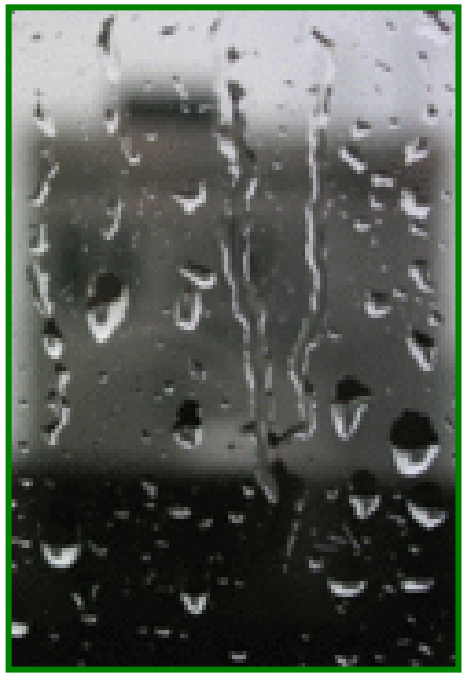
Multi-factor climate change effects on woody seedlings in an old-field ecosystem



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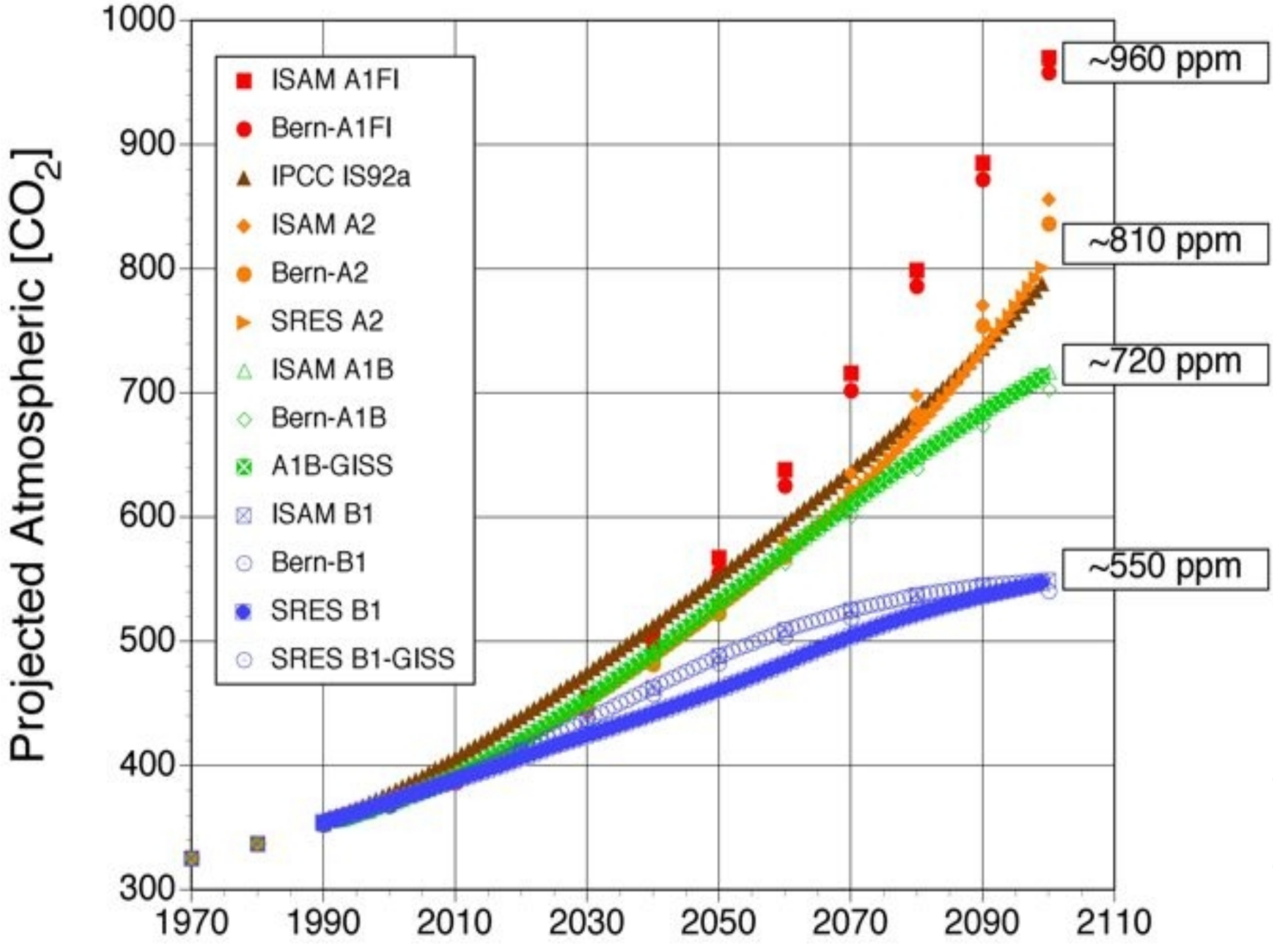
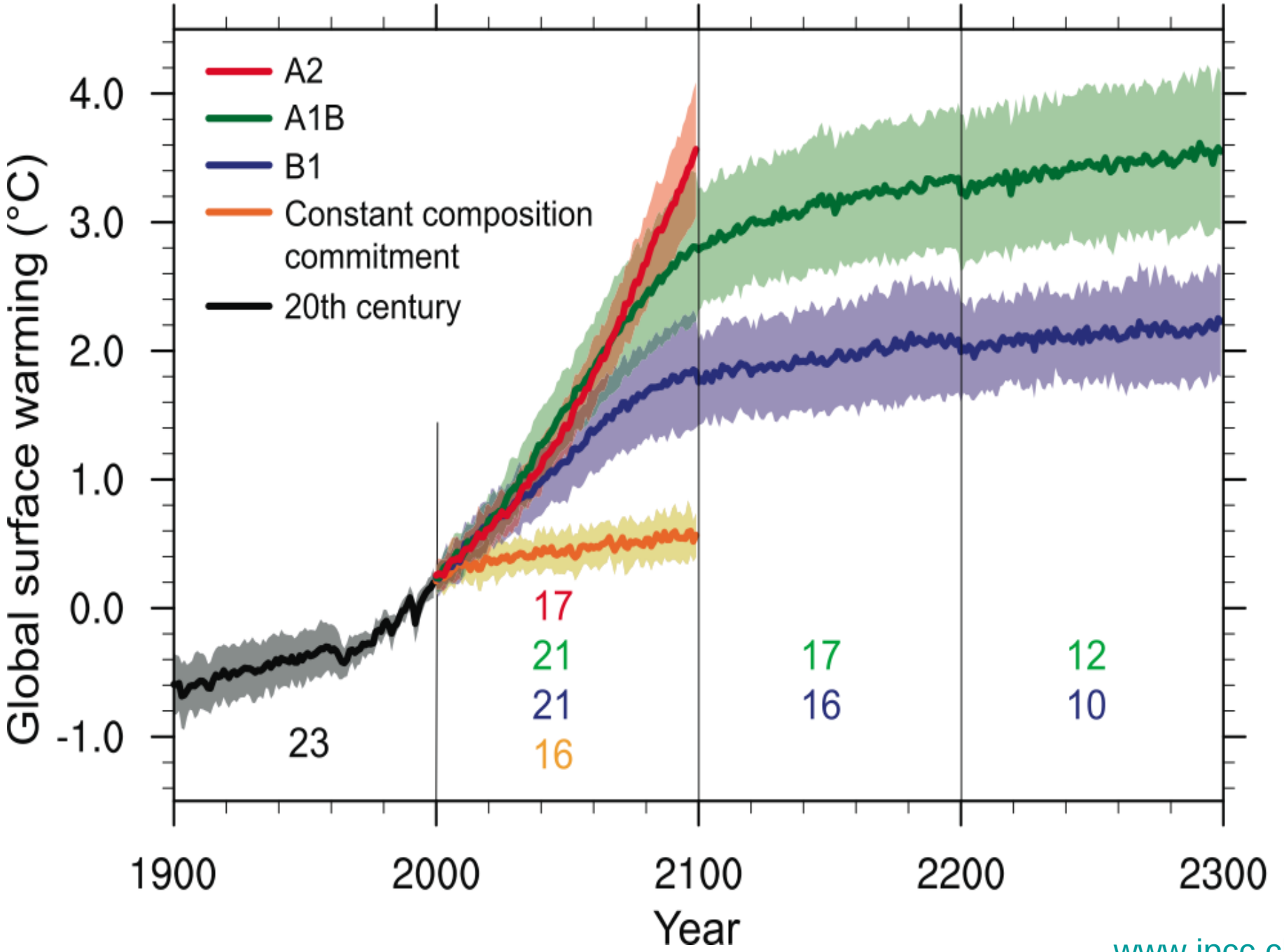
Global Change Education Program
GLOBAL CHANGE EDUCATION PROGRAM

THE UNIVERSITY of TENNESSEE KNOXVILLE


Projected Atmospheric [CO_2]
1000
900
800
700
600
500
400
300
1970
1990
2010
2030
2050
2070
2090
2110
ISAM A1FI
Bern-A1FI
IPCC IS92a
ISAM A2
Bern-A2
SRES A2
ISAM A1B
Bern-A1B
A1B-GISS
ISAM B1
Bern-B1
SRES B1
SRES B1-GISS
~960 ppm
~810 ppm
~720 ppm
~550 ppm
www.ipcc.ch


A2
A1B
B1
Constant composition commitment
20th century
Global surface warming (°C)
4.0
3.0
2.0
1.0
0.0
-1.0
1900
2000
2100
2200
2300
Year
23
17
21
21
16
17
16
12
10

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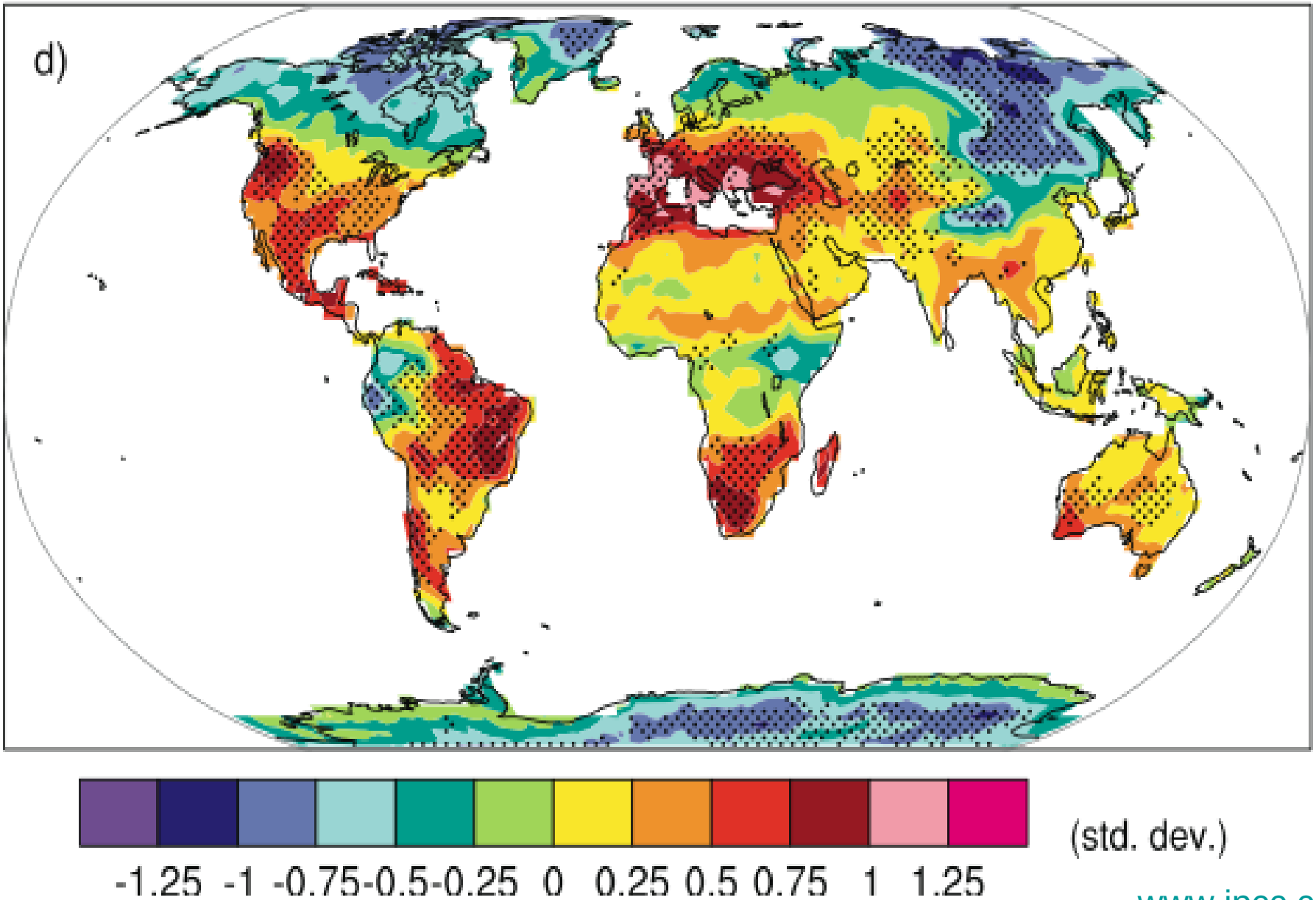
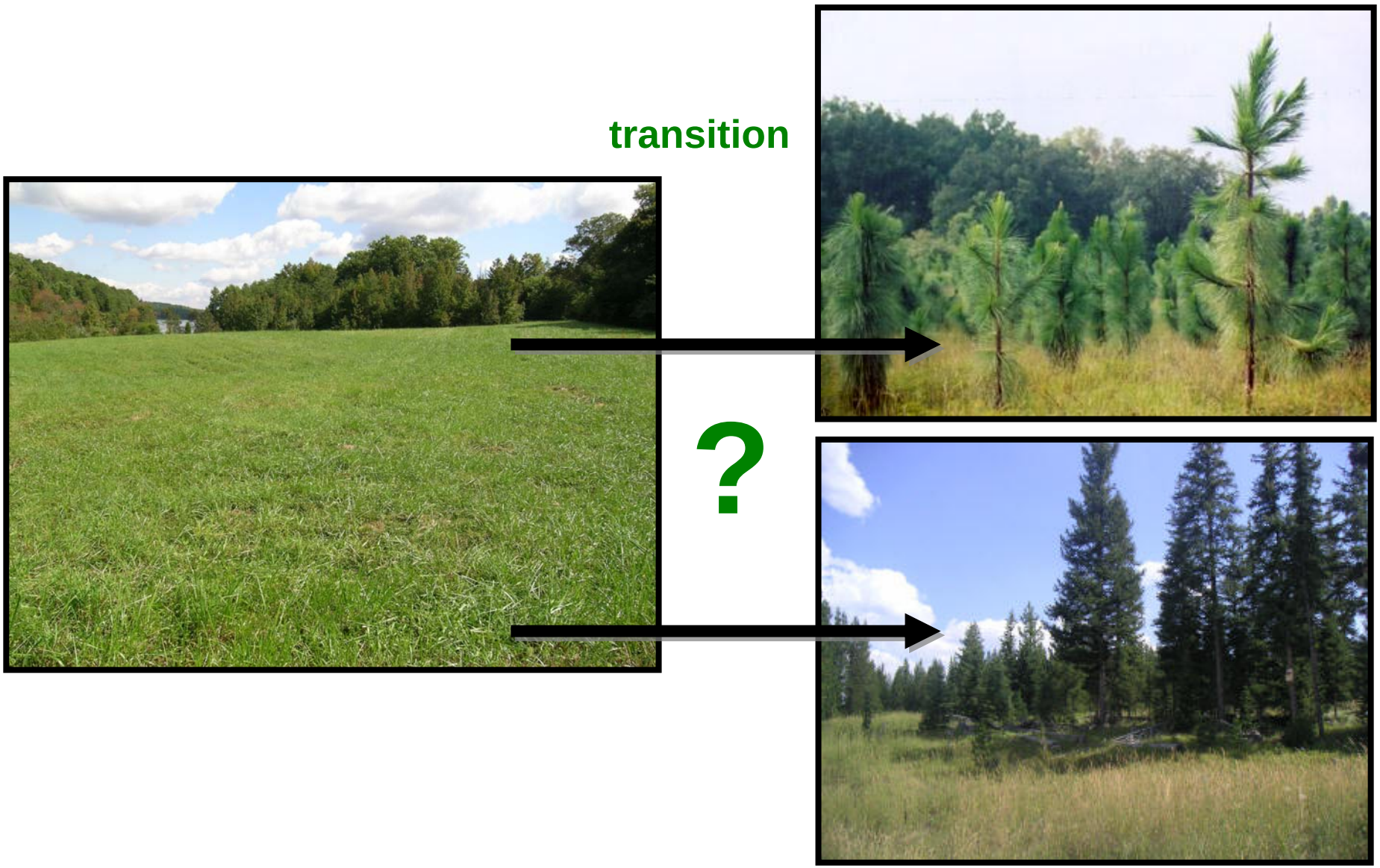
Dry days



CO_2, warming, and precipitation changes might interact to shape ecosystems



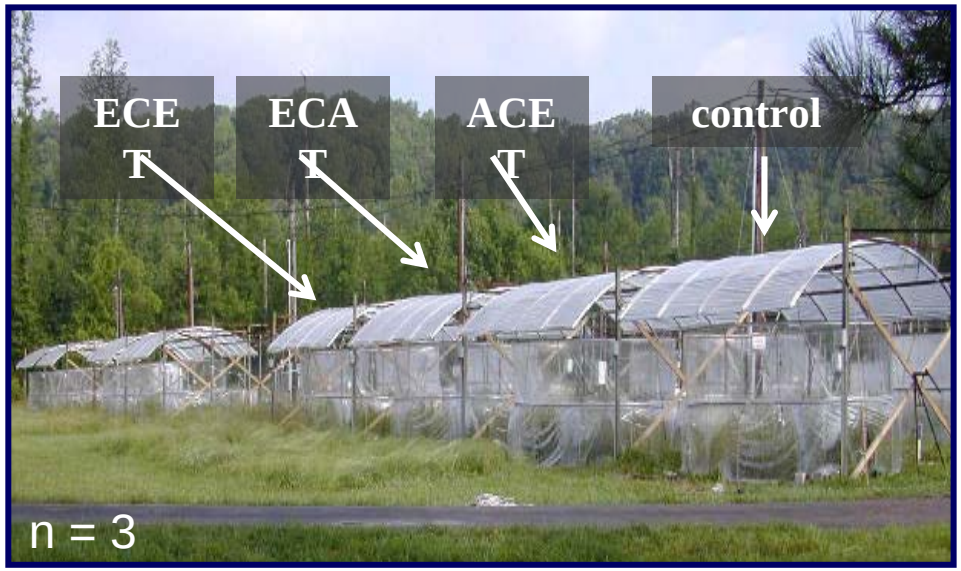
How do atmospheric and climate change factors alter woody seedling establishment?

Randomized, complete block, split plot design

- *Andropogon virginicus* C_4 grass
- *Dactylis glomerata* C_3 grass
- *Festuca pratense* C_3 grass
- *Lespedeza cuneata* N-fixer (C_3)
- *Plantago lanceolata* C_3 herb
- *Solidago canadensis* C_3 herb
- *Trifolium pratense* N-fixer (C_3)

Create a complex system

Randomized, complete block, split plot design



Multi-Factor

Elevated CO_2 (+300 ppm)
Warming (+3˚C)

- *Andropogon virginicus* C_4 grass
- *Dactylis glomerata* C_3 grass
- *Festuca pratense* C_3 grass
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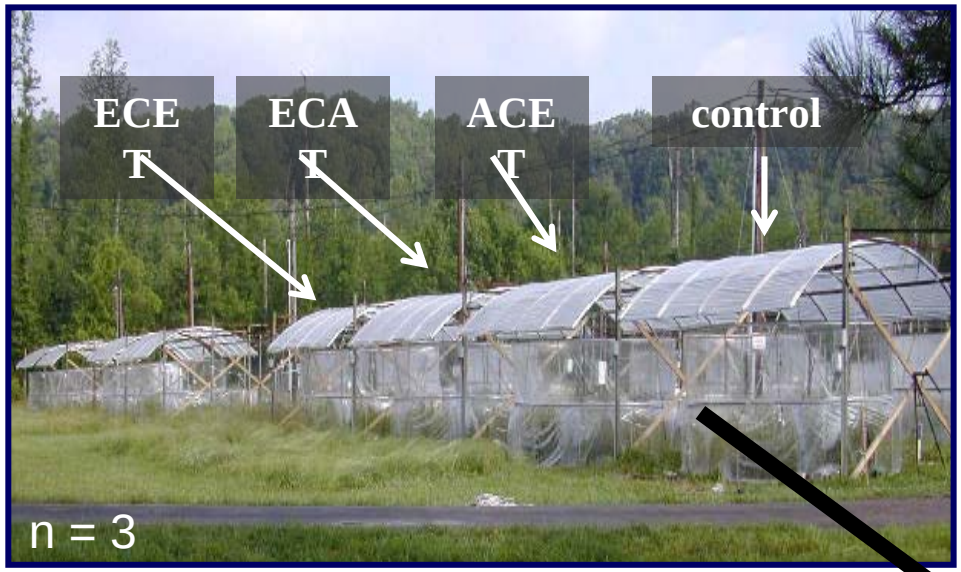
Create a complex system

Randomized, complete block, split plot design



Multi-Factor

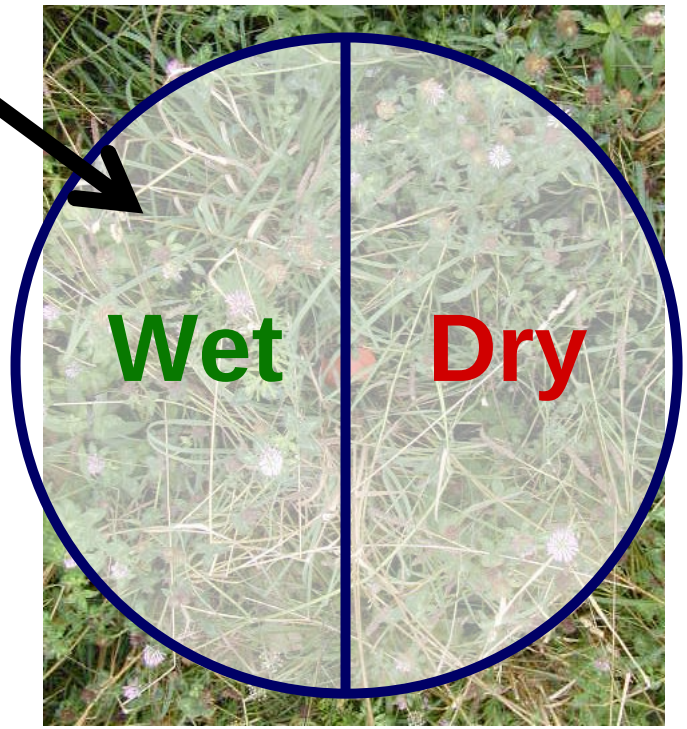
Elevated CO_2 (+300 ppm)

Warming (+3˚C)

Soil Moisture

- *Andropogon virginicus* C_4 grass
- *Dactylis glomerata* C_3 grass
- *Festuca pratense* C_3 grass
- *Lespedeza cuneata* N-fixer (C_3)
- *Plantago lanceolata* C_3 herb
- *Solidago canadensis* C_3 herb
- *Trifolium pratense* N-fixer (C_3)

Create a complex system



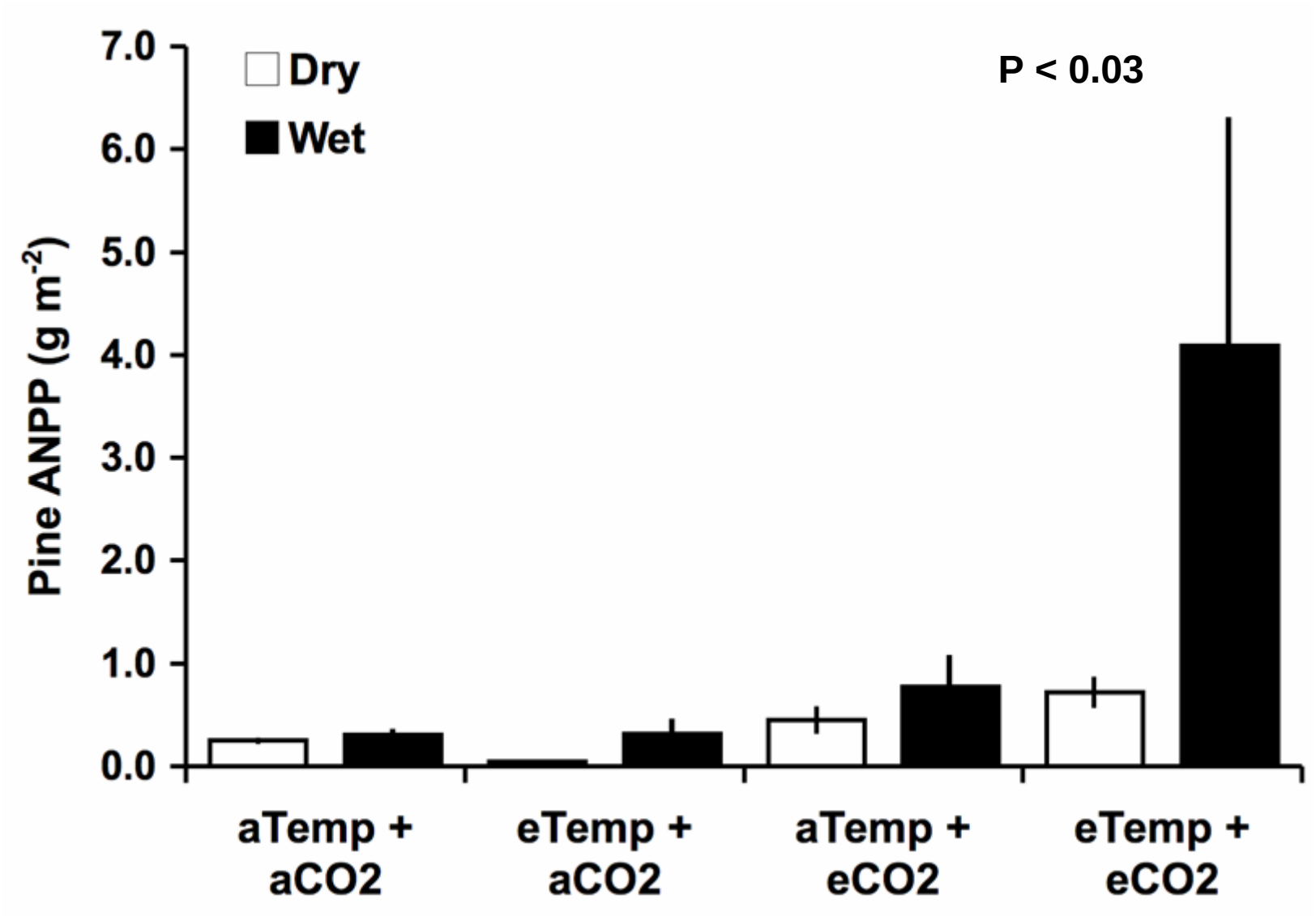
How do atmospheric and climate change factors alter woody seedling establishment?

Woody Seedling Success

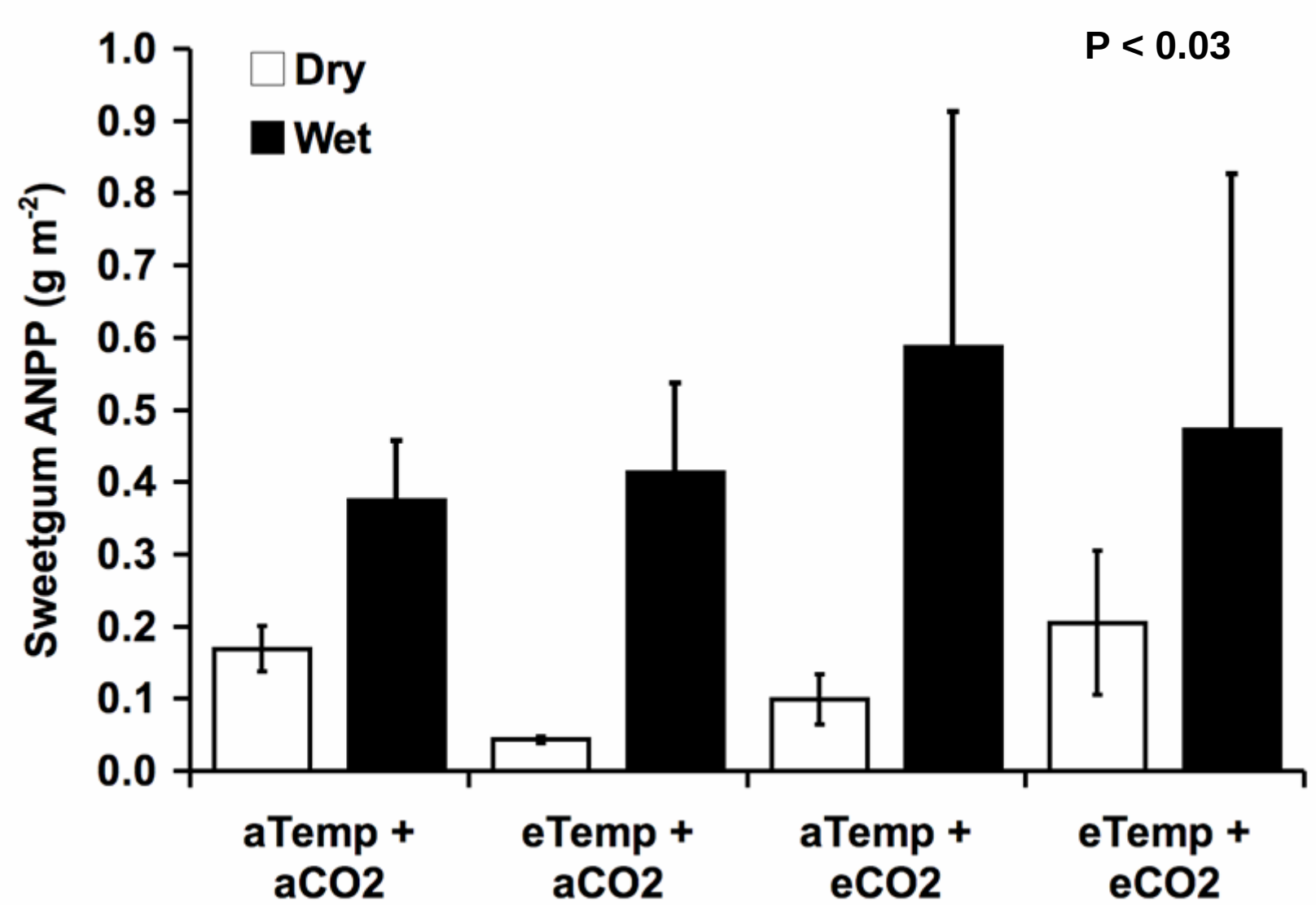
Loblolly Pine

Sweetgum

Elevated CO_2 increased ANPP 80 %



Dry treatments reduced ANPP 70 %



How do atmospheric and climate change factors alter woody seedling establishment?

ANPP reduced under drought

How do atmospheric and climate change factors alter woody seedling establishment?

ANPP reduced under drought

ANPP increased under elevated CO_2

How do atmospheric and climate change factors alter woody seedling establishment?

ANPP reduced under drought

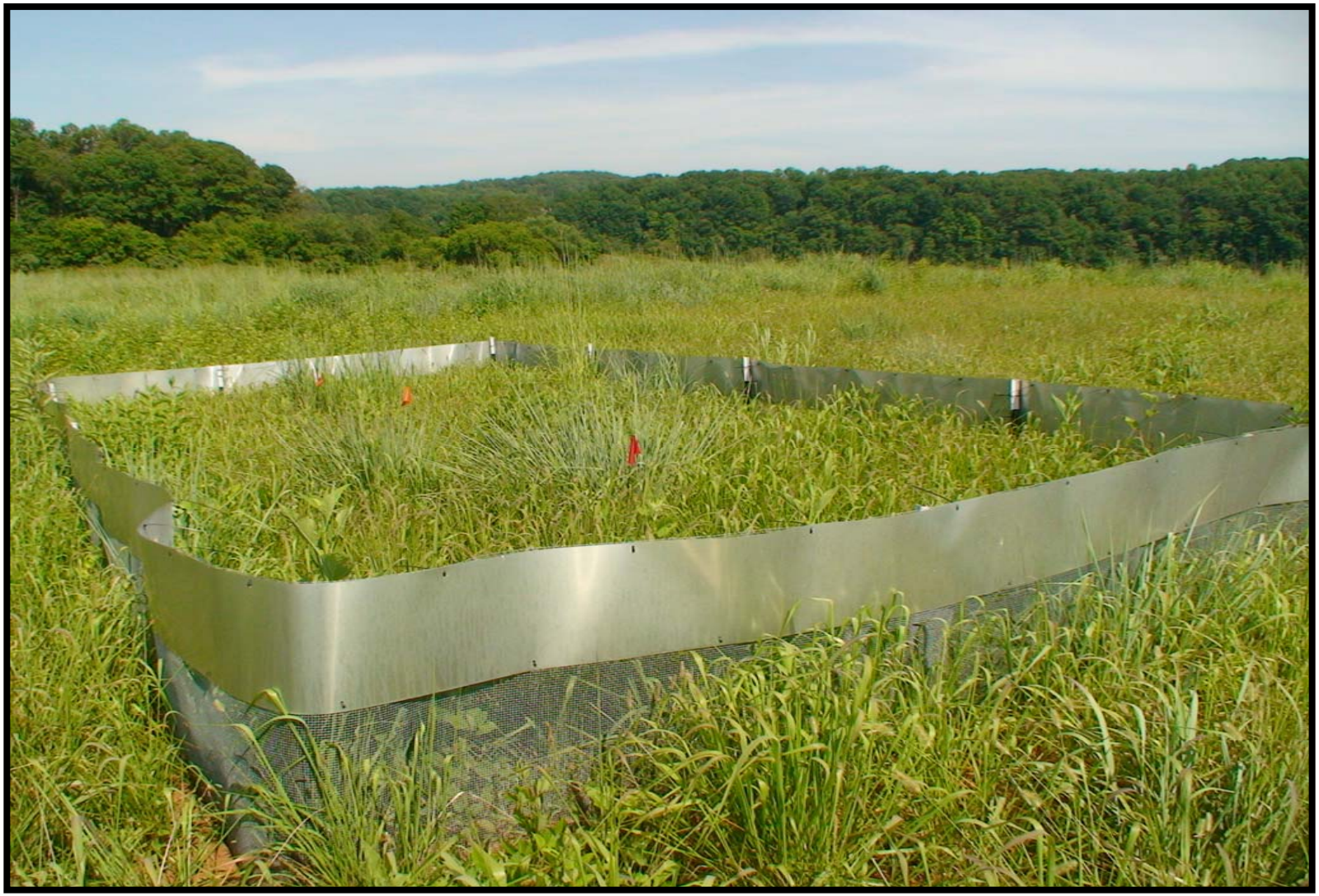
ANPP increased under elevated CO_2

Climatic change will alter transitional ecosystems

pines responded CO_2, sweetgum responded to water

Hypothesis: The effects of climate change treatments on soil microbial communities will persist and have consequences for seedling survival, plant growth, and plant competitive interactions

Does small mammal activity interact with precipitation to alter old-field ecosystems?



Future Directions

Acknowledgements