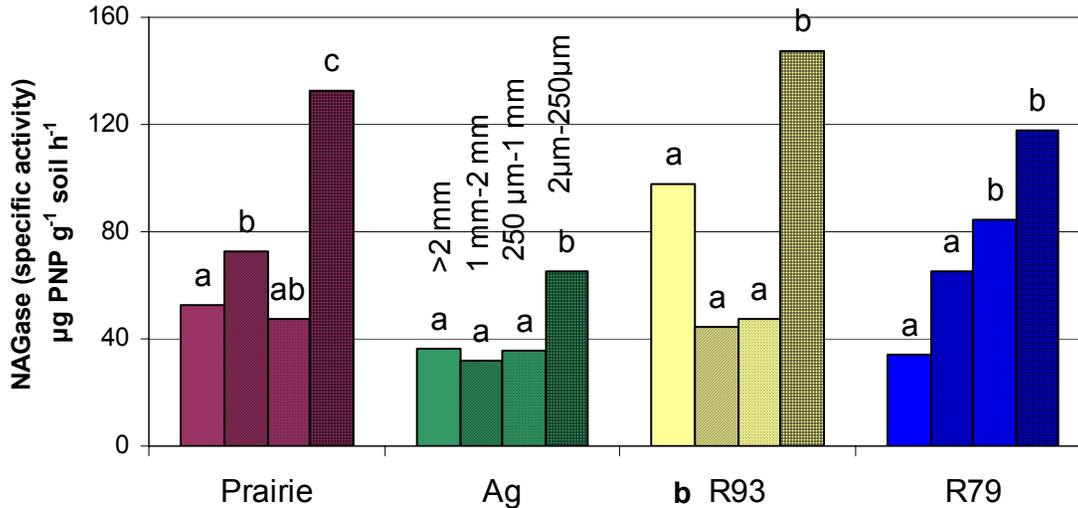
⇒ Specific activity of each aggregate size fraction **between** each soil of the chronosequence





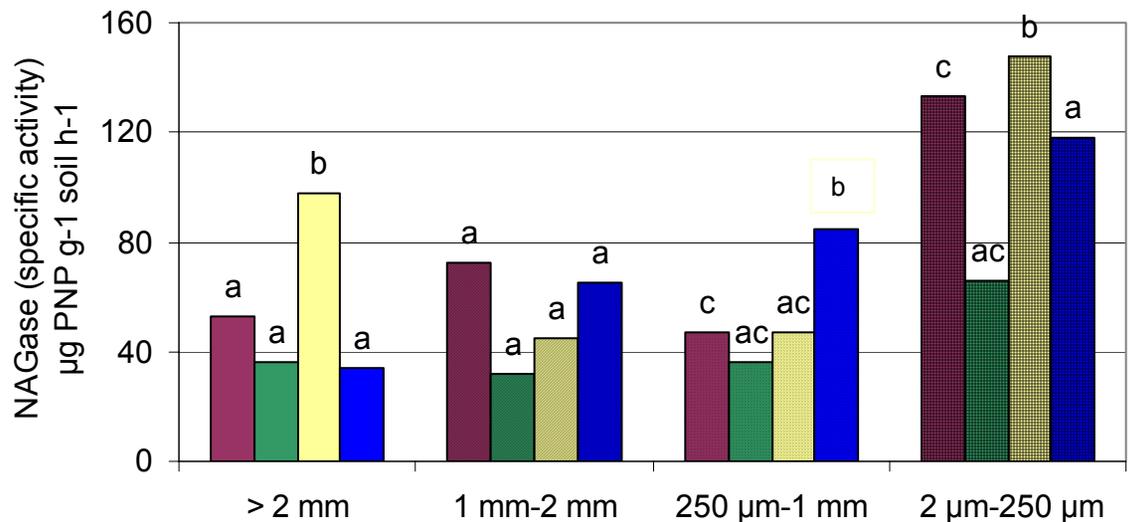
N-acetyl- β -glucosaminidase

Specific Activity = activity per gram of soil in that fraction



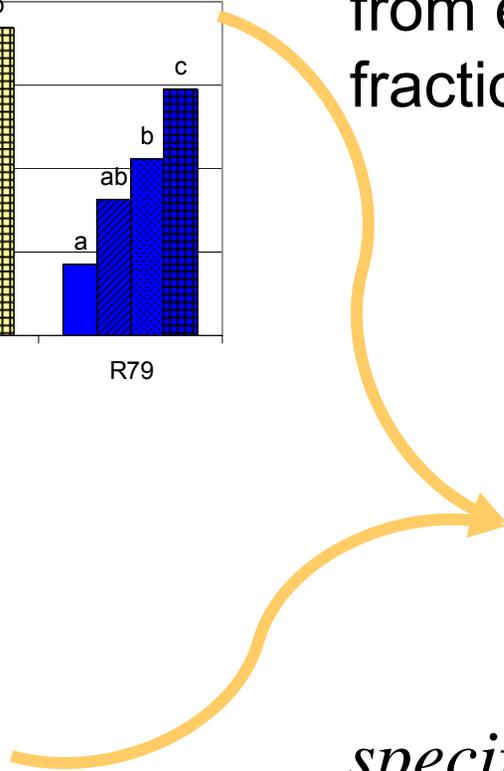
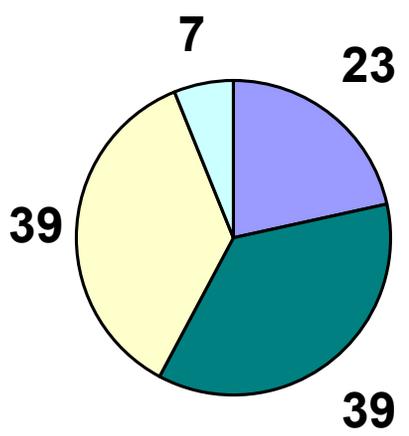
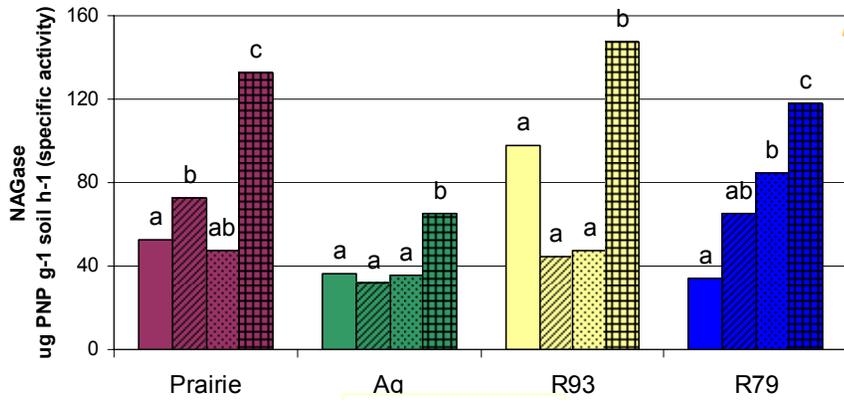
⇒ Specific activity of each aggregate size fraction **within** each soil of the chronosequence

⇒ Specific activity of each aggregate size fraction **between** each soil of the chronosequence





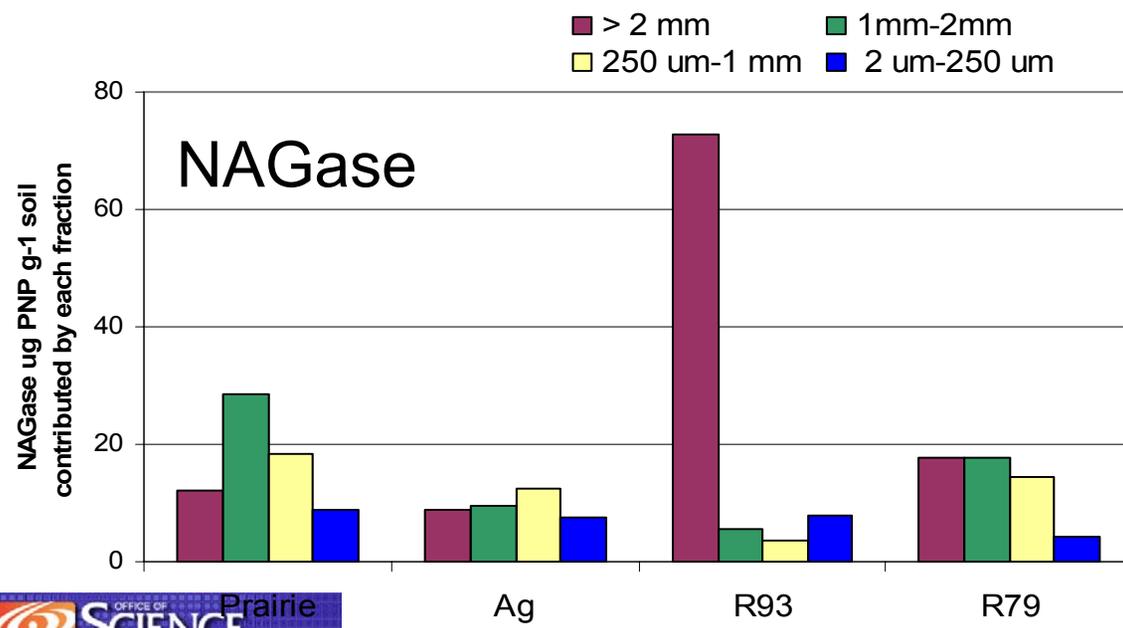
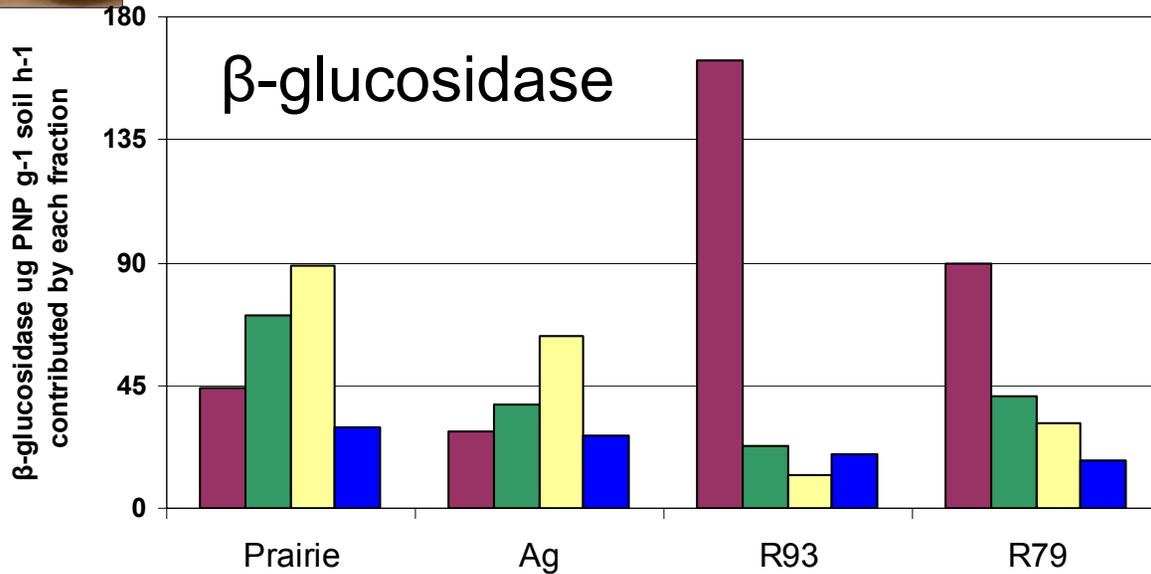
Enzyme activity contributed from each aggregate size fraction



$$= \frac{\text{specific activity}}{\text{proportion of each fraction relative to the whole soil}}$$



■ > 2 mm ■ 2 mm < 1mm
■ 1 mm < 250 μm ■ 250 μm < 2 μm



The amount of total enzyme activity **contributed** by each aggregate size fraction



Discussion

- ⇒ **Surface litter deposition in the restored prairie plots led to an increase in aggregation**

- ⇒ **The high specific activity of the microaggregate size (2 μm -250 μm) fraction is actually a small part of the whole soil.**
 - **The importance of this fraction can be seen in the restored prairie soils where microaggregates bind together to make macroaggregates.**