

DOES AMENDING BIOLOGICALLY

INERT COVERSOILS WITH

COMPOST AND MYCORRHIZAL

INNOCULANTS WORK?







PLANT NUTRITION – TWO APPROACHES


Exploit more soil volume (more roots)




Make more nutrients available (fertilize, nutrient cycling)




COMPOST – THE DREAM OF NUTRIENT CYCLING



“Organic matter” refers to a heterogeneous collection of substrates, which soil inhabitants use to capture energy and carbon for cell synthesis.



With molecules as different as hemicellulose, celluloses, proteins, pectin, starch, aromatic hydrocarbons, etc., the initial steps of decomposition differ, but



The final steps involve only a few simple sugars and organic acids. *There is a certain underlying unity in metabolic reaction (emphasis added).*

BENEFITS OF COMPOST

Soil structure

Fertilizer Effect

Chelation... Plexing heavy
metals?




BENEFITS OF COMPOST


Water-holding capacity

Aeration of “heavy
soils”


Nutrient cycling



COMPOST MUST BE
BIOLOGICALLY ACTIVE
TO CONTRIBUTE TO
NUTRIENT CYCLING



CAN YOU ESTABLISH
NUTRIENT CYCLING
CONCURRENT WITH
VASCULAR PLANTS?



OR DO THE VASCULAR
PLANTS HAVE TO
PRECEDE THE SOIL
FOODWEB?

THE FOLLOWING REVEGETATION
ALONG SILVER BOW CREEK WAS
TEN YEARS OLD WHEN SAMPLED

STARTS WITH BIOLOGICALLY
INERT COVERSOIL (BORROW)






















T12



AMOUNT OF PLANT COVER DID
NOT DIFFER SIGNIFICANTLY
IN COMPOSTED AND
UNCOMPOSTED REVEGETATION –

BUT NOT A PERFECT PAIRED
COMPARISON

Soil Microbiology Comparison Based on Taxon Diversity of:

- Heterotrophic bacteria
- Fungi (mycorrhiza and others)
- Free nitrogen-fixers
- Actinomycetes
- Pseudomonads (bacteria)

INTERPRETATION

Summed Indices

- High Diversity >12.5
- Moderate Diversity 7-12.5
- Low Diversity <7

SUMMED INDICES

COMPOSTED

5.3

UNCOMPOSTED

5.0

NO DIFFERENCE

PREFER HARD MEASUREMENTS?

2 COMPOSTS, 5 LABS

Organic Matter (loss on
ignition):

Compost A: 26 to 43%

Compost B: 50 to 98%

PREFER HARD MEASUREMENTS?

2 COMPOSTS, 5 LABS

Mineral N:

Compost A: 1,000 to 1,800 ppm
nitrate and 0 to 2,900 ppm
ammonium

Compost B: 260 to 780 ppm nitrate
and 480 to 4,160 ppm ammonium

PREFER HARD MEASUREMENTS?

2 COMPOSTS, 5 LABS

Percent Moisture:

Compost A: 36 to 44%

Compost B: 55 to 62%



NEXT A COMPARISON IN TWO-
YEAR-OLD REVEGETATION

ALSO SILVER BOW CREEK



CO 25
C 1



5000 culture - 10/10/10

C0-25

C 2



CO 25
UC 1



CO 25

VC 2



SUMMED DIVERSITY INDEX

COMPOSTED UNCOMPOSTED

4.5

4.4



AGAIN NO DIFFERENCE



TRY, TRY AGAIN

**ONE YEAR OLD, JUST ONE
SAMPLE EACH IN COMPOSTED
AND UNCOMPOSTED**









SUMMED DIVERSITY

COMPOSTED UNCOMPOSTED

4.1

4.6

NEXT, GOLDEN SUNLIGHT MINE

MANURE-BASED COMPOST

MORE DIFFICULT TO APPLY

UNIFORMLY AND INCORPORATE

COMPARED TO SILVER BOW

CREEK





2009 5500' NE SLOPE 25-50%



NE 2010 REGRADE <10% 95 ppm
Olsen P – Yikes!



OFF-LOADED, 1996, NO INNOC.
50-75% AM



M3

NE 2010 2:1 NO AM

M4
2010





NE 2009 2:1 SLOPE 50-75% AM



PUT THEM TOGETHER

SUMMED DIVERSITY MEAN 4.4

REMEMBER <7 IS LOW

DIVERSITY

RANGE FROM 3 TO 4.9



UNABLE TO CONCLUDE

FROM VASCULAR PLANT
PERFORMANCE OR
MICROBIOLOGICAL ANALYSIS

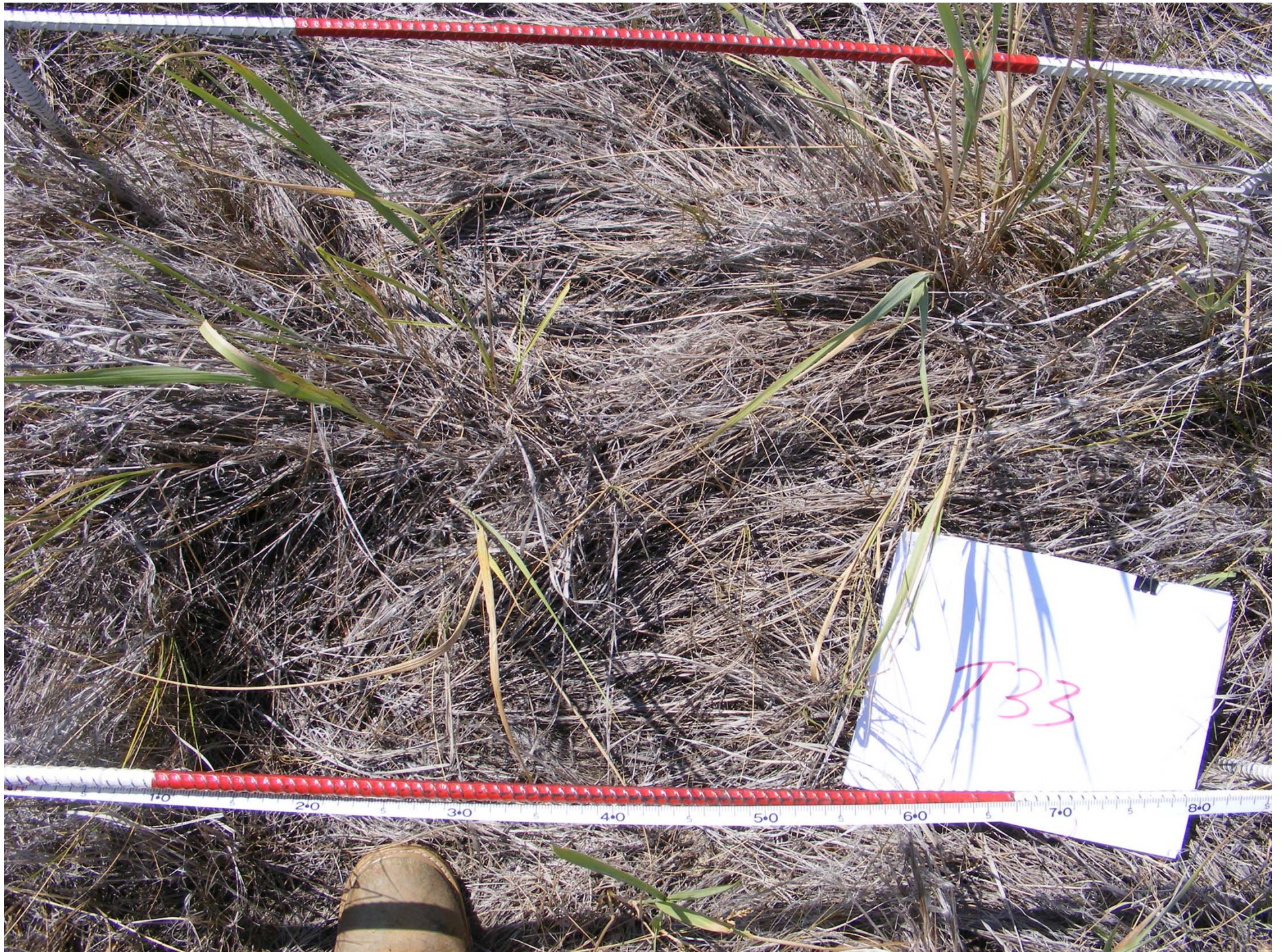
THAT COMPOST CONFERS
BENEFIT

NOT ENOUGH COMPOST!

YEAH, RIGHT

ODD THAT COMPOST PILE AREA
WOULD HAVE SCANT REVEG









T31



A photograph of a field with a white survey line and a brown paper tag labeled 'T31'. The field is filled with low-lying, green and brown vegetation. A white line runs diagonally across the field from the bottom left towards the top right. A brown paper tag with the handwritten text 'T31' is placed on the ground in the lower center of the image. The ground is covered with dry leaves and twigs.

T31



WHAT ABOUT

MYCORRHIZAL INOCULUM?

SILVER BOW CREEK

TEN YEARS OLD

UNINOCULATED

USEFUL AMOUNT OF AM

RANK 3+ ON SCALE OF

ZERO TO 5











2 YEARS OLD


Thickspike





Intermediate

5 MONTHS OLD




**A GOOD AM INOCULANT CAN
WORK WHEN BROADCAST WITH
SEED**


**DON'T CONFLICT WITH
FERTILIZATION!**



**REMEMBER, IT'S ALIVE
(BOTH SEED AND INOCULUM)**



COMPOST'S ROLE IN
ESTABLISHING NUTRIENT
CYCLING IS FAR LESS THAN
I HOPED



OTHER BENEFITS MADE MORE
SENSE WHEN COMPOST COST
\$10/CY THAN \$30/CY PLUS
INCORPORATION COSTS