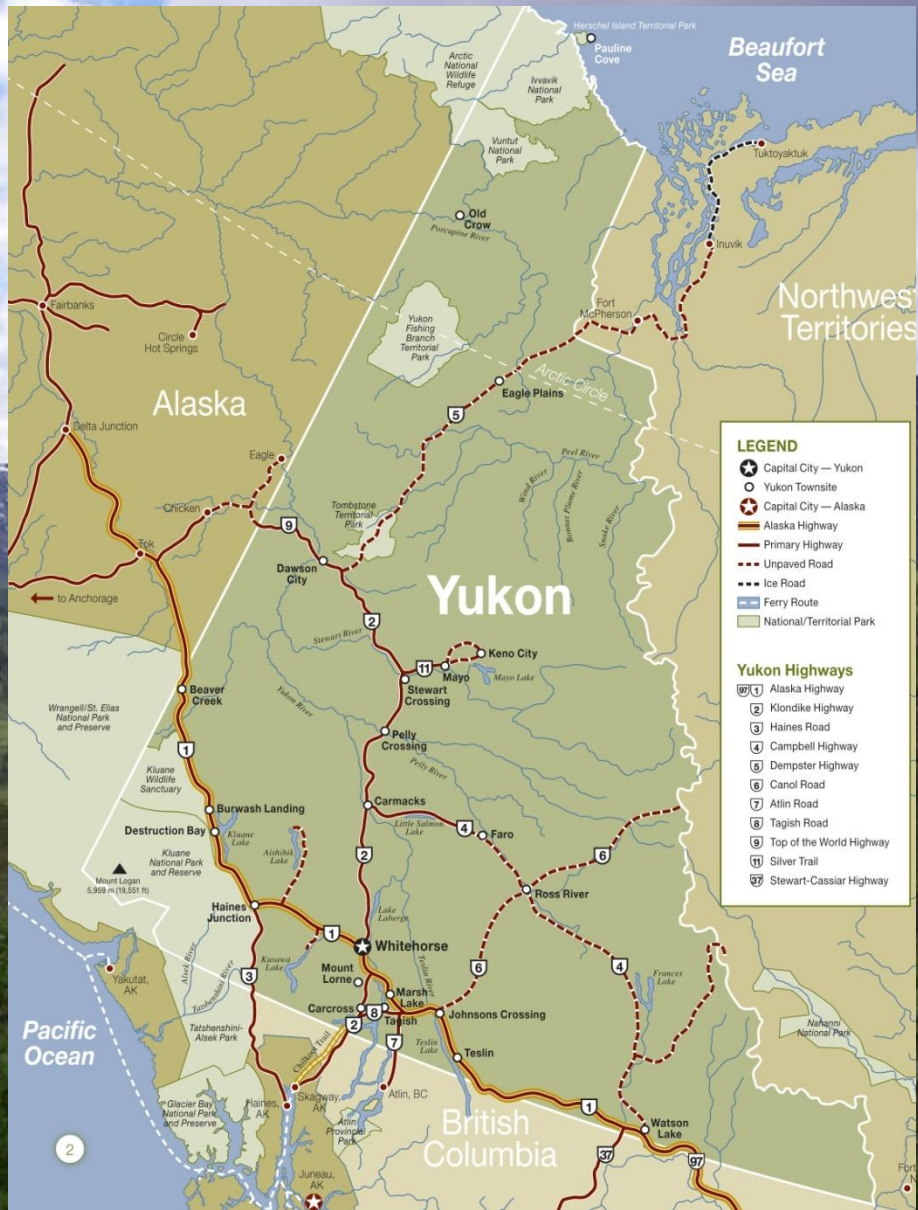


# Plant Traits in Native and Exotic Roadside Species on the North Klondike Highway: Different or the Same?

Jamie Leathem, Mark Vellend, Jeannette  
Whitton and Nathan Kraft

Department of Botany, University of British Columbia





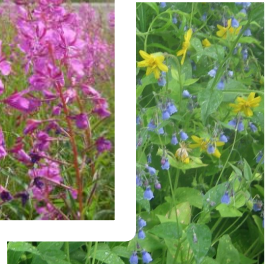
# Research Questions

---

1. Do exotic species have **different traits** than native species?



VS.



# Research Questions

---

1. Do exotic species have **different traits** than native species?
2. Do they have **different relationships with the environment?**

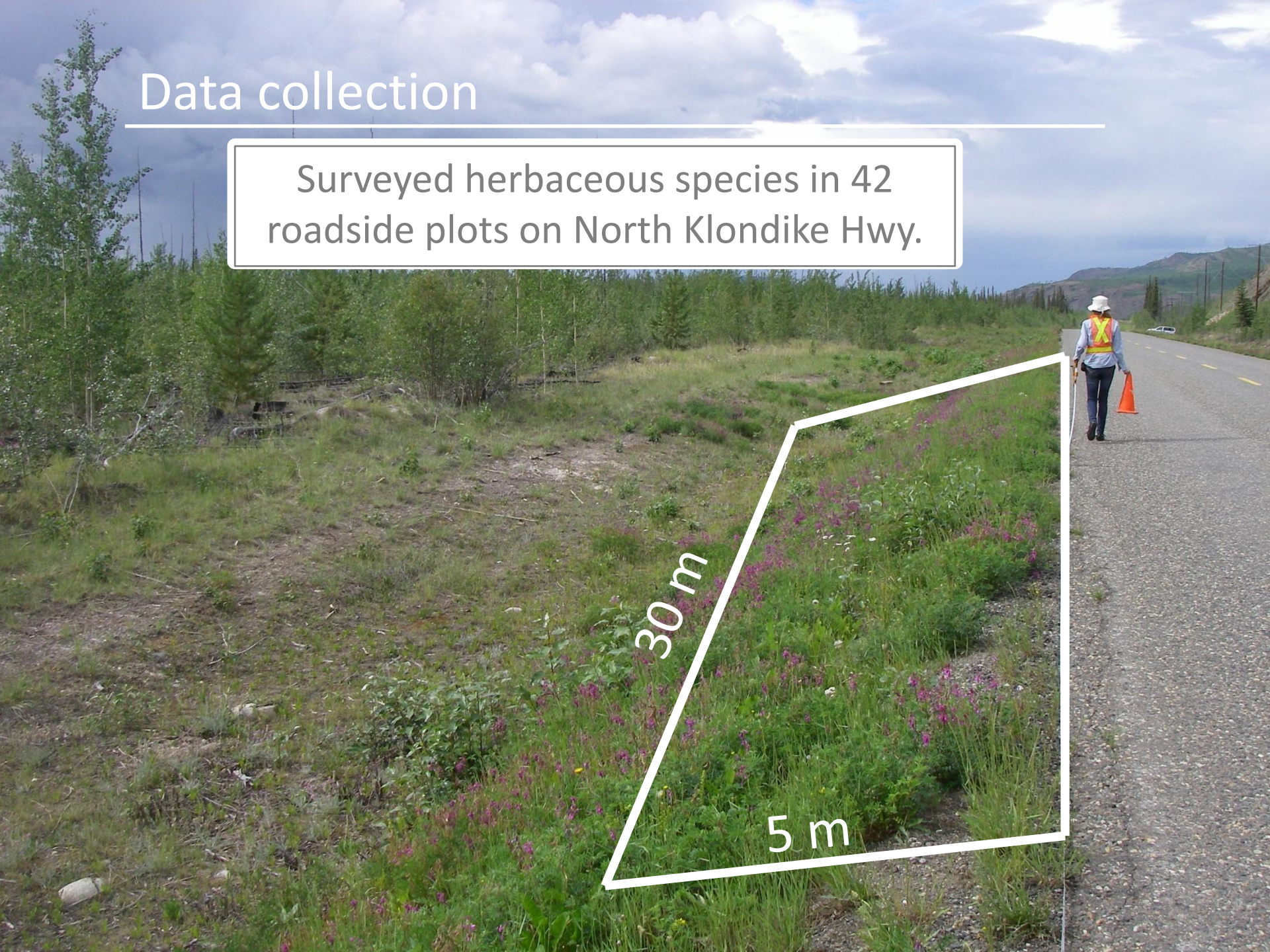


VS.



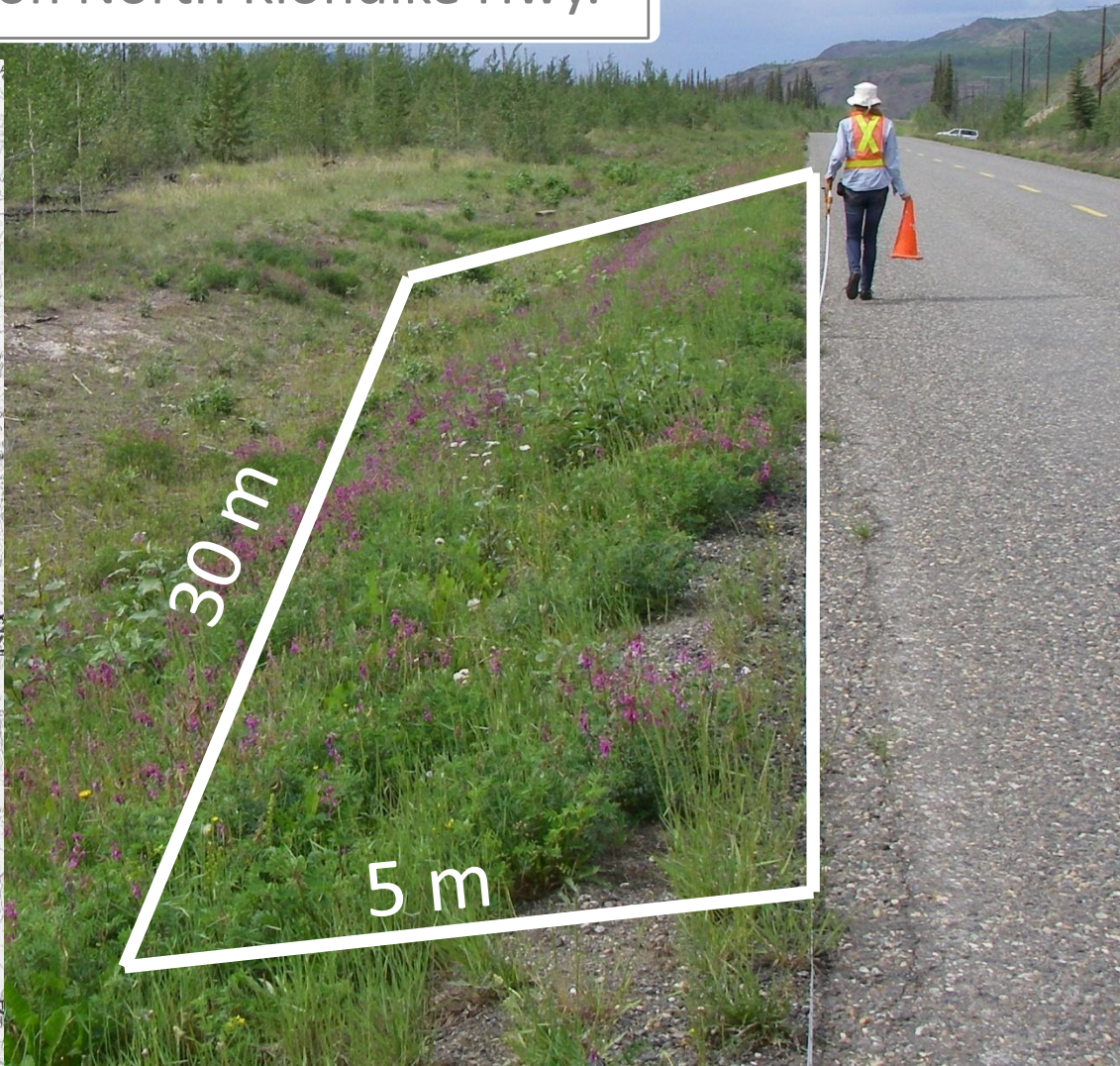
# Data collection

Surveyed herbaceous species in 42 roadside plots on North Klondike Hwy.



# Data collection

Surveyed herbaceous species in 42 roadside plots on North Klondike Hwy.



30 m

5 m

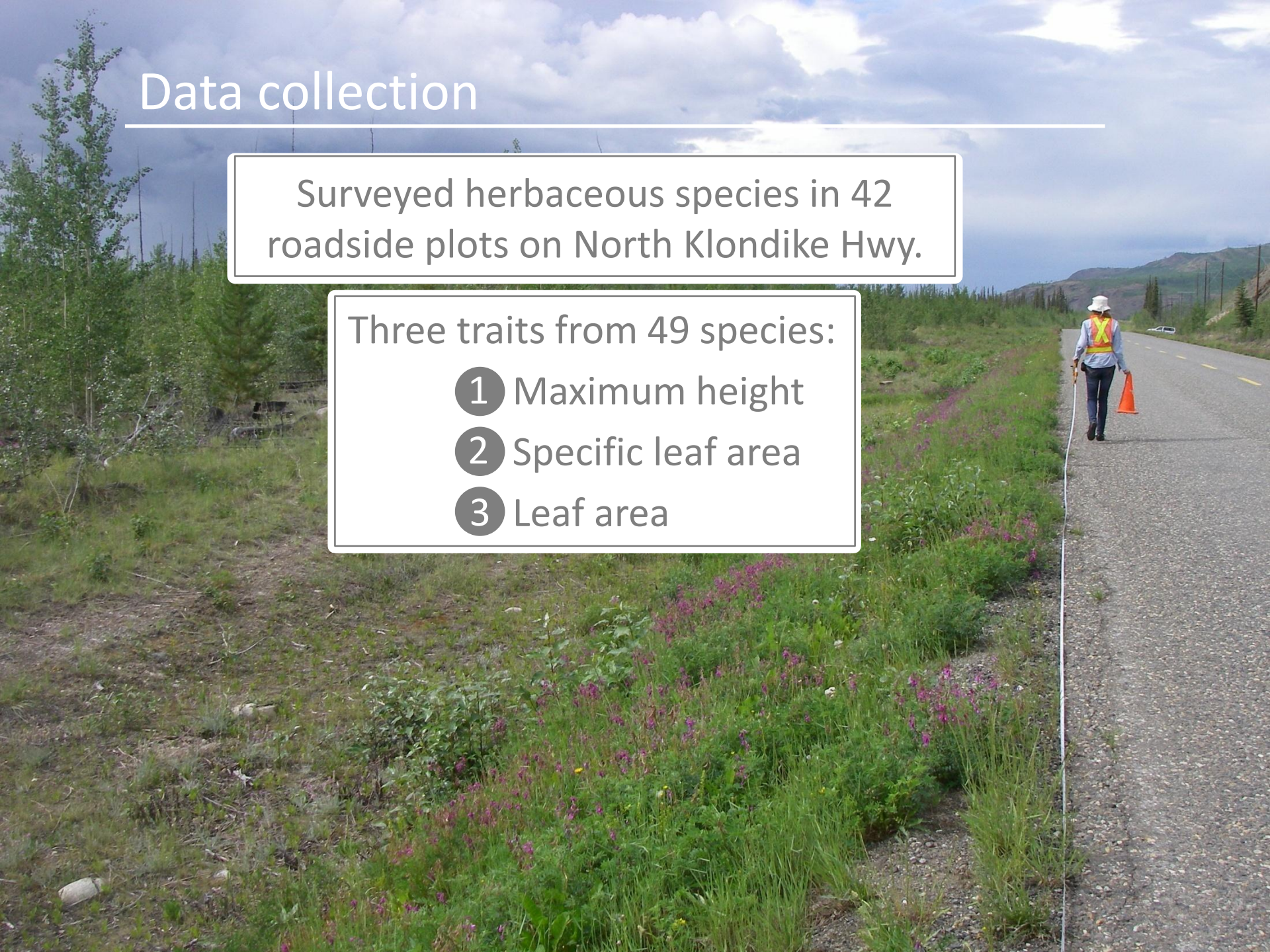
# Data collection

---

Surveyed herbaceous species in 42 roadside plots on North Klondike Hwy.

Three traits from 49 species:

- 1 Maximum height
- 2 Specific leaf area
- 3 Leaf area



# Data collection

---

Surveyed herbaceous species in 42 roadside plots on North Klondike Hwy.

Three traits from 49 species:

- 1 Maximum height
- 2 Specific leaf area
- 3 Leaf area

Four environmental variables:

Elevation

Latitude

Aspect

Age of roadside

(time since highway construction / reconstruction)



# Native plants on the North Klondike



Arctic lupine  
*Lupinus arcticus*



Fireweed  
*Chamerion angustifolium*



*Mertensia paniculata*  
*Arnica angustifolium*



Grass of Parnassus  
*Parnassia palustris*



Moonwort  
*Botrychium lunaria*



*Hedysarum boreale*  
subsp. *mackenzii*



Spotted lady's slipper  
*Cypripedium guttatum*

# Exotic plants on the North Klondike



White sweetclover  
*Melilotus alba*

# Exotic plants on the North Klondike



Narrowleaf hawkbeard  
*Crepis tectorum*



Smooth brome  
*Bromus inermis*



White sweetclover  
*Melilotus alba*

# Exotic plants on the North Klondike



Narrowleaf hawkbeard  
*Crepis tectorum*



Smooth brome  
*Bromus inermis*



White sweetclover  
*Melilotus alba*



Alsike clover  
*Trifolium hybridum*



Dandelion  
*Taraxacum officinale*



Alfalfa  
*Medicago sativa*

# Exotic plants on the North Klondike



Narrowleaf hawkbeard  
*Crepis tectorum*



Smooth brome  
*Bromus inermis*



White sweetclover  
*Melilotus alba*



Alsike clover  
*Trifolium hybridum*



Dandelion  
*Taraxacum officinale*



Alfalfa  
*Medicago sativa*

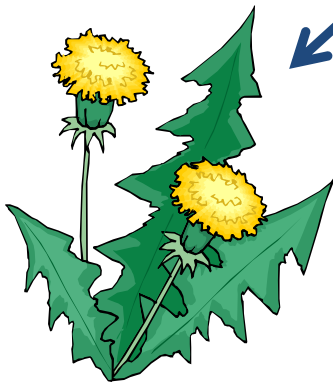
# Functional traits: revealing life strategy

---

## Functional trait:

A measurable characteristic  
(e.g. maximum height)  
that indicates a plant's "life strategy"

E.g. weedy vs. stress-tolerant



# Functional traits: revealing life strategy

---

## 1 Maximum height:

Growth rate

Light capture strategy

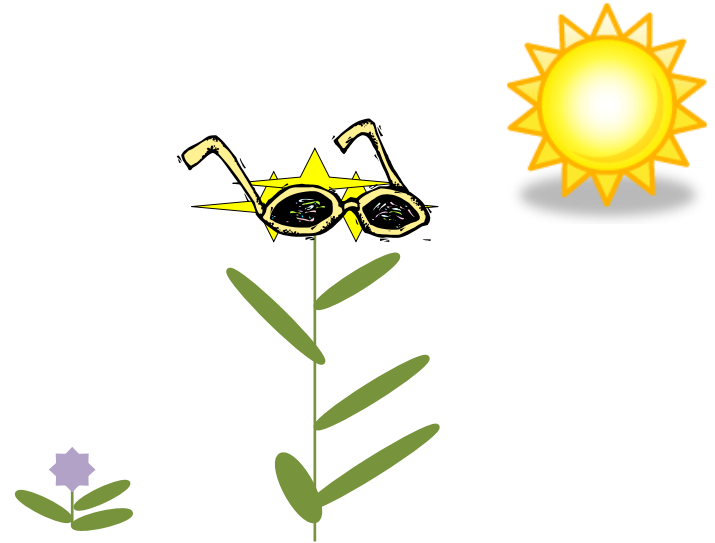
# Functional traits: revealing life strategy

---

## 1 Maximum height:

Growth rate

Light capture strategy



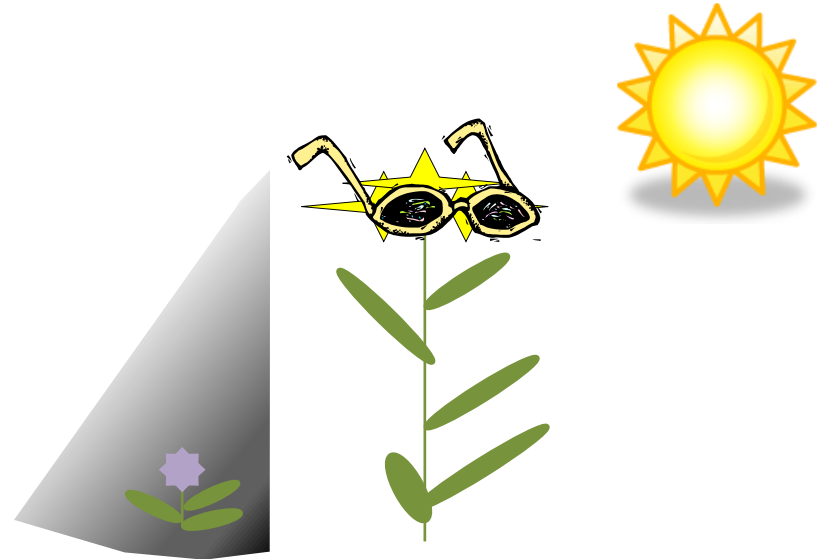
# Functional traits: revealing life strategy

---

## 1 Maximum height:

Growth rate

Light capture strategy



# Functional traits: revealing life strategy

---

2 Specific leaf area (SLA): =  $\frac{\text{leaf area}}{\text{leaf mass}}$

Leaf thickness – “expensiveness” of leaf

Photosynthetic efficiency

# Functional traits: revealing life strategy

---

2 Specific leaf area (SLA): =  $\frac{\text{leaf area}}{\text{leaf mass}}$

Leaf thickness – “expensiveness” of leaf

Photosynthetic efficiency

**High SLA:**

fast growing, thin



cross section



Grass of Parnassus  
*Parnassia palustris*

**Low SLA:**

slow growing, thick



cross section



Soapberry / *Shepherdia canadensis*



# Research Questions

---

1. Do exotic species have **different traits** than native species?



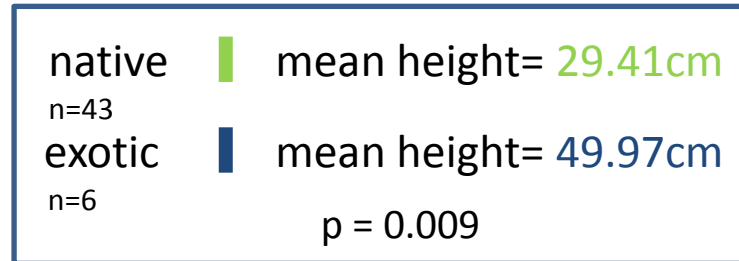
VS.



# Part 1: Trait differences

---

Exotic species are taller as a group





# Research Questions

---

2. Do exotic and native species have **different relationships to the environment?**

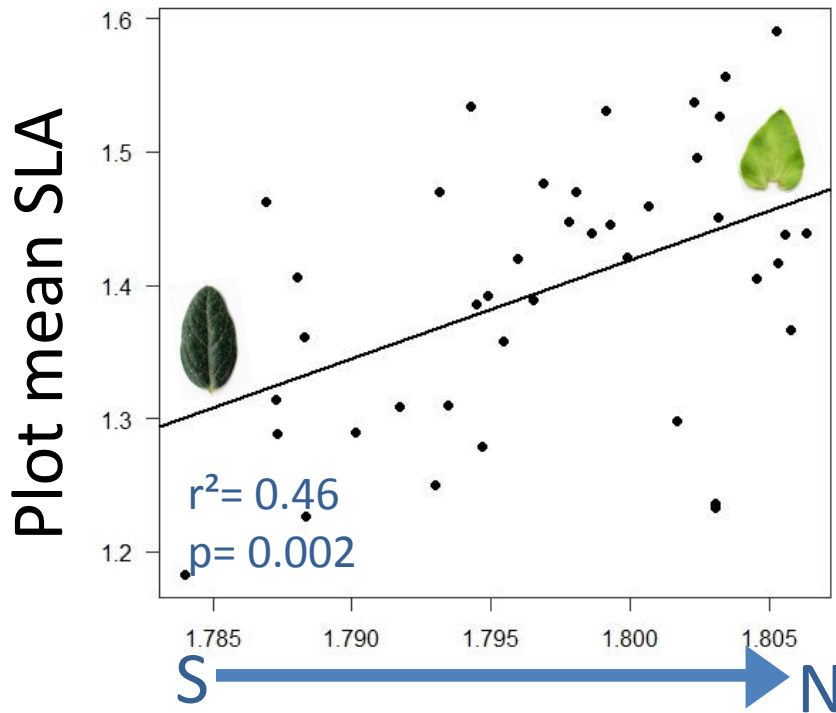


VS.

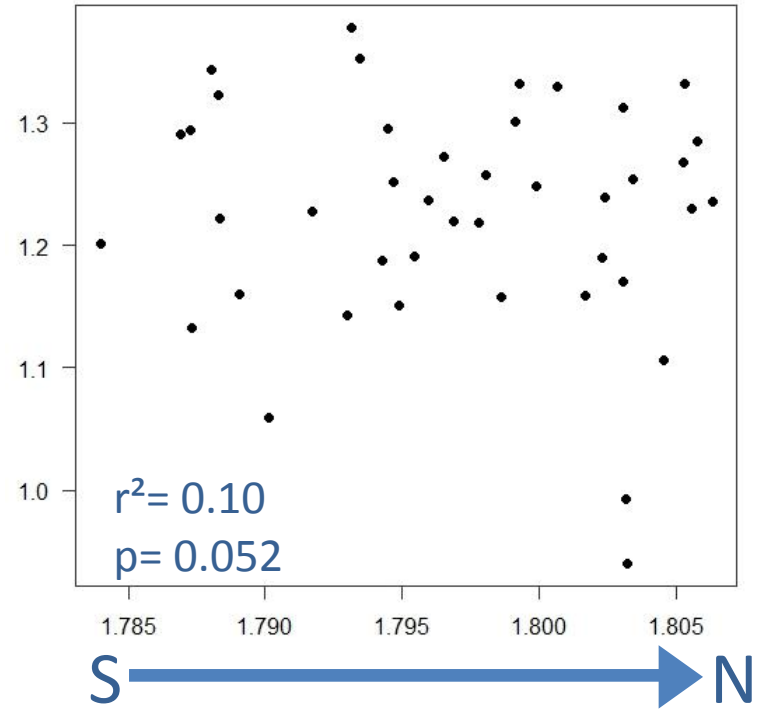


# SLA x Latitude: Exotic leaves get thinner farther north

## Exotic

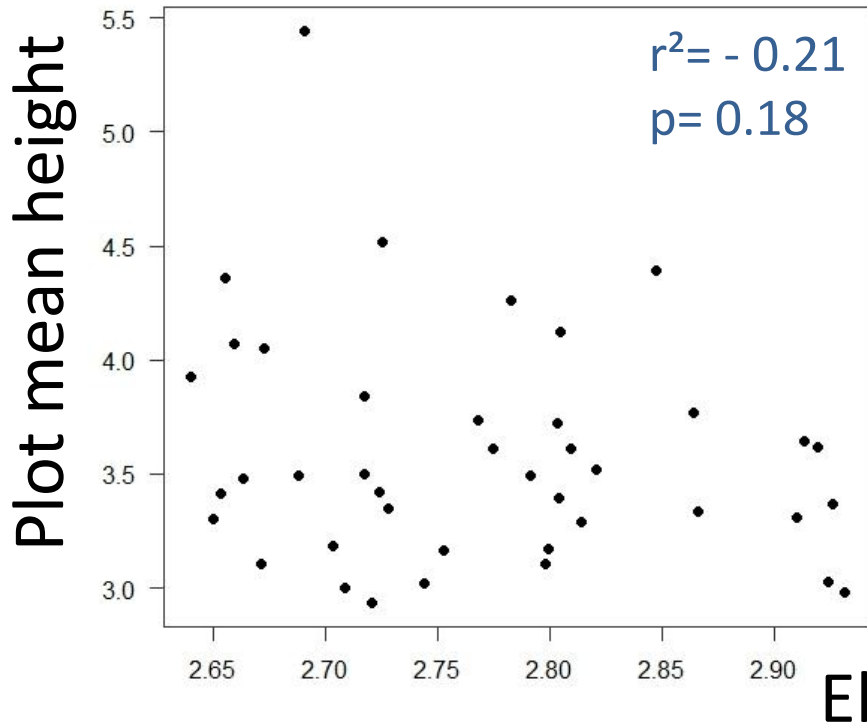


## Native

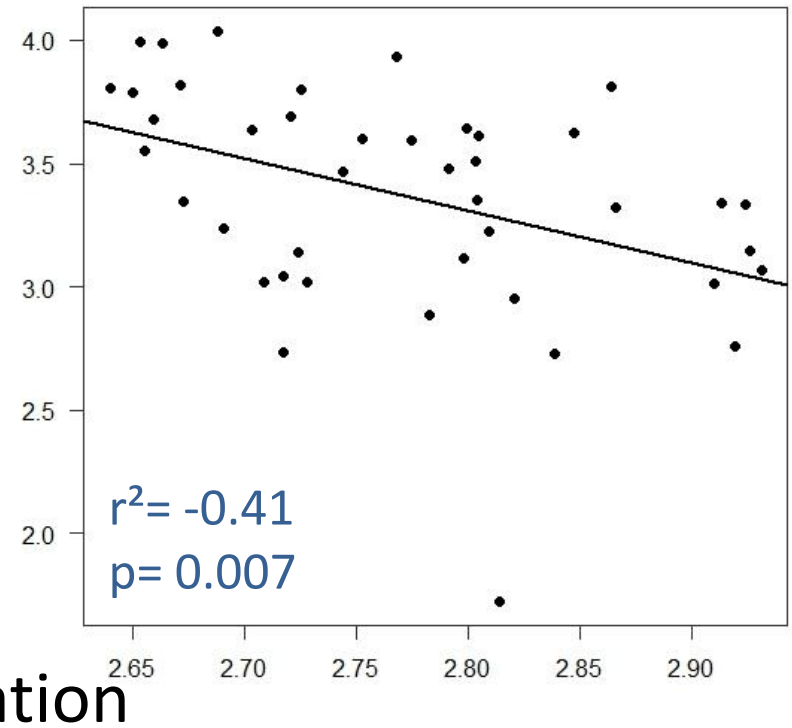


# Height x Elevation: Native plants get shorter as elevation increases

## Exotic



## Native



# Trait x environment summary

---

Exotic

Latitude x SLA : Leaves get thinner farther north



N



# Trait x environment summary

---

Exotic

Latitude x SLA : Leaves get thinner farther north



# Trait x environment summary

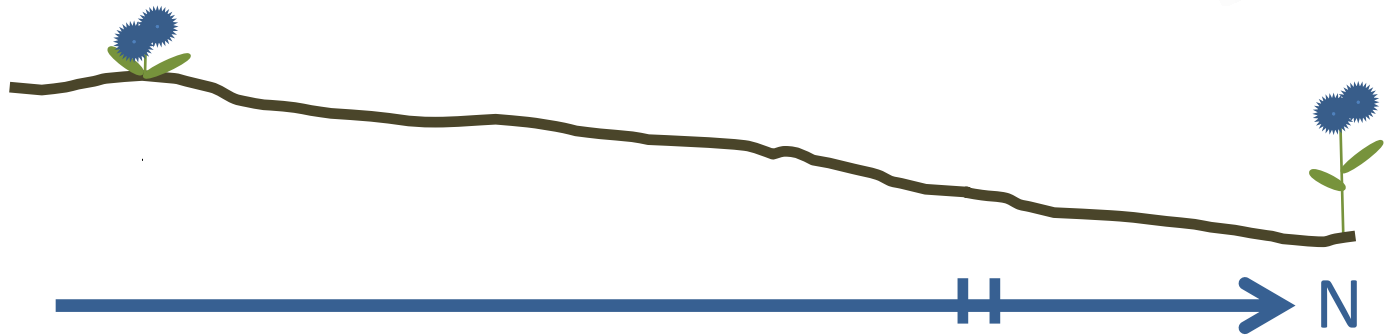
---

Exotic

Latitude x SLA : Leaves get thinner farther north



Native



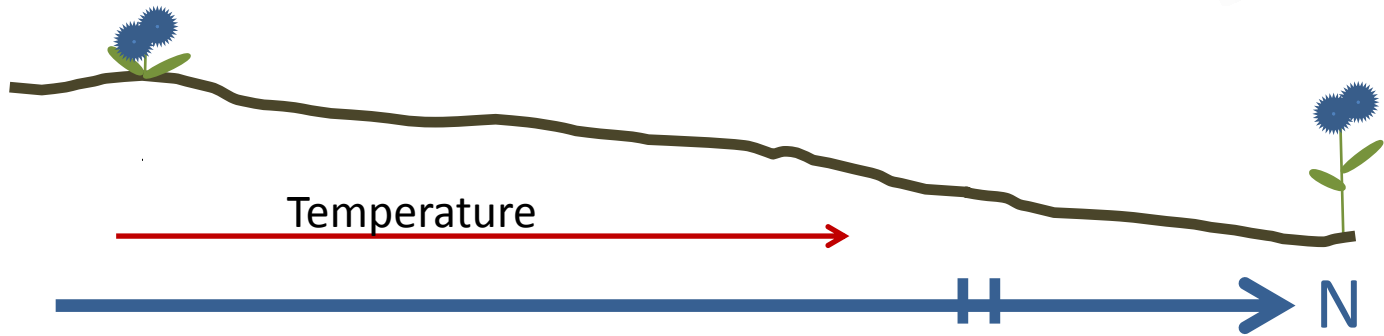
Height: Plants are taller -- at lower elevations  
--farther north  
--on older roadsides

# Trait x environment summary

---

Exotic

Latitude x SLA : Leaves get thinner farther north



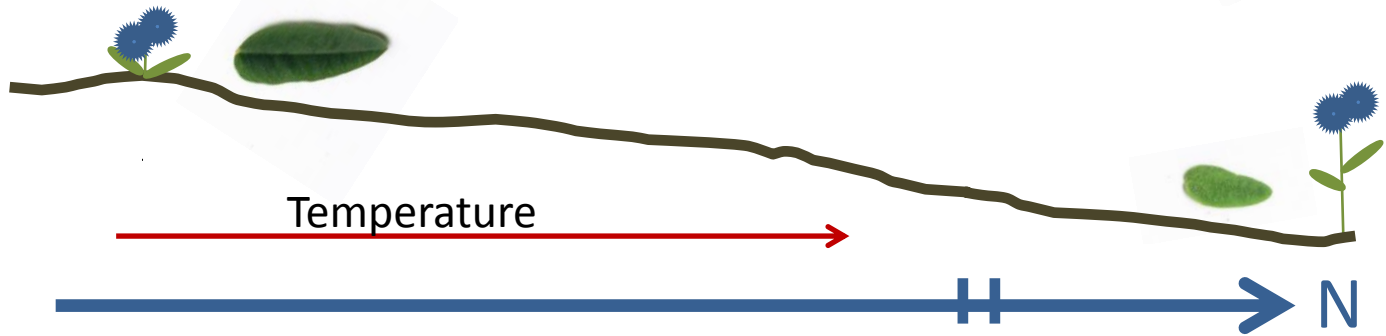
Native

Height: Plants are taller -- at lower elevations  
--farther north  
--on older roadsides

# Trait x environment summary

Exotic

Latitude x SLA : Leaves get thinner farther north



Native

Height: Plants are taller -- at lower elevations  
--farther north  
--on older roadsides

Leaf area: Leaves are smaller-- farther north  
-- on older roadsides

# Summary

---

As a group, exotic species are taller than native species

Competitive advantage?

Exotic and native species track environment differently

Exotics may be better at capitalizing on favourable conditions, possibly an advantage in a changing climate

No easy way to predict which exotics will become invasive

Invasive elsewhere?



# Thank you!

Coreen Forbes, Patrick Little,  
Bruce Bennett, army of undergraduate volunteers



the **BIODIVERSITY**  
RESEARCH CENTRE



**YISC**  
Yukon Invasive Species Council