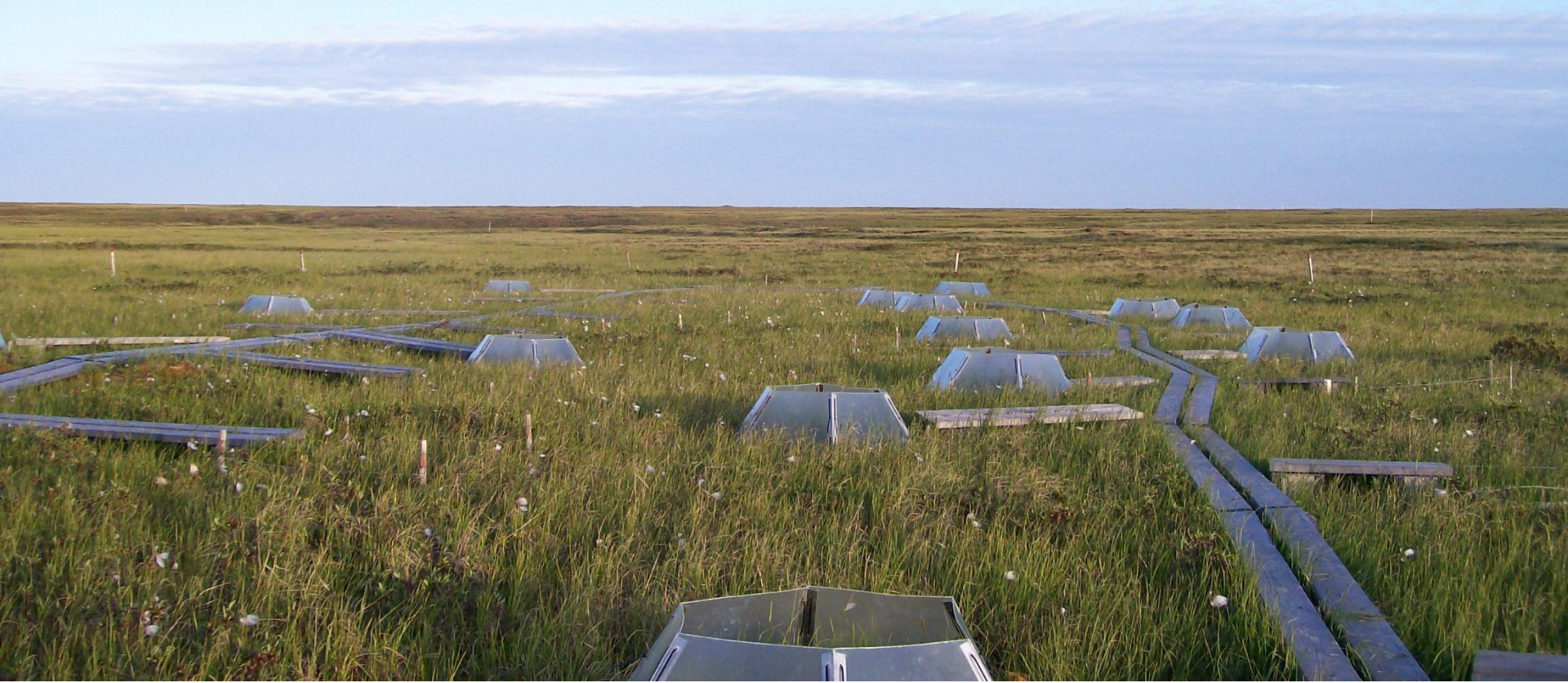
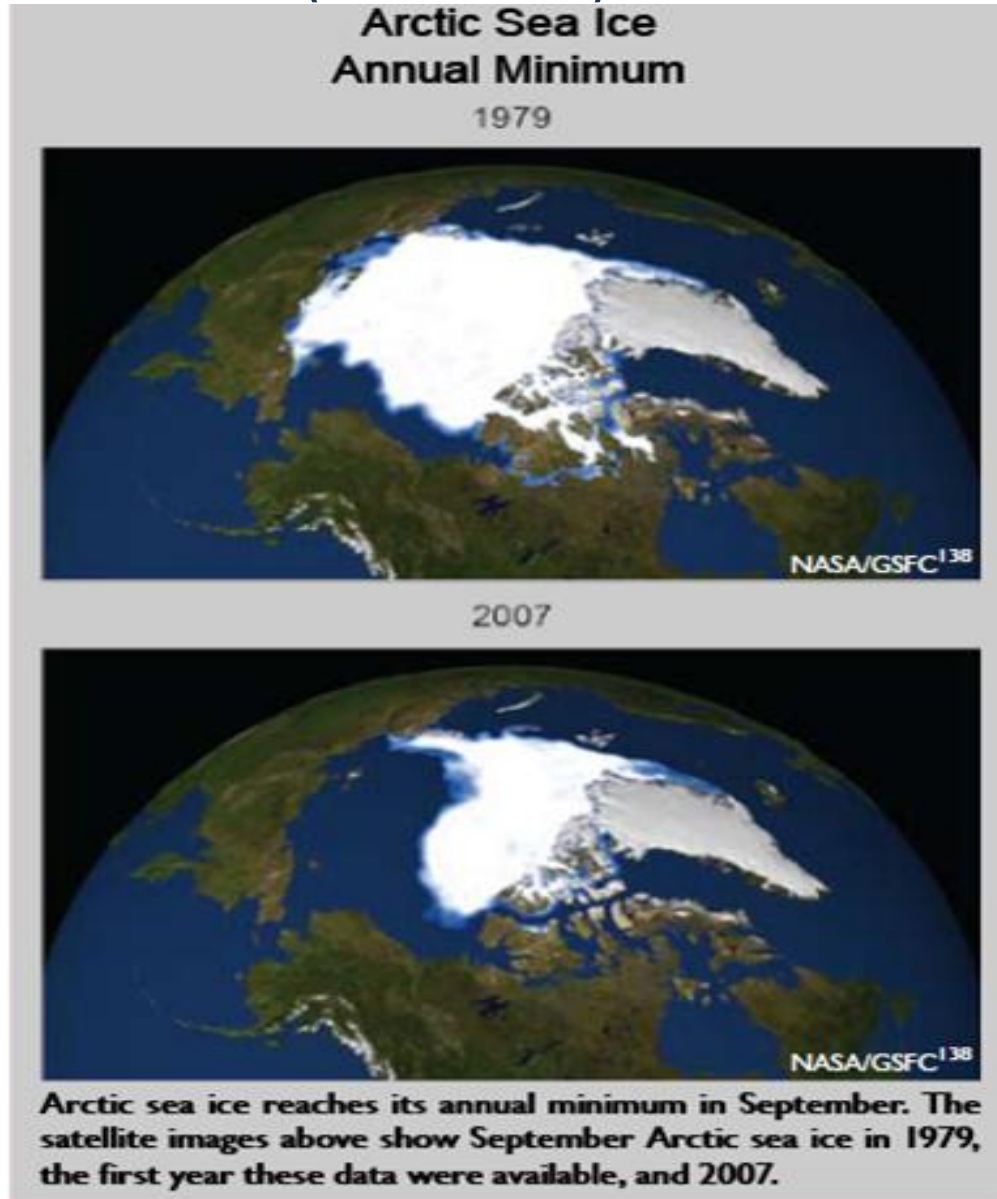


Long-Term Response of *Luzula arctica* and *Luzula confusa* to Warming in the Alaskan Tundra



Why Arctic?

- Linked to global climate (ACIA 2004)



Study Sites

Experimental Design

2 Dry Heath Communities:

Atqasuk Dry

Barrow Dry

1 Meter squared plots

-24 Control

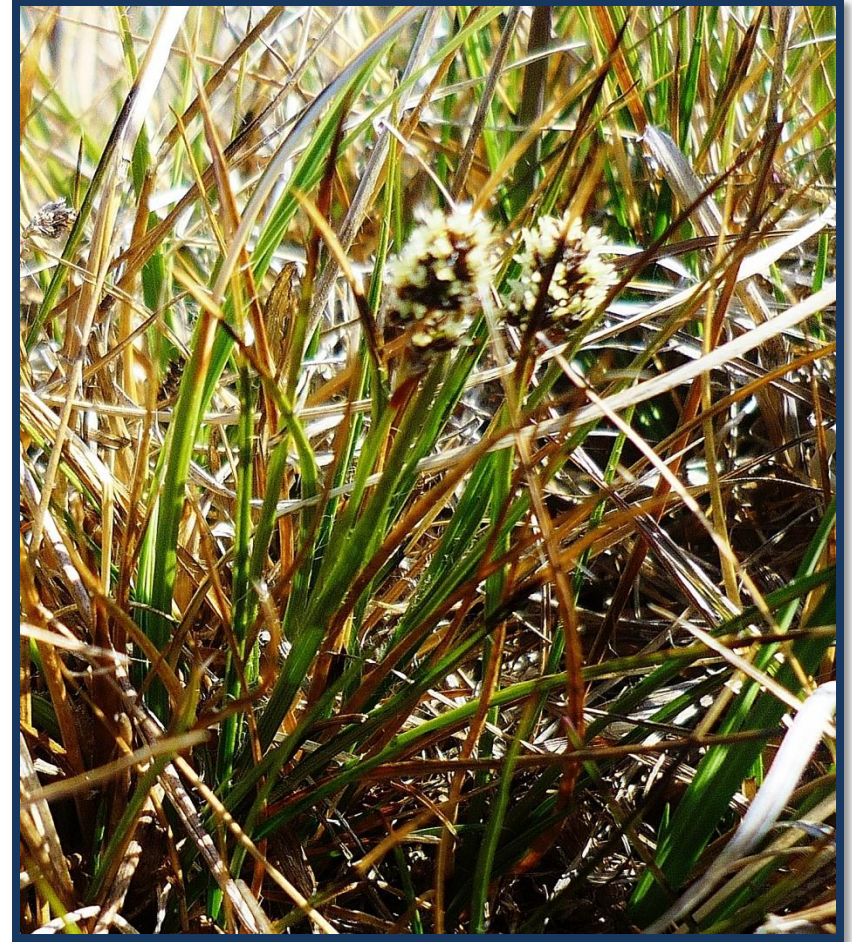
-24 Warmed



Passive open-top fiberglass chambers

Increase temperature 1-3° C

Luzula arctica and *Luzula confusa*



- Common rushes at both dry heath sites
- Associated with disturbances
- Known to hybridize



Measurements

Summer 1994-2010

- Inflorescence Height
- Number of Inflorescences
- Flowering date



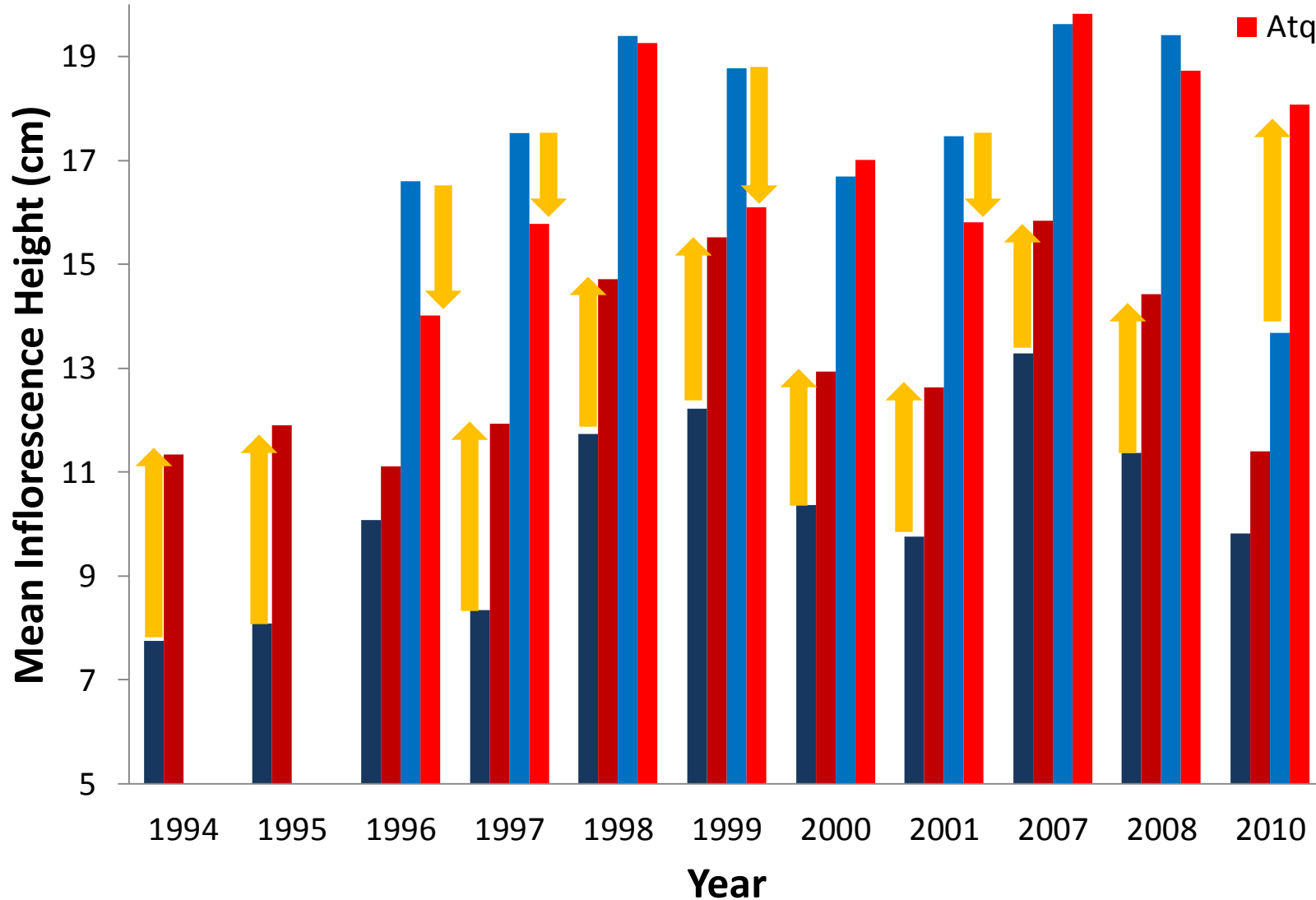
L. arctica
Hulten (1968)



Inflorescence Height

Luzula confusa

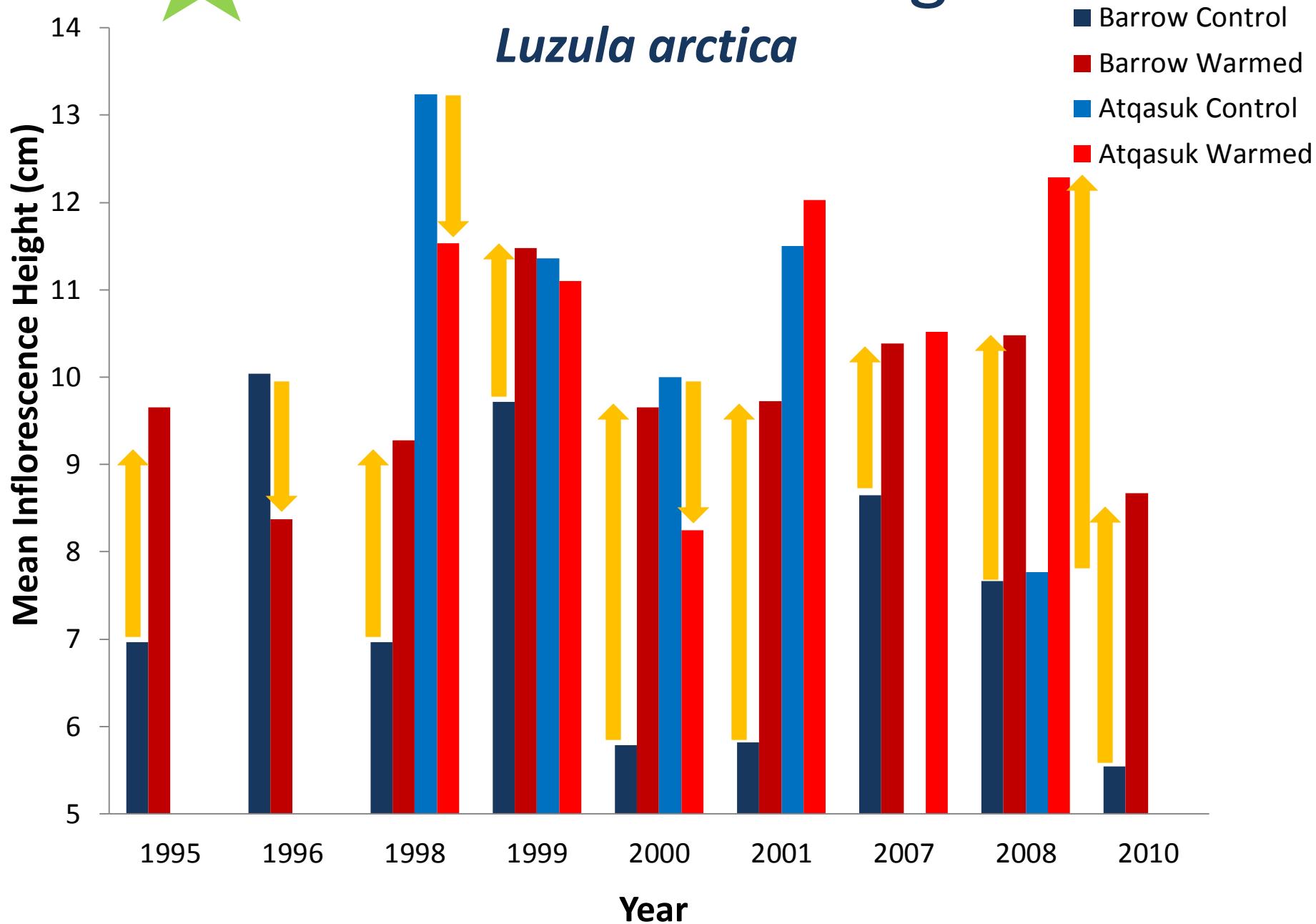
- Barrow Control
- Barrow Warmed
- Atqasuk Control
- Atqasuk Warmed





Inflorescence Height

Luzula arctica



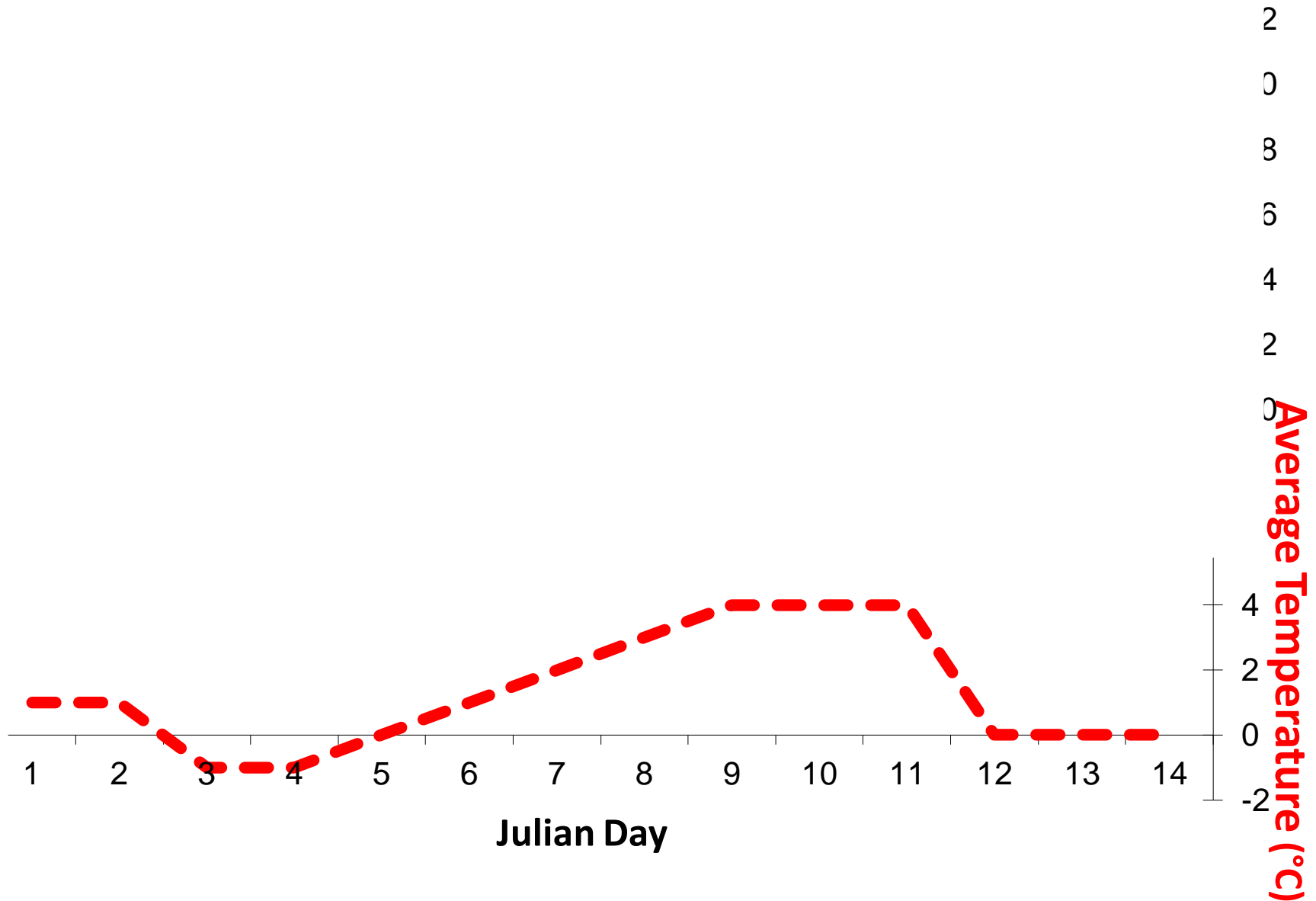
Question:

- What factor is causing a negative response in these years?

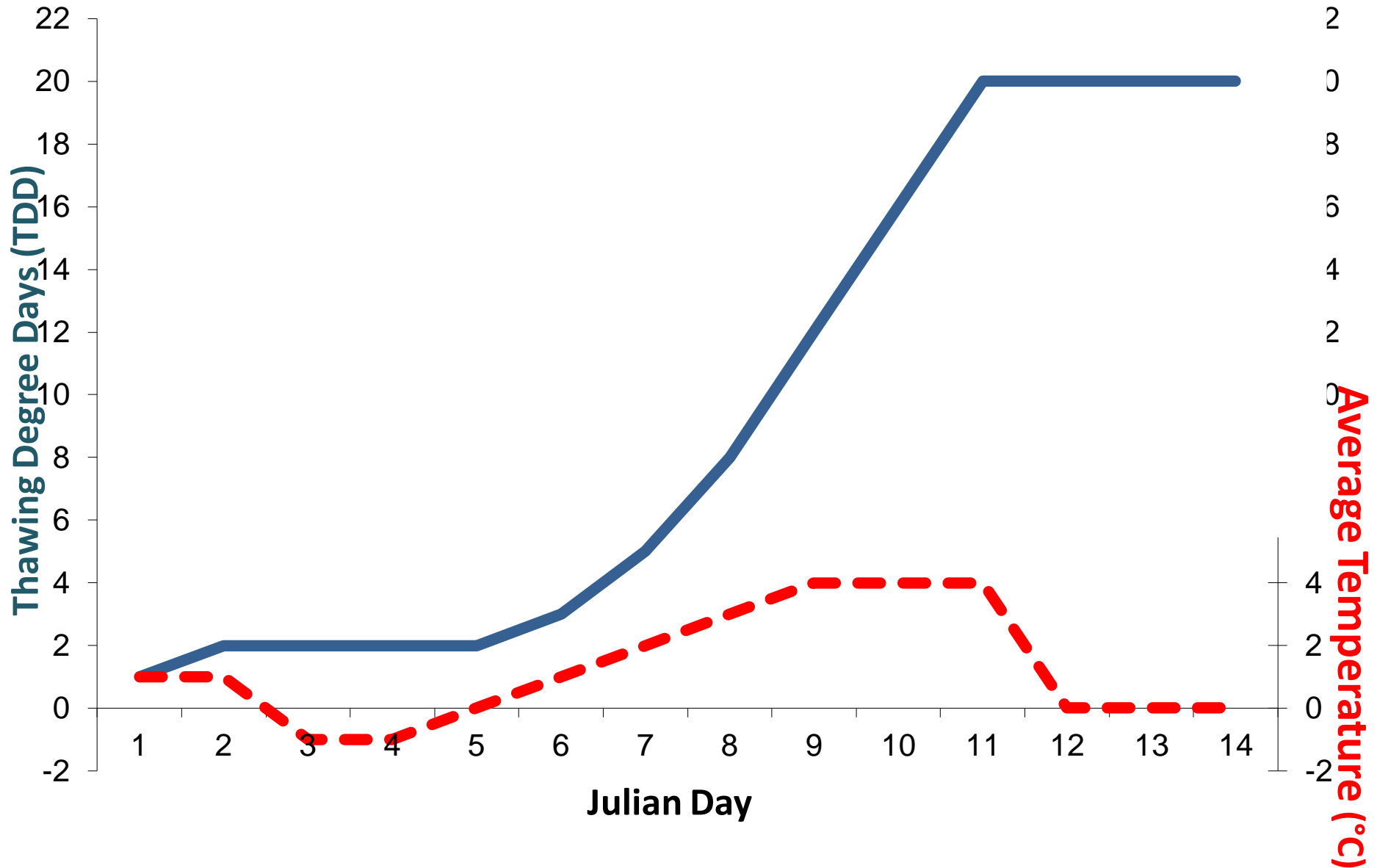
Relate to temperature:

Thawing Degree Days (TDD)- cumulative degree days above freezing (0°C)

Thawing Degree Days (TDD)



Thawing Degree Days (TDD)

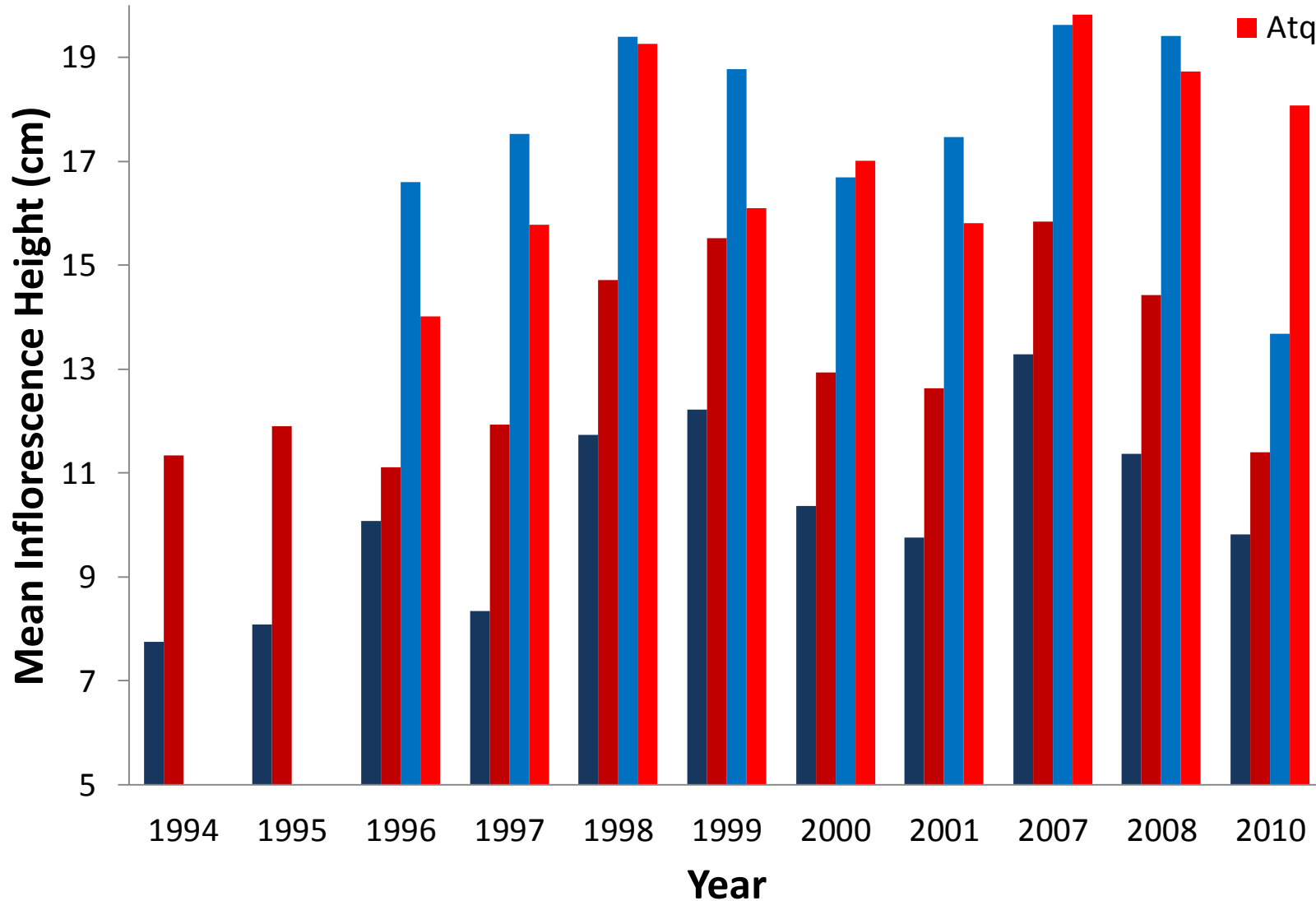




Inflorescence Height

Luzula confusa

- Barrow Control
- Barrow Warmed
- Atqasuk Control
- Atqasuk Warmed

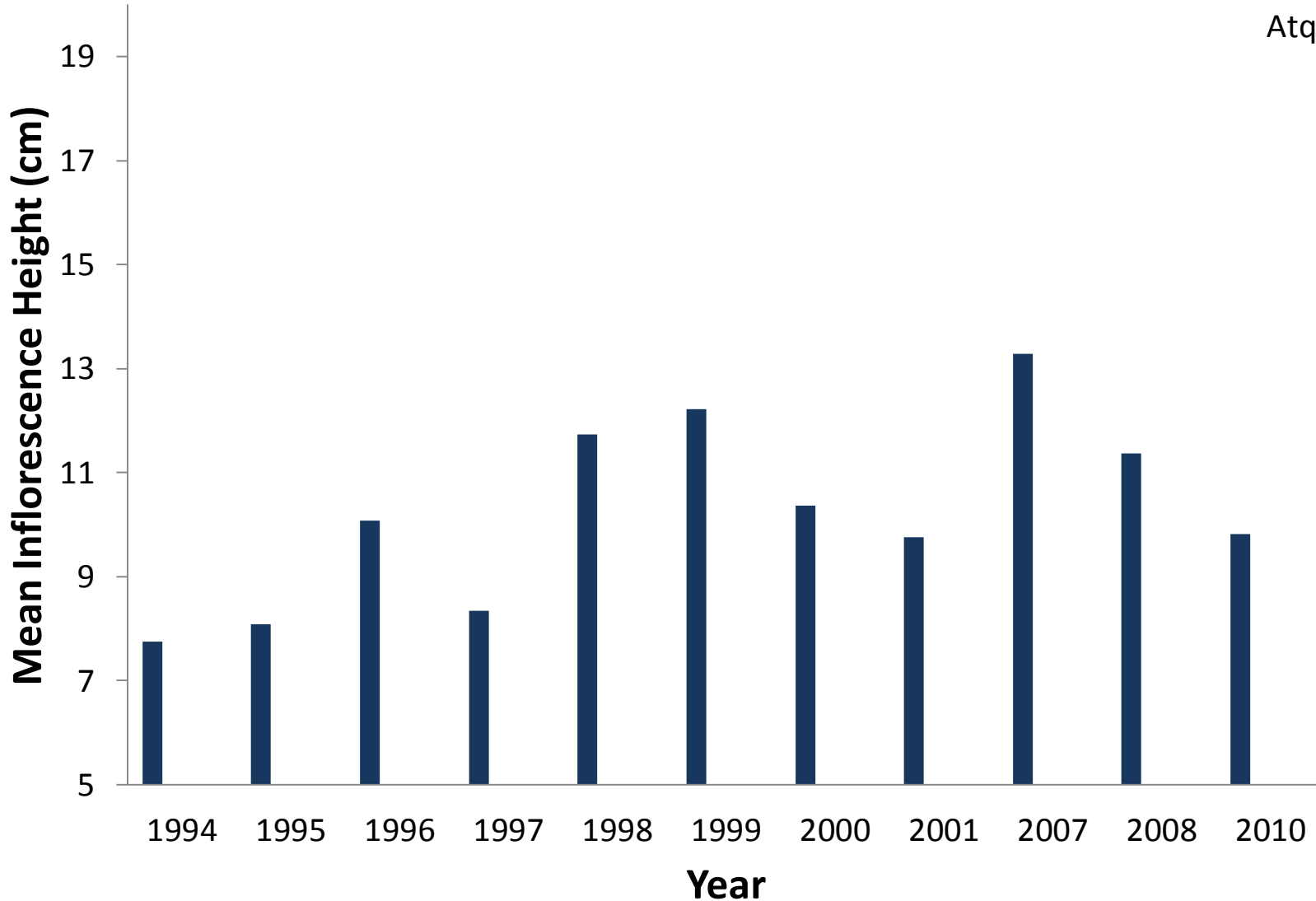




Inflorescence Height

Luzula confusa

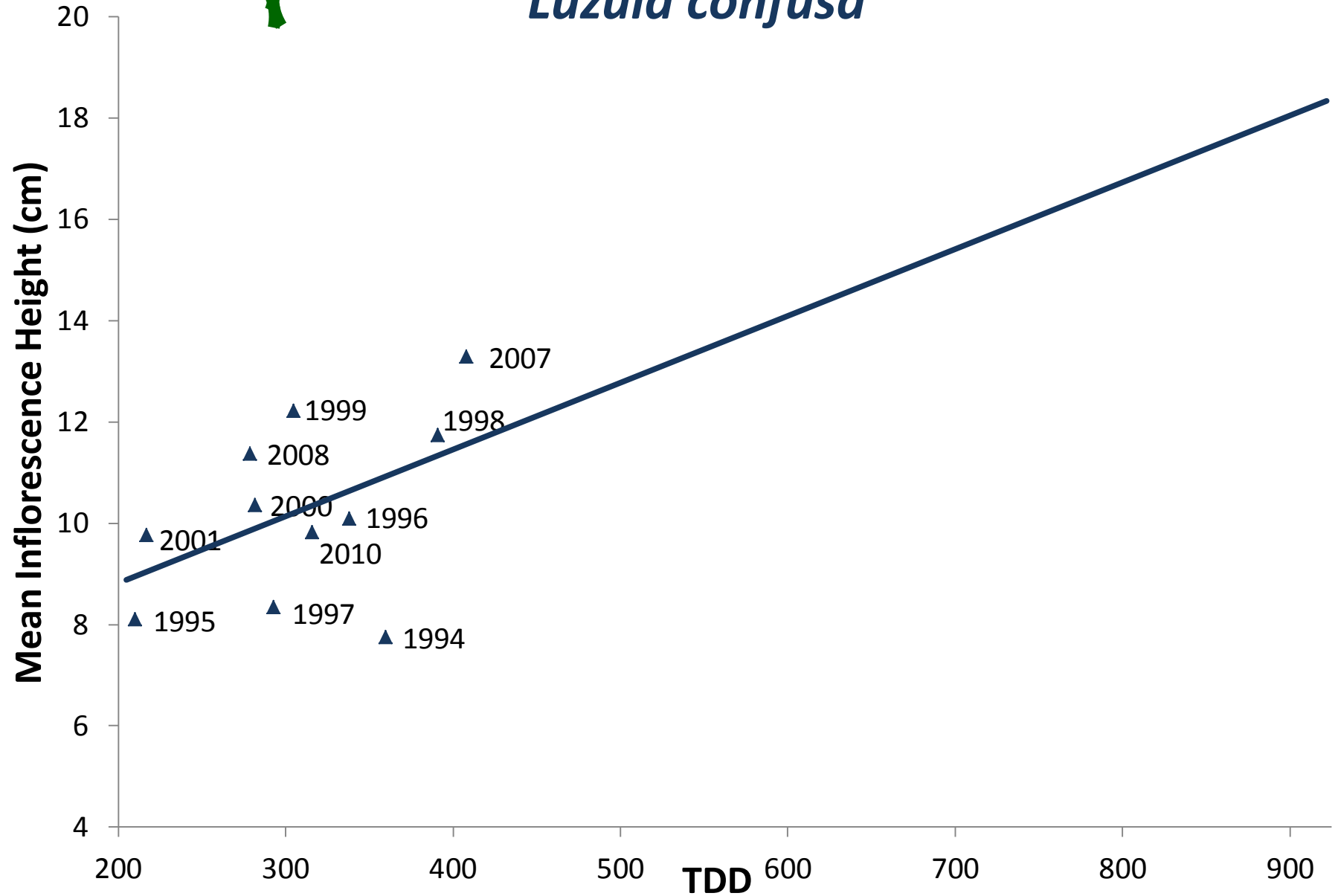
- Barrow Control
- Barrow Warmed
- Atqasuk Control
- Atqasuk Warmed





Inflorescence Height

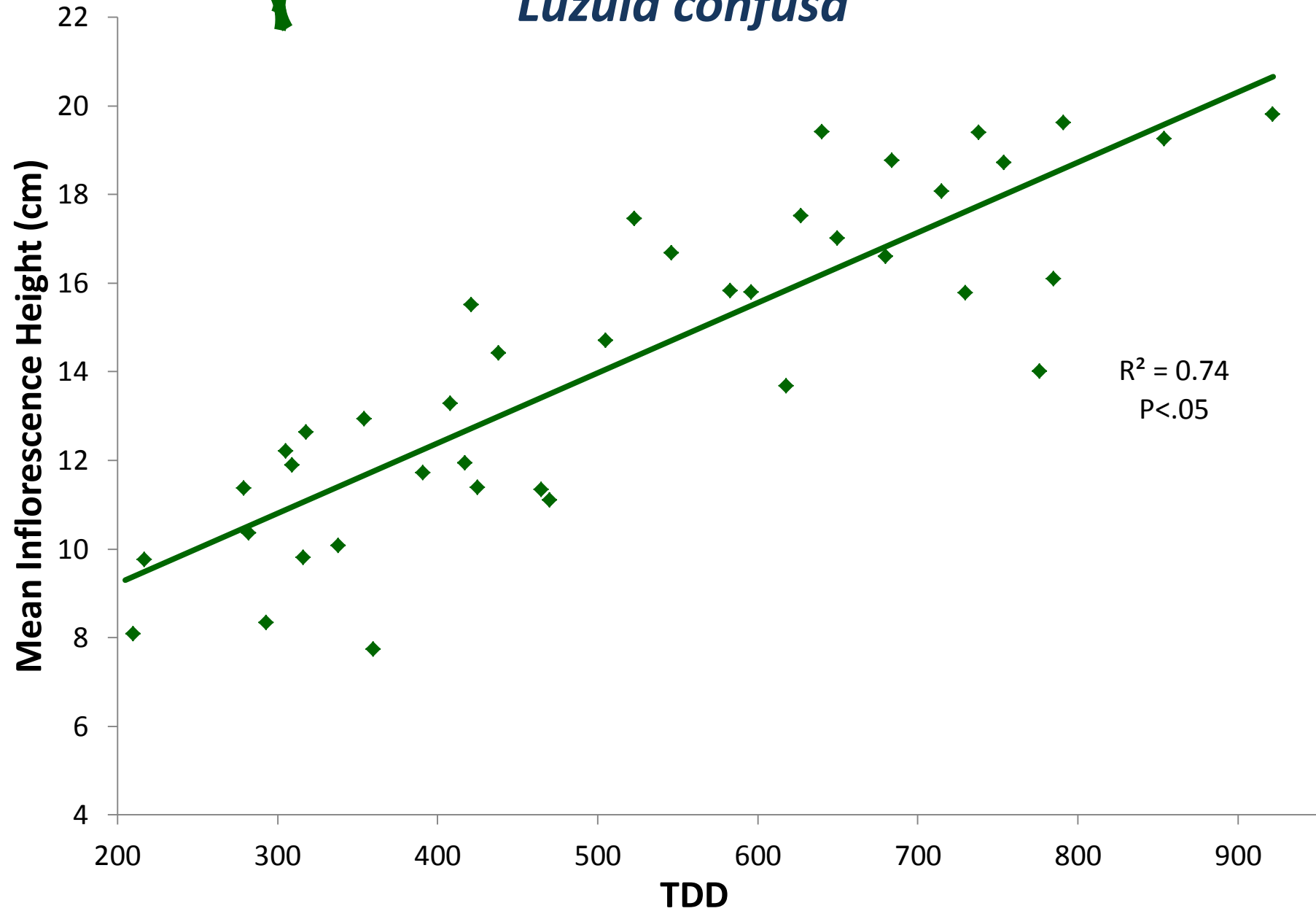
Luzula confusa





Inflorescence Height

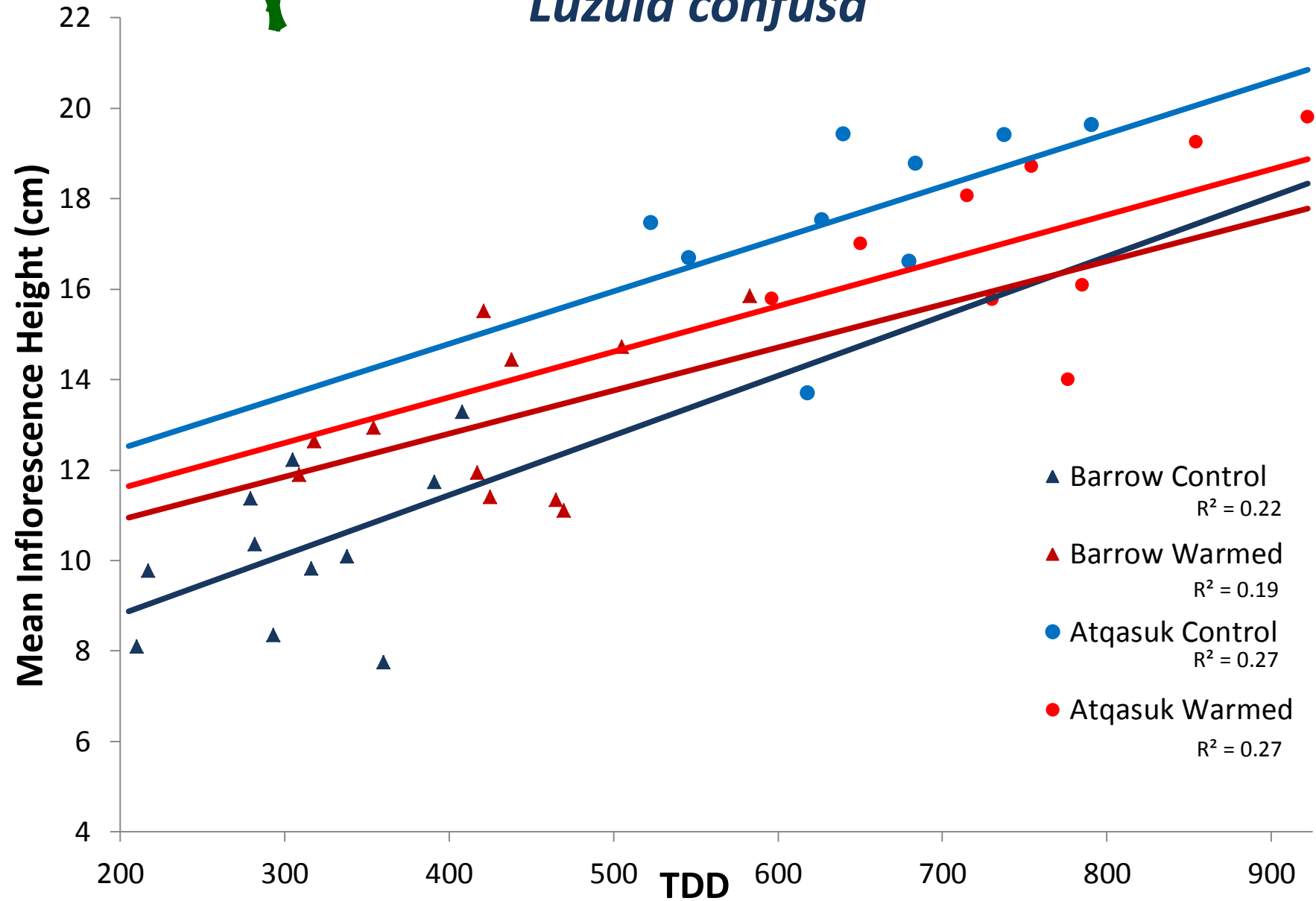
Luzula confusa





Inflorescence Height

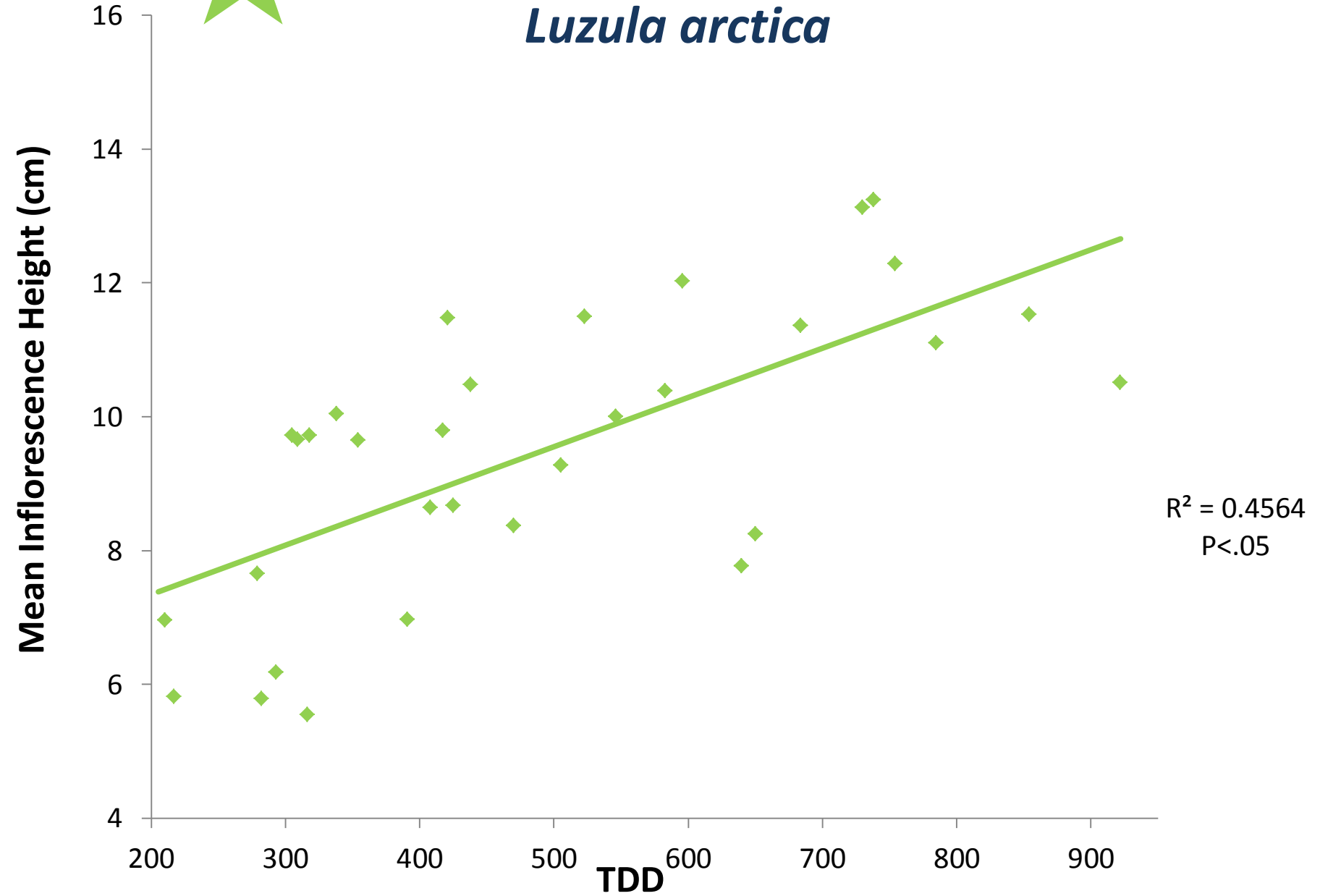
Luzula confusa





Inflorescence Height

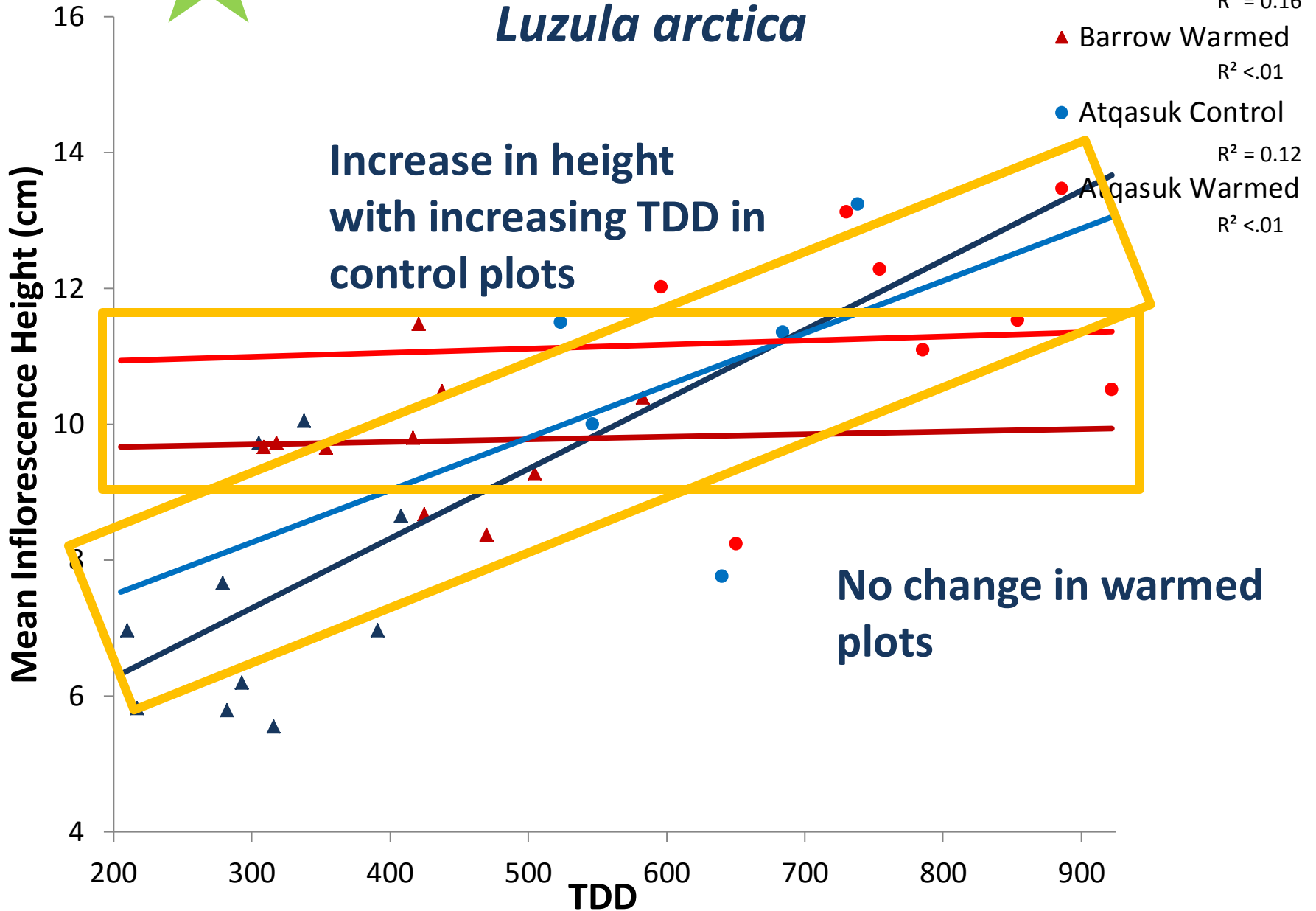
Luzula arctica





Inflorescence Height

Luzula arctica



Summary

Luzula confusa

Inflorescence Height

Overall: Increased TDD is associated with increased height.
All sites/treatments suggest increased height with increased TDD.

Luzula arctica

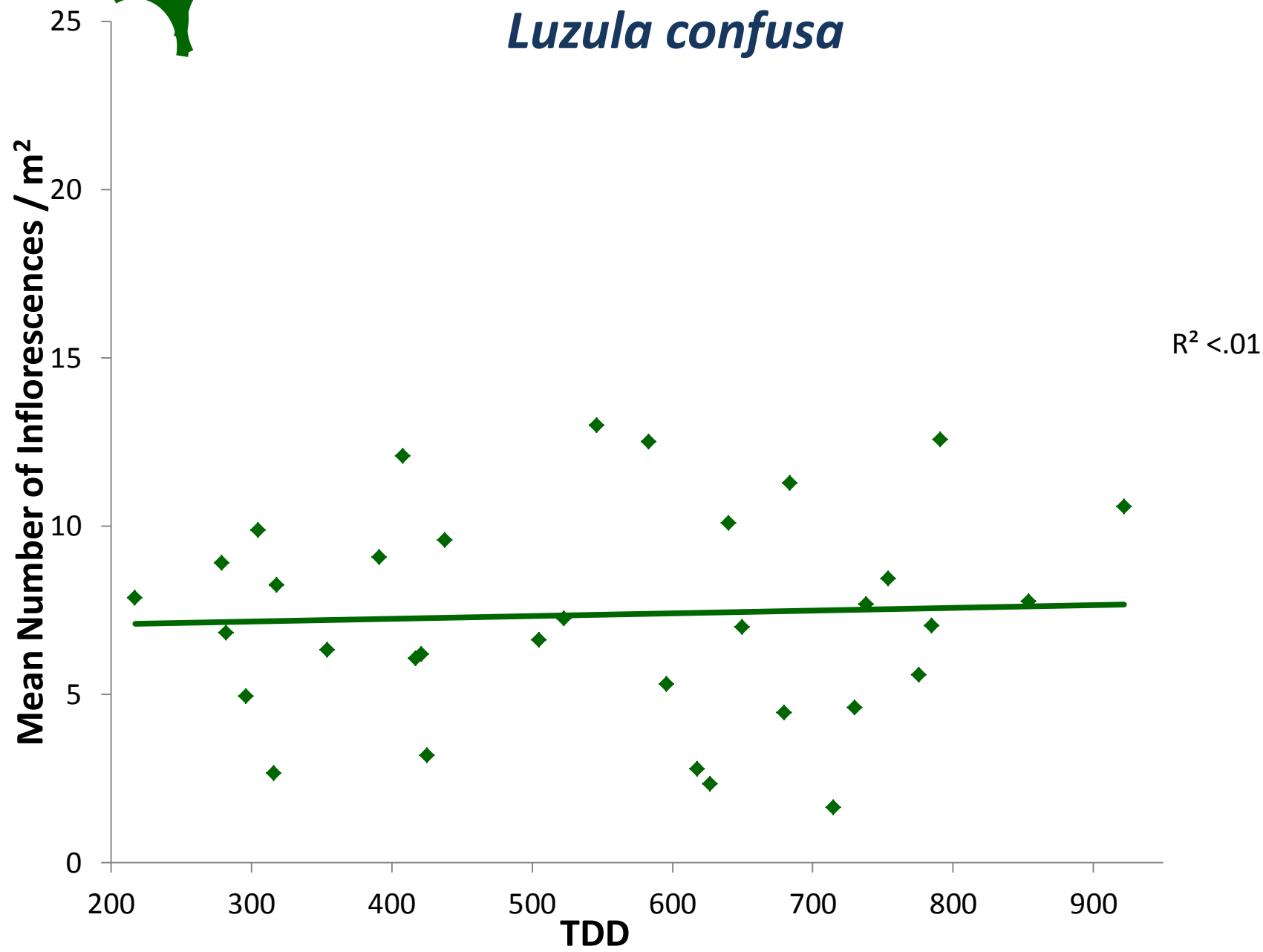
Inflorescence Height

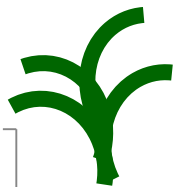
Overall: Increased TDD is associated with increased height.
All sites/treatments show no trend.



Number of Inflorescences

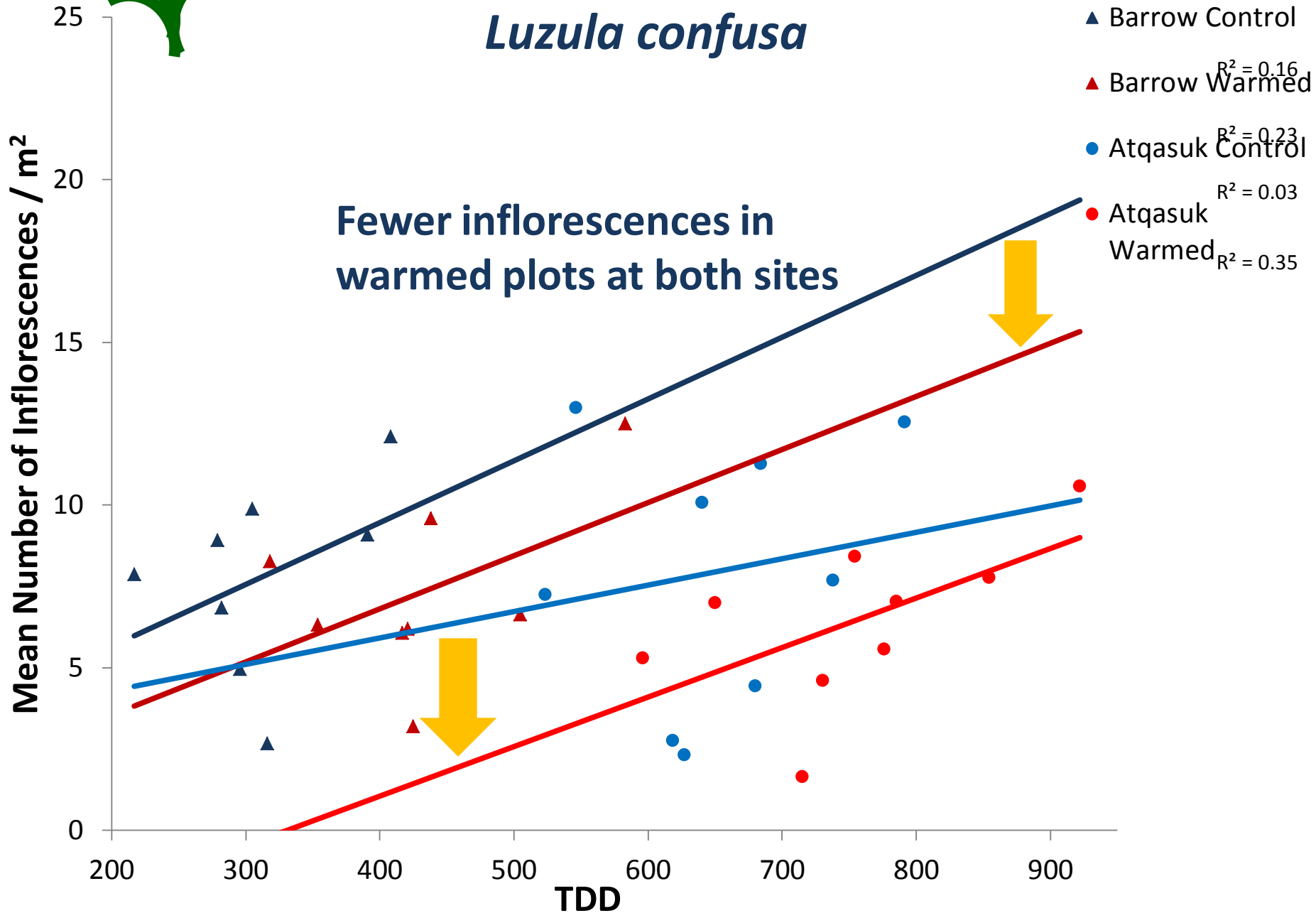
Luzula confusa





Number of Inflorescences

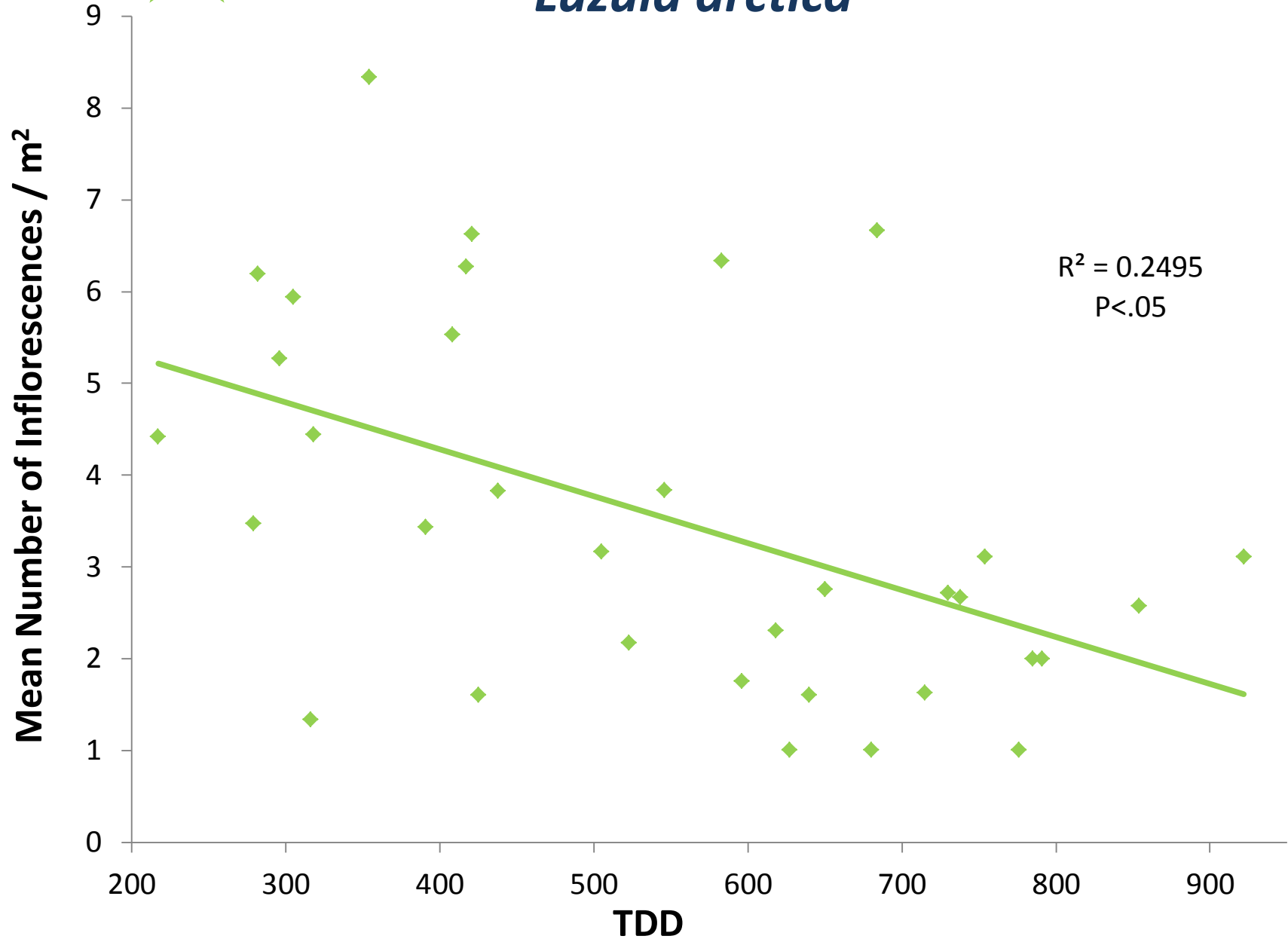
Luzula confusa





Number of Inflorescences

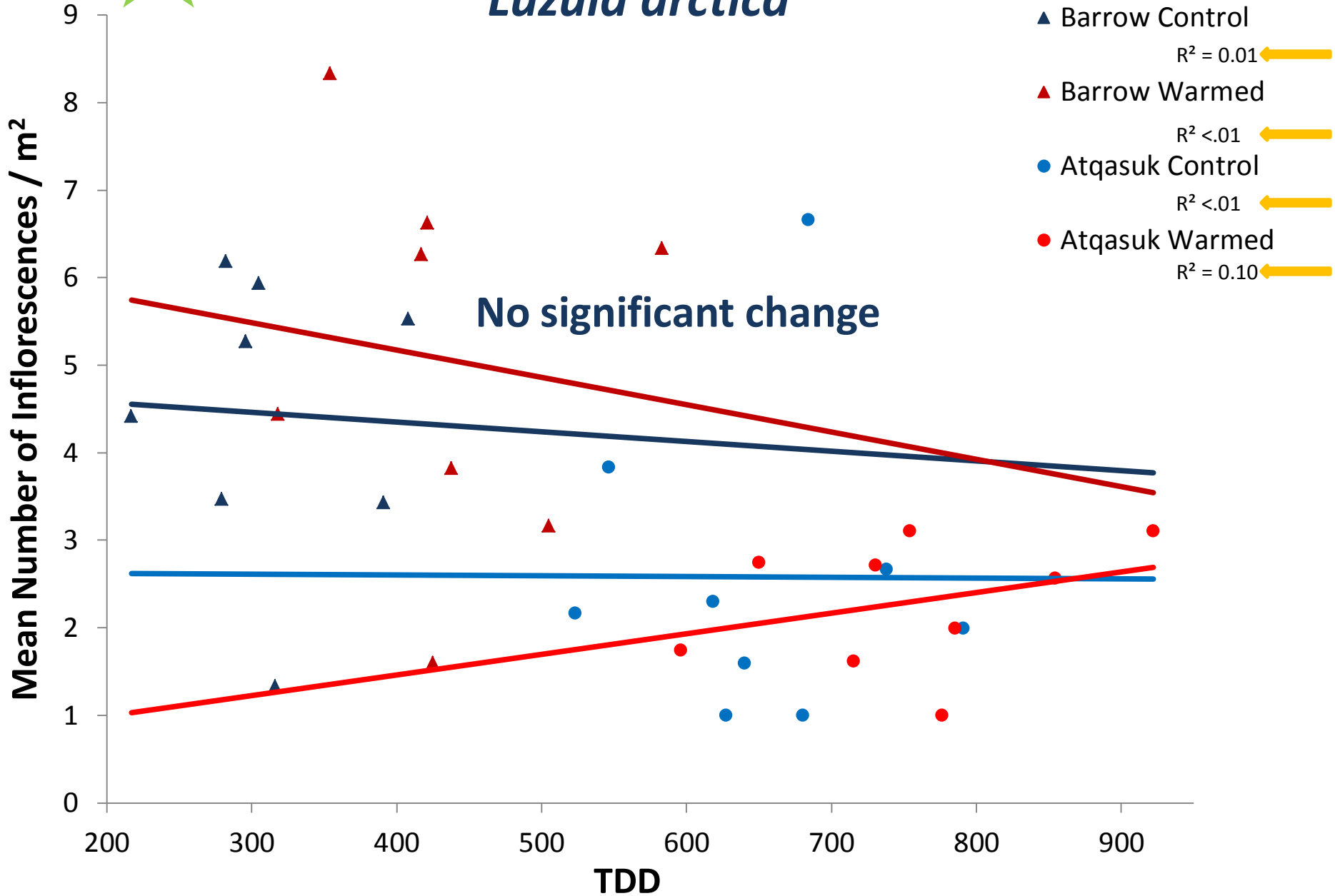
Luzula arctica





Number of Inflorescences

Luzula arctica



Summary

Luzula confusa

Inflorescence Height

Overall: Increased TDD is associated with increased height.

All sites/treatments suggest increased height with increased TDD.

Number of Inflorescences

Overall: No trend.

Control plots had more inflorescences than warmed plots.

Luzula arctica

Inflorescence Height

Overall: Increased TDD is associated with increased height.

All sites/treatments show no trend.

Number of Inflorescences

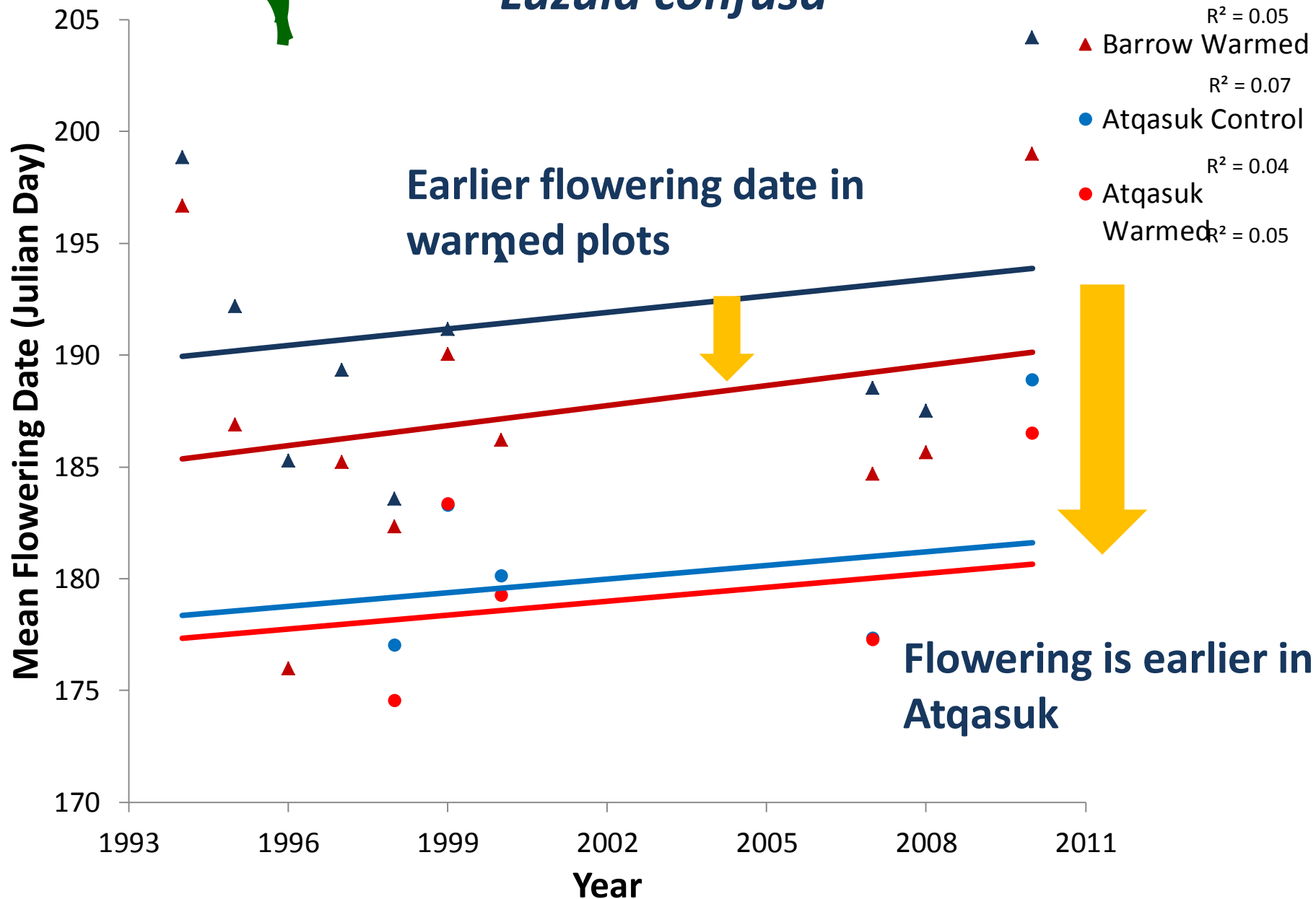
Overall: increased TDD is associated with decreased number of inflorescences.

All sites/treatments show no trend.



Flowering Date

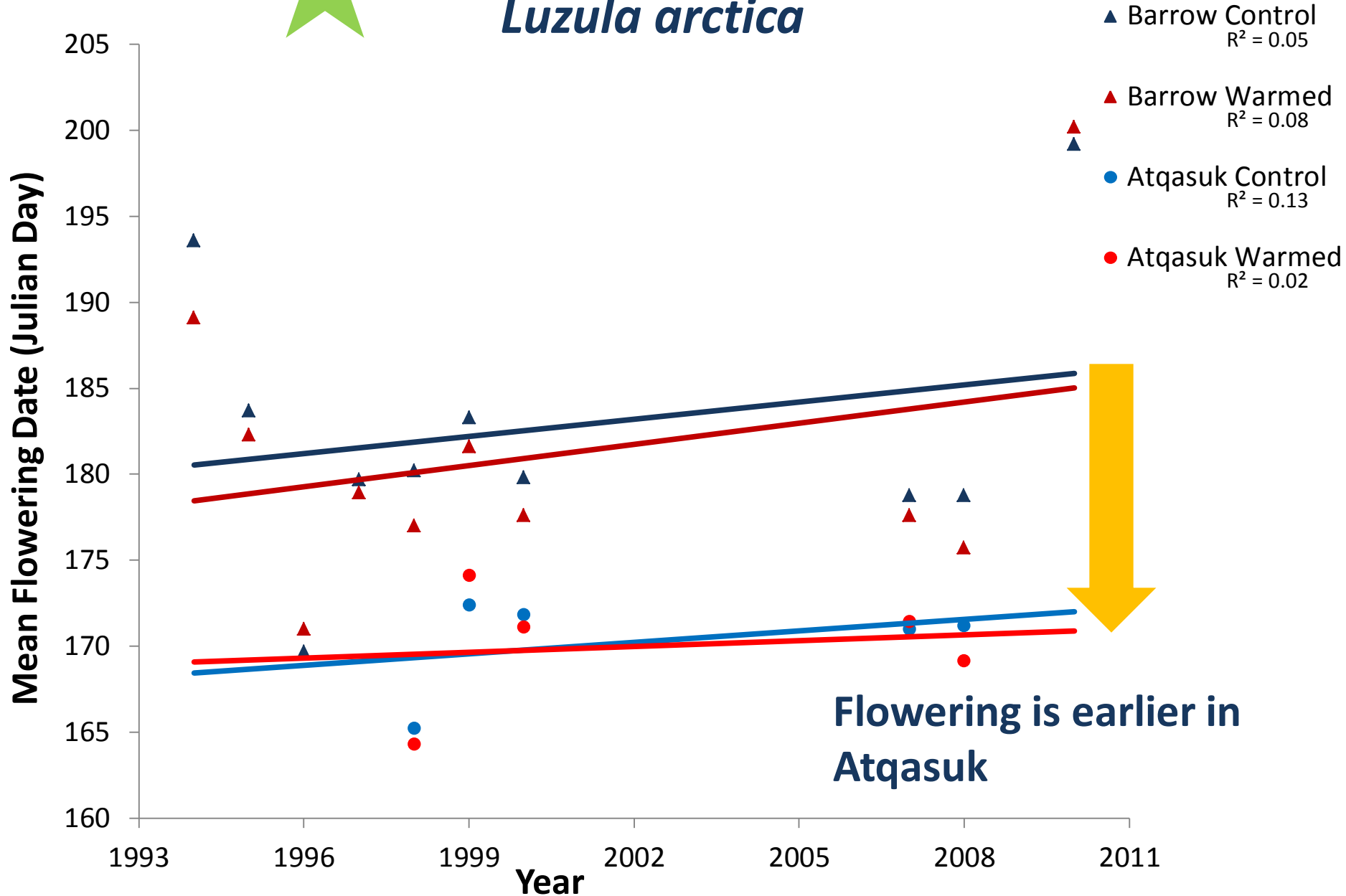
Luzula confusa





Flowering Date

Luzula arctica



Summary

Luzula confusa

Inflorescence Height

Overall: Increased TDD is associated with increased height.

All sites/treatments suggest increased height with increased TDD.

Number of Inflorescences

Overall: No trend.

Control plots had more inflorescences than warmed plots.

Flowering Date

Flowering occurs earlier with warming.

Luzula arctica

Inflorescence Height

Overall: Increased TDD is associated with increased height.

All sites/treatments show no trend.

Number of Inflorescences

Overall: increased TDD is associated with decreased number of inflorescences.

All sites/treatments show no significant change.

Flowering Date

No significant change.

Conclusions

- Both species are responding to warming
- Each species responds differently
- Response is different for each site

Future Plans

- Continue to look at other relationships.
 - What other factors are involved?
- More phenology

Questions?

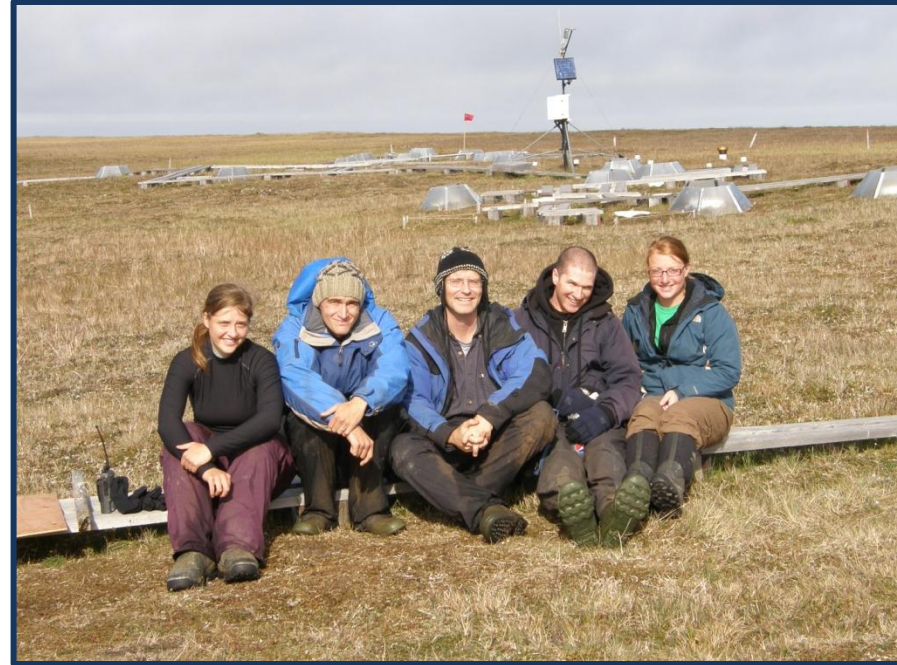
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Barrow Arctic Science Consortium



References:

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