

Simultaneous seeding of annual and perennial grasses in pipeline revegetation



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Water pipeline western ND

- Summer 2008 pipeline installed
- May 2009 seeded
- Western wheatgrass
- Slender wheatgrass
- Green needlegrass
- Sideoats grama
- Common oat
- Millet



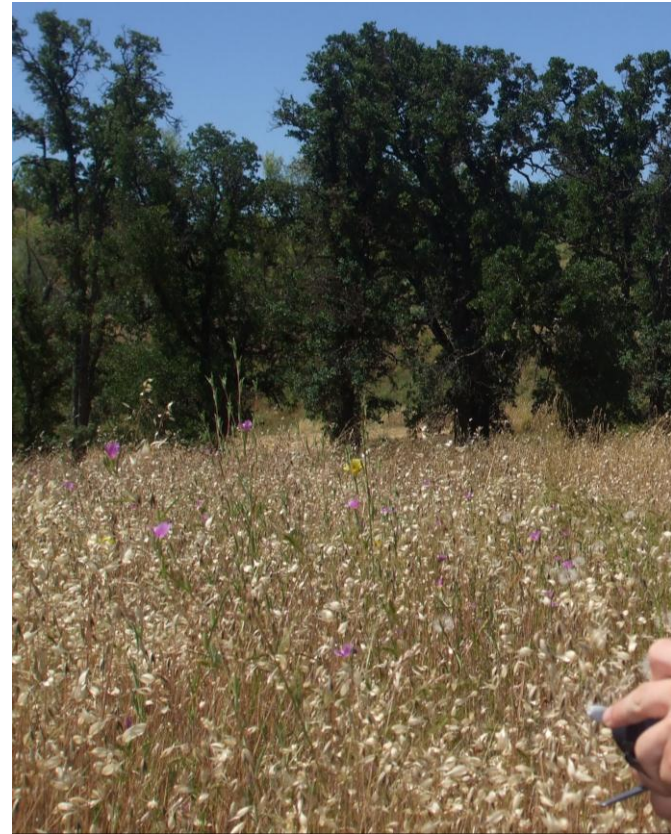
Do annuals reduce perennial performance?

- Annual grasses outcompete perennials
 - Great Basin
 - CA
- Invasives
- But...?
- Common oat
- Millet



Plant competition and annual spread

- Competition is a mainstay in plant ecology
- Occurs within restoration?
- Will annuals spread beyond the pipeline and persist as weeds?



Benefits of annuals

- Soil stabilization
- Forage

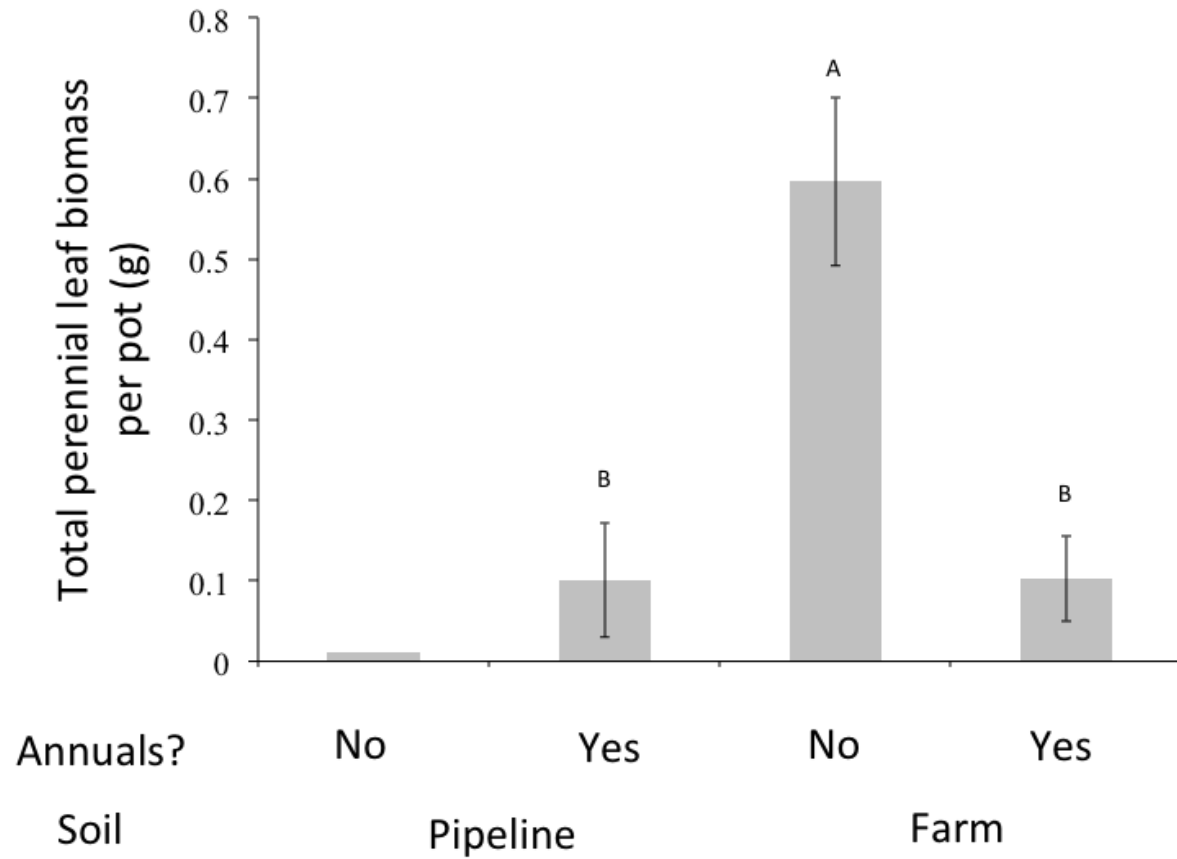


Experiments in 2009

- Do annuals inhibit germination and early growth of perennials?
- Does removing annuals improve perennial growth?



2009 greenhouse result: unfertilized soil



Do annuals inhibit germination and early growth of perennials?

- Greenhouse experiment
- Pipeline soil and farm soil
- Answer: only on farm soil



Does removing annuals improve perennial growth?

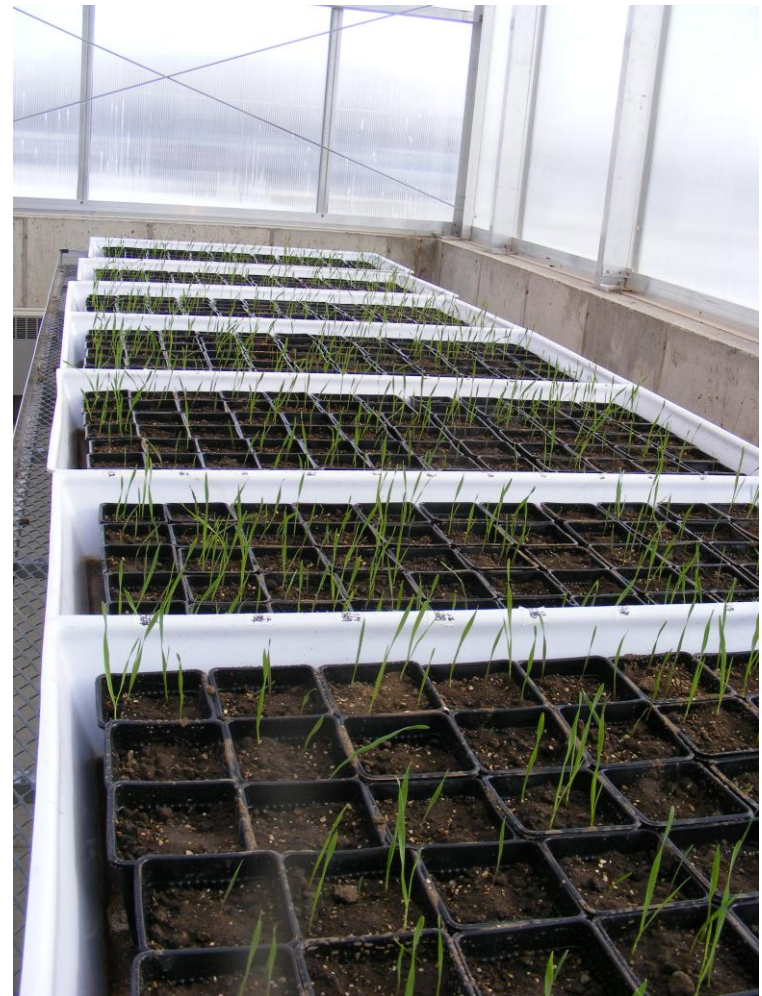
- Thinned annuals from large plots in pipeline
- Answer: NO



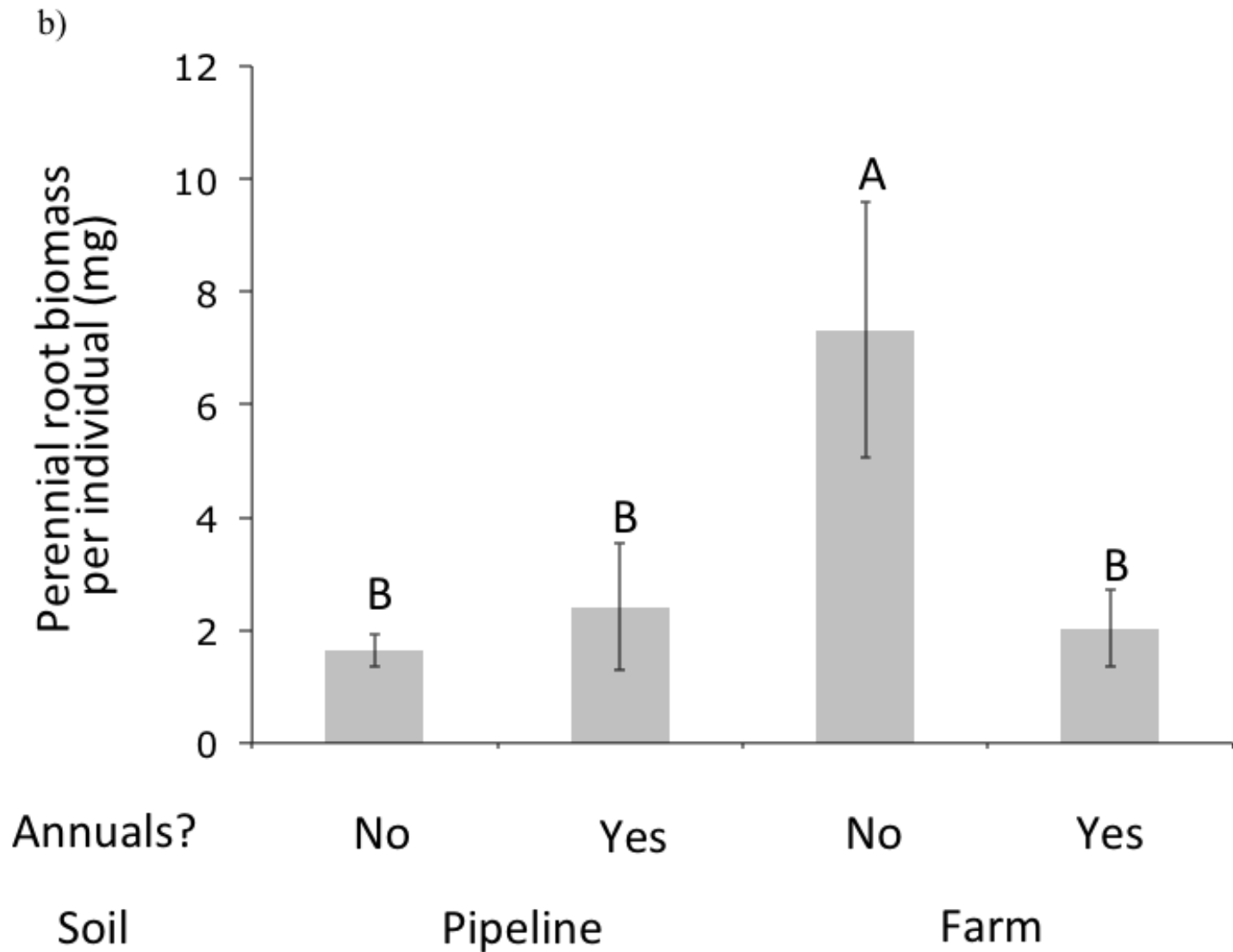
Do annuals inhibit germination and early growth of perennials when FERTILIZED?

2010 follow up
experiment

- Greenhouse experiment
- Pipeline soil and farm soil
- Answer: only in farm soil
- (Farm soil productivity same in 2009 & 2010, pipeline soil doubled in 2010)



2010 greenhouse result: fertilized soil



What is going on with pipeline soil?

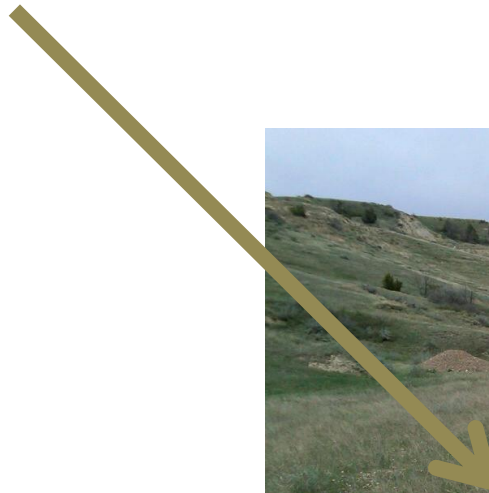
Farm

High in Nitrogen
High in Phosphorous



Pipeline

High in Na (sodium)
High in Sulfur



Soil type gradient: stress to no-stress

Farm

High in Nitrogen
High in Phosphorous



Grassland

Variable among 3 locations
Lower in Na and S

Pipeline

High in Na (sodium)
High in Sulfur



Do annuals affect germination and early growth in natural conditions?

farm

grassland

pipeline



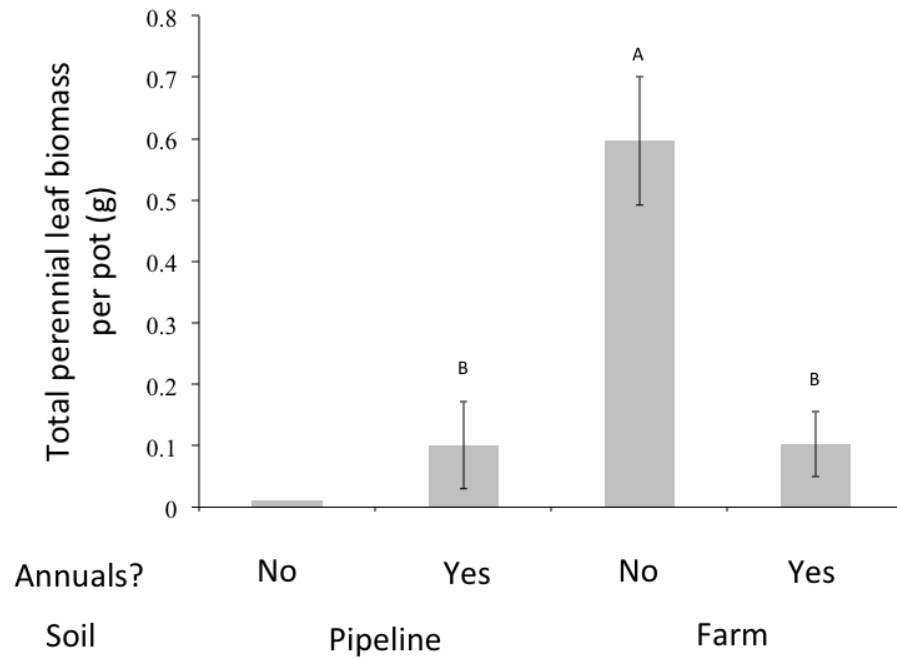
Annuals do not affect germination and early growth in natural conditions

- Pipeline plots destroyed (washed out)
- Farm: NO
- Grassland: NO

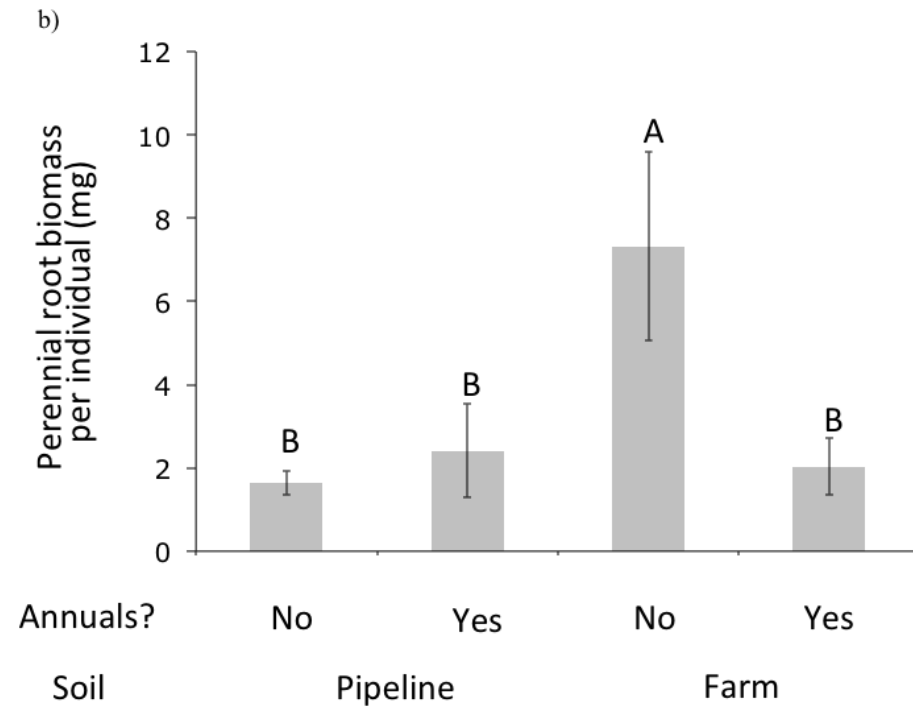


Similar results in both greenhouse experiments

2009



2010



Summary

- Annuals only competed with perennials on farm soil under controlled conditions
- High variability led to no effect of annuals under field conditions
- Stressful soil in pipeline meant competition was not important



Special conditions

- 2009-2011 were very wet years
- Site grazed, light stocking rate
- Annuals did not persist beyond first year (due to grazing?)
- Weeds not a problem: few at site prior to pipeline



Annuals do not prevent blow-outs



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