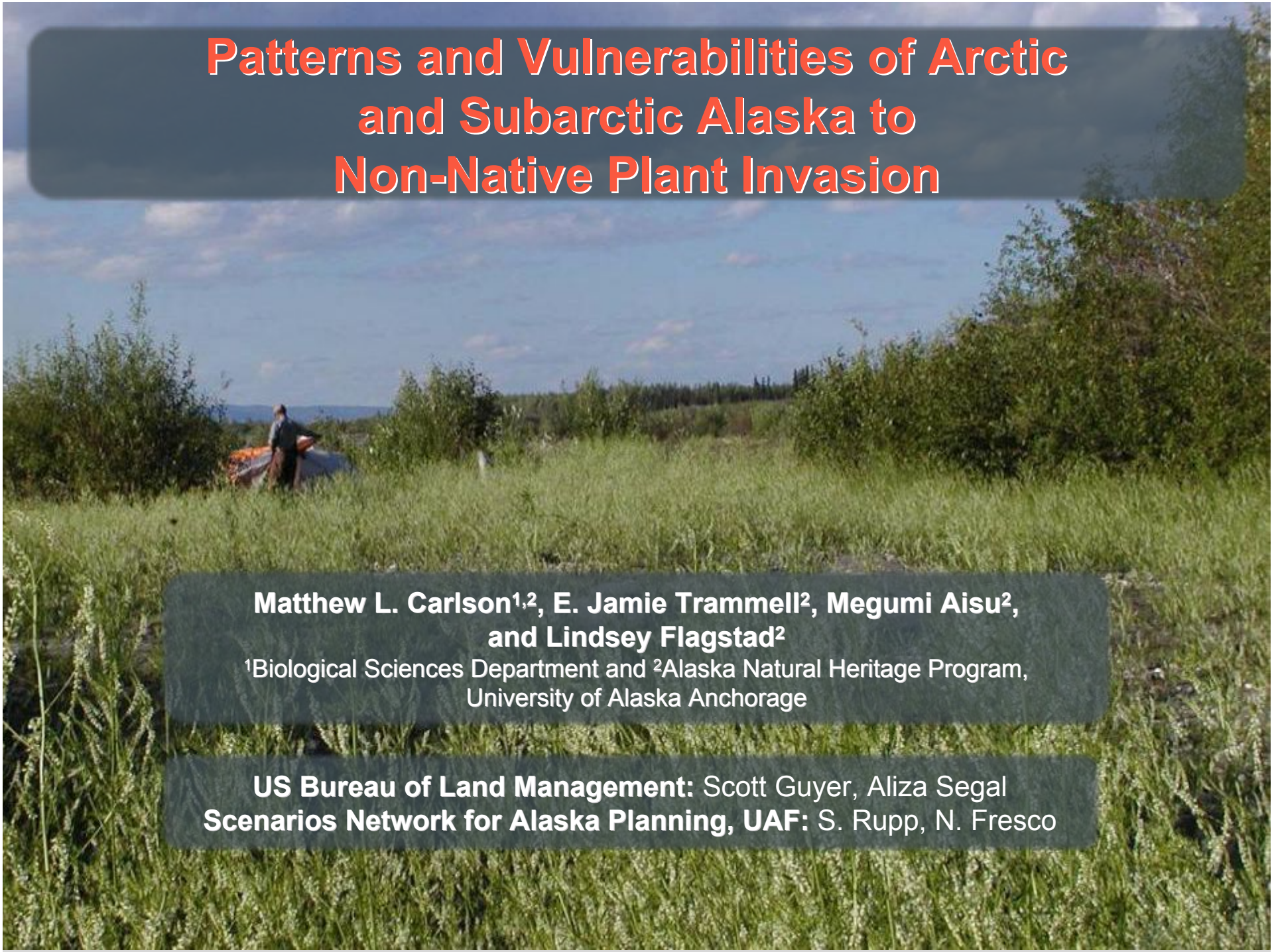

Patterns and Vulnerabilities of Arctic and Subarctic Alaska to Non-Native Plant Invasion

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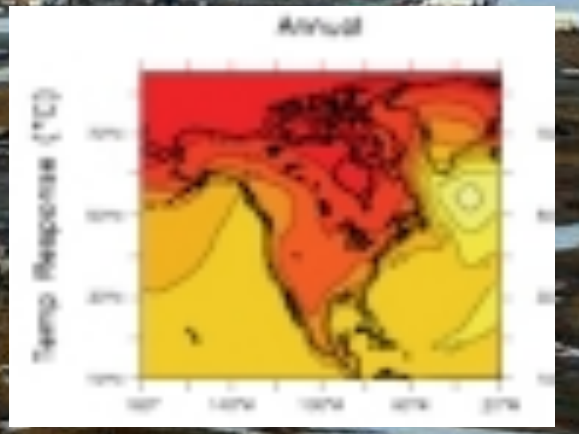
US Bureau of Land Management: Scott Guyer, Aliza Segal

Scenarios Network for Alaska Planning, UAF: S. Rupp, N. Fresco

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

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

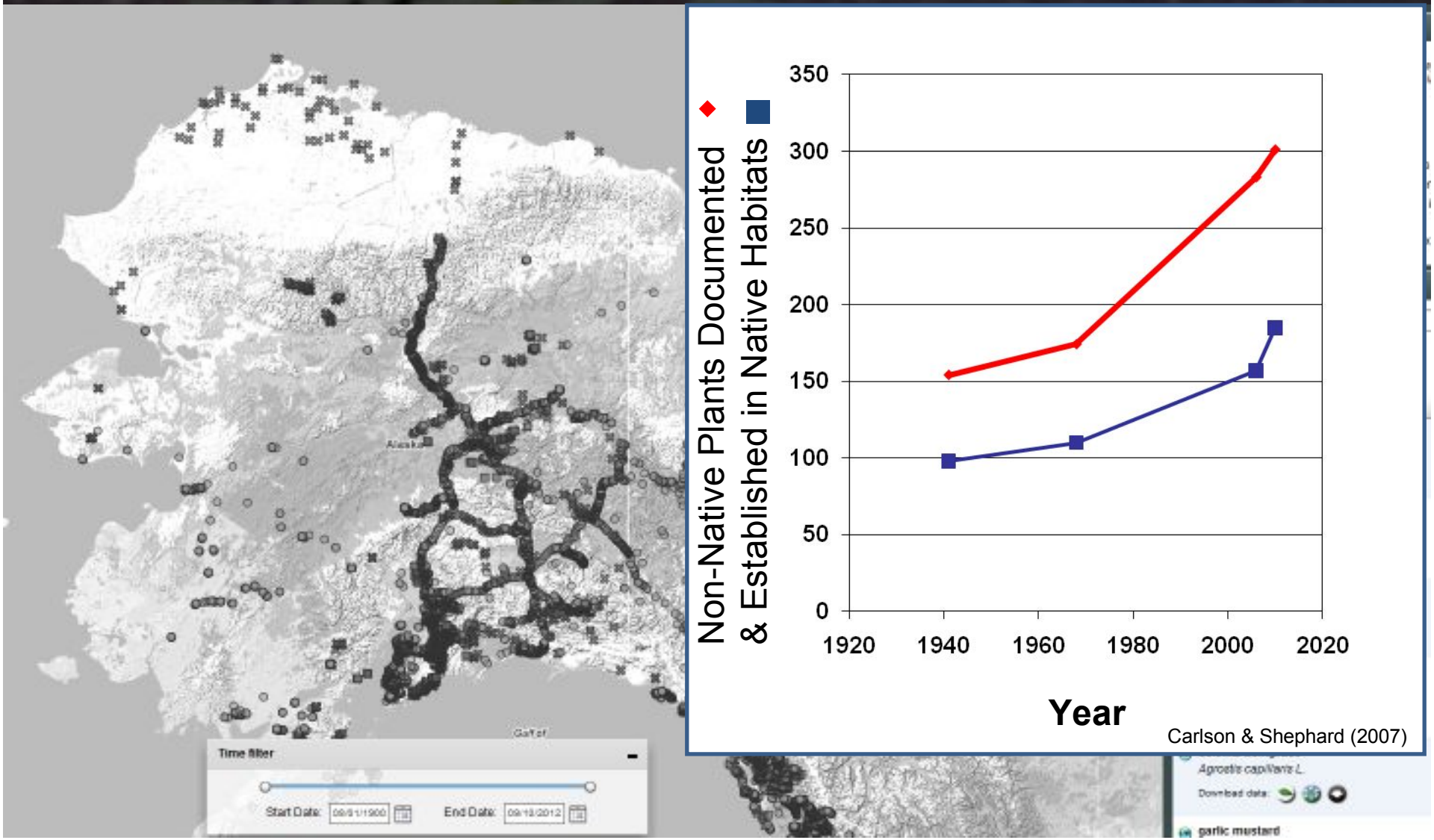
Arctic and boreal systems facing numerous stressors



IPCC 2007

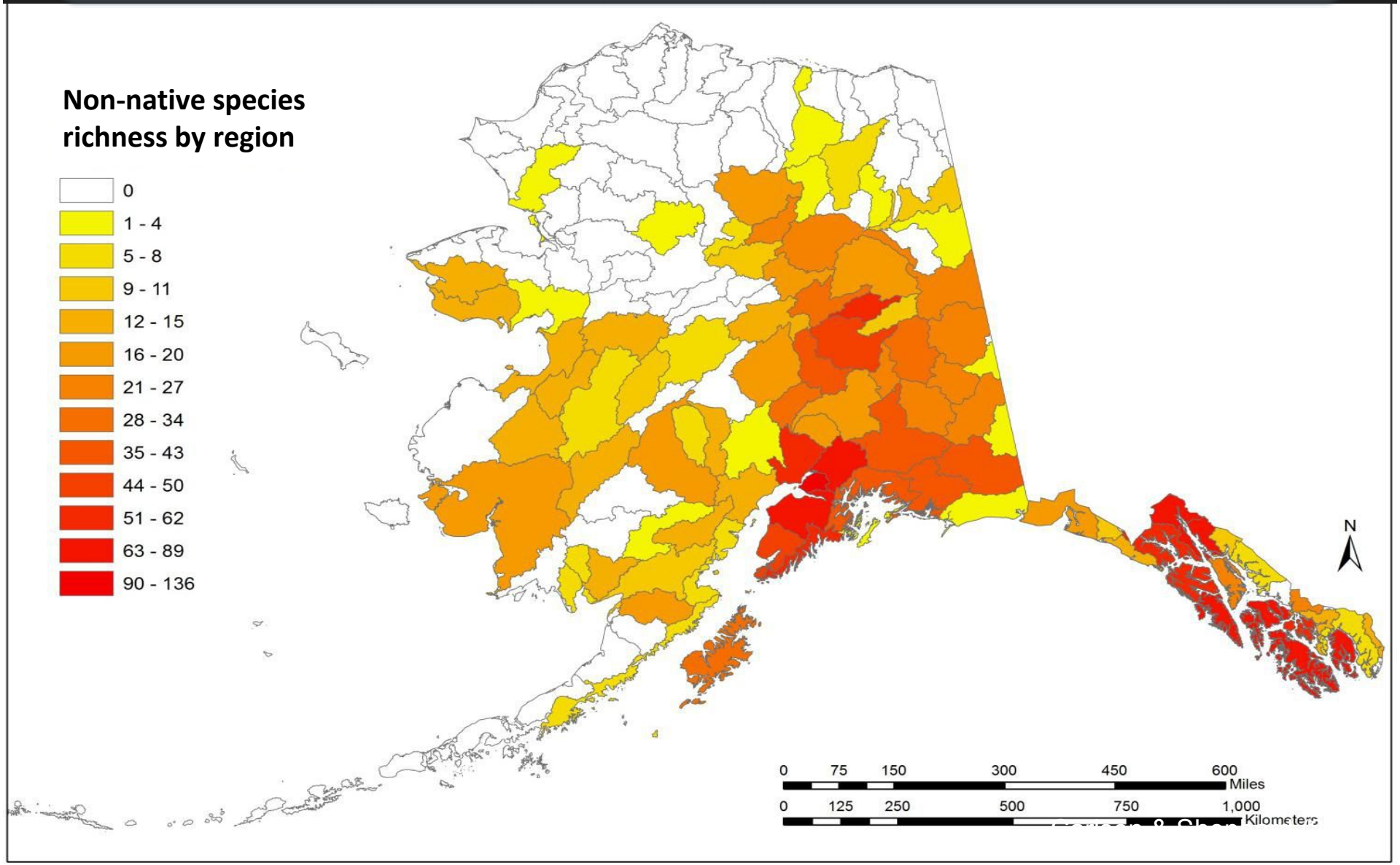
Current Status – Distribution

- Presence and Absence Data (AKEPIC Database)

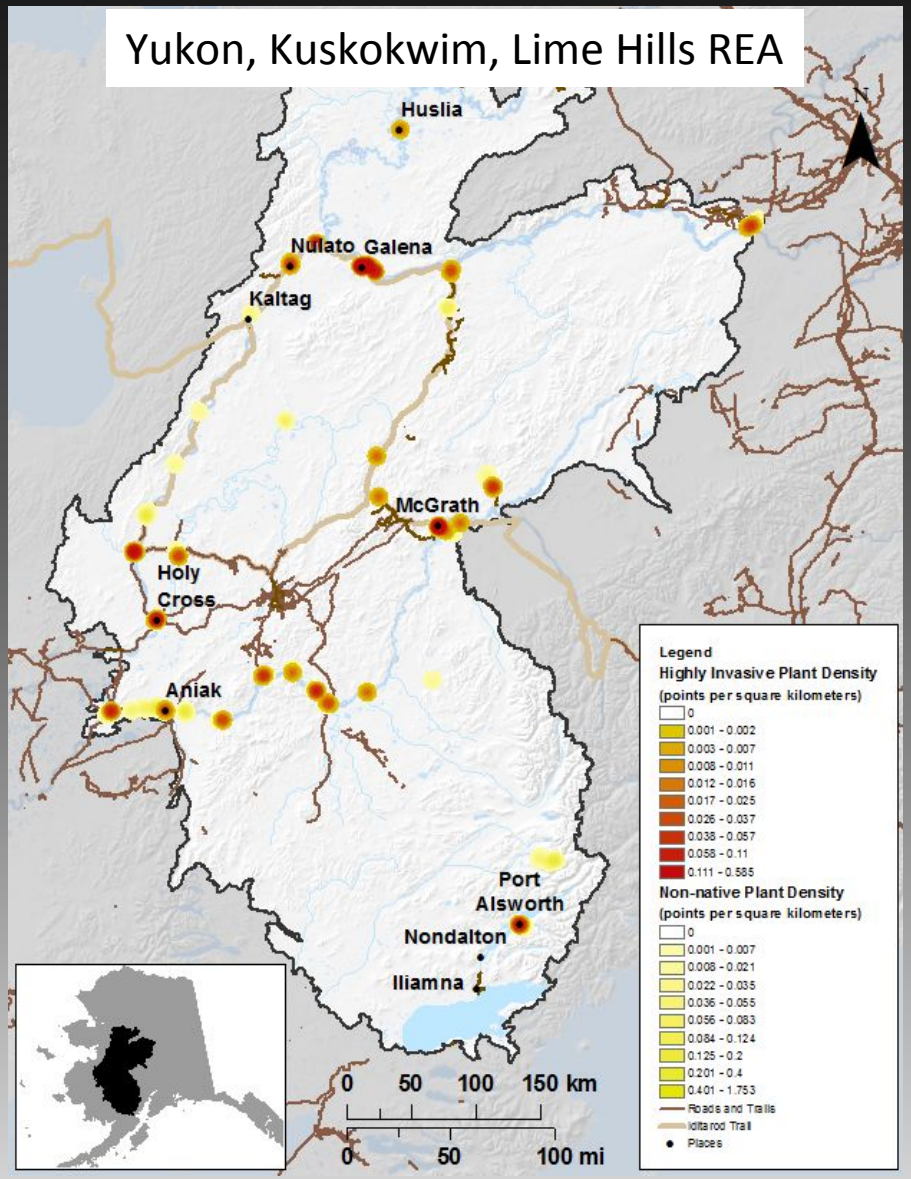


Carlson & Shephard (2007)

Current Status - Geographic patterns of non-native plant diversity



Exploring Scenarios of Infestation Vulnerability – Subarctic



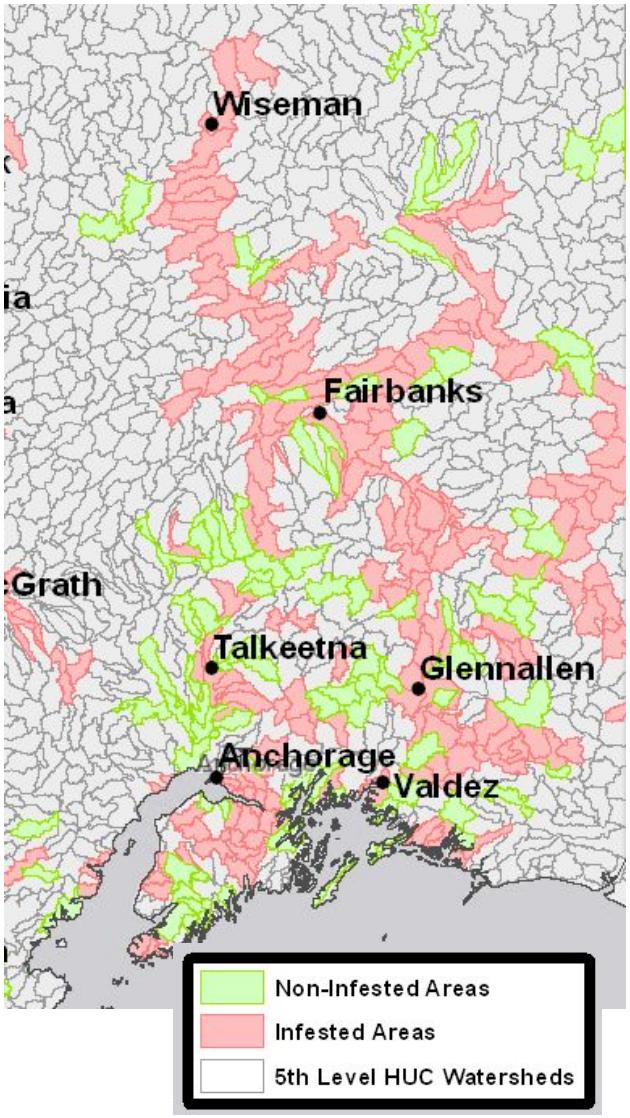
Current infestations concentrated in villages

- Secondarily along trails

Explore possible future conditions with a synthetic approach

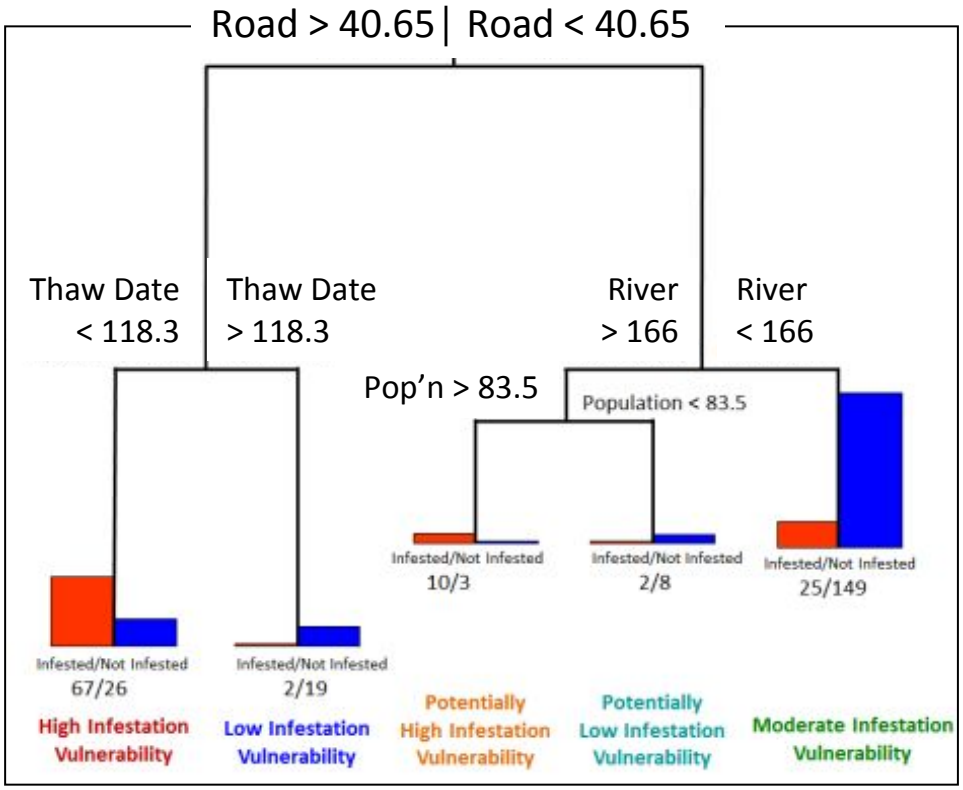
Exploring Scenarios of Infestation Vulnerability – Subarctic

- Watersheds classified with invasive plant problem or not
- 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.

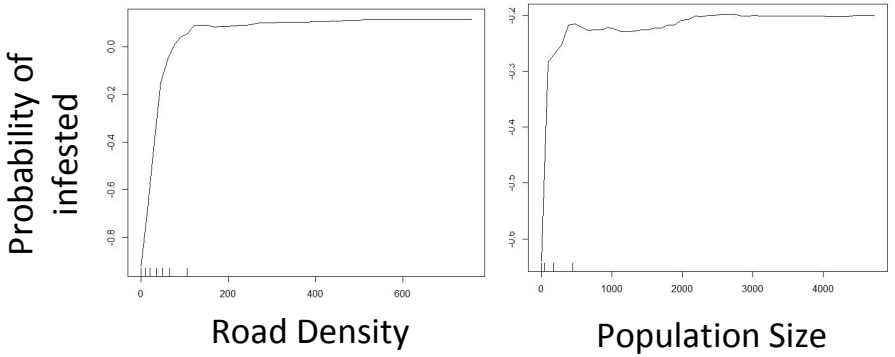


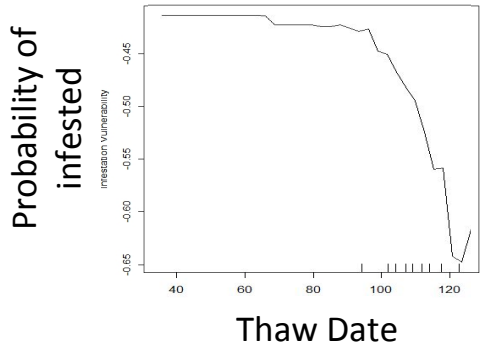
Exploring Scenarios of Infestation Vulnerability – 1 Subarctic

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



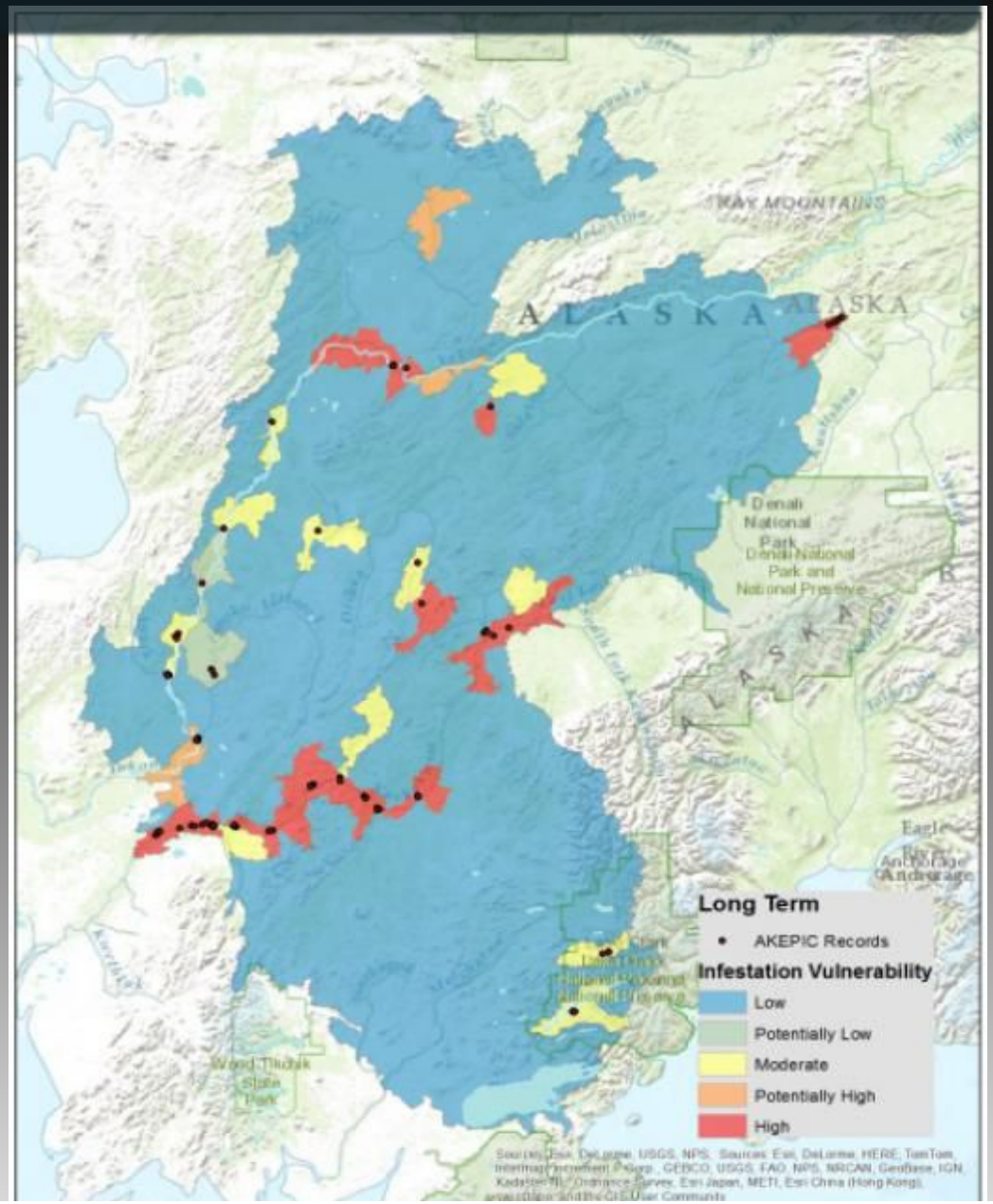
Partial Dependence Plots





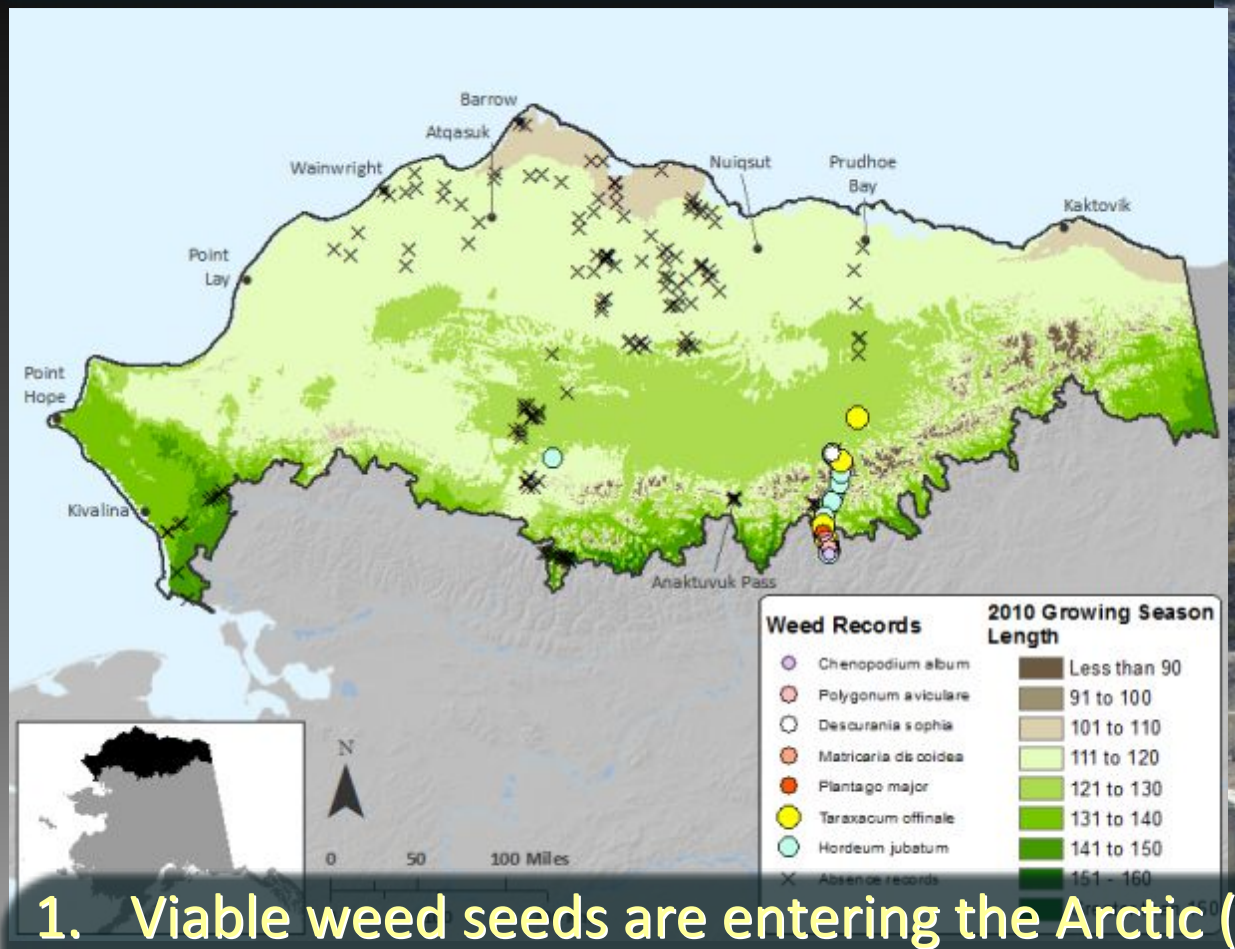
Exploring Scenarios of Infestation Vulnerability –Subarctic

- Model outputs mapped on to regional are reasonable correspondence with known infestations
- Low vulnerabilities overall
- Predicted increase risk along the Kuskokwim by 2060 due to increasing road densities



Exploring Scenarios of Infestation Vulnerability –Arctic

Exploring Scenarios of Infestation Vulnerability – Arctic



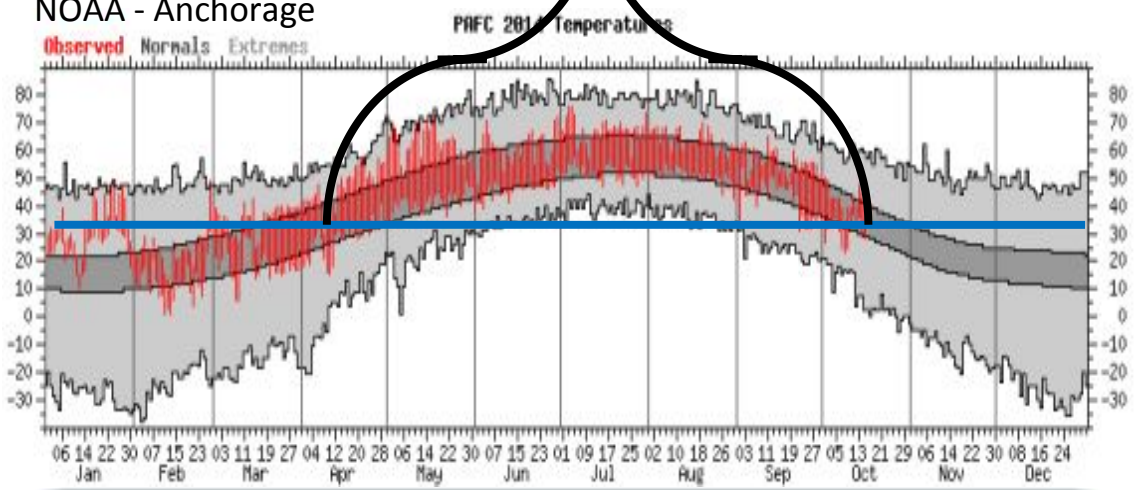
1. Viable weed seeds are entering the Arctic (Ware et al. 2011)
2. Yet, no weeds have been detected in surveys in Prudhoe Bay, Barrow, etc.

Currently weeds are only known from areas with a 'growing season' of ≥ 120 days

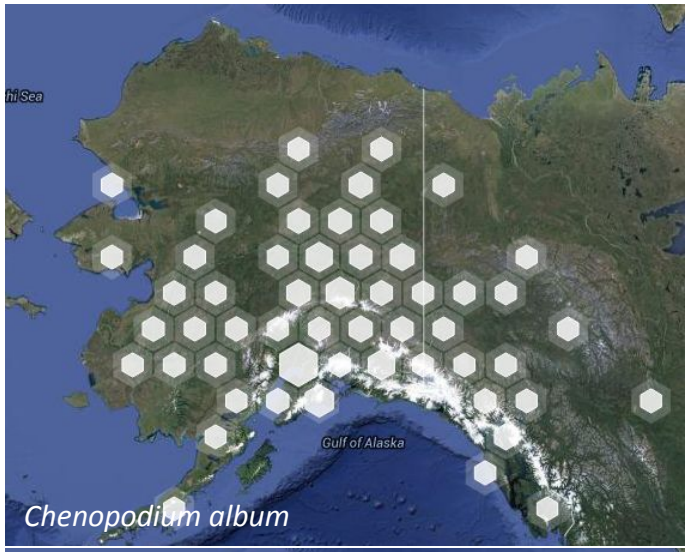
Exploring Scenarios of Infestation Vulnerability – Arctic

"Length of Growing Season"

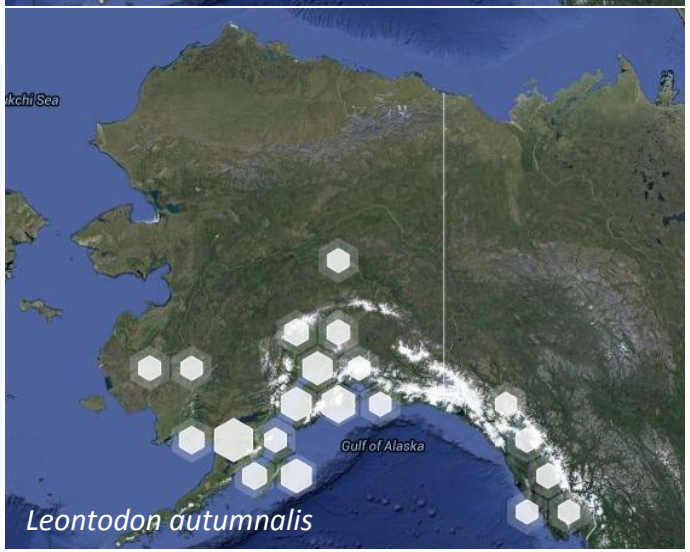
NOAA - Anchorage



- Assumption #1: modeled "Length of Growing Season" is correlated with variables that affect most weed species ability to persist
- Non-native species in Alaska differ in minimum growing season length

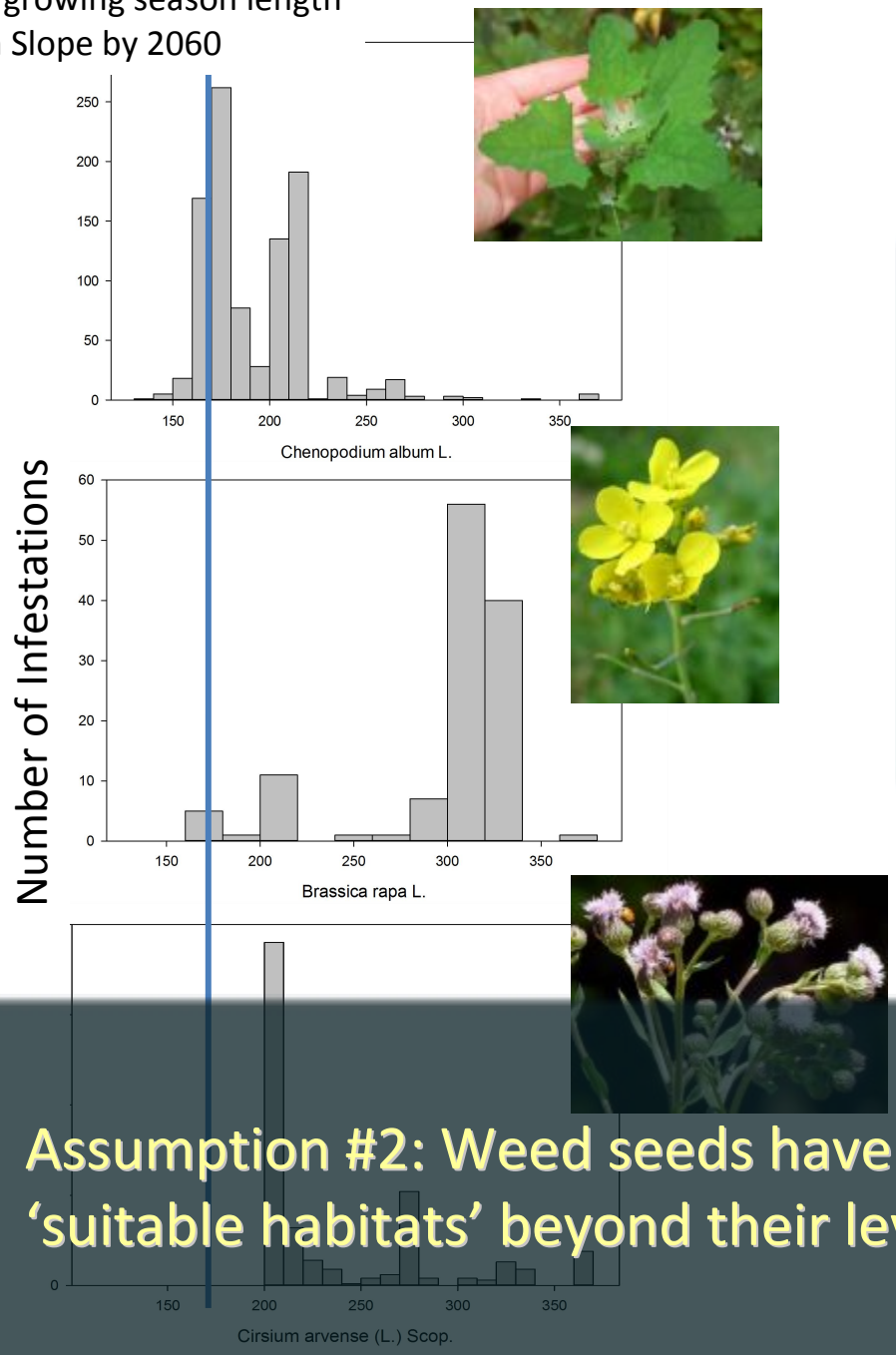


Chenopodium album



Leontodon autumnalis

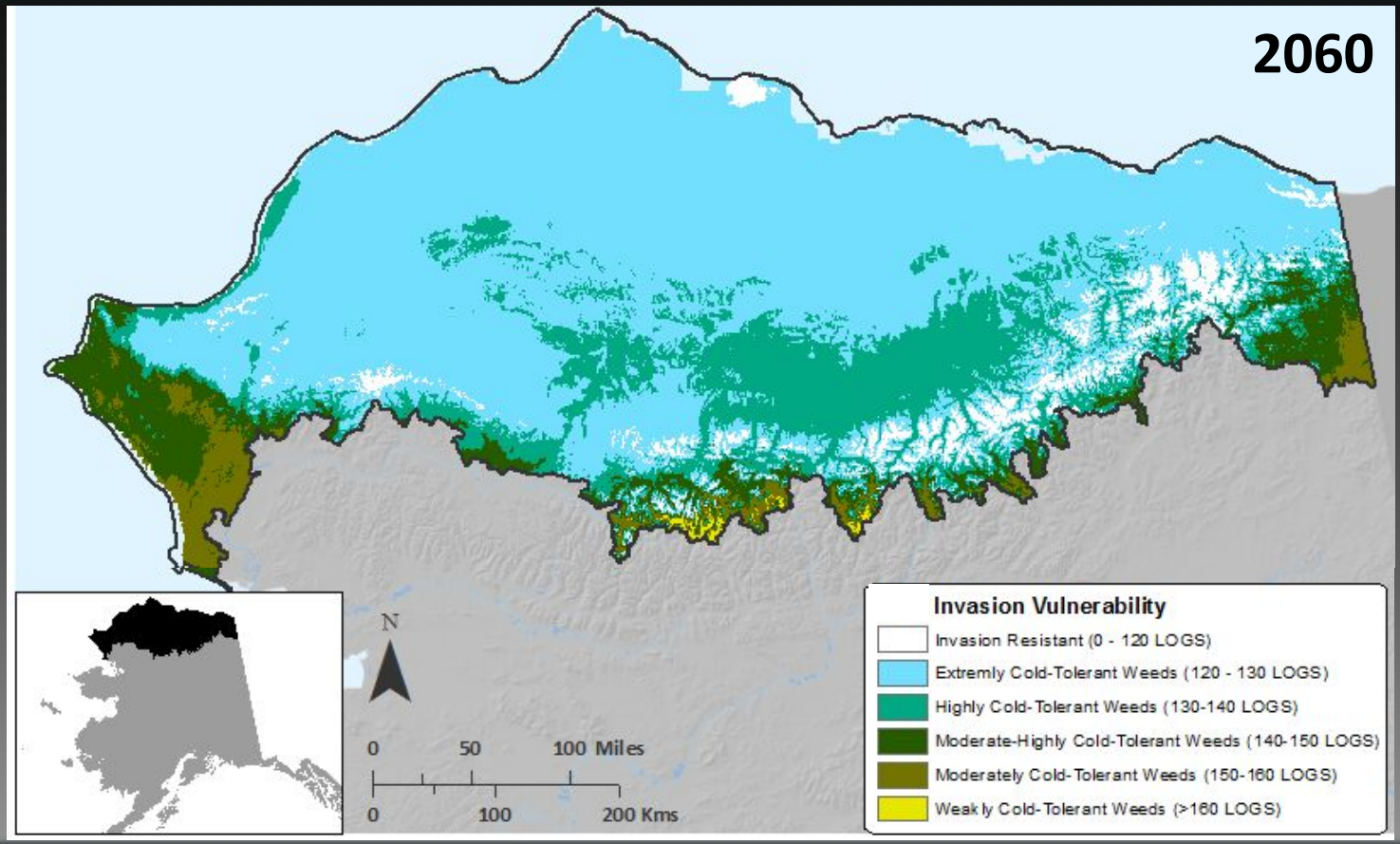
Longest growing season length
In North Slope by 2060



- Categorize AK weeds by cold tolerance
  - Extreme (120-130)
  - High (130-140)
  - Moderate-High (140-150)
  - Moderate (150-160)
  - Low (160-170)

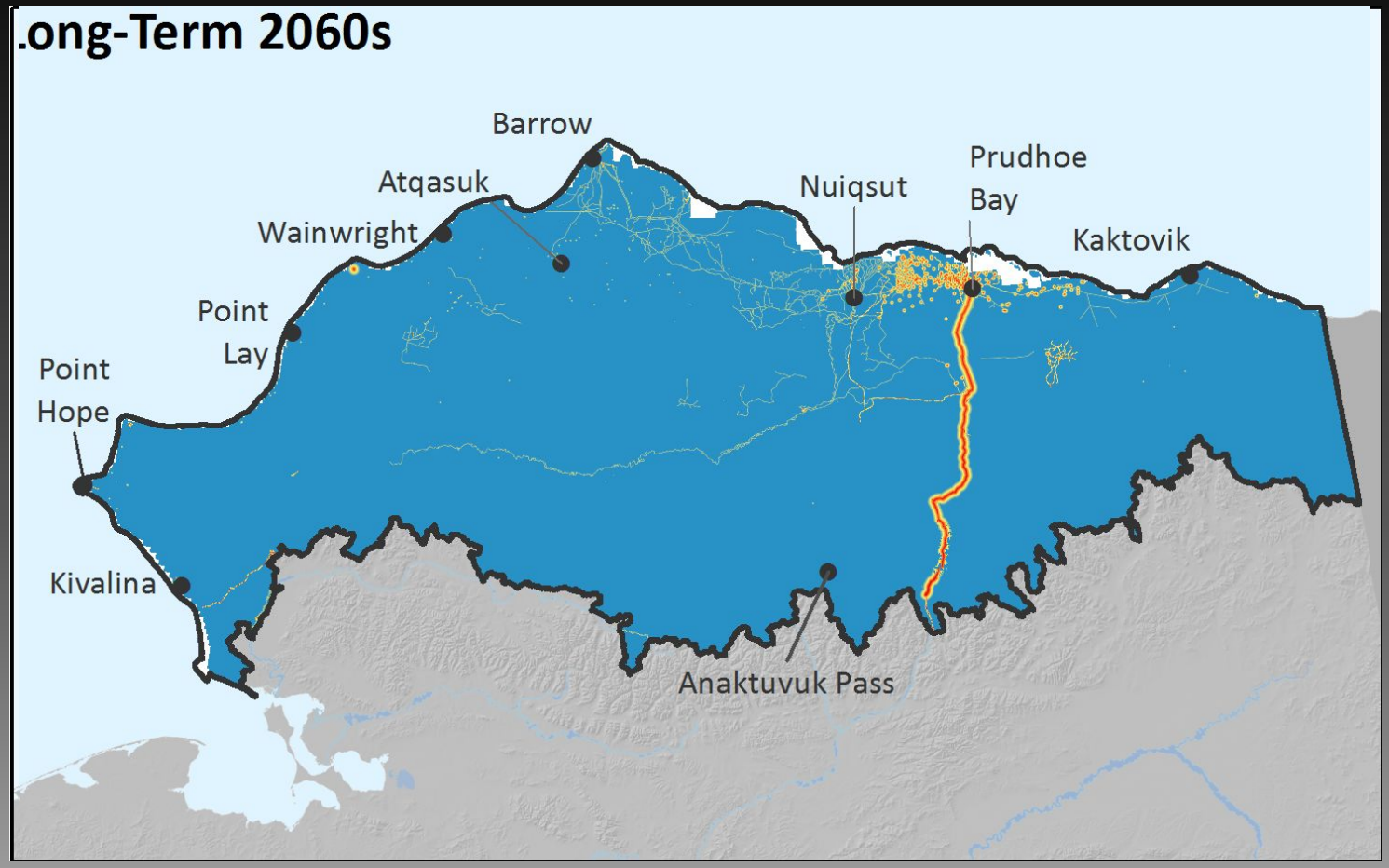
- Assumption #2: Weed seeds have been dispersed to ‘suitable habitats’ beyond their level of cold tolerance

Exploring Scenarios of Infestation Vulnerability – Arctic



- Transition from largely inhospitable to vulnerable to extremely cold-tolerant weeds
- Southern margin projected to be vulnerable to establishment of moderately cold-tolerant weeds

Exploring Scenarios of Infestation Vulnerability – 2 Arctic



- Specific areas most susceptible?
  - Warm areas *and* population centers, road corridors, etc.

Summary: Exploring Scenarios of Infestation Vulnerability