

# Plant reproductive responses to natural and experimental temperature variation in Barrow and Atqasuk, Alaska.

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# Climate Change & the Arctic

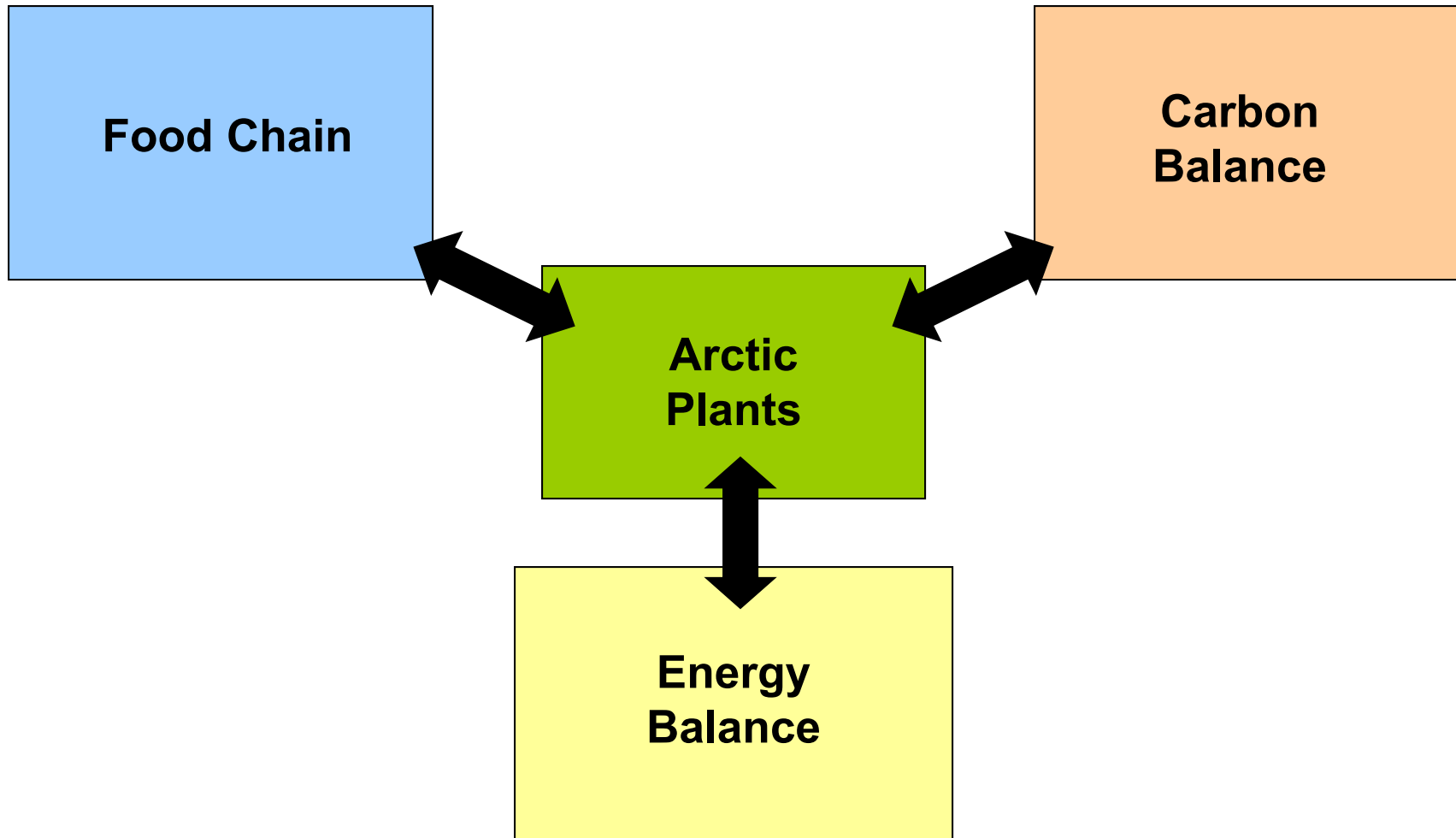
## Warming in the Arctic

- Greatest amount
- Fastest pace
- Large effect on plants
  - Adapted to cold

IPCC 2007



# Why are plants important?



# Predicting the Effects of Warming

## Open Top Chambers (OTC's)

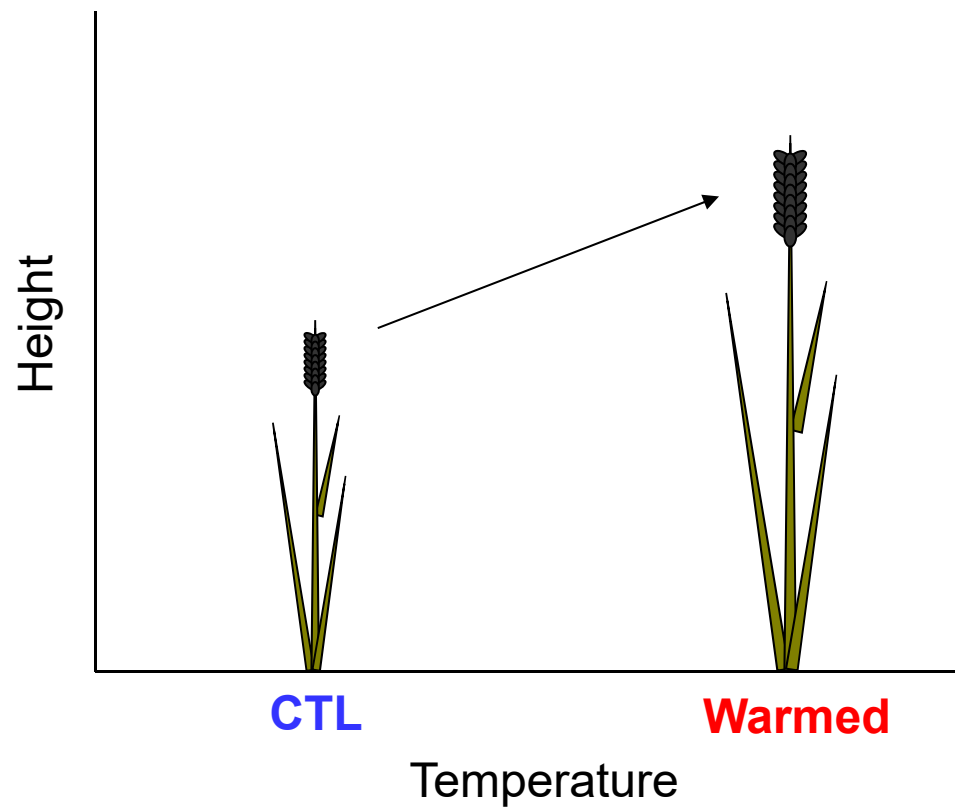
- Trap heat
- Allow light to pass
- Allow gas exchange
- Allow pollination
- Allow seed dispersal
  
- Block wind
- Dry Soil
- Lower light
- Access to herbivores / pollinators
- Increased daily range of temperatures



# Previous Findings

## Inflorescence Height

In general plants grow taller in response to warming

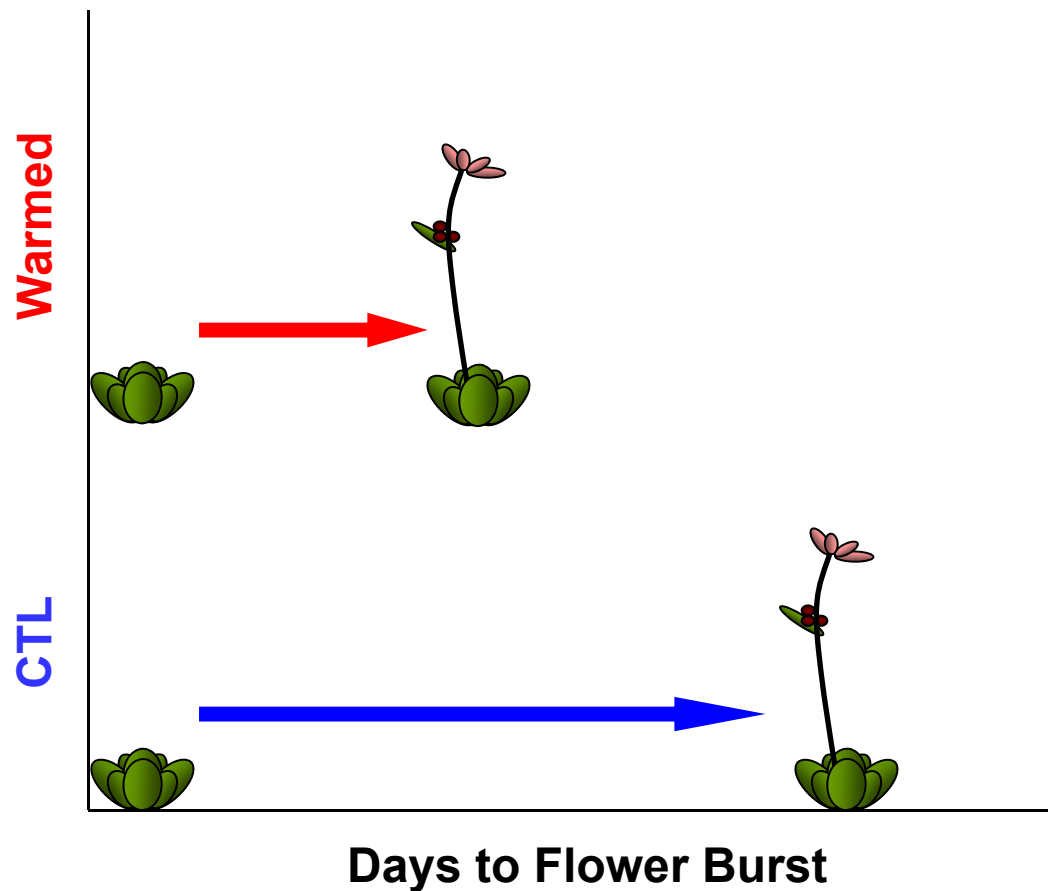


Arft et al 1999

# Previous Findings

## Flower Burst Date

In general most plants flower earlier in response to warming



Arft et al 1999

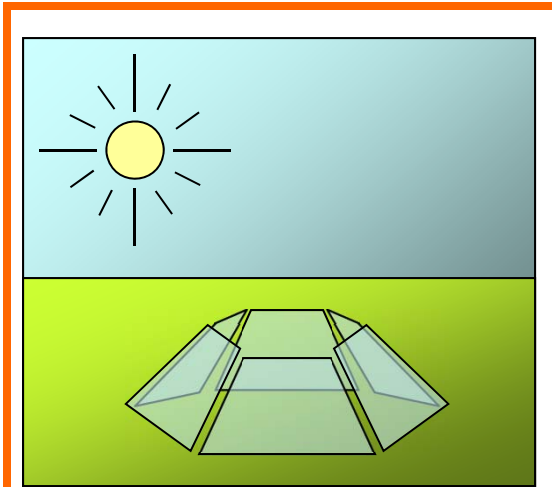
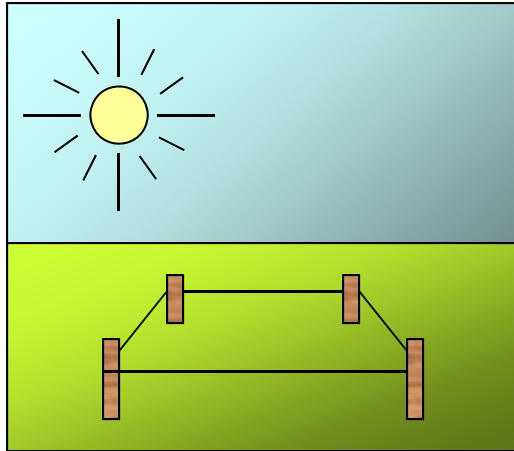
Are OTC's a valid means of predicting responses to Climate Change?



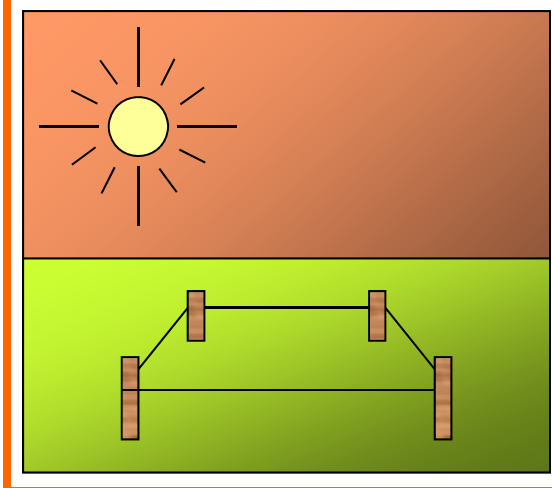
# Hollister & Webber 2000

## Barrow Wet Site

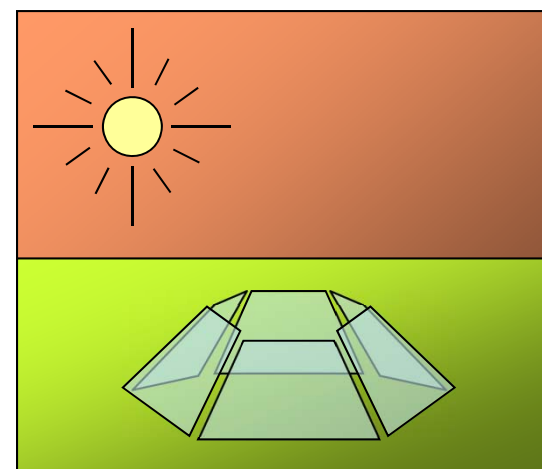
### Cooler Year



### Warmer Year



- Influence lengths responded similarly to experimental & natural temp. increase
- Flower burst dates responded similarly to experimental & natural temp. increase





Study Sites

**Barrow**

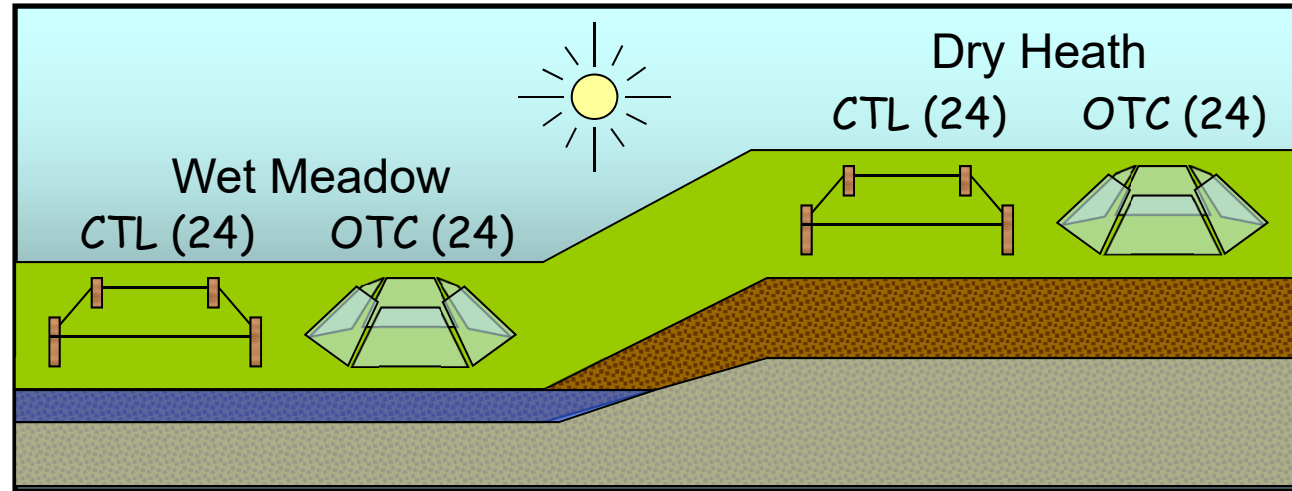


**Atqasuk**

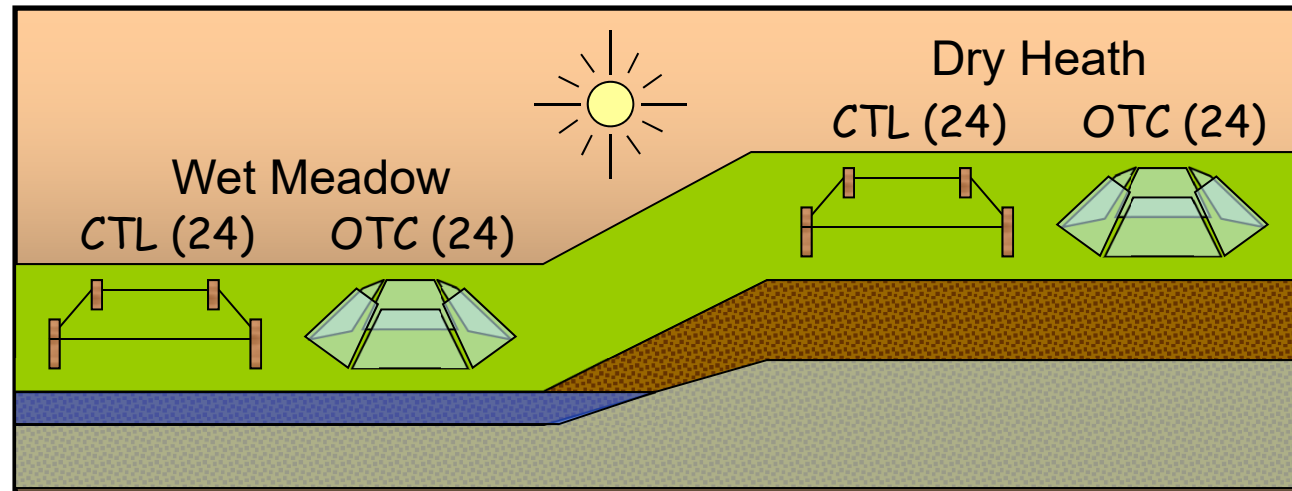


# Treatments

## BARROW

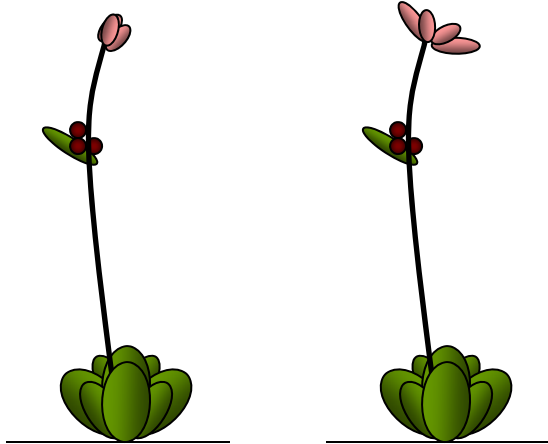


## ATQASUK



# Data Collection

## Flower Burst



- 3 marked individuals of each species & total plot

## Inflorescence Height



- Measured from ground to tip
- 3 marked individuals of each species & total plot/largest reproductive

# Data Collection



## Temperature

- Hourly Recordings

## Degree Days

Cumulative measure of temperature

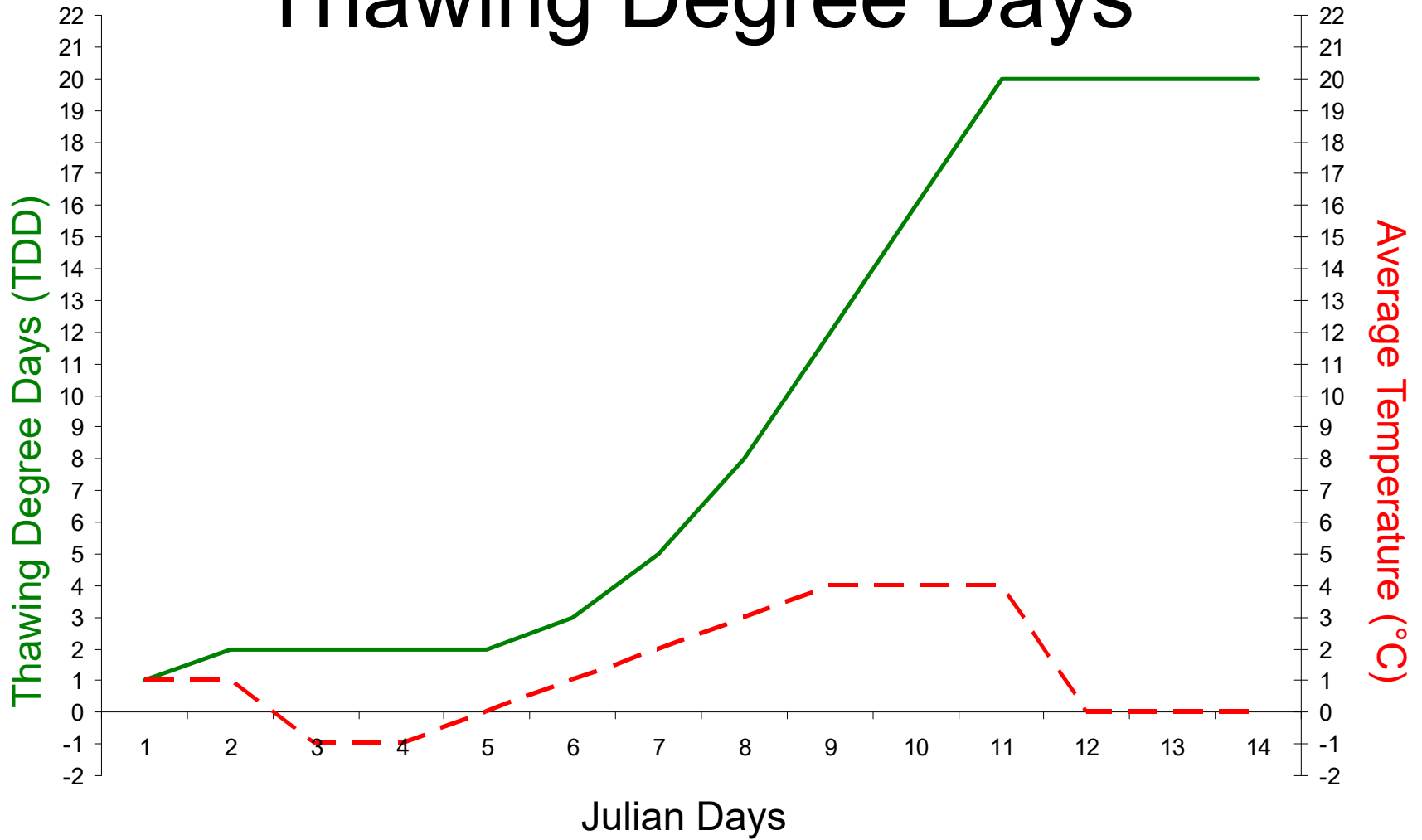
Growing Degree Days

-Temperatures above 10°C

Thawing Degree Days (TDD)

-Temperatures above 0°C

# Thawing Degree Days



# INF Height vs TDD

# Temp & Treatment on Height

AD	LUTCON
AW	DUPPSI
AW	ERIRUS
AD	CARBIG
AD	DIALAP
AD	HIEALP
AD	LUTARC
AD	POLBIS
AD	VACVIT
AW	CARAQU
AW	ERIANG
AW	PEDSUD
BD	CASTET
BD	DRAMIC
BD	PEDKAN
BD	SALROTF
BW	CARSUB
BW	ERIRUS
BW	ERITRI
BW	HIEPAU
BW	STELAE
BD	LUTARC
BD	PAPHUL
BD	POTHYP
BW	CALHOL
BW	POAARC
BW	SAXCER
AD	LEDPAL
BD	ARCLAT
BD	LUTCON
BD	POAARC
BD	SENATR
BD	SAXFOL
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	JUNBIG
BW	LUTARC
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

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All Species

# Temp & Treatment on Height

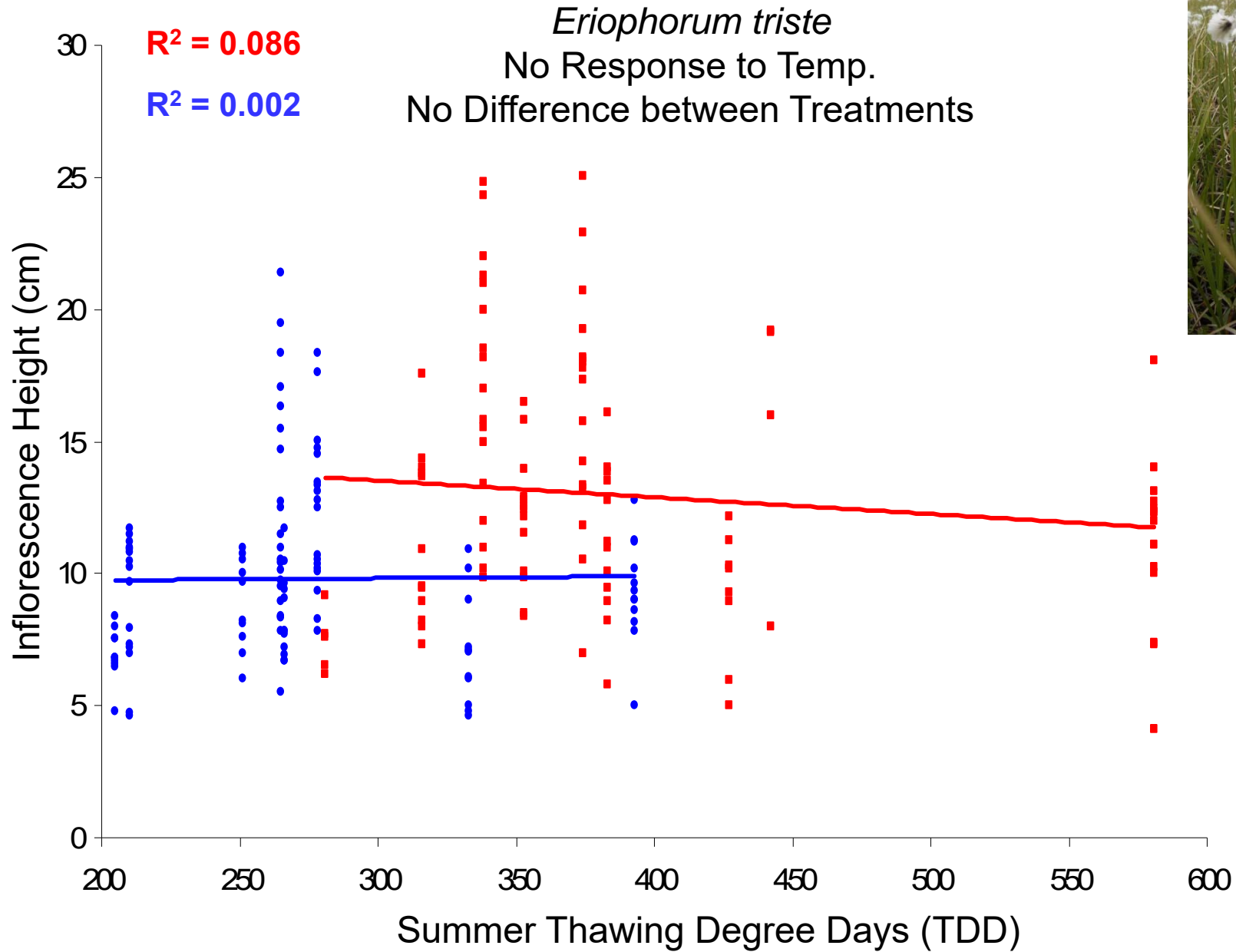
AD	LUTCON
AW	DUPPSI
AW	ERIRUS
AD	CARBIG
AD	DIALAP
AD	HIEALP
AD	LUTARC
AD	POLBIS
AD	VACVIT
AW	CARAQU
AW	ERIANG
AW	PEDSUD
BD	CASTET
BD	DRAMIC
BD	PEDKAN
BD	SALROTF
BW	CARSUB
BW	ERIRUS
BW	ERITRI
BW	HIEPAU
BW	STELAE
BD	LUTARC
BD	PAPHUL
BD	POTHYP
BW	CALHOL
BW	POAARC
BW	SAXCER
AD	LEDPAL
BD	ARCLAT
BD	LUTCON
BD	POAARC
BD	SENATR
BD	SAXFOL
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	JUNBIG
BW	LUTARC
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

**47% Showed No Response to Temp.**

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All Species





# Temp & Treatment on Height

AD LUTCON  
 AW DUPPSI  
 AW ERIRUS  
 AD CARBIG  
 AD DIALAP  
 AD HIEALP  
 AD LUTARC  
 AD POLBIS  
 AD VACVIT  
 AW CARAQU  
 AW ERIANG  
 AW PEDSUD  
 BD CASTET  
 BD DRAMIC  
 BD PEDKAN  
 BD SALROTF  
 BW CARSUB  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW STELAE  
 BD LUTARC  
 BD PAPHUL  
 BD POTHYP  
 BW CALHOL  
 BW POAARC  
 BW SAXCER  
 AD LEDPAL  
 BD ARCLAT  
 BD LUTCON  
 BD POAARC  
 BD SENATR  
 BD SAXFOL  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW JUNBIG  
 BW LUTARC  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR



**53%**



BD LUTARC  
 BD PAPHUL  
 BD POTHYP  
 BW CALHOL  
 BW POAARC  
 BW SAXCER  
 AD LEDPAL  
 BD ARCLAT  
 BD LUTCON  
 BD POAARC  
 BD SENATR  
 BD SAXFOL  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW JUNBIG  
 BW LUTARC  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

All Species

Responded to Temp.

# Temp & Treatment on Height

**25% Showed Response to Temp.  
& Response to Treatment**

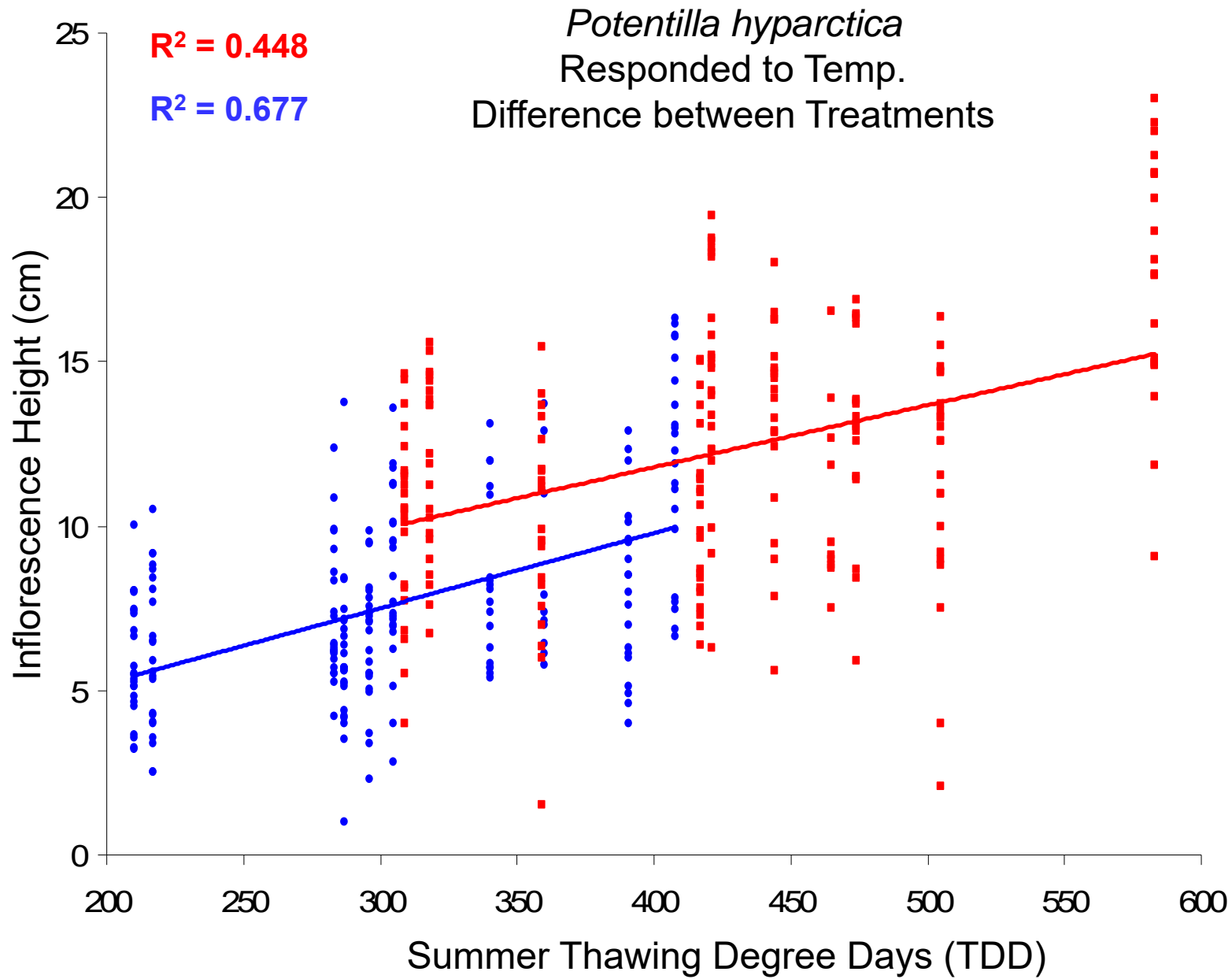
- AD LUTCON
- AW DUPPSI
- AW ERIRUS
- AD CARBIG
- AD DIALAP
- AD HIEALP
- AD LUTARC
- AD POLBIS
- AD VACVIT
- AW CARAQU
- AW ERIANG
- AW PEDSUD
- BD CASTET
- BD DRAMIC
- BD PEDKAN
- BD SALROTF
- BW CARSUB
- BW ERIRUS
- BW ERITRI
- BW HIEPAU
- BW STELAE
- BD LUTARC
- BD PAPHUL
- BD POTHYP
- BW CALHOL
- BW POAARC
- BW SAXCER
- AD LEDPAL
- BD ARCLAT
- BD LUTCON
- BD POAARC
- BD SENATR
- BD SAXFOL
- BD STELAE
- BD SAXPUN
- BW CARPRA
- BW CARSTA
- BW DUPFIS
- BW DRALAC
- BW JUNBIG
- BW LUTARC
- BW LUTCON
- BW SAXFOL
- BW SAXHIE
- BW SAXHIR

- BD LUTARC
- BD PAPHUL
- BD POTHYP
- BW CALHOL
- BW POAARC
- BW SAXCER

**53%**

All Species

Responded to Temp.



# Temp & Treatment on Height

AD LUTCON  
 AW DUPPSI  
 AW ERIRUS  
 AD CARBIG  
 AD DIALAP  
 AD HIEALP  
 AD LUTARC  
 AD POLBIS  
 AD VACVIT  
 AW CARAQU  
 AW ERIANG  
 AW PEDSUD  
 BD CASTET  
 BD DRAMIC  
 BD PEDKAN  
 BD SALROTF  
 BW CARSUB  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW STELAE  
 BD LUTARC  
 BD PAPHUL  
 BD POTHYP  
 BW CALHOL  
 BW POAARC  
 BW SAXCER  
 AD LEDPAL  
 BD ARCLAT  
 BD LUTCON  
 BD POAARC  
 BD SENATR  
 BD SAXFOL  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW JUNBIG  
 BW LUTARC  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

53%

BD LUTARC  
 BD PAPHUL  
 BD POTHYP  
 BW CALHOL  
 BW POAARC  
 BW SAXCER  
 AD LEDPAL  
 BD ARCLAT  
 BD LUTCON  
 BD POAARC  
 BD SENATR  
 BD SAXFOL  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW JUNBIG  
 BW LUTARC  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

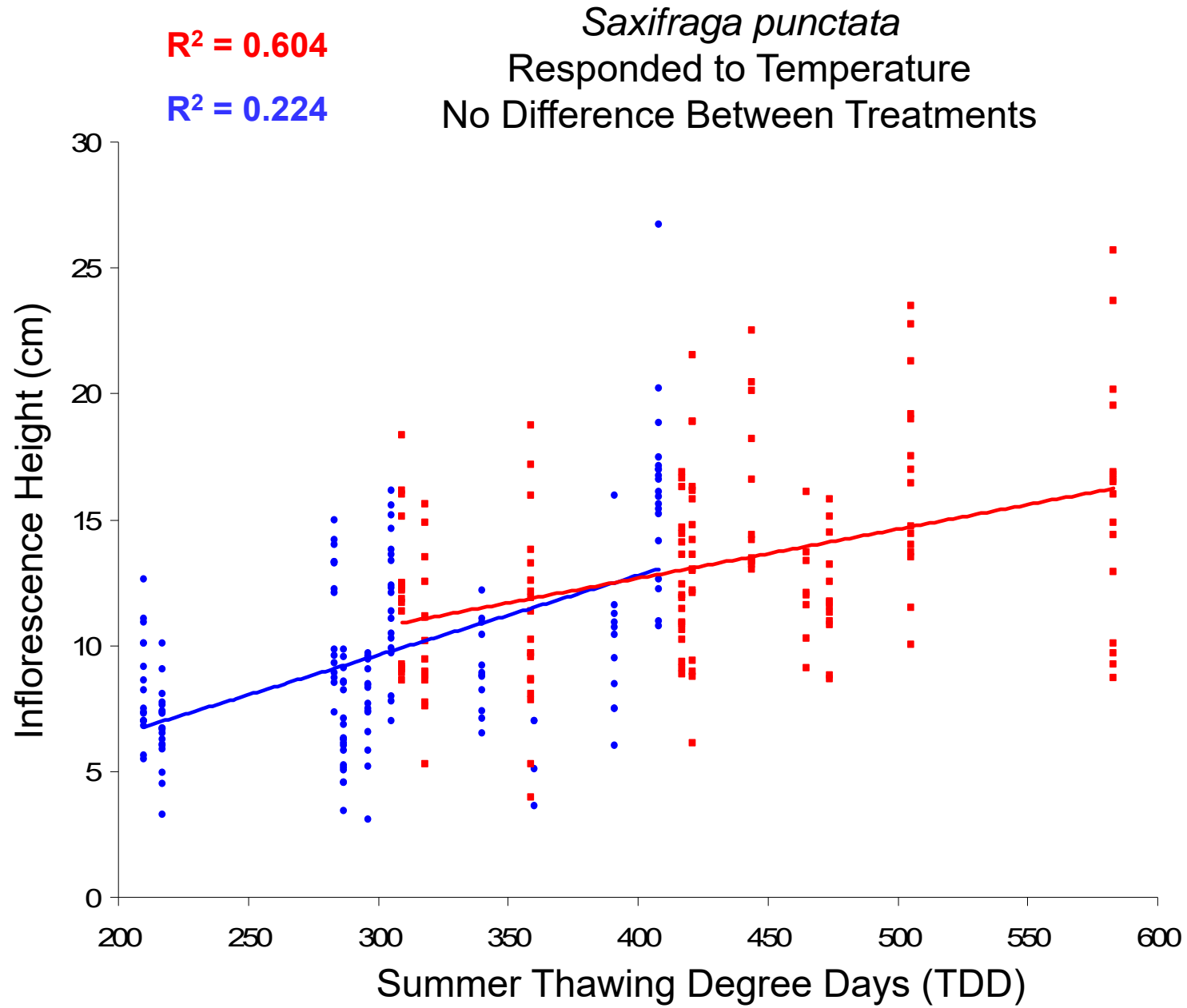
75%

AD LEDPAL  
 BD ARCLAT  
 BD LUTCON  
 BD POAARC  
 BD SENATR  
 BD SAXFOL  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW JUNBIG  
 BW LUTARC  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

All Species

Responded to Temp.

No Treatment Effect



AD	LUTCON
AW	DUPPSI
AW	ERIRUS
AD	CARBIS
AD	DIALAP
AD	HIEALP
AD	LUTARC
AD	POLBIS
AD	VACVIT
AW	CARAQU
AW	ERiang
AW	PEDSUD
BD	CASTET
BD	DRAMIC
BD	PEDKAN
BD	SALROTF
BW	CARSUB
BW	ERIRUS
BW	ERITRI
BW	HIEPAU
BW	STELAE
BD	LUTARC
BD	PAPHUL
BD	POTHYP
BW	CALHOL
BW	POAARC
BW	SAXCER
AD	LEDPAL
BD	ARCLAT
BD	LUTCON
BD	POAARC
BD	SENATR
BD	SAXFOL
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	JUNBIG
BW	LUTARC
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

# Temp & Treatment on Height

**7% of all Spp showed no response to Temp. but did respond to Treatment**

**53%**

**75%**

BD	LUTARC
BD	PAPHUL
BD	POTHYP
BW	CALHOL
BW	POAARC
BW	SAXCER
AD	LEDPAL
BD	ARCLAT
BD	LUTCON
BD	POAARC
BD	SENATR
BD	SAXFOL
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	JUNBIG
BW	LUTARC
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

AD	LEDPAL
BD	ARCLAT
BD	LUTCON
BD	POAARC
BD	SENATR
BD	SAXFOL
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	JUNBIG
BW	LUTARC
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

All Species

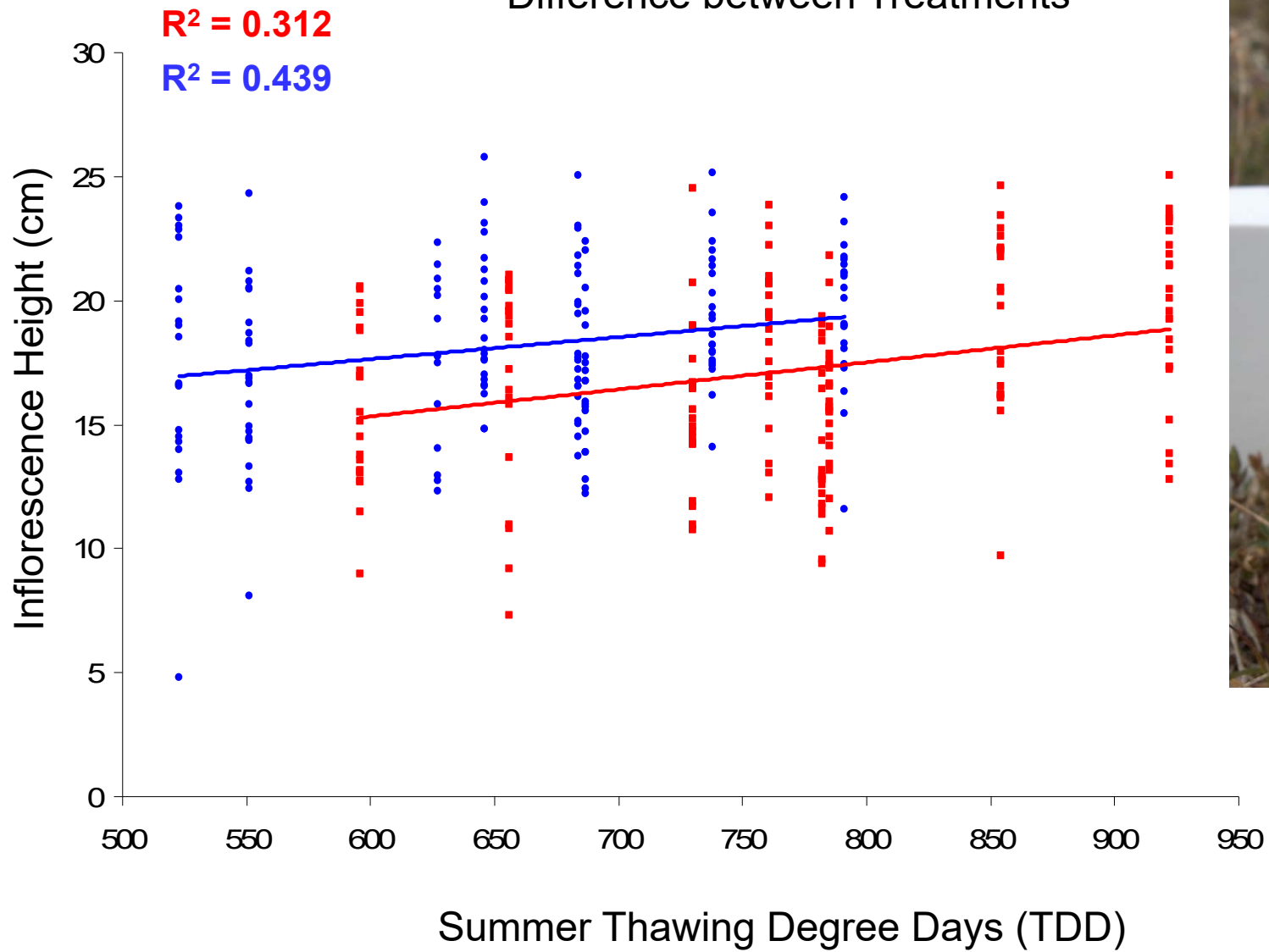
Responded to Temp.

No Treatment Effect

*Luzula confusa*

No Response to Temp.

Difference between Treatments





# Flower Burst vs TDD

# Temp & Treatment on Flower Burst

BD	ARCLAT
AD	CARBIG
AD	CASTET
AD	HIEALP
AD	LUTARC
AD	POLBIS
AW	DUPPSI
AW	ERiang
AW	ERIRUS
AW	SALPLR
AW	SALPLR
BD	DRALAC
BD	DRAMIC
BD	JUNBIG
BD	LUTARC
BD	POAARC
BD	PEDKAN
BD	SENATR
BD	SALROTF
BD	SALROTM
BW	CARSUB
BW	JUNBIG
BW	LUTARC
BW	POAARC
BW	SAXCER
BW	STELAE
AD	DIALAP
AD	LUTCON
AD	LEDPAL
AD	VACVIT
AW	CARAQU
BD	CASTET
BD	LUTCON
BD	PAPHUL
BD	POTHYP
BD	STELAE
BD	SAXPUN
BW	CARPRA
BW	CARSTA
BW	DUPFIS
BW	DRALAC
BW	ERIRUS
BW	ERITRI
BW	HIEPAU
BW	LUTCON
BW	SAXFOL
BW	SAXHIE
BW	SAXHIR

**54% Showed No Response to Temp.**

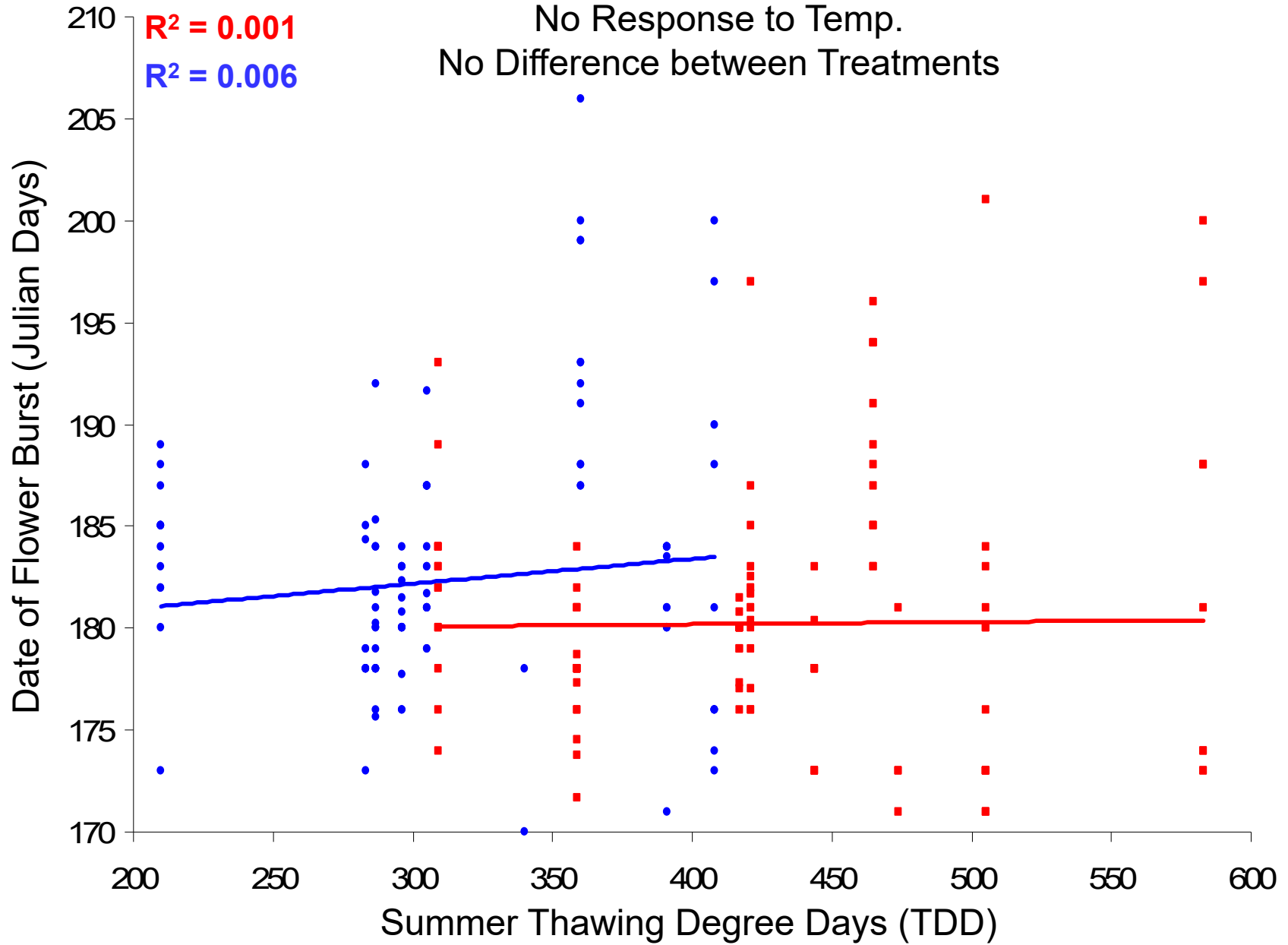
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All Species

*Luzula arctica*

No Response to Temp.

No Difference between Treatments



# Temp & Treatment on Flower Burst

BD ARCLAT  
 AD CARBIG  
 AD CASTET  
 AD HIEALP  
 AD LUTARC  
 AD POLBIS  
 AW DUPPSI  
 AW ERIANG  
 AW ERIRUS  
 AW SALPLR  
 AW SALPLR  
 BD DRALAC  
 BD DRAMIC  
 BD JUNBIG  
 BD LUTARC  
 BD POAARC  
 BD PEDKAN  
 BD SENATR  
 BD SALROTF  
 BD SALROTM  
 BW CARSUB  
 BW JUNBIG  
 BW LUTARC  
 BW POAARC  
 BW SAXCER  
 BW STELAE  
 AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

46%

All Species

Responded to Temp.

# Temp & Treatment on Flower Burst

BD ARCLAT  
 AD CARBIG  
 AD CASTET  
 AD HIEALP  
 AD LUTARC  
 AD POLBIS  
 AW DUPPSI  
 AW ERIANG  
 AW ERIRUS  
 AW SALPLR  
 AW SALPLR  
 BD DRALAC  
 BD DRAMIC  
 BD JUNBIG  
 BD LUTARC  
 BD POAARC  
 BD PEDKAN  
 BD SENATR  
 BD SALROTF  
 BD SALROTM  
 BW CARSUB  
 BW JUNBIG  
 BW LUTARC  
 BW POAARC  
 BW SAXCER  
 BW STELAE  
 AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

AD DLAPB  
 AD LCONB  
 AD LPALB  
 AD VVITB  
 AW CAQUB  
 BD CTETB  
 BD LCONB  
 BD PHULB  
 BD PHYPB  
 BD SLAEB  
 BD SPUNB  
 BW CPRAB  
 BW CSTAB  
 BW DFISB  
 BW DLACB  
 BW ERUSB  
 BW ETRIB  
 BW HPAUB  
 BW LCONB  
 BW SFOLB  
 BW SHIEB  
 BW SHIRB

46%

100%

All Species

Responded to Temp.

No Treatment Effect

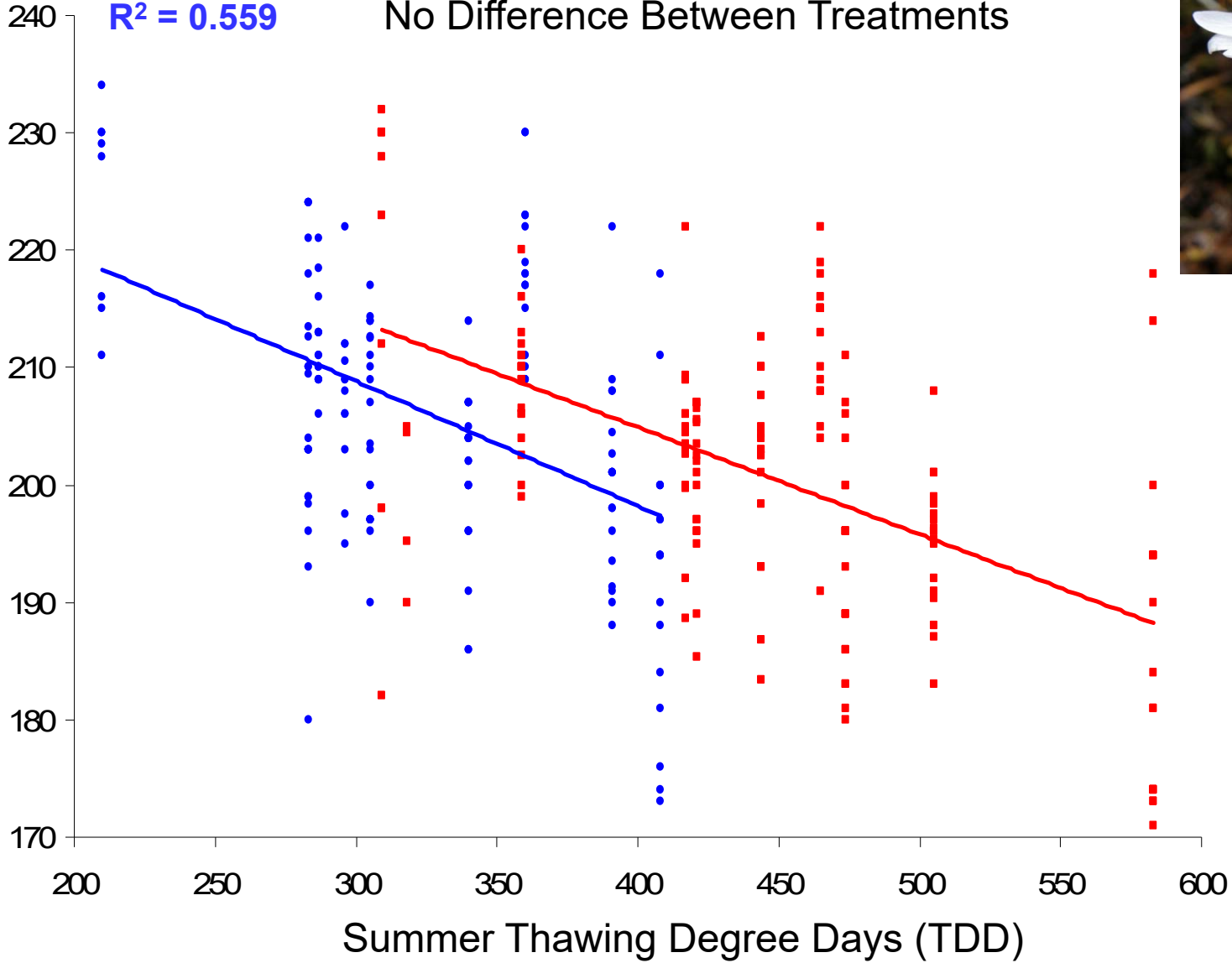
*Stellaria laeta*

Responded to Temperature  
No Difference Between Treatments

$R^2 = 0.472$

$R^2 = 0.559$

Date of Flower Burst (Julian Days)



# Temp & Treatment on Flower Burst

BD ALATB  
 AD CLGB  
 AD CTEB  
 AD HALPB  
 AD LARCB  
 AD PBISB  
 AW DPSIB  
 AW EANGB  
 AW ERUSB  
 AW SPLRF  
 AW SPLRM  
 BD DLACB  
 BD DMICB  
 BD JBIGB  
 BD LARCB  
 BD PARCB  
 BD PKANB  
 BD SATRB  
 BD SROTF  
 BD SROTM  
 BW CSUBB  
 BW JBIGB  
 BW LARCB  
 BW PARCB  
 BW SCERB  
 BW SLAEB  
 AD DLAPB  
 AD LCONB  
 AD LPALB  
 AD VVITB  
 AW CAQUB  
 BD CTETB  
 BD LCONB  
 BD PHULB  
 BD PHYPB  
 BD SLAEB  
 BD SPUNB  
 BW CPRAB  
 BW CSTAB  
 BW DFISB  
 BW DLACB  
 BW ERUSB  
 BW ETRIB  
 BW HPAUB  
 BW LCONB  
 BW SFOLB  
 BW SHIEB  
 BW SHIRB

- No response to Temp.
- Response to Treatment

46%

AD DLAPB  
 AD LCONB  
 AD LPALB  
 AD VVITB  
 AW CAQUB  
 BD CTETB  
 BD LCONB  
 BD PHULB  
 BD PHYPB  
 BD SLAEB  
 BD SPUNB  
 BW CPRAB  
 BW CSTAB  
 BW DFISB  
 BW DLACB  
 BW ERUSB  
 BW ETRIB  
 BW HPAUB  
 BW LCONB  
 BW SFOLB  
 BW SHIEB  
 BW SHIRB

100%

AD DLAPB  
 AD LCONB  
 AD LPALB  
 AD VVITB  
 AW CAQUB  
 BD CTETB  
 BD LCONB  
 BD PHULB  
 BD PHYPB  
 BD SLAEB  
 BD SPUNB  
 BW CPRAB  
 BW CSTAB  
 BW DFISB  
 BW DLACB  
 BW ERUSB  
 BW ETRIB  
 BW HPAUB  
 BW LCONB  
 BW SFOLB  
 BW SHIEB  
 BW SHIRB

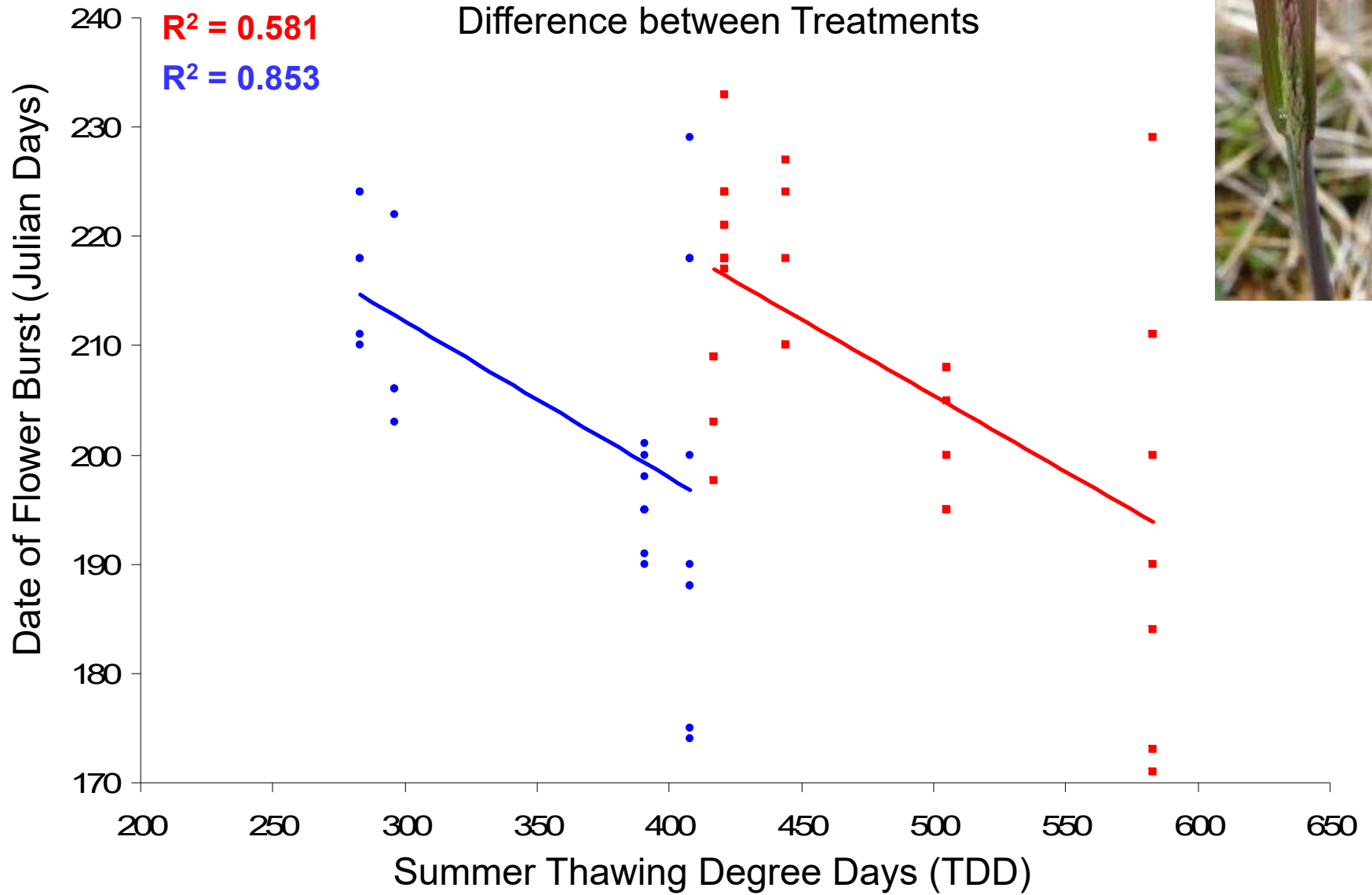
All Species

Responded to Temp.

No Treatment Effect

*Arctagrostis latifolia*

No Response to Temp.  
Difference between Treatments





# What is the response to warming?

Is the response to experimental warming consistent with the response observed in warm years?

## Inflorescence Heights

- 53% Species responded to warming
- 75% of these consistent between CTL & EXP

## Flower Burst Dates

- 46% Species Responded to warming
- 100% of these consistent between CTL & EXP

# Future Research

- Look at other traits w/same method
- Why did some respond to treatment but not temp?
- Other factors playing a role (water, nutrients, light levels)?
- Is there a cumulative temp. effect?
- Use data from this project to project future responses to warming

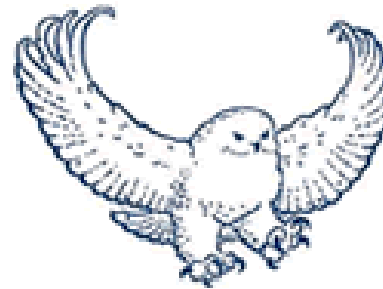
# Acknowledgements



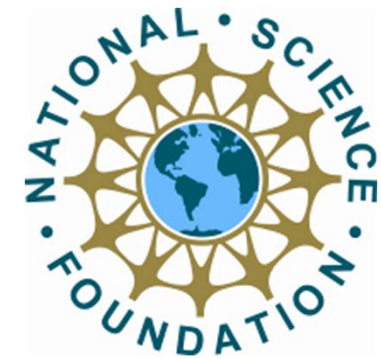
## GVSU Arctic Ecology Program

- Bob Hollister (PI)
- Jeremy May, Jean Galang, Jenny Liebig, Michael Lothschutz, Amanda Snyder

## GVSU Stats Department



**UKPEAGVIK  
INUPIAT  
CORPORATION**



# Sources

Arft, A.M., M.D. Walker, J. Gurevitch, J.M. Alatalo, M.S. Bret-Harte, M. Dale, M. Diemer, F. Gugerli, G.H.R. Henry, M.H. Jones, R.D. Hollister, I.S. Jónsdóttir, K. Laine, E. Lévesque, G.M. Marion, U. Molau, P. Mølgaard, U. Nordenhäll, V. Raszhivin, C.H. Robinson, G. Starr, A. Stenström, M. Stenström, Ø. Totland, P.L. Turner, L.J. Walker, P.J. Webber, J.M. Welker, and P.A. Wookey. 1999. Response patterns of tundra plant species to experimental warming: a meta-analysis of the International Tundra Experiment. Ecological Monographs 69(4): 491-511.

IPCC (ed) 2007. Climate Change 2007: The Scientific Basis. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. Cambridge, United Kingdom. 230 pp.

Hollister, R.D. and P.J. Webber 2000. Biotic validation of small open-top chambers in a tundra ecosystem. Global Change Biology 6(7): 835-842.

# Questions?







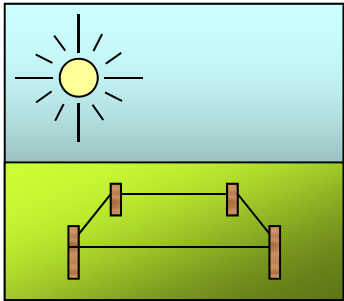
# Treatments

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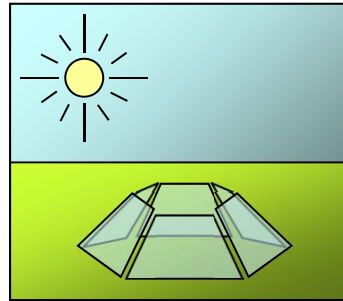
## BARROW

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Wet

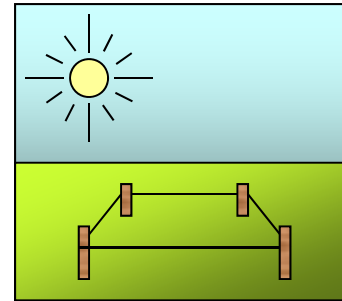


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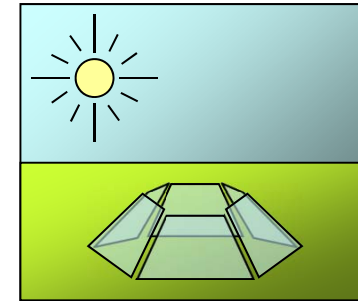


OTC (24)

Dry



CTL (24)



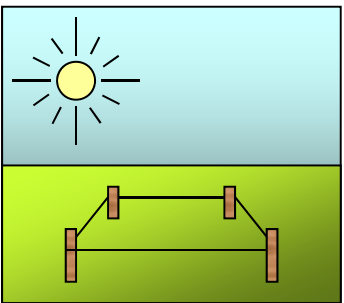
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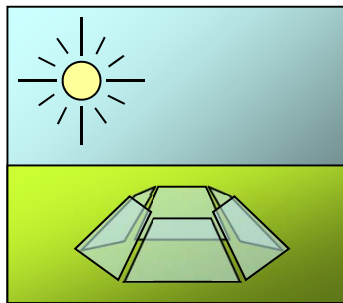
## ATQASUK

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Wet

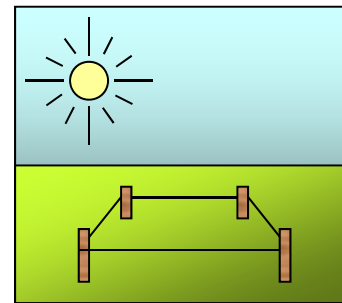


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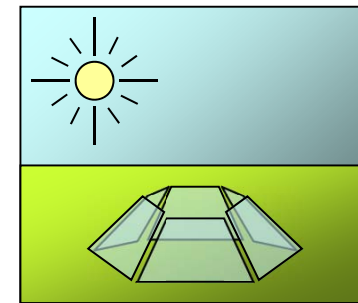


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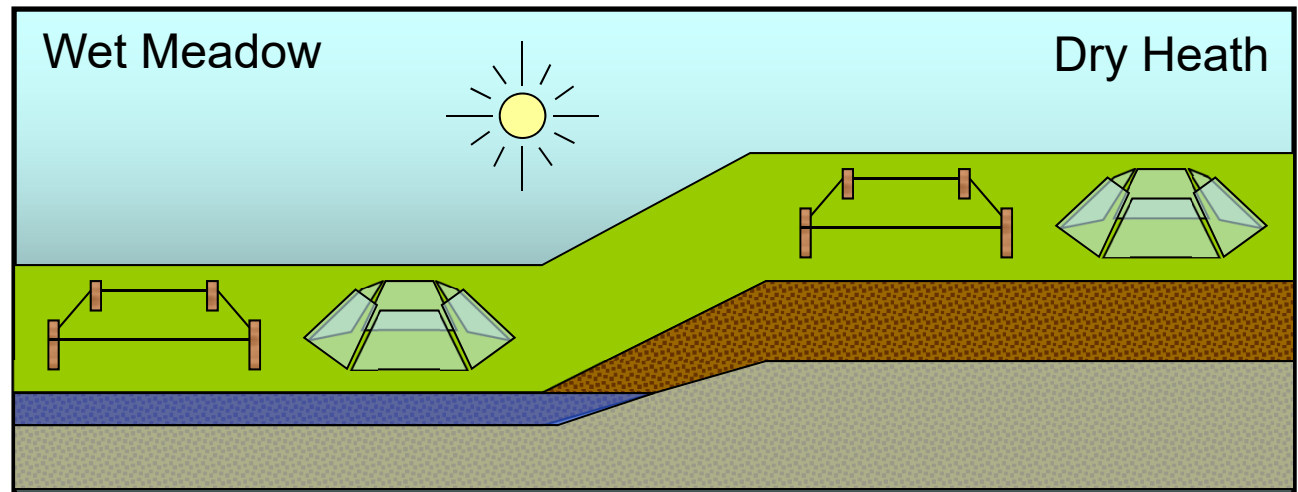
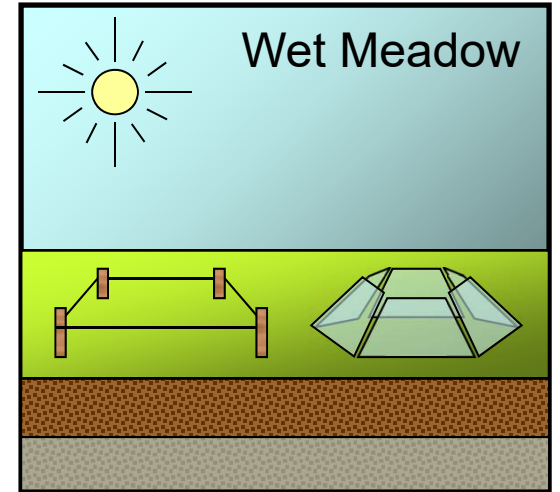
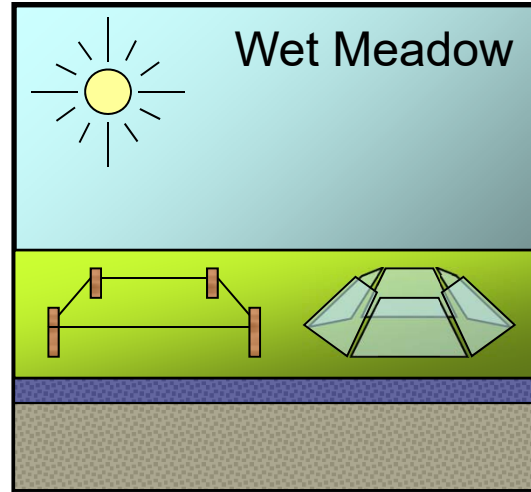
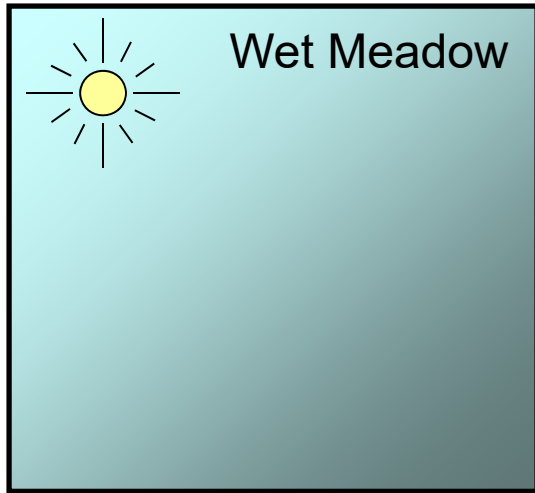


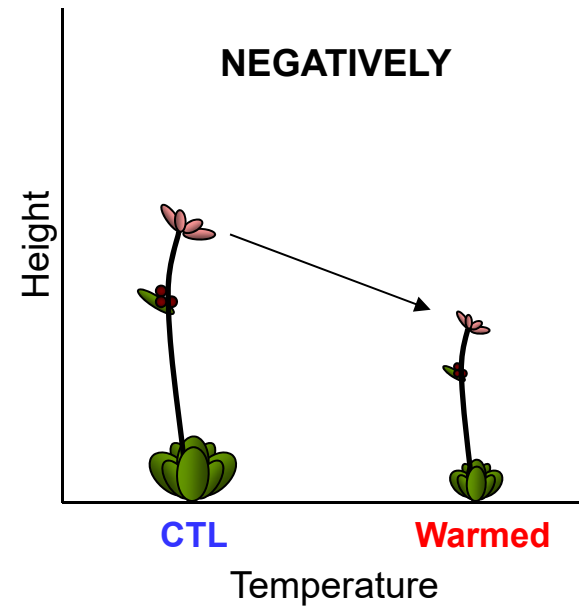
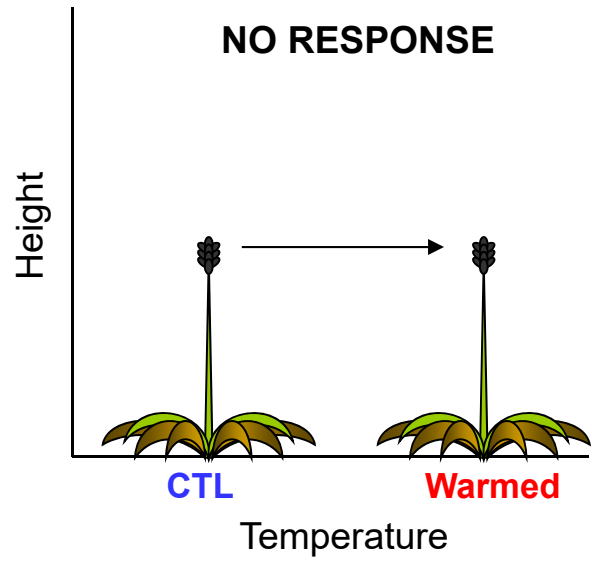
CTL (24)



OTC (24)







# Temp & Treatment on Flower Burst

BD ARCLAT  
 AD CARBIG  
 AD CASTET  
 AD HIEALP  
 AD LUTARC  
 AD POLBIS  
 AW DUPPSI  
 AW ERIANG  
 AW ERIRUS  
 AW SALPLR  
 AW SALPLR  
 BD DRALAC  
 BD DRAMIC  
 BD JUNBIG  
 BD LUTARC  
 BD POAARC  
 BD PEDKAN  
 BD SENATR  
 BD SALROTF  
 BD SALROTM  
 BW CARSUB  
 BW JUNBIG  
 BW LUTARC  
 BW POAARC  
 BW SAXCER  
 BW STELAE  
 AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

AD DIALAP  
 AD LUTCON  
 AD LEDPAL  
 AD VACVIT  
 AW CARAQU  
 BD CASTET  
 BD LUTCON  
 BD PAPHUL  
 BD POTHYP  
 BD STELAE  
 BD SAXPUN  
 BW CARPRA  
 BW CARSTA  
 BW DUPFIS  
 BW DRALAC  
 BW ERIRUS  
 BW ERITRI  
 BW HIEPAU  
 BW LUTCON  
 BW SAXFOL  
 BW SAXHIE  
 BW SAXHIR

AD DLAPB  
 AD LCONB  
 AD LPALB  
 AD VVITB  
 AW CAQUB  
 BD CTETB  
 BD LCONB  
 BD PHULB  
 BD PHYPB  
 BD SLAEB  
 BD SPUNB  
 BW CPRAB  
 BW CSTAB  
 BW DFISB  
 BW DLACB  
 BW ERUSB  
 BW ETRIB  
 BW HPAUB  
 BW LCONB  
 BW SFOLB  
 BW SHIEB  
 BW SHIRB

46%

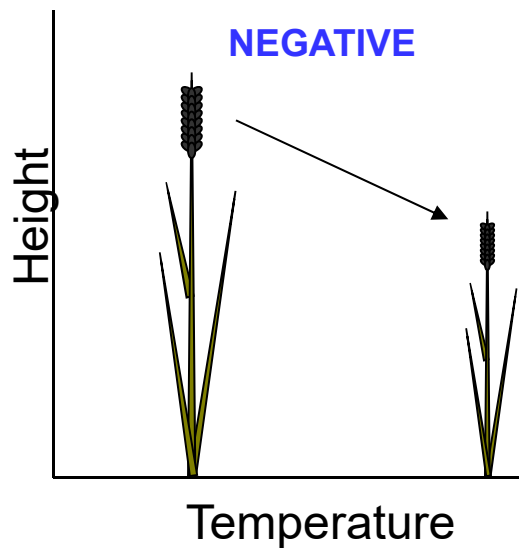
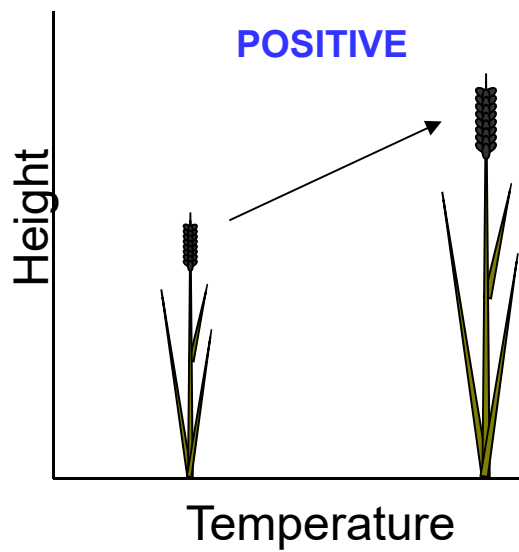
100%

All Species

Responded to Temp.

No Treatment Effect

53% Responded to Temp.

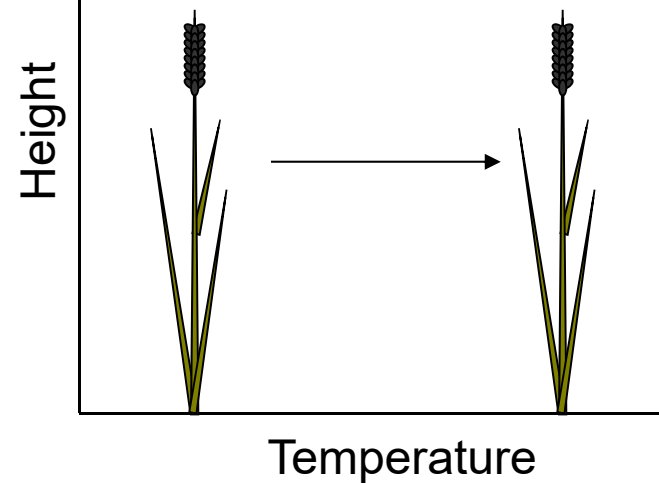


# Discussion

## Inflorescence Height

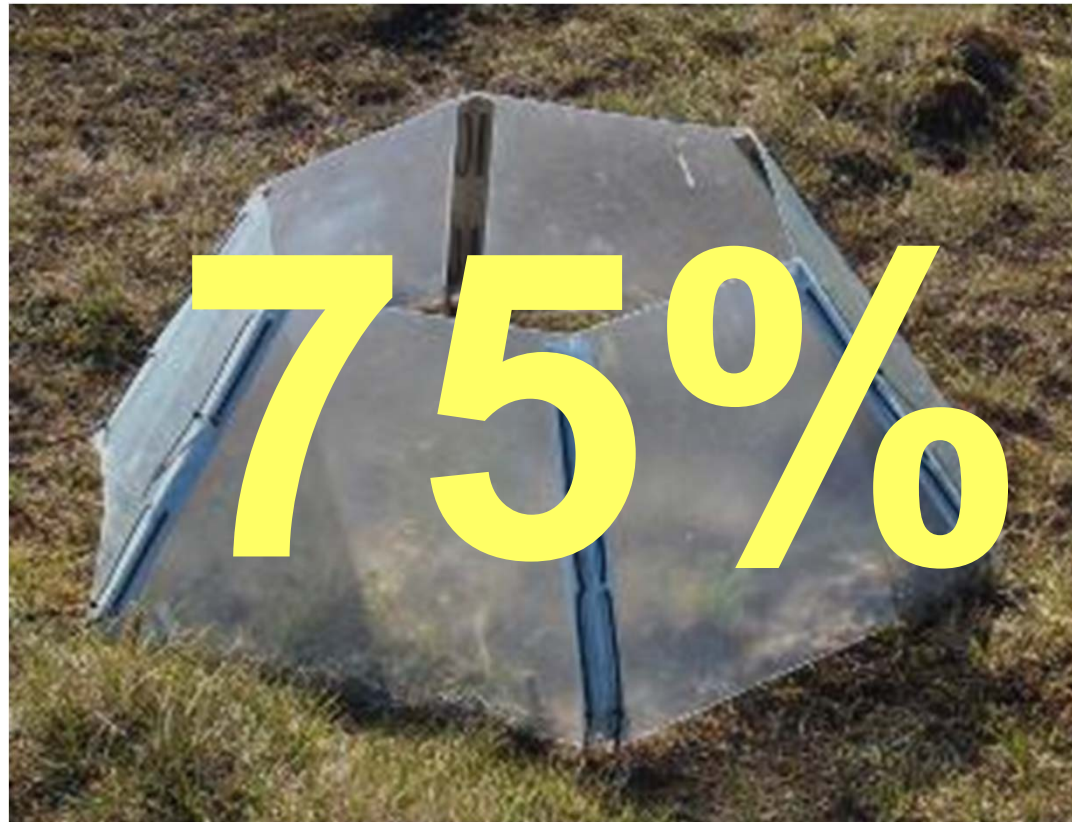
47% Did Not

NO RESPONSE



# Discussion

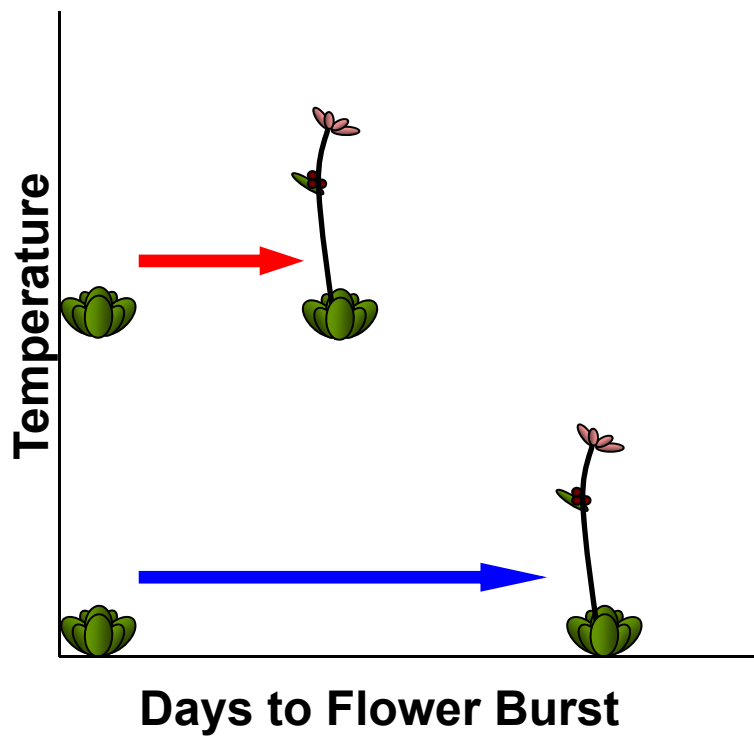
Inflorescence Height & Chamber Agreement



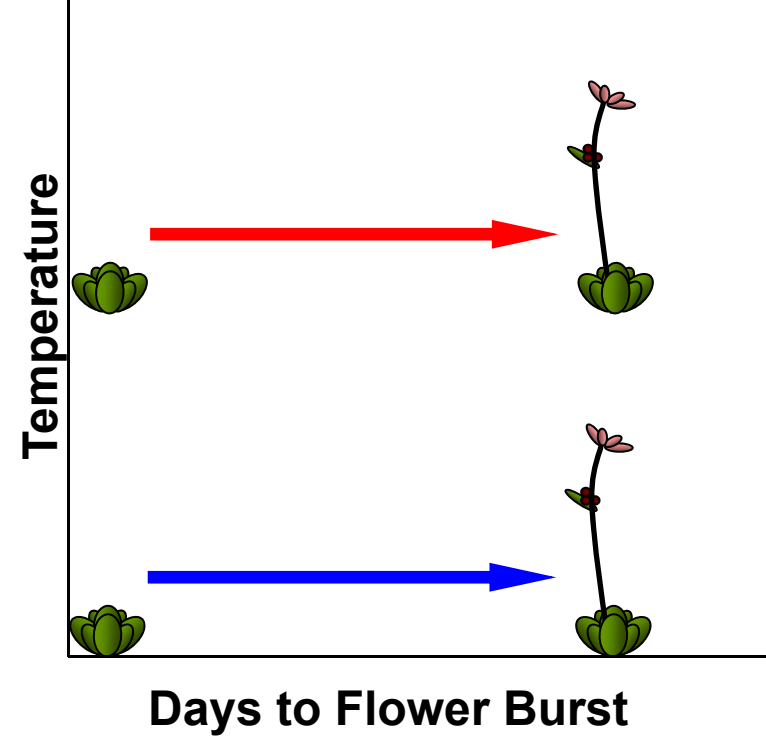
# Discussion

## Flower Burst

53% Responded to Temp.



47% Did Not



# Discussion

Flower Burst & Chamber Agreement

