Nitrogen Benefits of Pulses

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MONTANA STATE UNIVERSITY EXTENSION

AGRICULTURE

MAKING A DIFFERENCE IN MONTANA COMMUNITIES

Nitrogen Pulse Credit vs Benefit

- Nitrogen Pulse Credit – The amount of nitrogen (N) that you can back off from a yield goal based fertilizer guideline b/c the previous crop was a legume.
  - *MSU Fertilizer Guidelines are based on early spring soil sampling*
  - Nitrogen pulse credit in Montana
    ~10 lb N/ac for one time pulse crop
    ~20 lb N/ac when been in pulses for a few rotations
- Nitrogen benefit – Less clear a definition:

1. Fertilizer N saved compared to an alternative crop (e.g. oilseed)
2. Fertilizer N saved in following year compared to after an alternative crop
3. Fertilizer N saved in following year compared to after fallow
4. Fixed N remaining in pulse residue/roots – soil N removed in grain (can be negative)

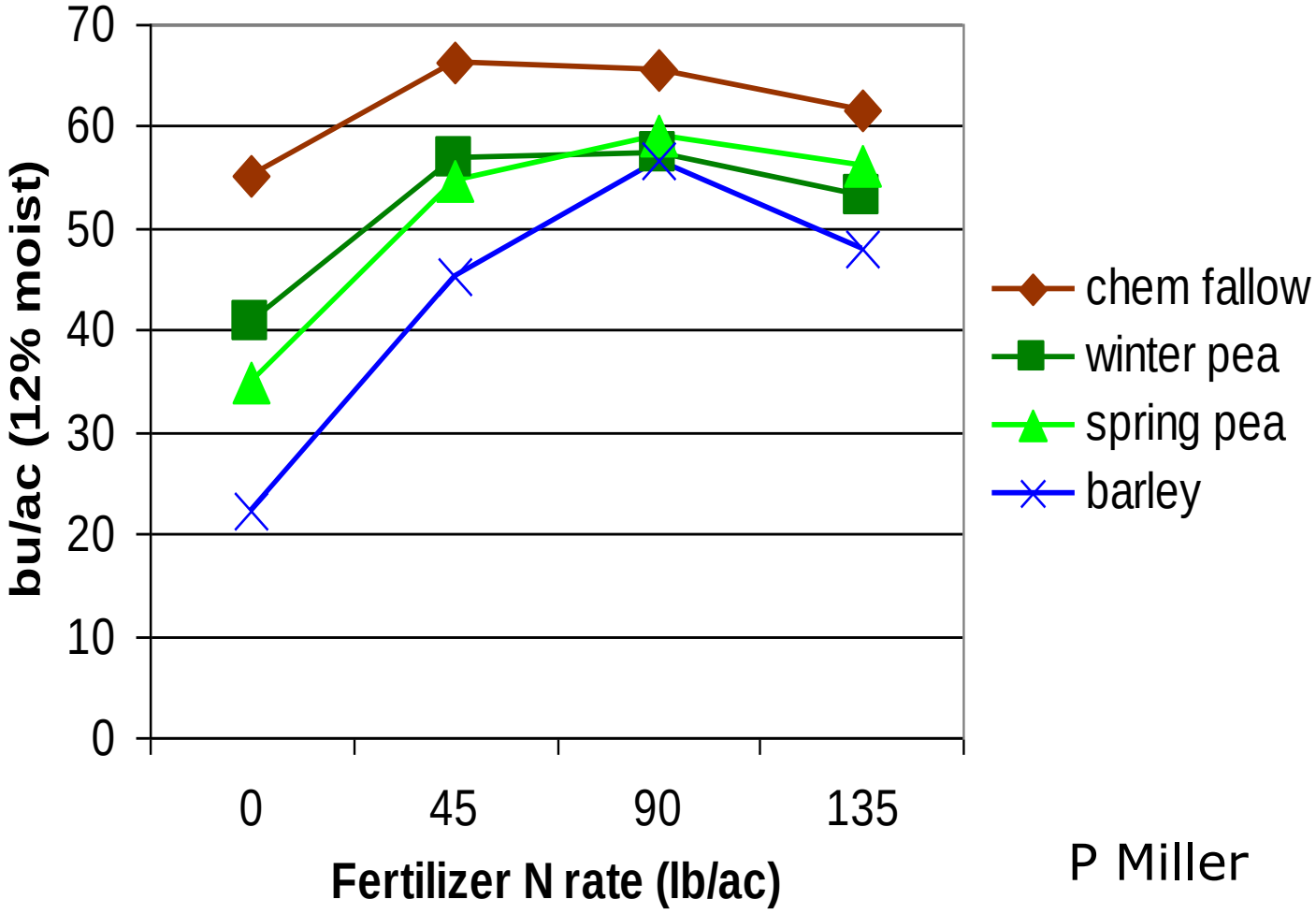
Nitrogen Credit Question: Do soil nitrate-N levels change much between fall and spring sampling?

Nitrate changes averaged for 3 years, 8 sites across Montana (Jones et al., unpub. data):

Previous Crop	Aug to Apr (lb N/ac)	Nov to Apr (lb N/ac)
Pulse	+26 a	+8
Small Grain	+14 b	+3

Note: If your soil is sampled in late summer after a pulse, you can possibly back off fertilizer N more than standard spring N credit. Depends on soil and climate.

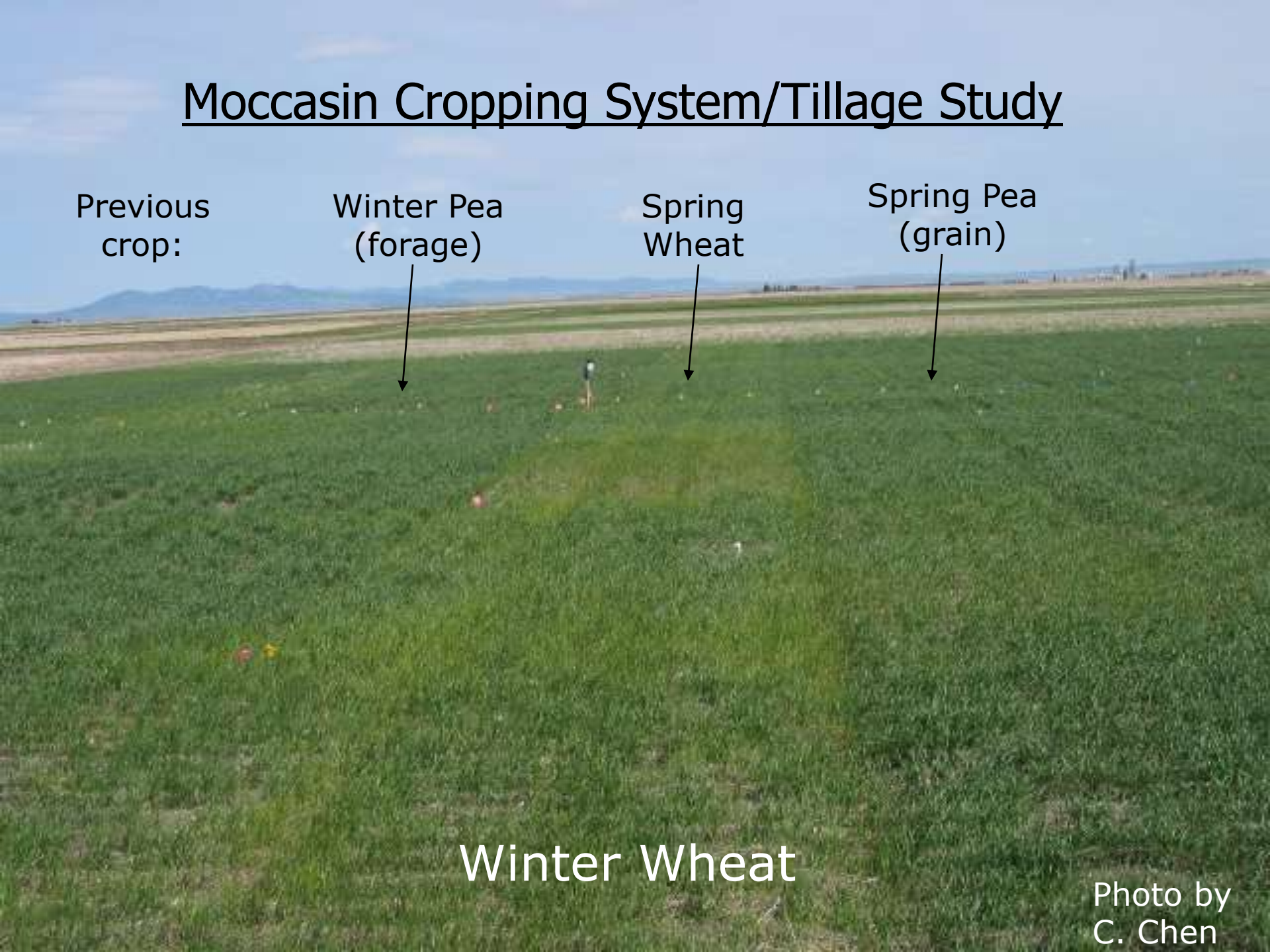
Nitrogen Benefits: Effect of Previous Crop on N Needed to Optimize Wheat Yield



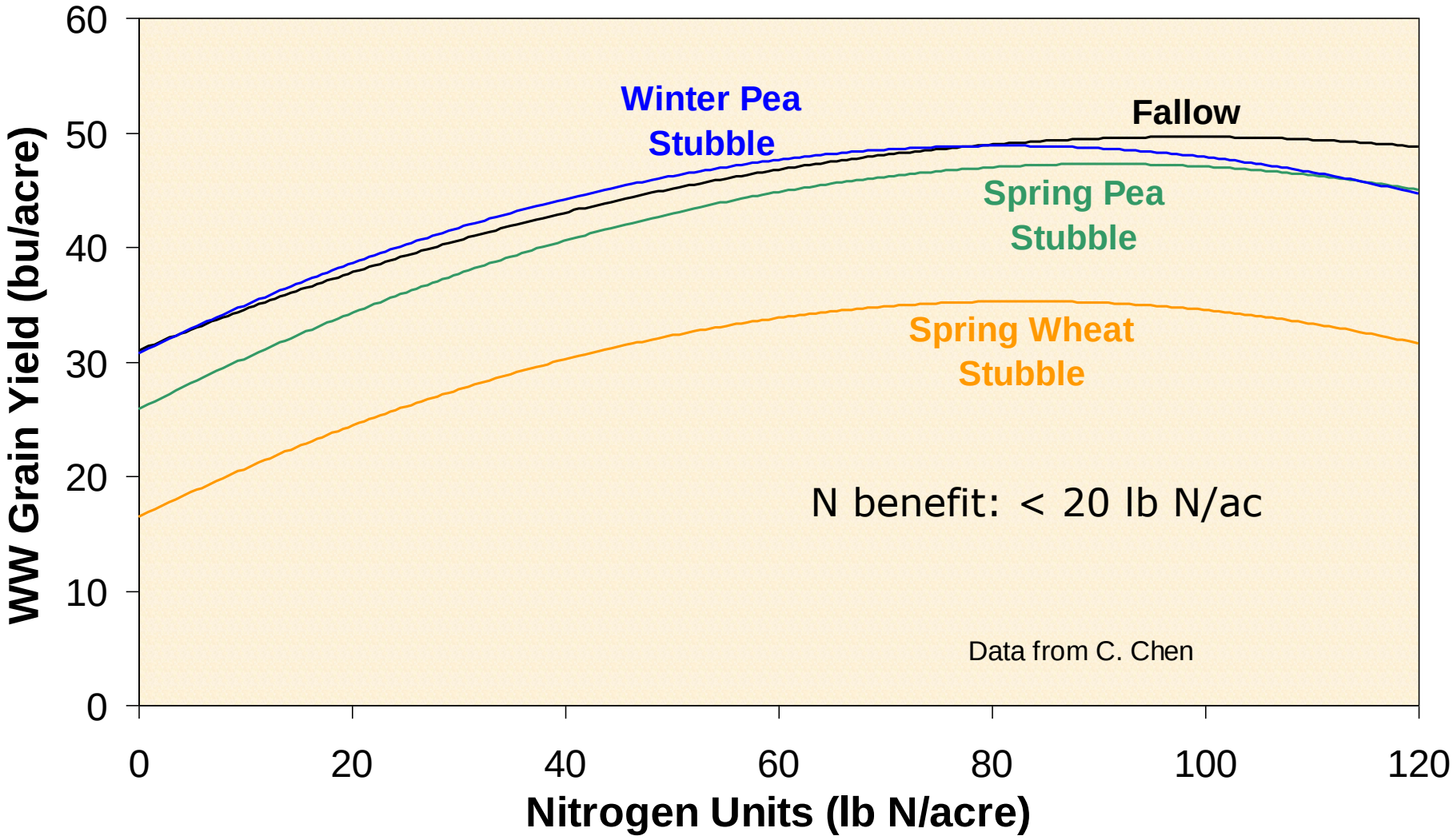
P Miller

Wheat needs 0 to 45 lb/ac less fertilizer N when grown on fallow or pea than on barley.

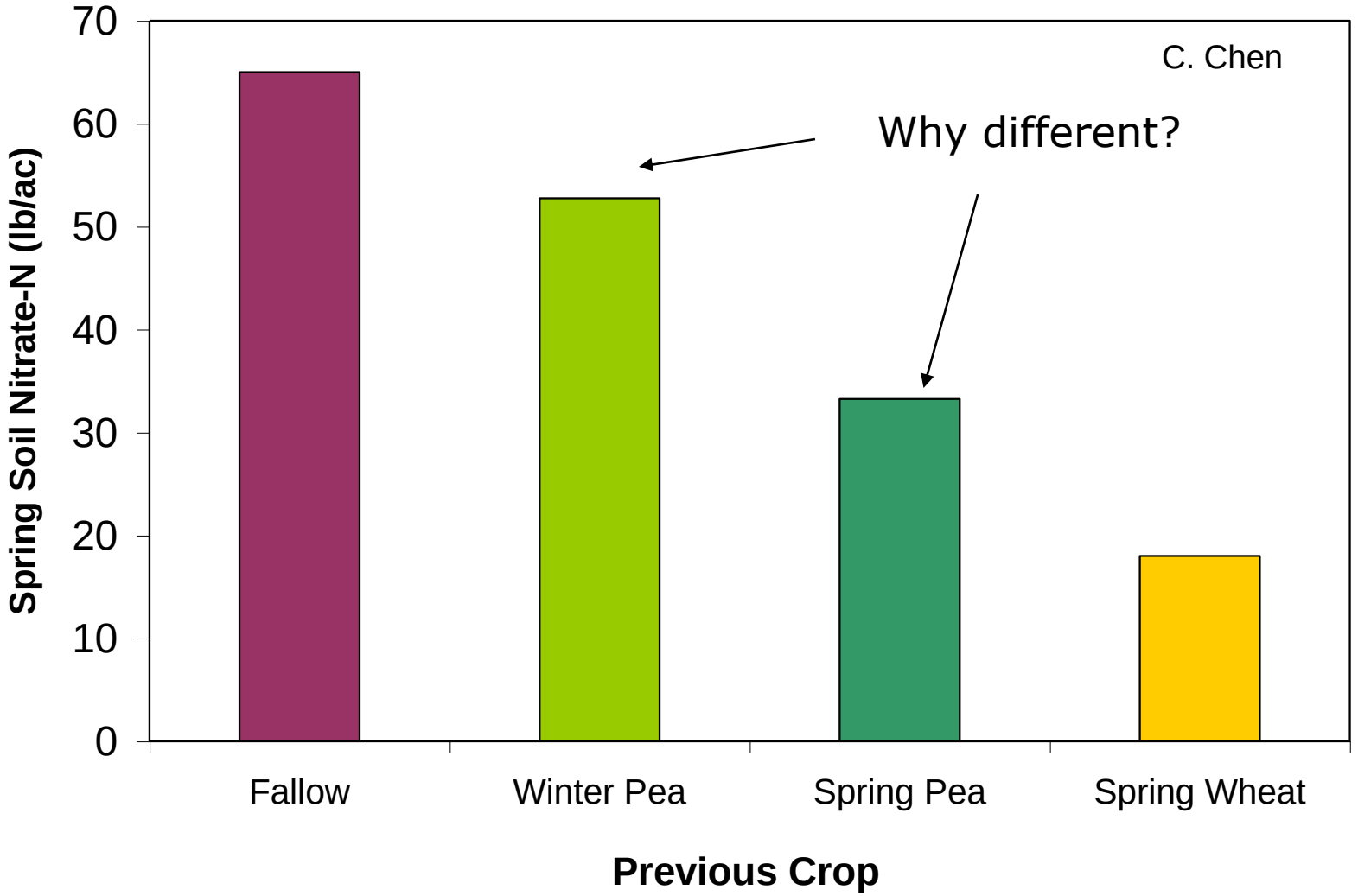
Moccasin Cropping System/Tillage Study



Nitrogen Benefit: Effect of Previous Crop and N on 2006 Winter Wheat Grain Yield (NT) at Moccasin, MT



Nitrogen Benefits: Effect of Previous Crop on Spring Nitrate-N



N benefit = N fixed – N grain

- N benefit ~ 10 - 20 lb N/ac for pea and lentil in northern Great Plains (Walley et al. 2007)
- N benefit ~ 0 lb N/ac for chickpea
- Need more than ~50% of N uptake to be fixed N to have a positive N benefit.

Why is N benefit not larger?

- Peas and lentils CAN 'fix' about 2-4 lb N/bu.
  Ex: 50-100 lb N/acre for 25 bu crop.
- About 2/3 of this is removed at harvest leaving ~16 to 33 lb N/ac of residue and root N.
- Credit TO NEXT CROP is about 10 lb N/acre. Where did rest go?

How do I maximize N benefit?

- Seed legume into soil with low available N
- Inoculate, especially if field never had legumes
- Provide sufficient phosphorus (P), potassium (K), and sulfur (S)

Not Fertilized

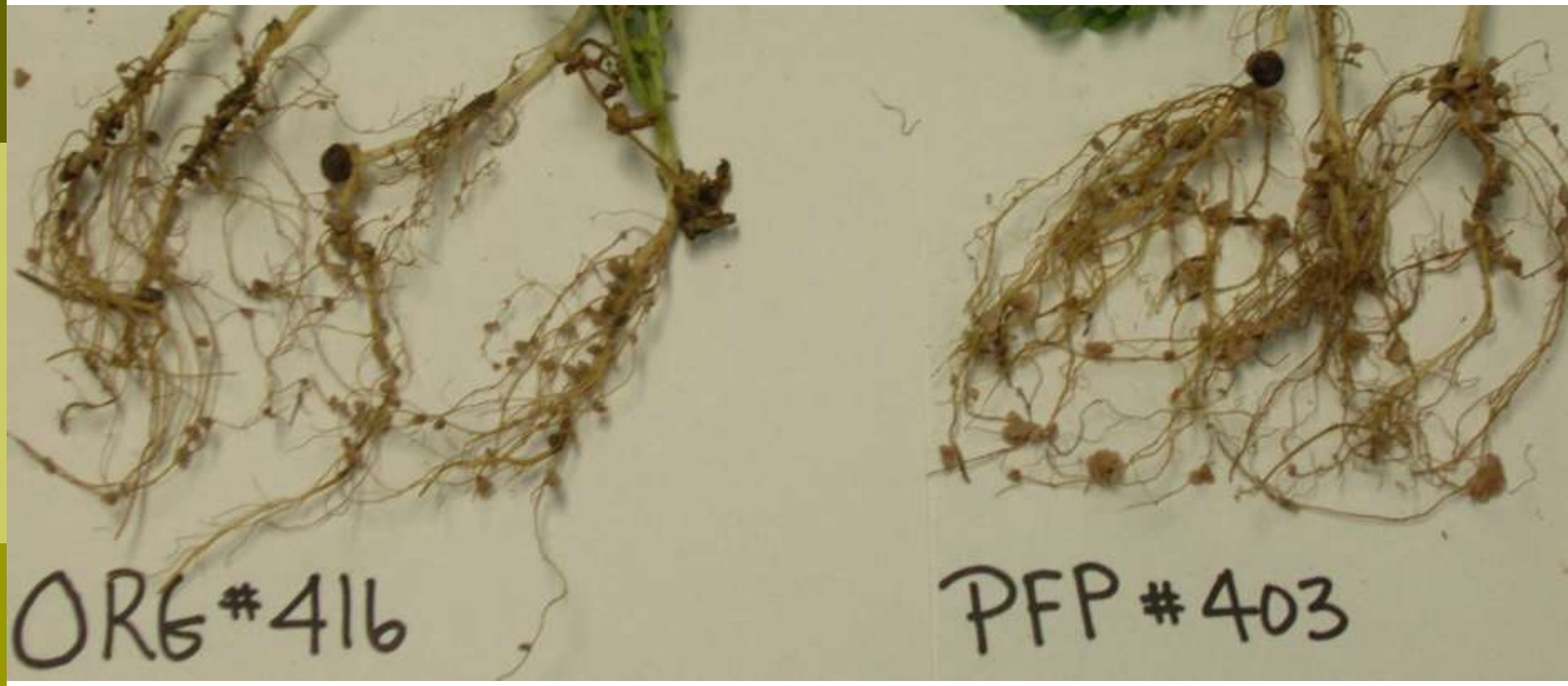
Fertilized w/ P, K, and S

Winter Pea, Bozeman, 5/17/07

Winter Pea Roots

Not Fertilized

Fertilized with P, K, and S



Winter Pea, Bozeman, 5/17/07

Conclusions on N benefits of pulses

- N credit and benefits are not the same
- N credit and benefit are relatively low b/c most of the fixed N is removed at harvest
- N credit for fall sampling (instead of spring) appears to be higher than pulse credit
- Benefits should increase the longer that pulses are in a rotation
- With high pulse prices, maximizing fixed N and yield with P, K, and/or S fertilization can likely pay for itself.

For more information

- Soil Fertility Website: http://landresources.montana.edu/soilfertility
- Cropping Systems Website: http://scarab.msu.montana.edu/CropSystems

With good fertility you can grow big pods

Shameless Plug

For a chance to win $100 worth of seed and help us with our urea volatilization study, please fill out survey in back of room.

Drawing for seed will be tomorrow at the end of Rick Engel's presentation on volatilization.