

# Patterns and Vulnerabilities of Arctic and Subarctic Alaska to Non-Native Plant Invasion

**Matthew L. Carlson<sup>1,2</sup>, E. Jamie Trammell<sup>2</sup>, Megumi Aisu<sup>2</sup>, and Lindsey Flagstad<sup>2</sup>**


<sup>1</sup>Biological Sciences Department and <sup>2</sup>Alaska Natural Heritage Program,  
University of Alaska Anchorage



# Bureau of Land Management: Rapid Ecoregional Assessments

Funding and guidance:  
AK BLM, Scott Guyer,  
Alisa Segal, and  
Management Team


Collaborators:  
SNAP – UAF  
ISER – UAA  
AKNHP – UAA

 **Alaska Natural Heritage Program**  
UNIVERSITY of ALASKA ANCHORAGE

[Skip to content](#) | [Contact](#) | [Sitemap](#)

Search for:

[Home](#) | [Programs](#) | [Staff](#) | [Contact us](#)



Landscape-ecology


[Home »](#)

## Conservation Planning

### Rapid Ecoregional Assessments

The Alaska Natural Heritage Program (AKNHP) in cooperation with the Bureau of Land Management (BLM), the Institute for Social and Economic Research (ISER), and the Scenarios Network for Alaska Planning (SNAP) is currently developing two **Rapid Ecoregional Assessments** (REAs). REAs are intended to target and answer important management questions identified by land managers, collect and in some cases develop new distribution maps for key resource values, document potential impact from environmental change agents, identify science gaps, and provide baseline data for future management decisions. REAs for the Yukon River Lowlands – Kuskokwim Mountains – Lime Hills (YKL) ecoregions and the North Slope ecoregions are currently in progress.

Click the study areas highlighted on the map below for more information on each REA:



#### What is a Rapid Ecoregional Assessment?

#### Rapid Ecoregional Assessments

##### YKL REA

- YKL Study Area
- YKL Management Questions
- YKL Conceptual Ecoregional Model
- YKL Conservation Elements
- YKL Change Agents
- YKL Maps
- YKL Products

##### North Slope REA

- North Slope Study Area
- North Slope Management Questions
- North Slope Conceptual Ecoregional Model
- North Slope Conservation Elements
- North Slope Change Agents
- North Slope Maps
- North Slope Products

##### Central Yukon REA

- Central Yukon Study Area
- Central Yukon Maps
- Central Yukon Products

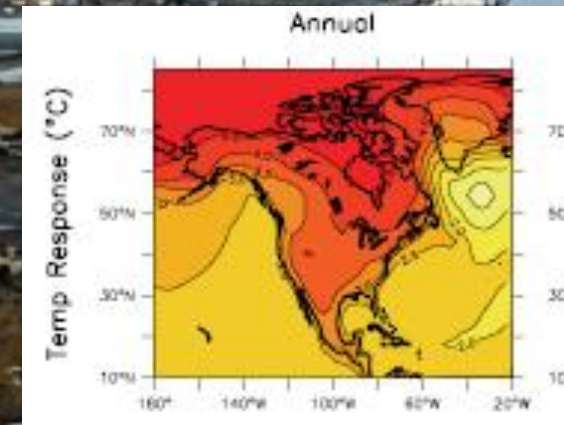
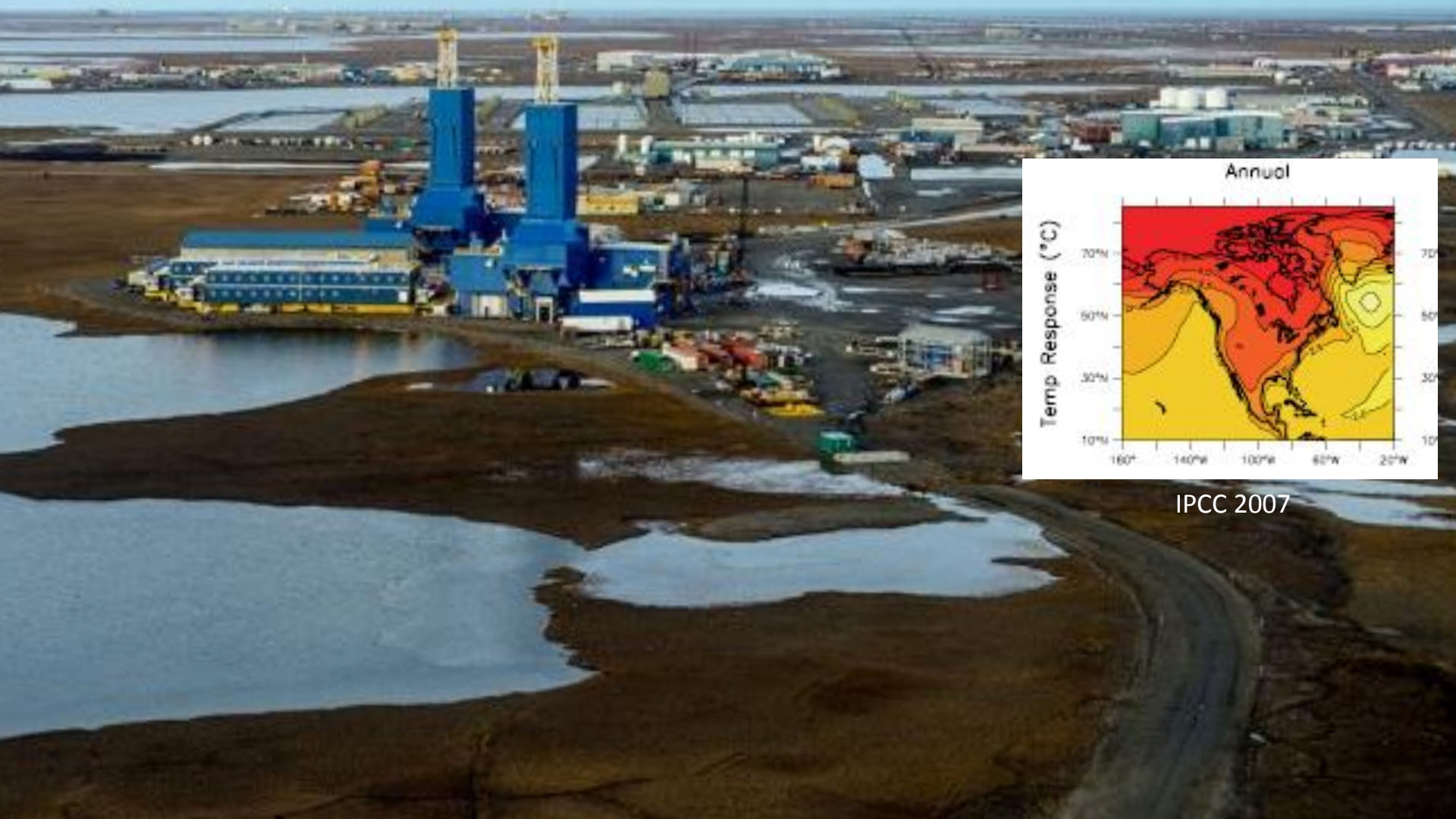
**Arctic and boreal systems: lower levels of large scale human-induced habitat alteration than most other biomes**  
**- And fewer non-native species**

Economies (subsistence & market) largely reliant on highly functional natural ecological systems  
However, systems with low resistance and resiliency





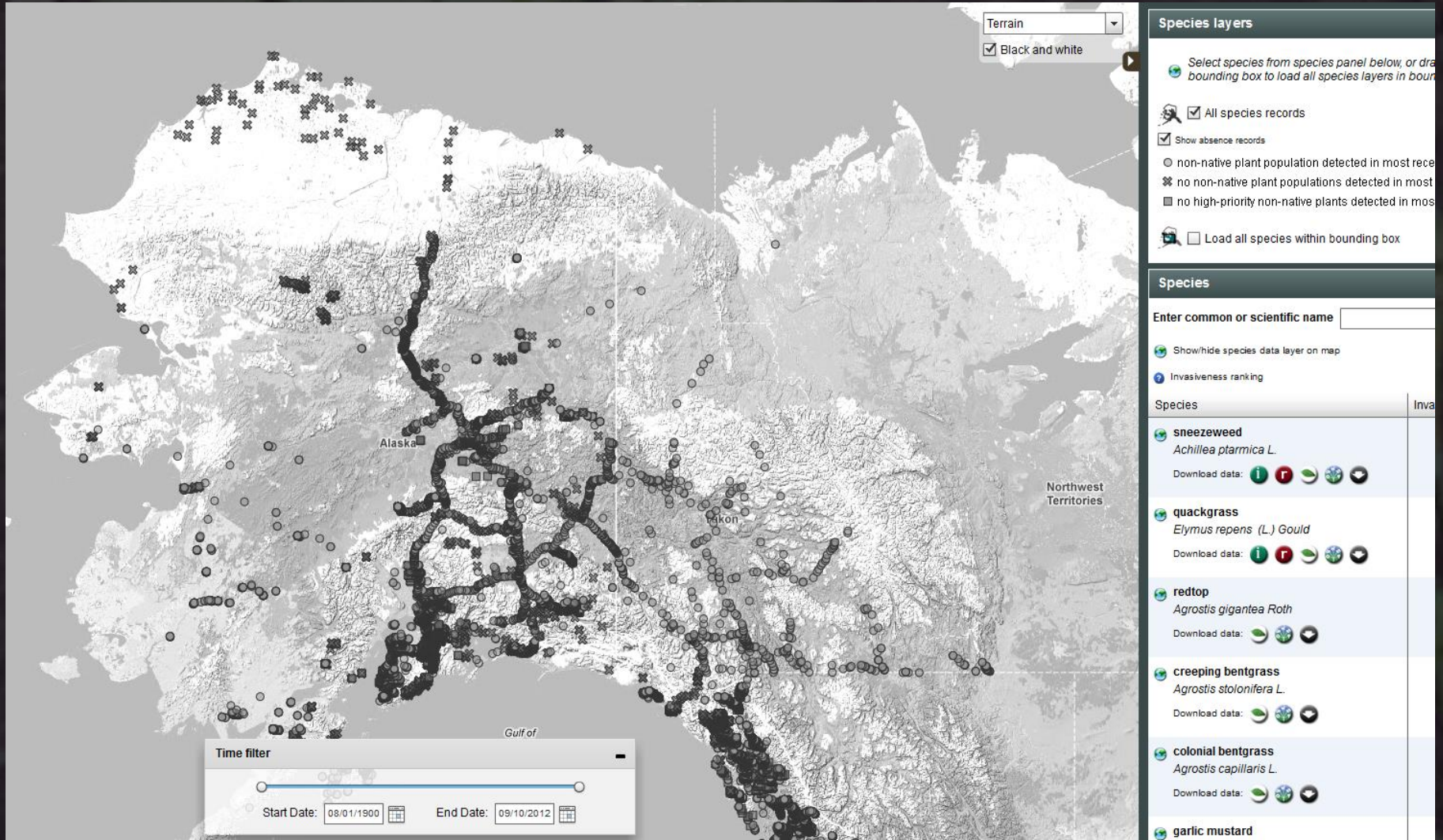
# Arctic and boreal systems facing numerous stressors



IPCC 2007

# Current Status – Distribution

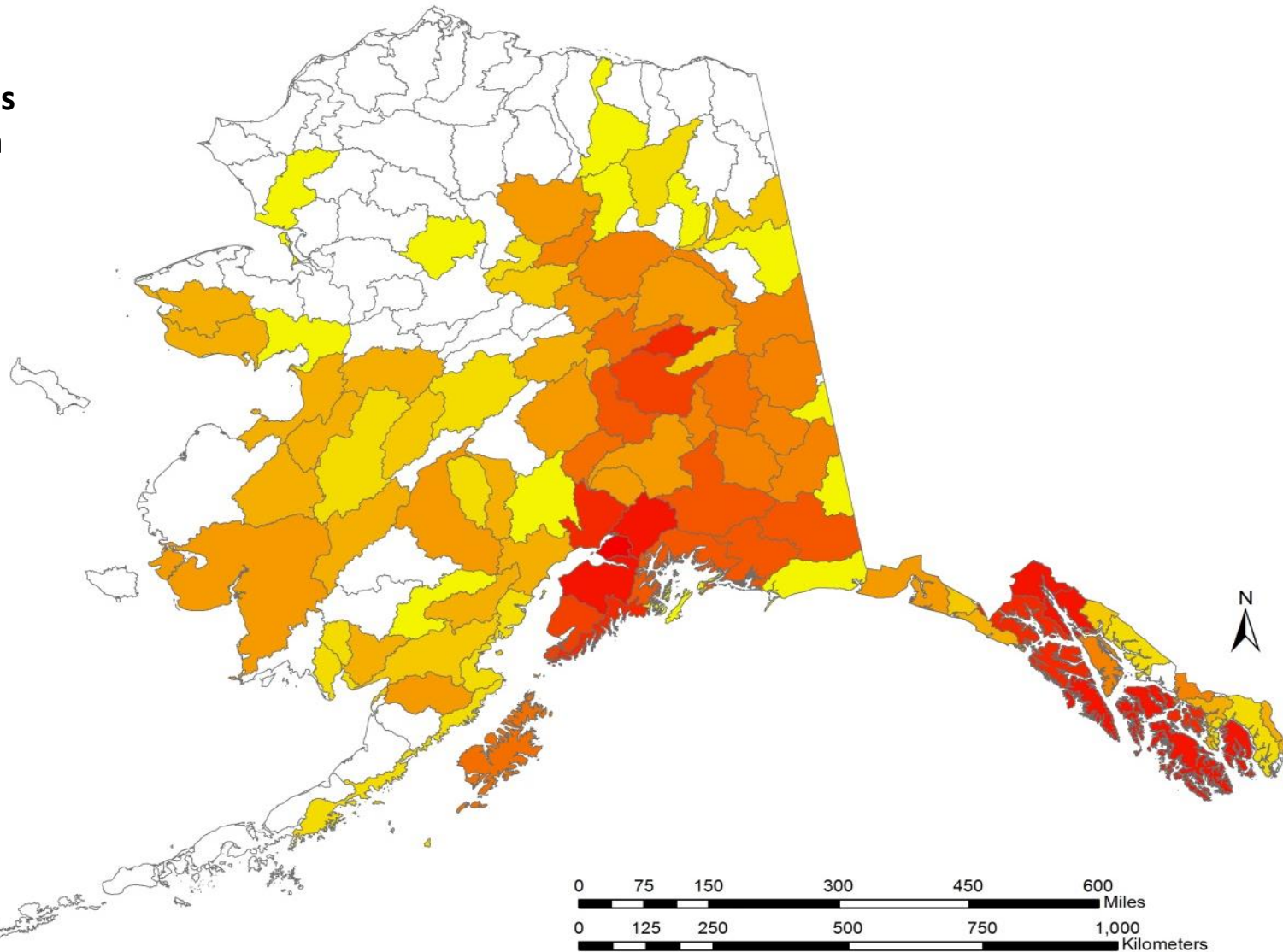
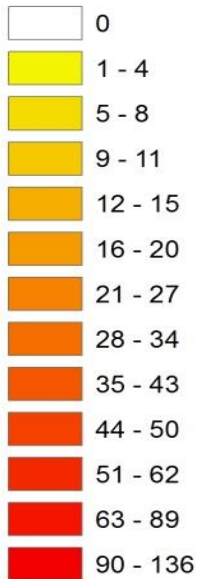
- Presence and Absence Data (AKEPIC:  
<http://aknhp.uaa.alaska.edu/maps/akepic/>)



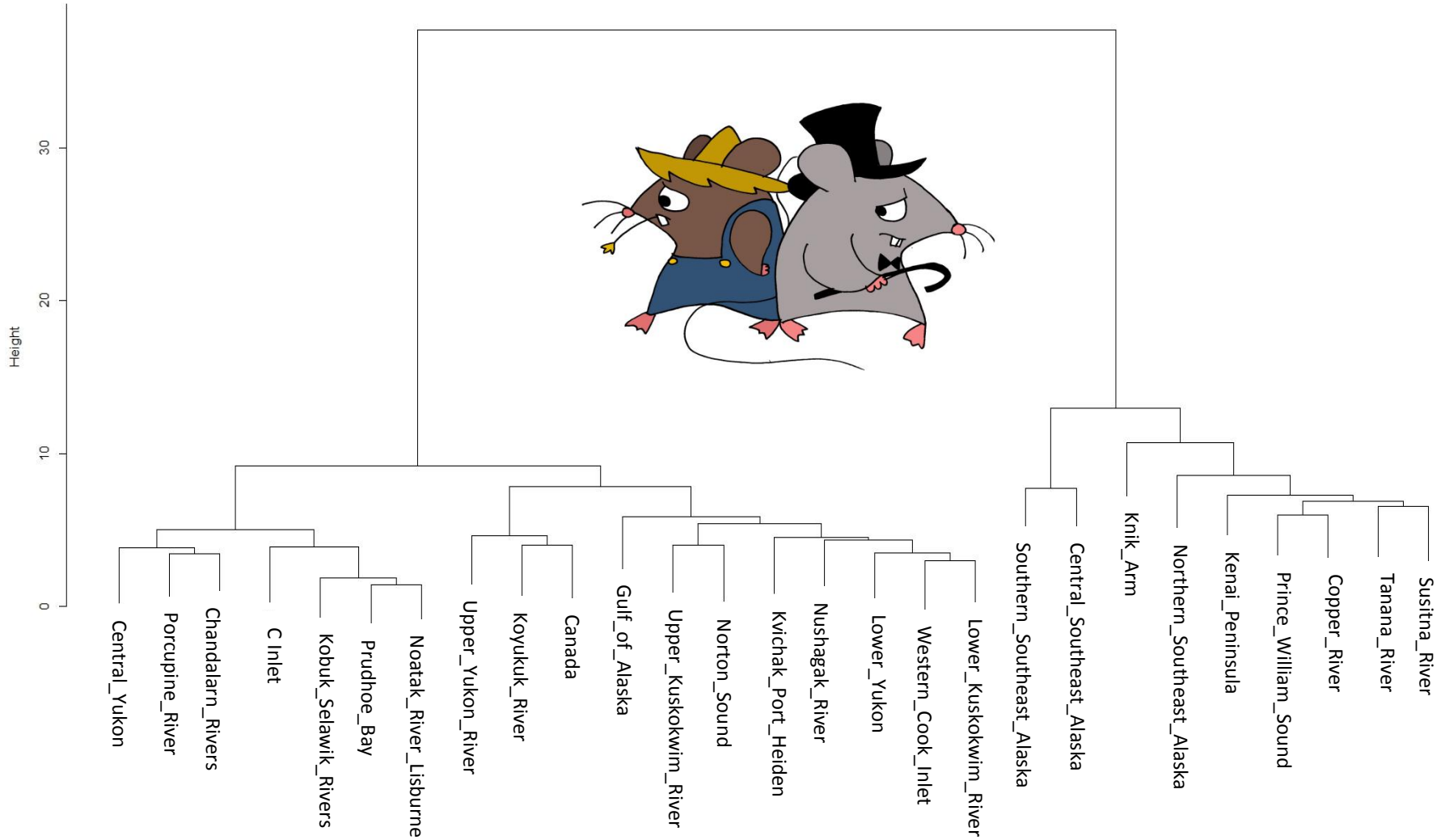


# Current Status - Geographic patterns of non-native plant diversity

Non-native species richness by region

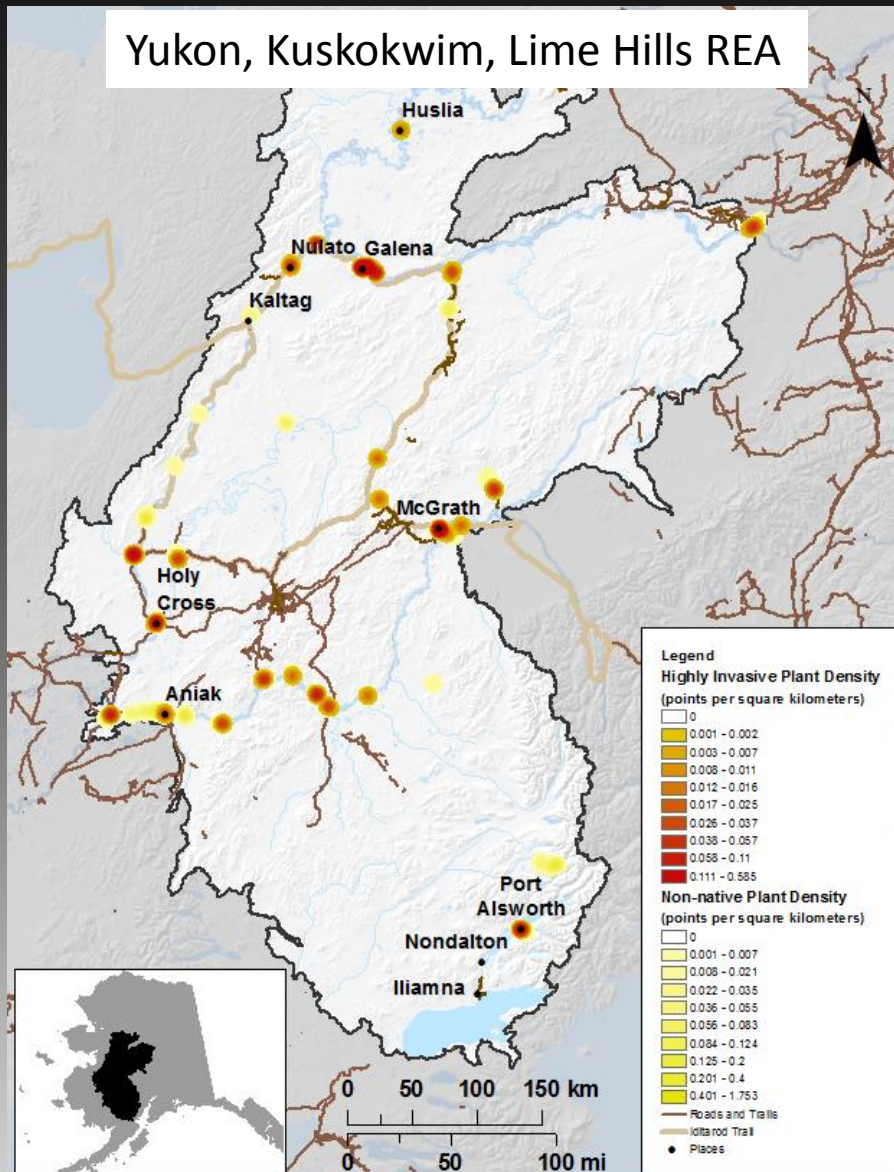


# Geographic Pattern of Non-Native Species Assemblages



# Exploring Scenarios of Infestation Vulnerability – 1

## Subarctic



Current infestations concentrated in villages

- Secondly along trails



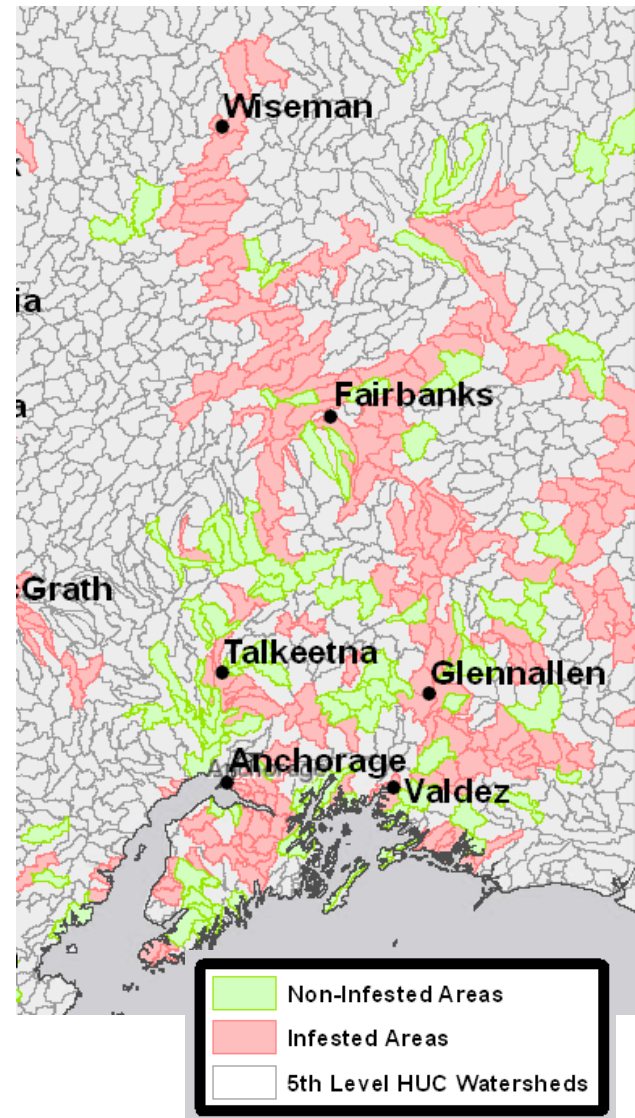
Explore possible future conditions with a synthetic approach



# Exploring Scenarios of Infestation Vulnerability – 1

## Subarctic

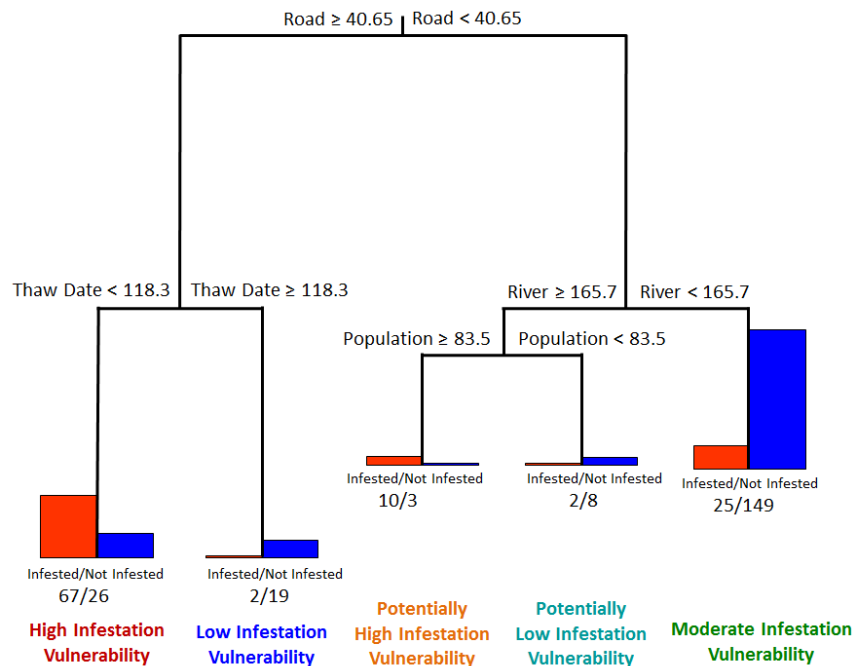
- Infestation index: Watersheds with “moderately-highly invasive” species record and  $\geq 10$  non-native species
- Association of 28 climate, habitat, and anthropogenic explanatory variables with 315 “infested/not infested” watersheds in CART and Random Forest
- Identify important threshold values
- Project onto region of interest in GIS
- Explore potential scenarios of climate, development, etc.



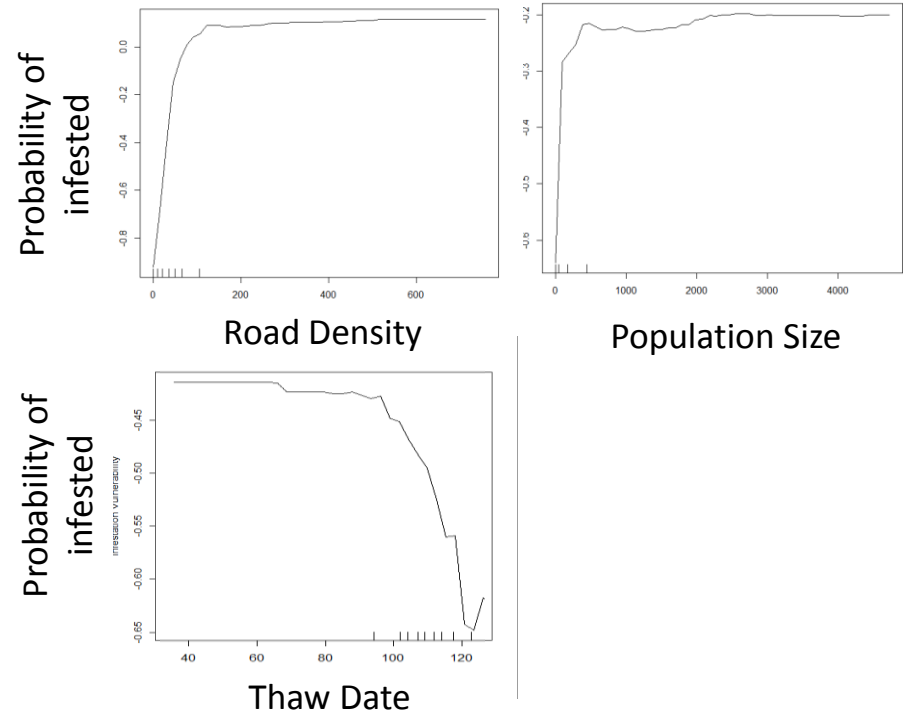
# Exploring Scenarios of Infestation Vulnerability – 1

## Subarctic

- Moderate model performance
- Useful explanatory variables
  - Road density
  - Date of thaw
  - River length
  - Population size



Partial Dependence Plots



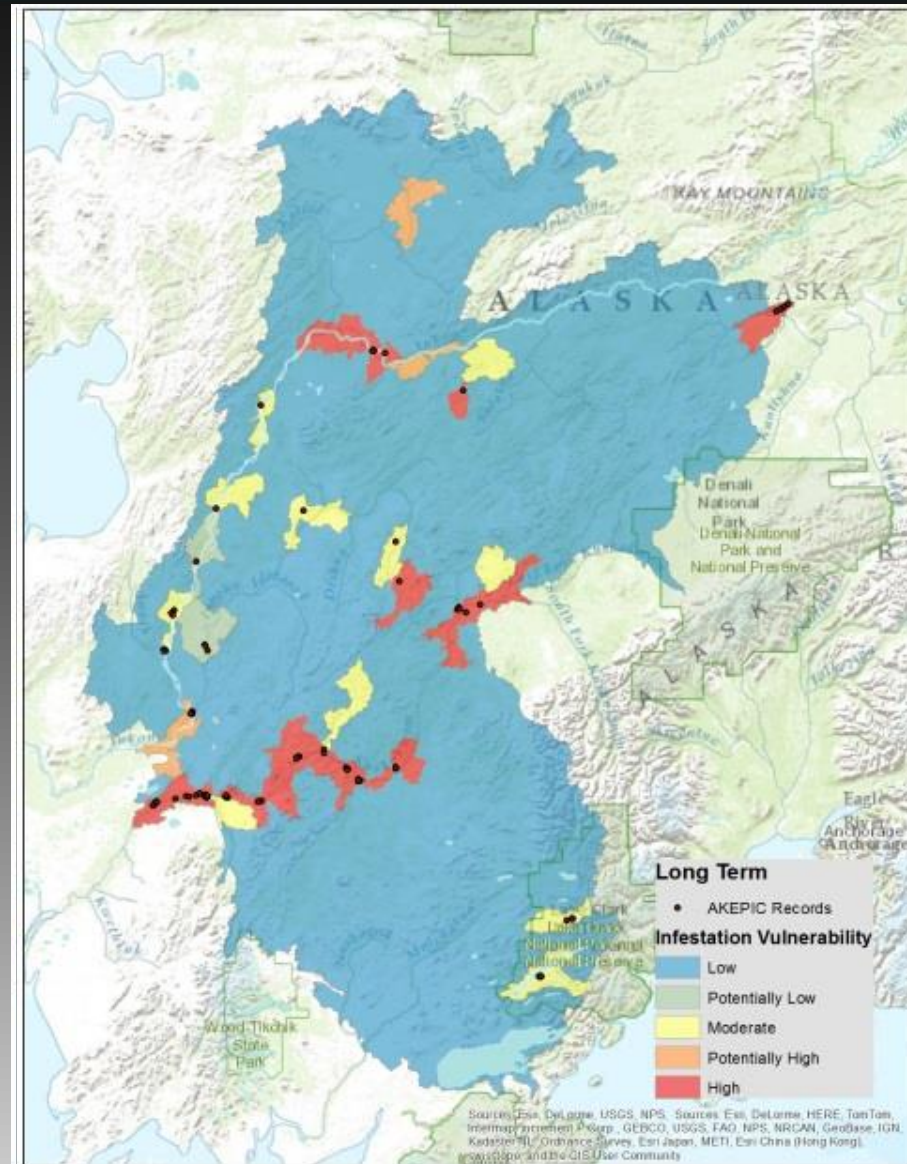


# Exploring Scenarios of Infestation Vulnerability – 1

## Subarctic

### Yukon, Kuskokwim, Lime Hills Ecoregions

- Model outputs mapped on to YKL are reasonable correspondence with known infestations
- Low vulnerabilities overall
- Predicted increase risk along the Kuskokwim by 2060



## Exploring Scenarios of Infestation Vulnerability – 2

### Arctic

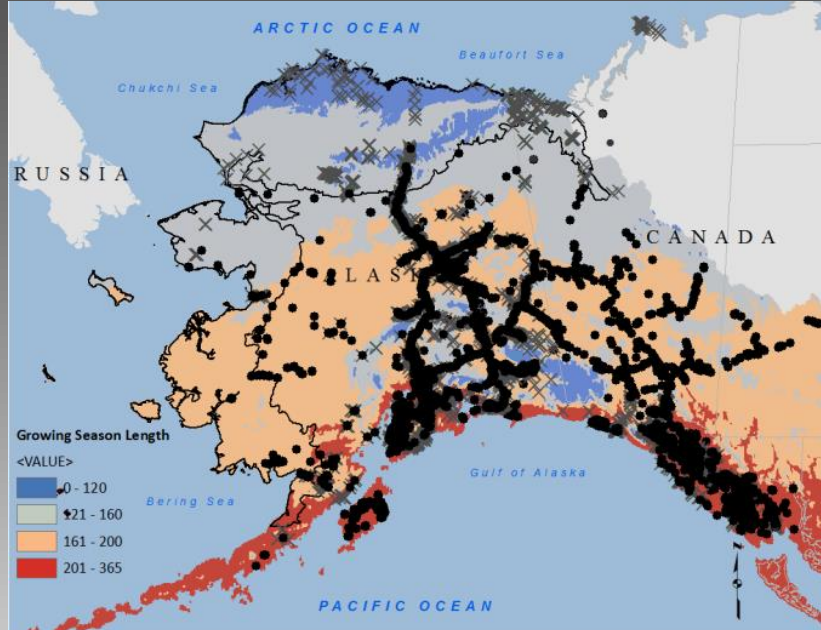




# Exploring Scenarios of Infestation Vulnerability – 2

## Arctic

- Non-native plants restricted to warm margins of arctic Alaska
- Cosmopolitan cold-tolerant weeds
- Short growing seasons and low temperatures appear to limit the number of non-native plant species



# Exploring Scenarios of Infestation Vulnerability – 2

## Arctic

