

# Invasive species on a northward march

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# Alien species in the Arctic - background



Invasive species: human-induced (2013)

## Aichi Biodiversity Target 9

«By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introductions and establishment.»

*“We have a unique opportunity in the Arctic. We can act now – decisively – to prevent and mitigate the adverse impacts of invasive alien species that plague much of the rest of the world”.*



# Alien species in the Arctic

- Relatively low number of established alien species
  - Relatively limited human activity
  - Cold climate is an effective filter
  - Vulnerable environment, highly specialized species
- } Changing processes

**Early detection –  
rapid response**



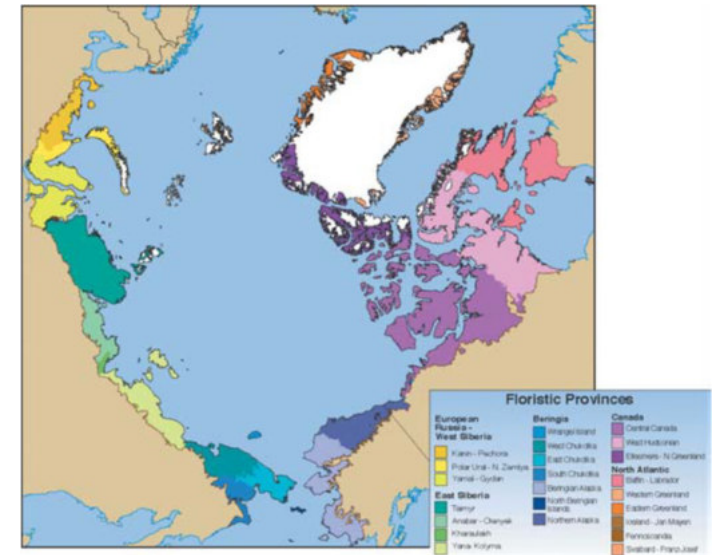
Photos: Kristine Bakke Westergaard

# Non-native vascular plants in the Arctic (START)

Wasowicz, Sennikov, Westergaard, Spellman, Carlson, Gillespie, Saarela, Seefeldt, Bennett, Bay, Ickert-Bond & Väre. *In review*

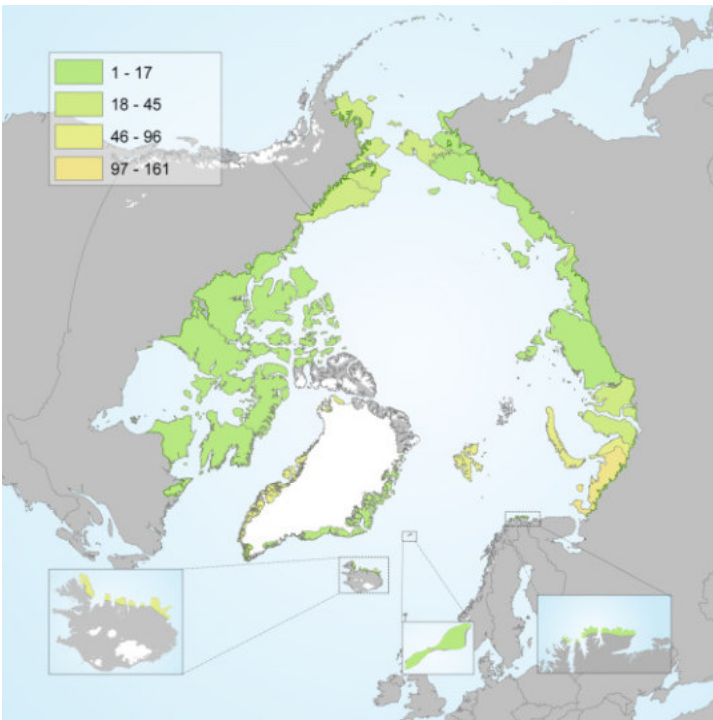
- Non-native plants are more likely to cause irreversible ecosystem impacts
- The non-native flora of the Arctic is still not well known and catalogues of the non-native flora in many regions have never been published
- Classification: casual or naturalized (invasive or transformers) sensu Richardson et al (2000)
- Diversity, characteristics and biogeography

The Arctic defined by vegetation, subdivided into 23 regions



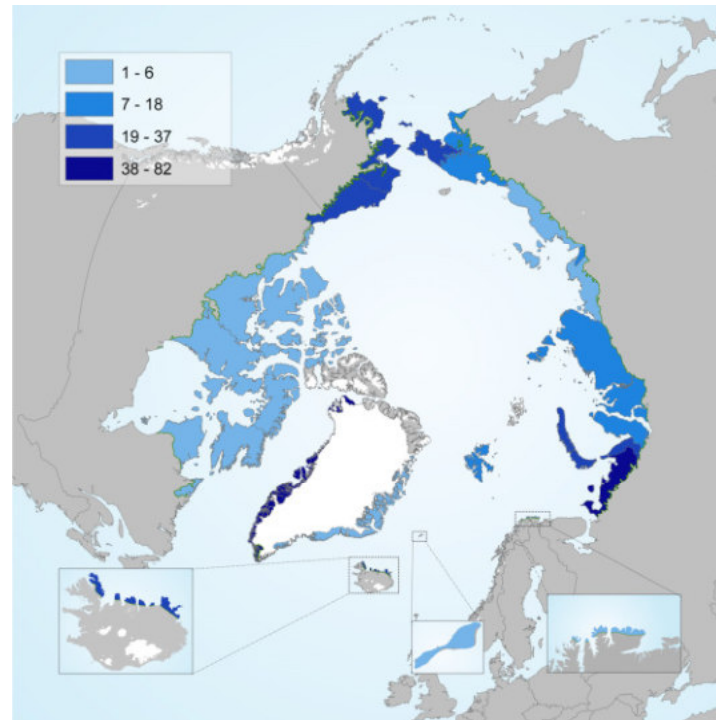
Walker et al (2005) The circumpolar vegetation map  
Elven et al (2011) The pan-Arctic flora checklist

# Non-native vascular plant species richness in Arctic regions



**A.** total non-native species  
(casual and naturalized)

**298 non-native species**



**B.** naturalized species

Non-native species are present  
but not yet recorded.



**C.** invasive species

**11 invasive species**



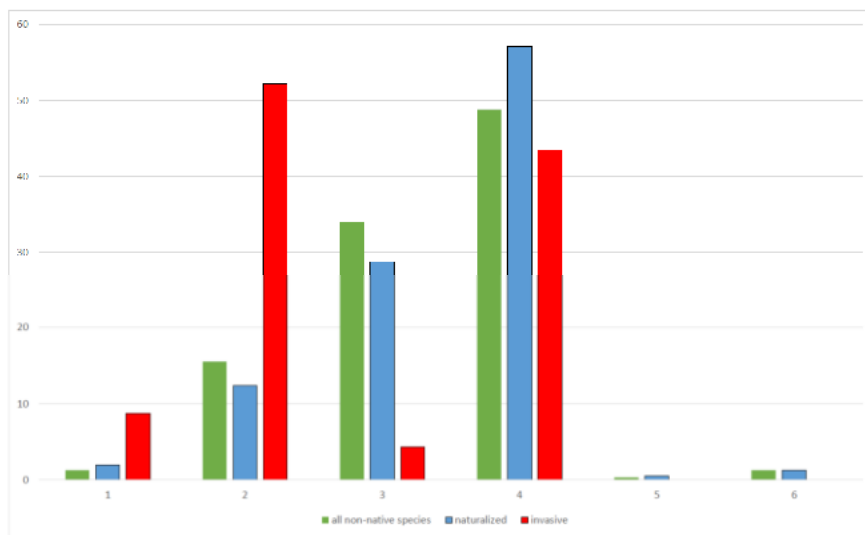
# Biogeography of the non-native flora



## Hierarchical clustering

- European & North-American Arctic (red)
- Asiatic Arctic (blue)
- geographically clustered regions share unique assemblages of non-native species
- different species source pools
- isolation in terms of historical patterns of trade

# Pathways of non-native plant introductions to the Arctic



1. Release in nature
  2. Escape from confinement
  3. Transport - contaminant
  4. Transport – stowaway
  5. Corridor
  6. Unaided
- (Hulme et al. 2009; CBD 2014)

## Introduction pathways

- 52% *Escape from confinement*
- 48% *Transport-stowaway pathway* (57% of naturalized non-natives)

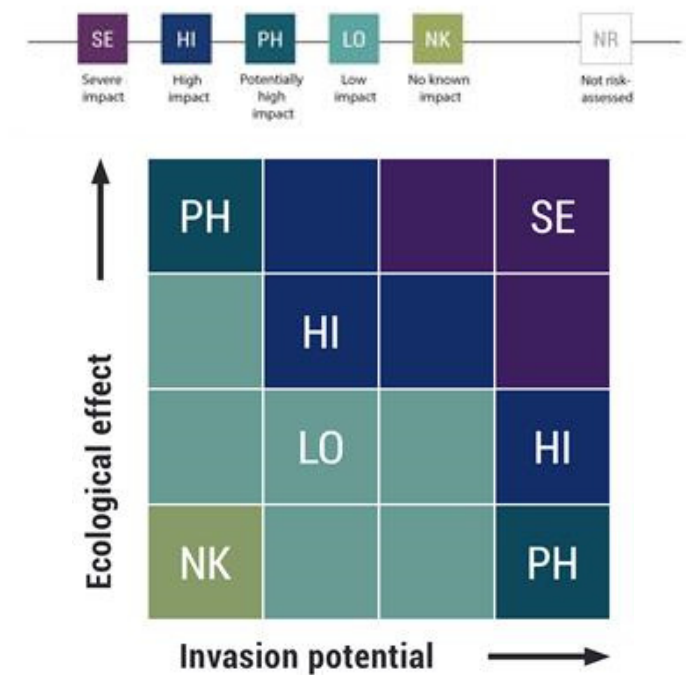
## Pathway subcategories

- 25 % *People and their luggage/equipment (in particular tourism)*
- 24 % *Seed contaminants*

# Ecological risk assessment of alien species 2018

- 98 alien vascular plants Svalbard/Jan Mayen

9 low impact (LO)	10 no known impact (NK)
<i>Achillea millefolium</i>	<i>Alchemilla subcrenata</i>
<i>Anthriscus sylvestris</i>	<i>Capsella bursa-pastoris</i>
<i>Barbarea vulgaris</i>	<i>Lepidotheca suaveolens</i>
<i>Deschampsia cespitosa</i> ssp. <i>cespitosa</i>	<i>Poa annua</i>
<i>Festuca rubra</i> ssp. <i>rubra</i>	<i>Poa humilis</i>
<i>Poa pratensis</i>	<i>Rumex acetosa</i>
<i>Ranunculus acris</i> ssp. <i>friesianus</i>	<i>Stellaria media</i>
<i>Ranunculus repens</i>	<i>Taraxacum</i> sect. <i>Ruderalia</i>
<i>Ranunculus subborealis</i> ssp. <i>villosus</i>	<i>Trifolium repens</i>
	<i>Tripleurospermum maritimum</i>



The connection between invasion potential, ecological effect and risk category. Norwegian Biodiversity Information Centre.



# What can be done?

- Cow parsley *Anthriscus sylvestris* in Barentsburg, discovered in 2007 – high ecological risk
- Mechanically removed individuals since 2008
- Not seen since 2016, now categorized as having low ecological risk



Governor of Svalbard action plan against harmful alien species in Svalbard

[www.nina.no](http://www.nina.no)



Photo: Dagmar Hagen



# Where do we find alien plant species in Svalbard?

- Disturbance is the key to plant invasions in cold environments
- Around the settlements, both the old ones and the ones still in use



Photo: Dagmar Hagen



# How do alien plant species come to Svalbard?

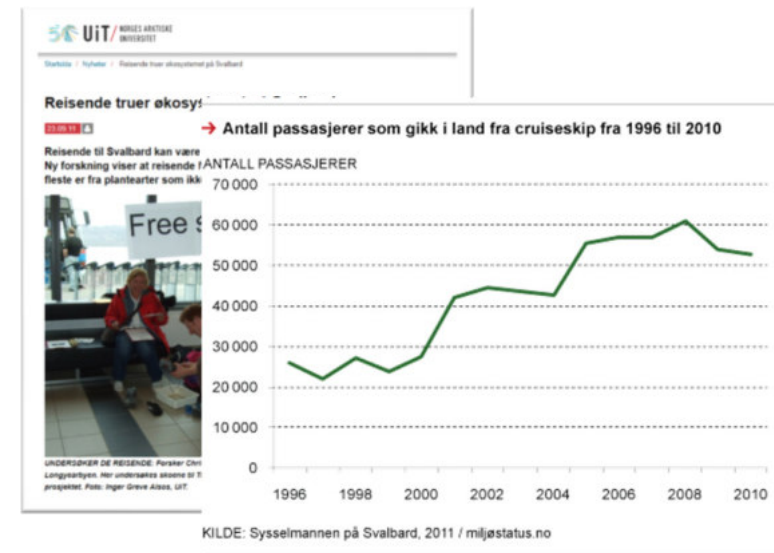
Svalbard Environmental Act regulates import of alien species

- reduced risk of intentional introductions

## Focus: unintentional introductions

Sampled the footwear of 259 travelers arriving by air to Svalbard:

- 1019 seeds (3,9 seeds per pair of hiking boots)
- 53 species (mostly grasses, majority is alien to Svalbard)
- 26 % germinated under Svalbard conditions
- 270 000 seeds/year



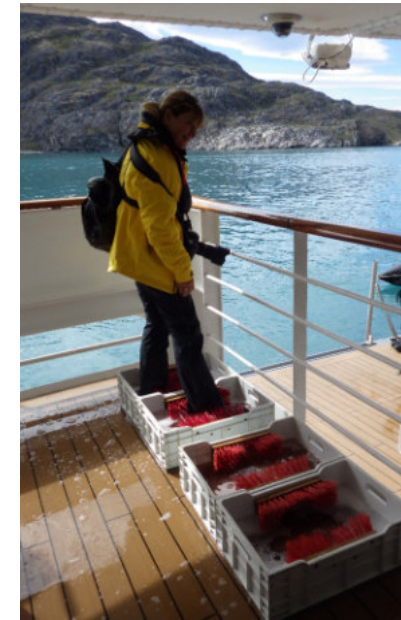


# Disinfection and cleaning



## Reducing human-mediated dispersal

- Plant seeds
- Bryophyte fragments
- Microorganisms
- Microbial pathogens



# Recommendations for monitoring alien plant species in the Arctic

- Early detection – rapid response
- Systematic and regular registration in disturbed and nutrient rich soils
- General screening by experts, field inspectors and citizen science
- Bird cliffs – nutrient-rich soils
  - ▶ No alien vascular plant species found in six birdcliffs close to the settlements in Svalbard



Photo: Kristine Bakke Westergaard

Increased human activities = increased and repetitive seed introductions  
Changing climate = higher chances of alien plant establishment and reproduction

# Cooperation and expertise for a sustainable future

