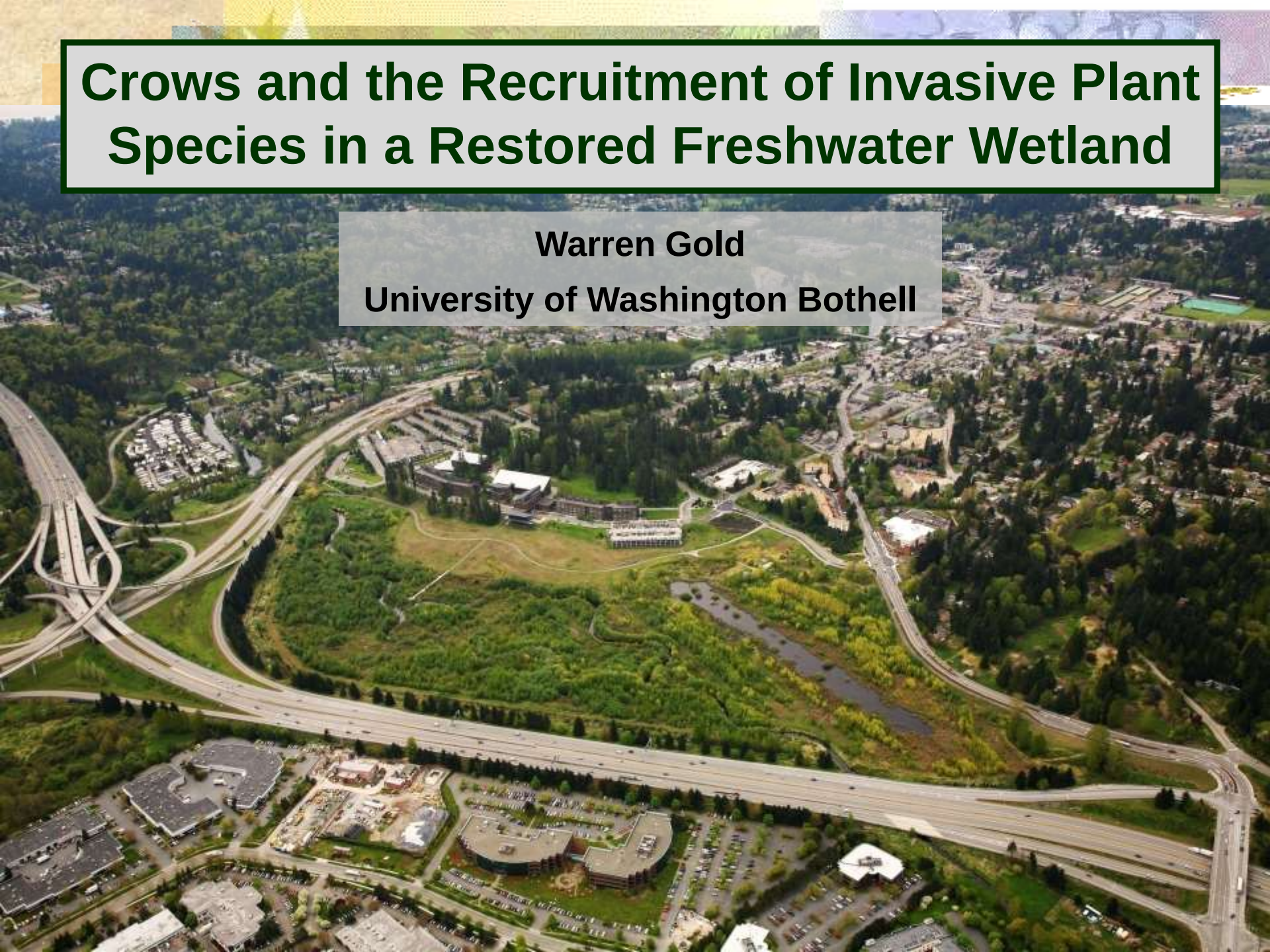
Crows and the Recruitment of Invasive Plant Species in a Restored Freshwater Wetland

Warren Gold

University of Washington Bothell



Crows and the Recruitment of Invasive Plant Species in a Restored Freshwater Wetland

Ian Barlow Sarah Park Holly Zox

UW Bothell Edmonds CC

UW Bothell Campus Wetlands: An Island of Nature

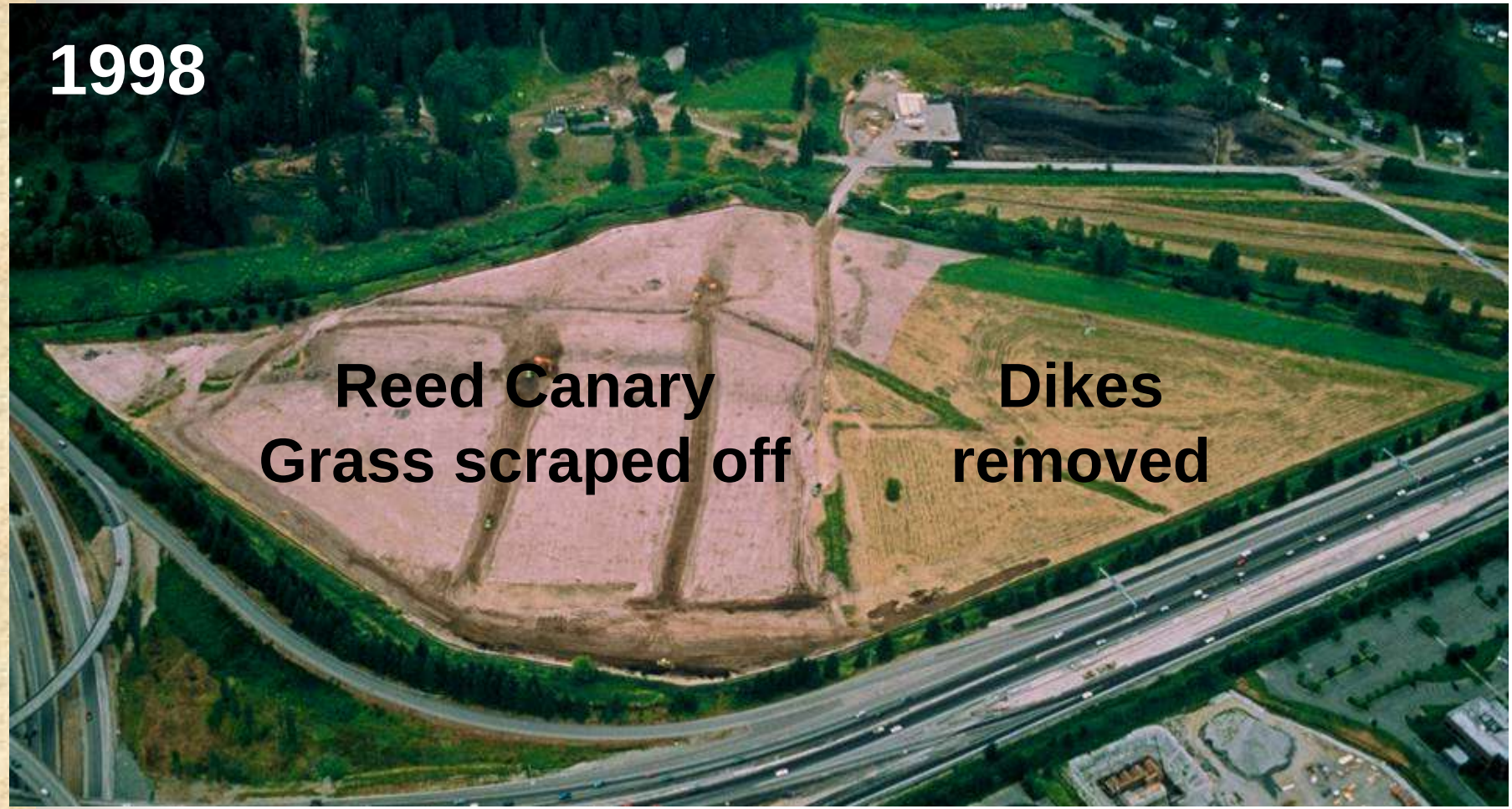
The Truly Ranch: pasture & a straightened stream

Pastures: A Sea of Reed Canary Grass

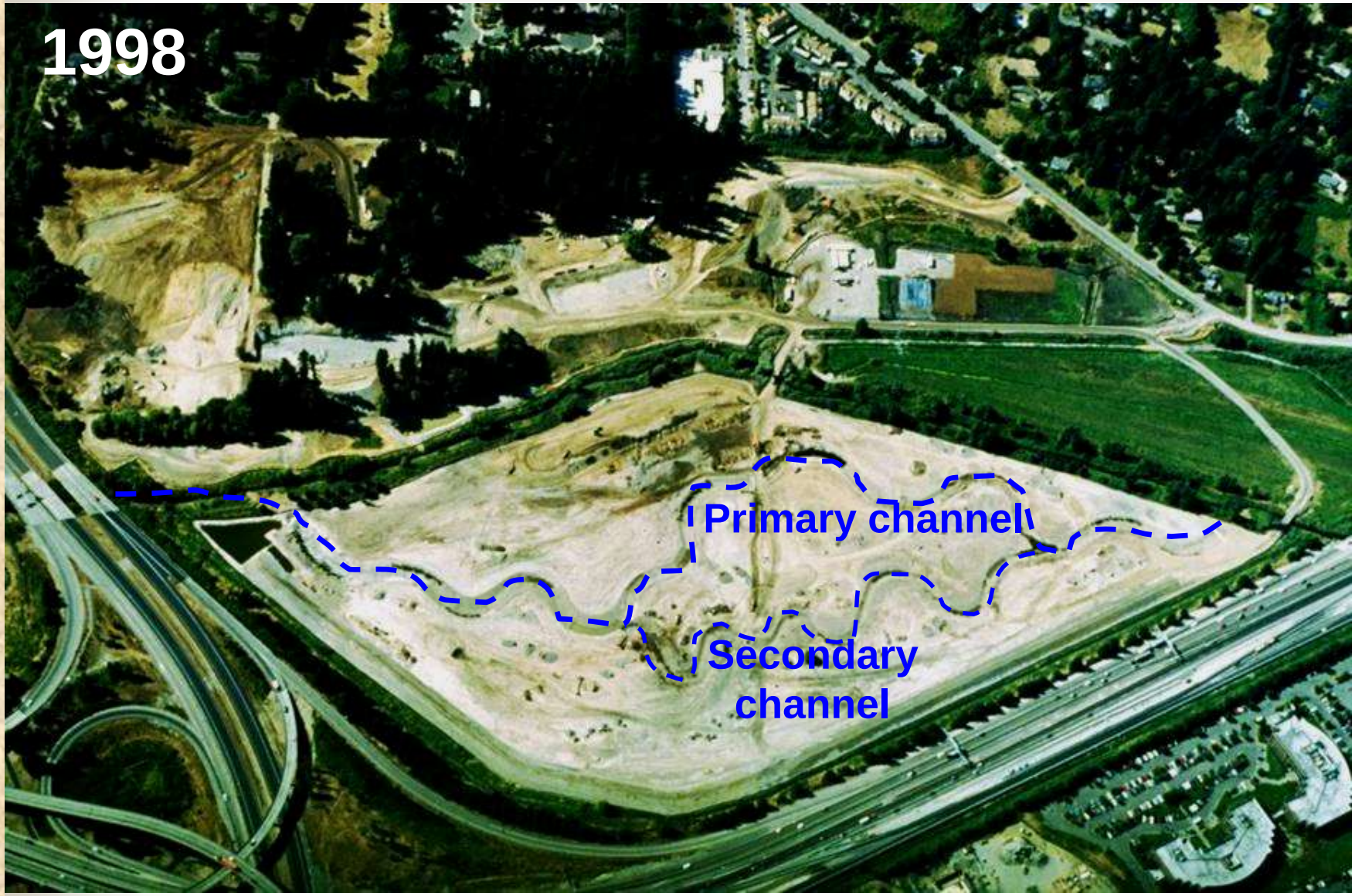
Phalaris arundinacea

The Mandate for Restoration

Creating a Functioning Floodplain Wetland Ecosystem



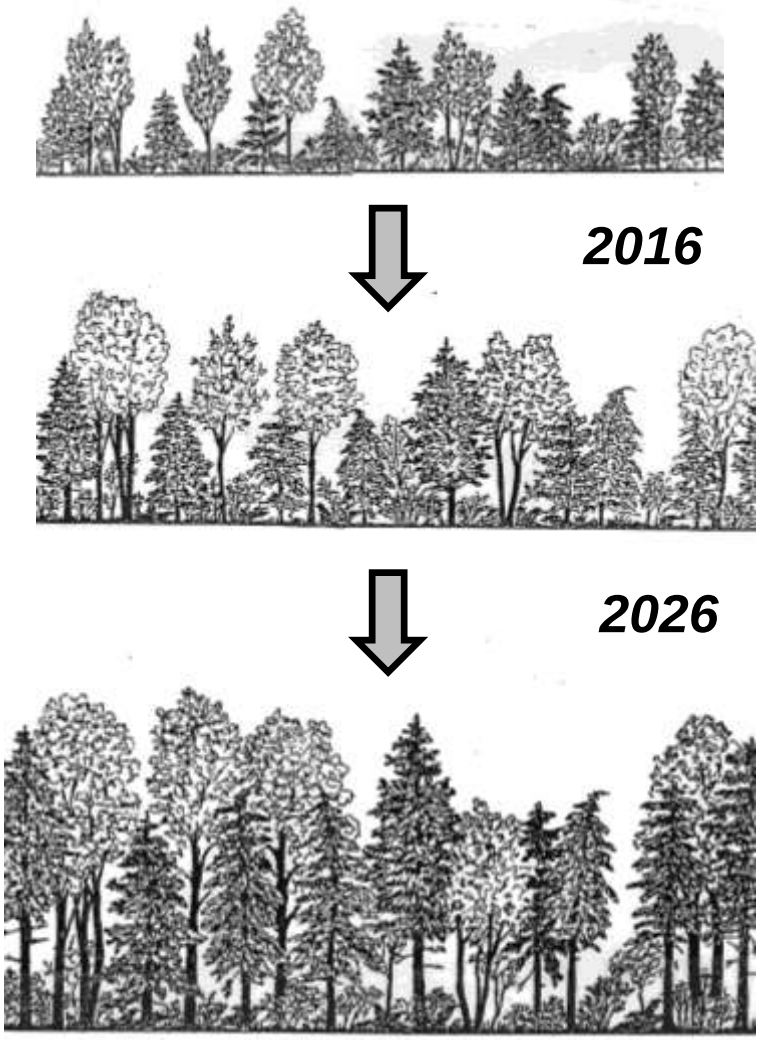
Creating a New Stream Channel



Greening the Wetland

1998 - 2002

Natural development of a forested floodplain wetland



1 Year

11 Years

An enduring lesson: the law of unexpected consequences

Build it and they shall come

Corvus brachyrhynchos

The UW Bothell Crow Roost

Early evening massing

The UW Bothell Crow Roost

Pre-roosting on campus buildings

The UW Bothell Crow Roost

Pre-roosting on campus buildings

The UW Bothell Crow Roost

Pre-roosting on campus trees

The UW Bothell Crow Roost

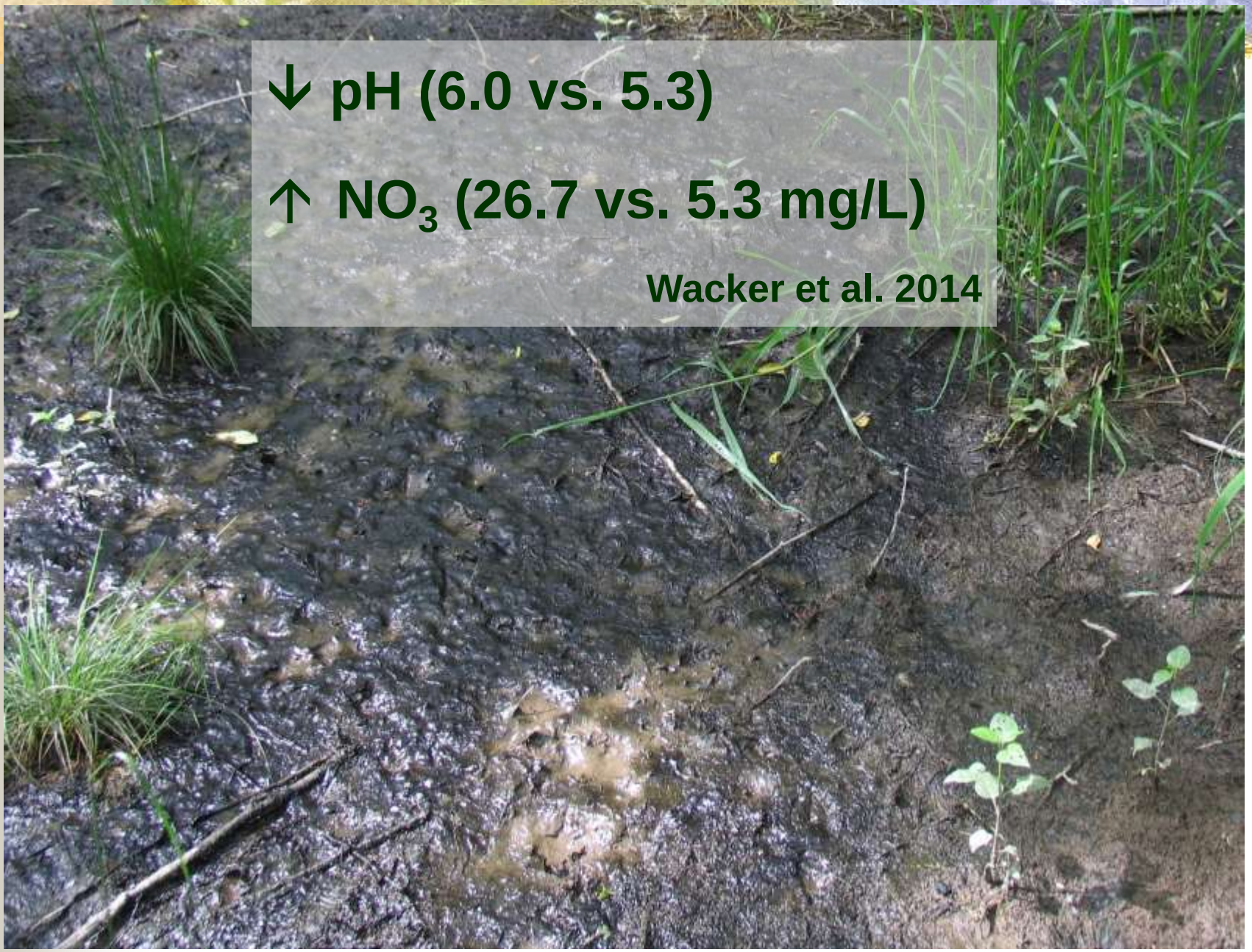
Moving to the wetland for nighttime roost

The UW Bothell Crow Roost

Moving to the wetland for nighttime roost

Crow Roost Area

Alnus rubra dominated roost habitat


↓ pH (6.0 vs. 5.3)
↑ NO_3 (26.7 vs. 5.3 mg/L)
Wacker et al. 2014

Research Question

<u>Observation</u>: invasive plant species seedlings showing up in class plots under crow roost (2013)

European ash (*Sorbus aucuparia*)

Research Question

<u>Observation</u>: invasive plant species seedlings showing up in class plots under crow roost

European ash (*Sorbus aucuparia*)

Bittersweet nightshade (*Solanum dulcamara*)

All commonly bird-dispersed

English ivy (*Hedera helix*)

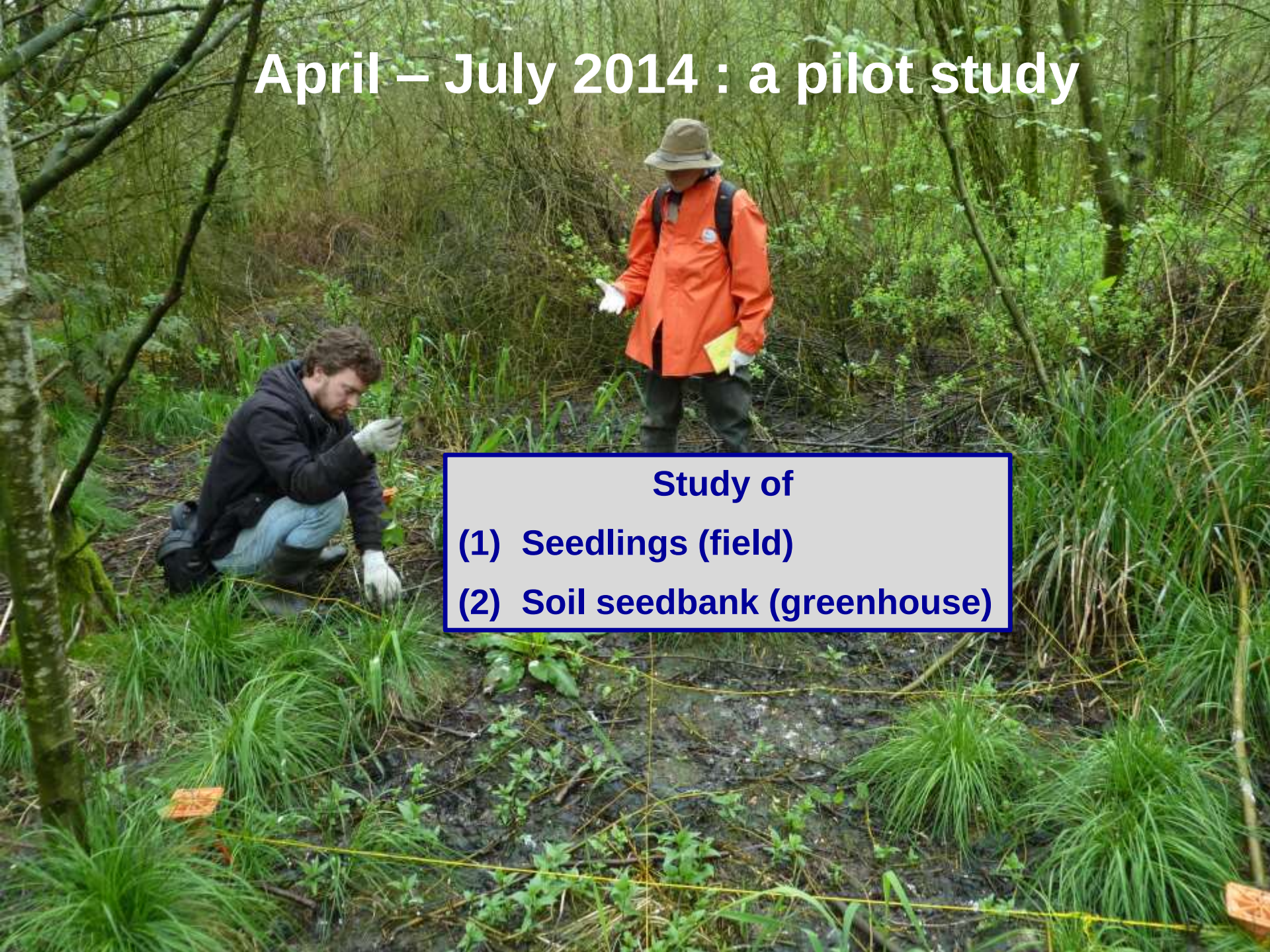
English holly (*Ilex aquifolium*)

Research Question

Observation: invasive plant species seedlings showing up in class plots under crow roost

Question: are crows facilitating recruitment of invasive plant species?

April – July 2014 : a pilot study



Study of

(1) Seedlings (field)

(2) Soil seedbank (greenhouse)

Research Design

Field Study of Invasive Seedlings

2 red alder communities

- Alder – shrub
- Alder – *Carex*

Alnus rubra

Field Communities

Alder - shrub

Alder - *Carex*

Study Community Locations

Research Design

Field Study

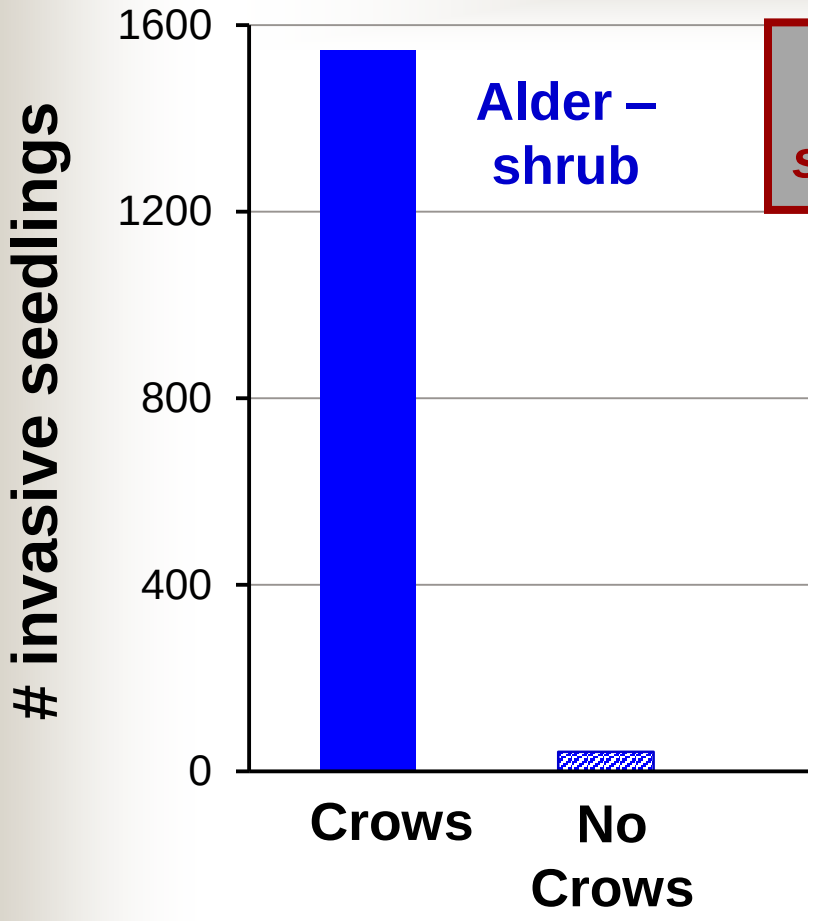
- *2 x 2 meter plots*
- *5 plots / community*

Research Methods

Field Study

Counting seedlings inside plots

Field Study: Early results from mid-April

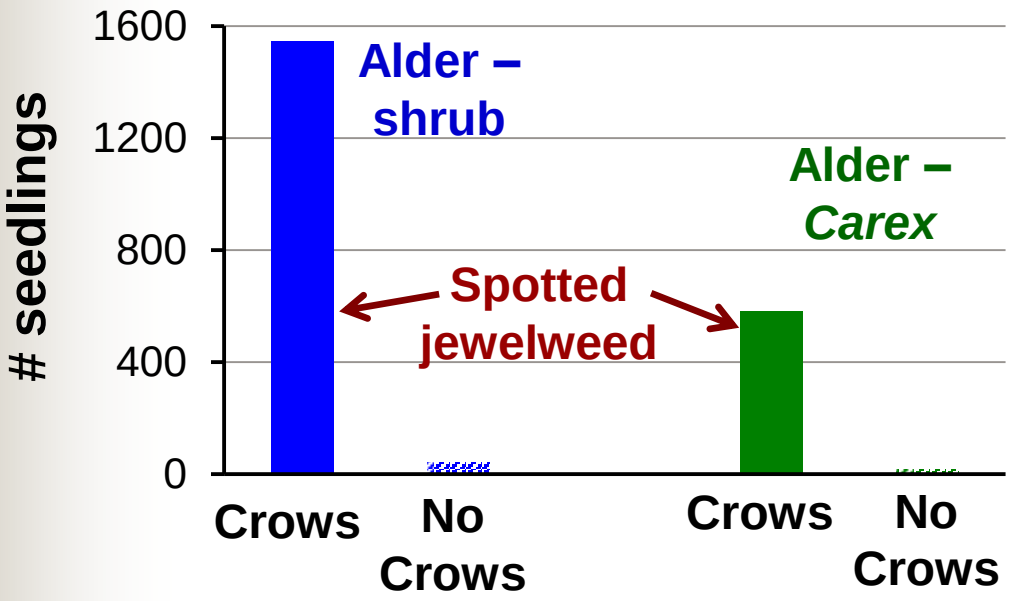


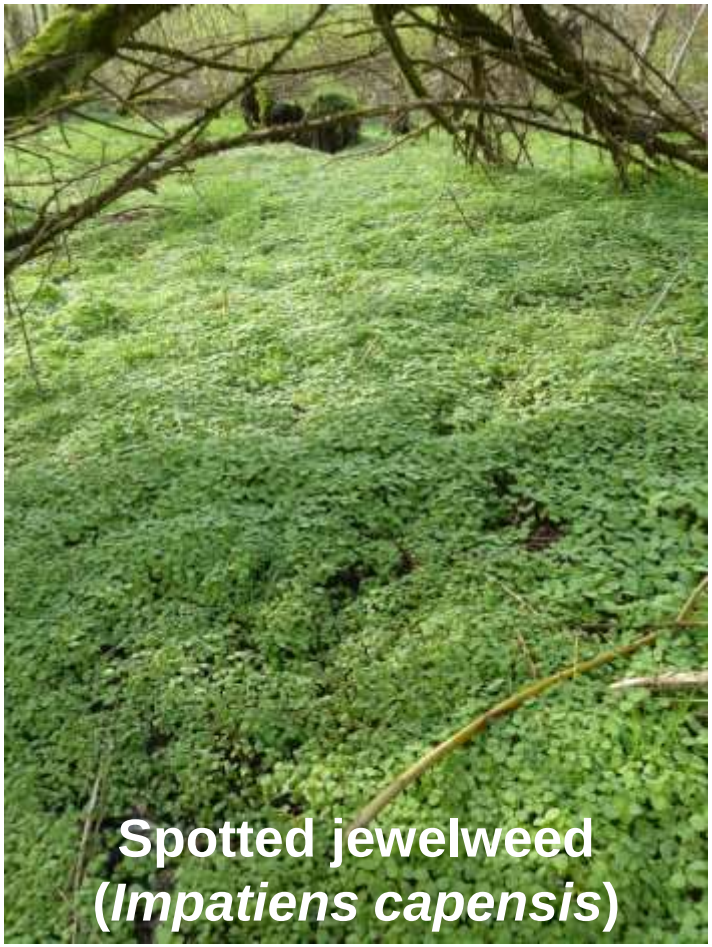
April 16, 2014

Total # seedlings in all 5 plots

Field Study: Early results from mid-April

Spotted jewelweed dominates



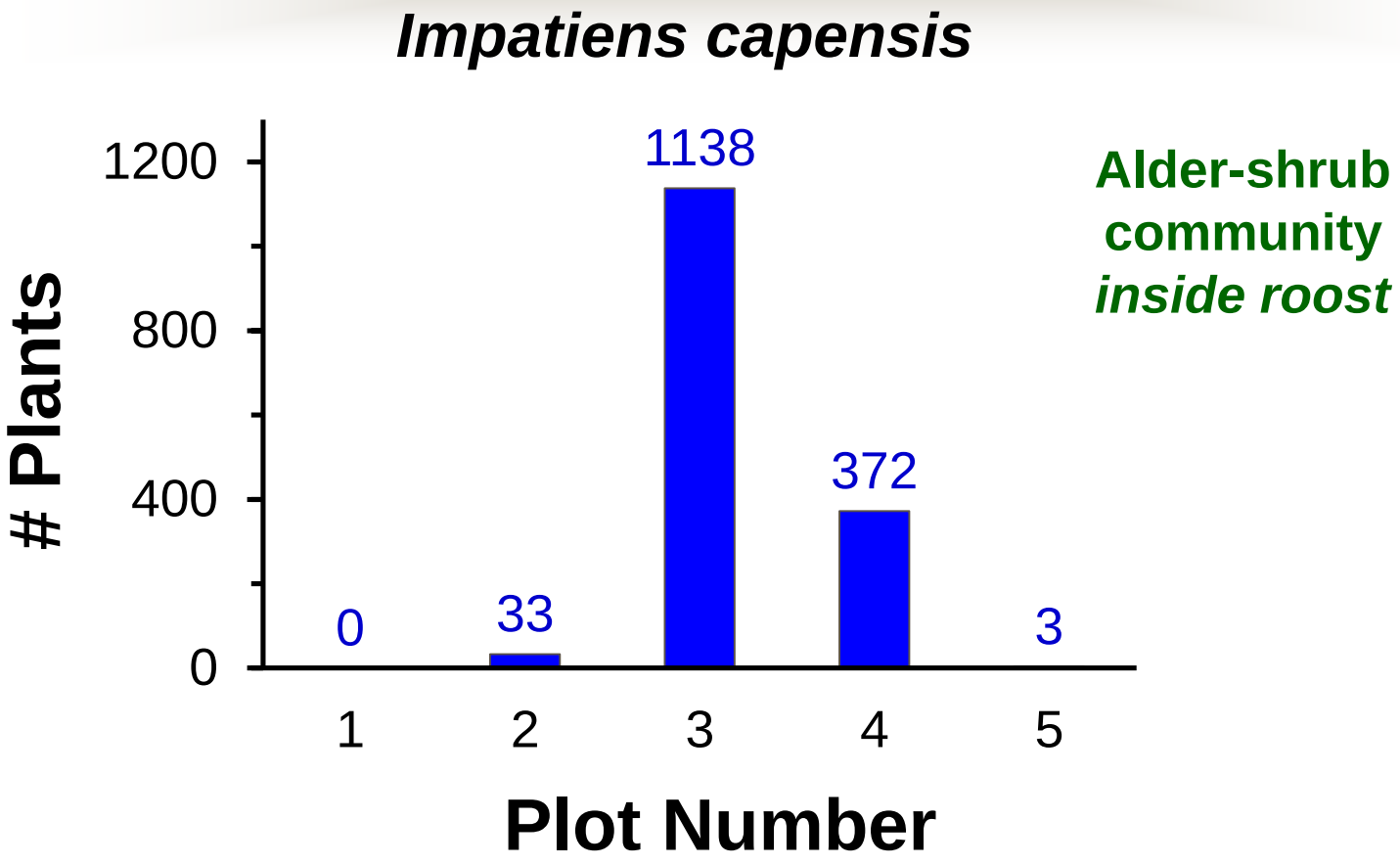


Field Study

Interpreting early results

- **Higher numbers of invasives in crow roost**
- **Cautions:**
  - ✓ invasives dominated by few (or one) species
  - ✓ mid-April is early for many germinants
  - ✓ very high spatial variability

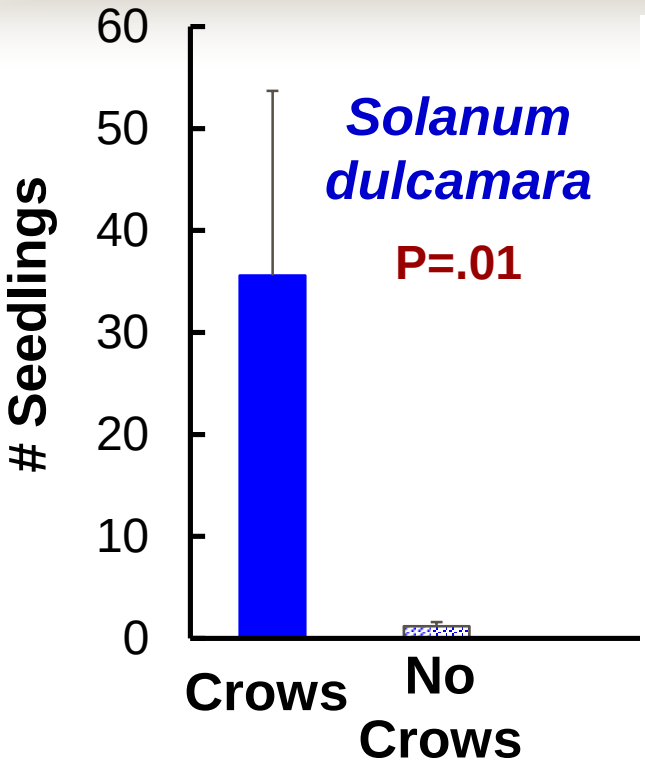
Field Study: High variability among plots



Field Study: July Belt Transects

↑ Invasive seedlings in crow roost for *some species*

- Roost
- Off roost

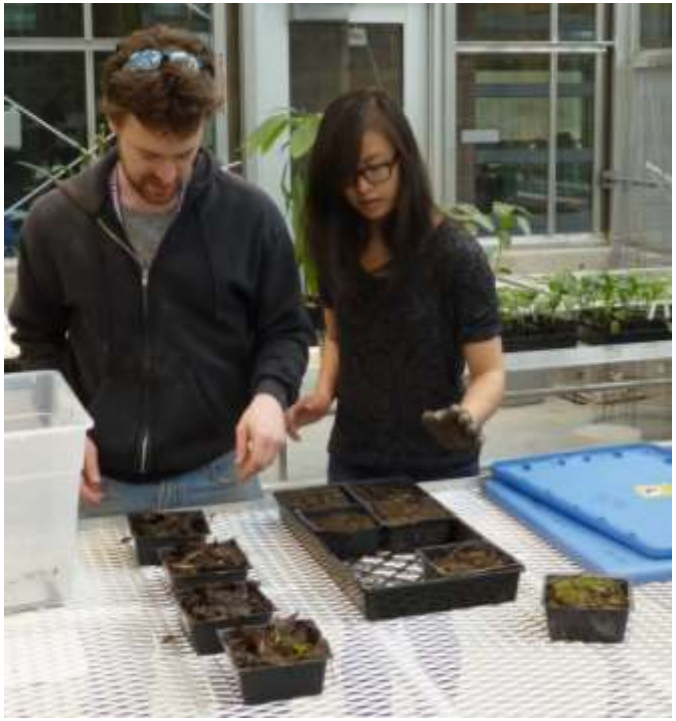


Total # seedlings	**178**	**6**	**35**	**4**

Research Methods

Greenhouse Study

Collect soil samples ⇨ **Place in greenhouse** ⇨ **Identify & count seedlings 2x / week**



Greenhouse Study: *monitoring & tracking seedlings*

- *7 soil block samples / community*
- *161 cm^2 soil block samples (5 cm. deep)*

Research Methods

Greenhouse Study: *monitoring & tracking seedlings*

Challenges

Identification is difficult

Research Methods

Greenhouse Study: *monitoring & tracking seedlings*

Challenges

Identification is difficult

With patience & growth many can be identified

Epilobium ciliatum

Research Methods

Greenhouse Study: *monitoring & tracking seedlings*

Challenges

Identification is difficult

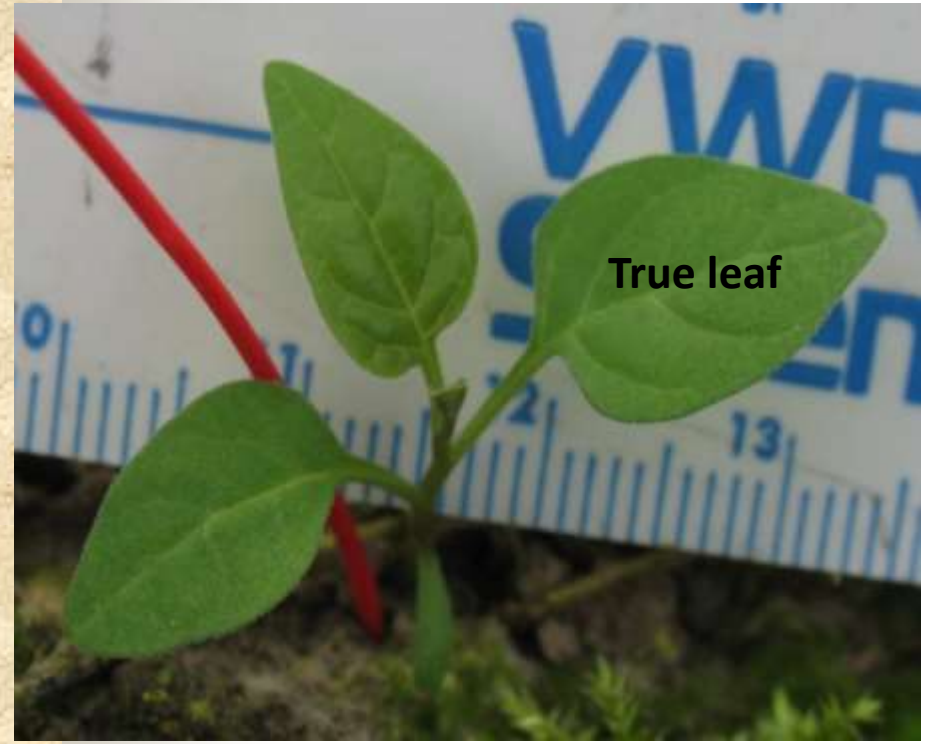
Seeds don't all germinate at the same time

Mark seedlings for each sampling period

Research Methods

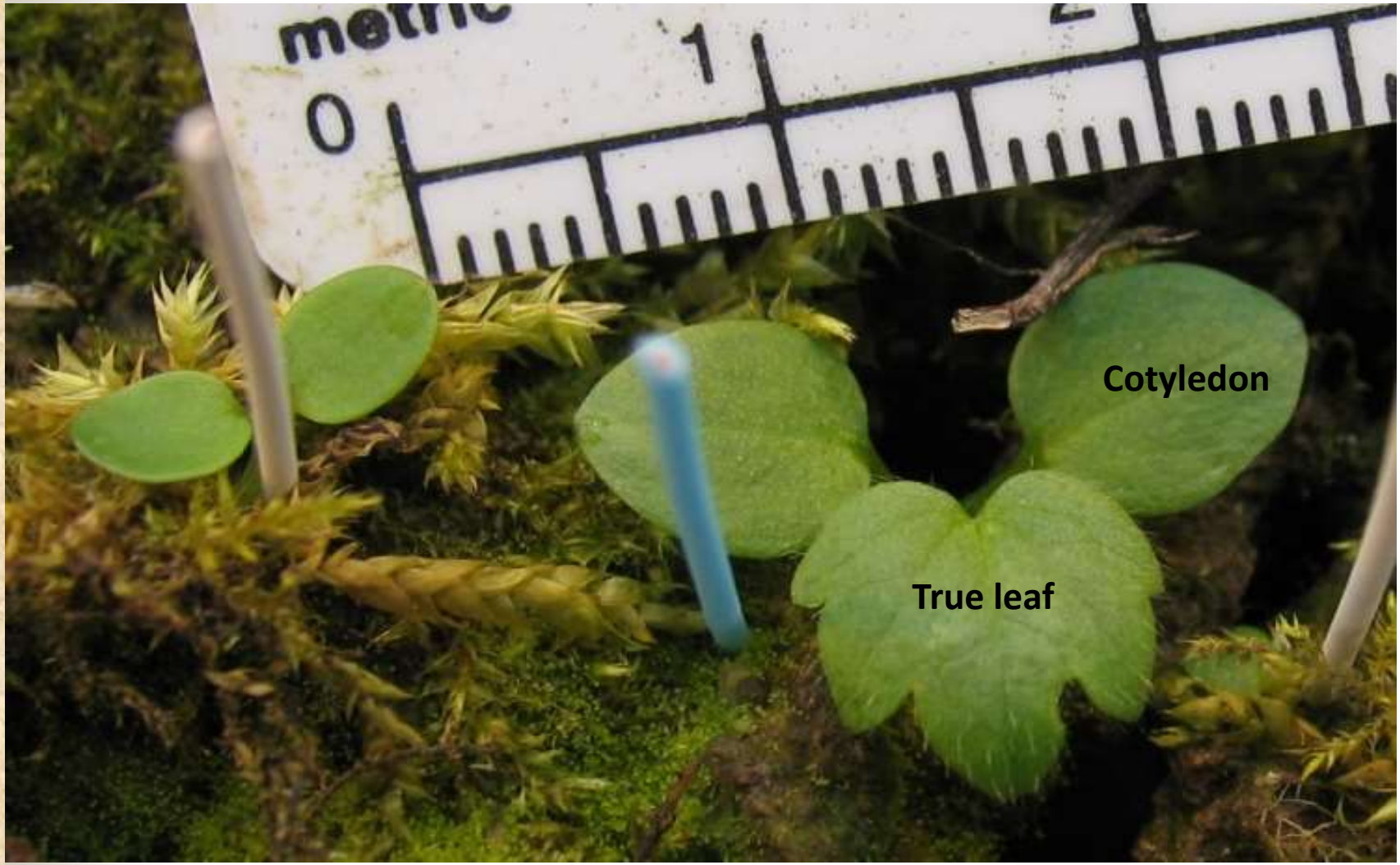
Greenhouse Study: *seedling identification*

***Solanum dulcamara* (bittersweet nightshade)**

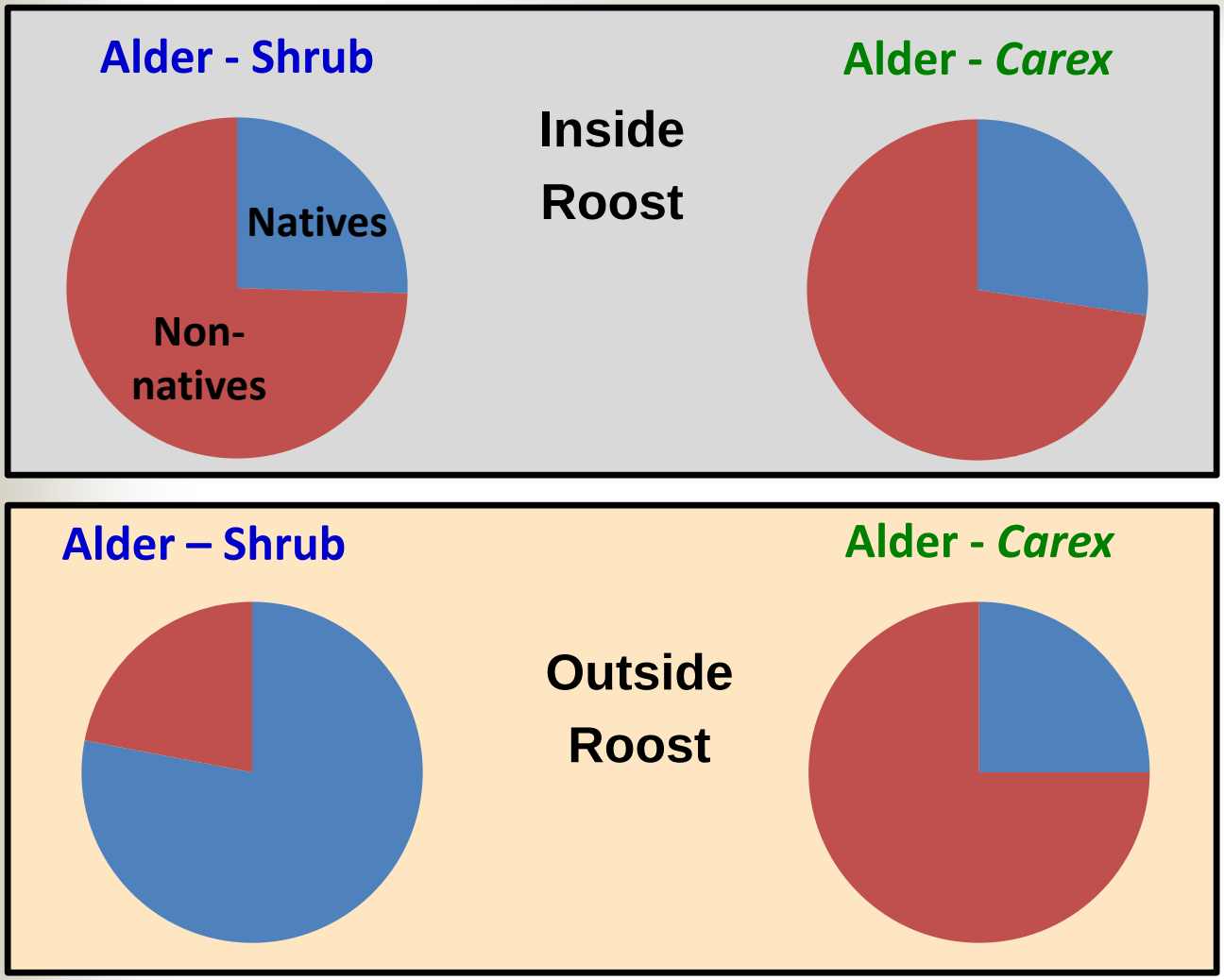


Greenhouse Study: *seedling identification*

***Ranunculus repens* (creeping buttercup)**

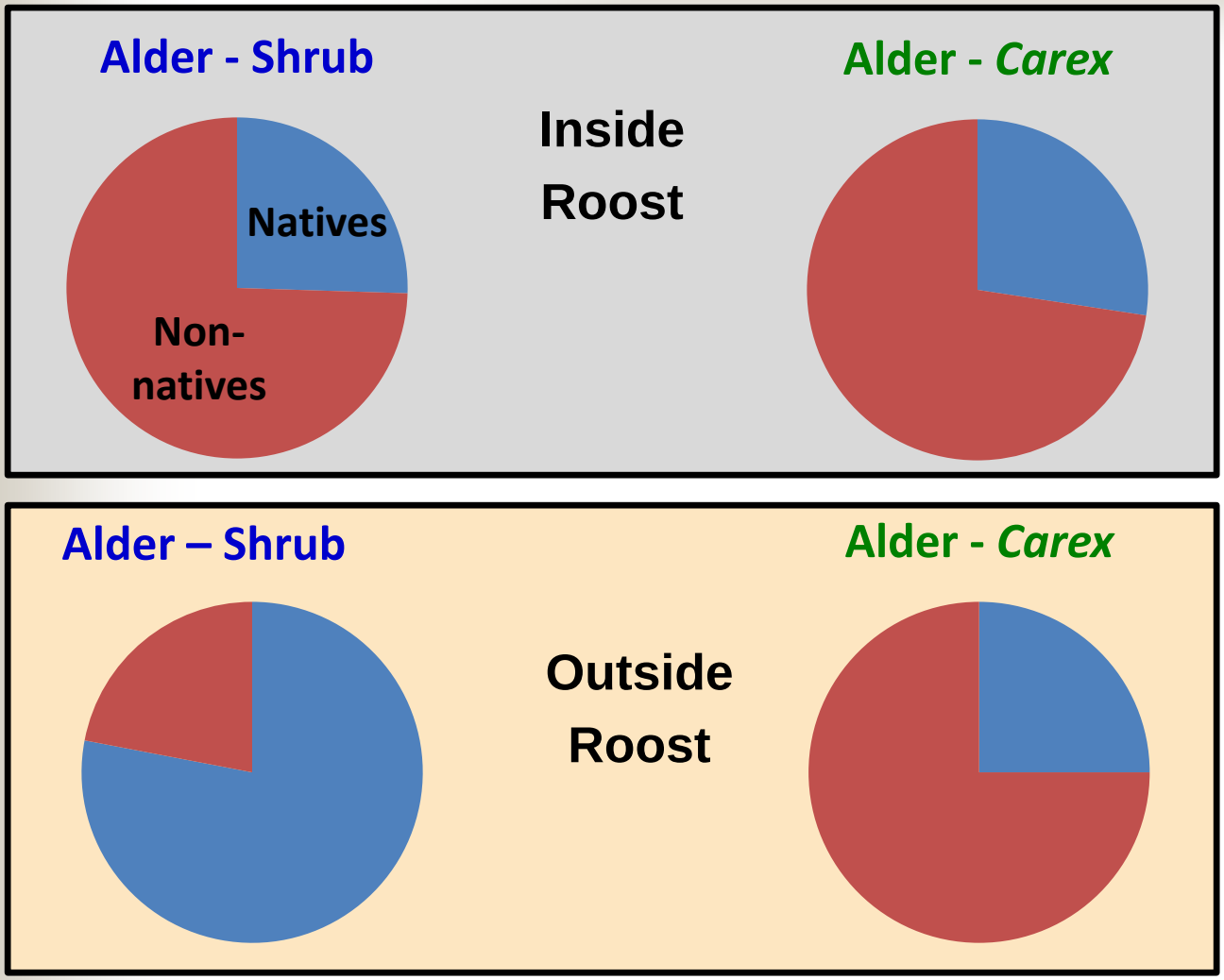


Greenhouse Results



Non-native species dominate dicot germinants

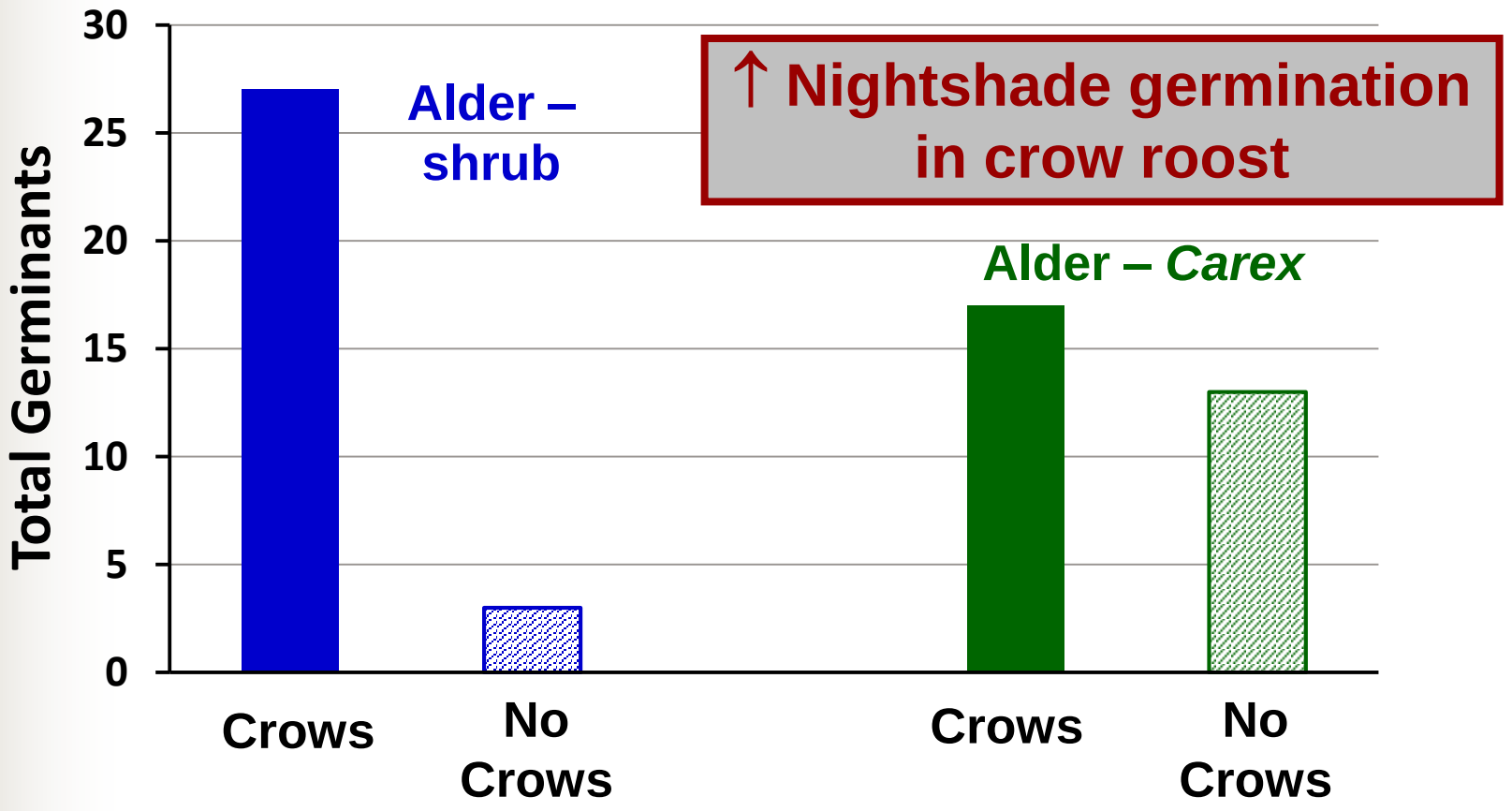
Conclusions



Invasive species dominate more under the crow roost in SOME communities

Greenhouse Results

Bittersweet nightshade (*Solanum dulcamara*)



Results

- **Some common invasives in the seedbank <u>may</u> not be bird-dispersed** (but still may be affected by birds)
  - ✓ White clover (*Trifolium repens*)
  - ✓ Birds-foot trefoil (*Lotus corniculatus*)
  - ✓ Creeping buttercup (*Ranunculus repens*)

Potential mechanisms:
crows modify the soil chemical environment

Crow waste:

- ↑ Acidity
- ↑ Nitrogen

Direct effects

∆ Plant

- Reproduction
- Growth
- Competition
- Fungal relationships

Potential mechanisms:
crows modify the soil chemical environment

Crow waste:

- ↑ Acidity
- ↑ Nitrogen

Indirect effects

- Other soil chemistry
- Soil biota
- Etc.

∆ Plant

- Reproduction
- Growth
- Competition
- Fungal relationships

Conclusions

Restoration

↑ Shade

Crows

↓ Invasives

↑ Invasives

Long term effects: ???

What's Next

Some challenges and questions to address

- High spatial variability
- Identifying seedlings and understanding mortality rates
- How do these results change over seasons?
- Do the crows really disperse invasive seeds?
  - ✓ Crow waste – germination study
- Are the crows altering the soil environment in ways that affect invasion / success of non-native plants?

Acknowledgments

Wetland Researchers

- Rob Turner & students
- Doug Wacker & students
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- Tyson Kemper
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- Tyson Kemper
- Tony Guerrero

Acknowledgments

Field Work

Photo: Ian Barlow