Exotic tree species in Icelandic Forestry

Pröstur Eysteinsson
Division Chief, National Forests
Iceland Forest Service
Only three native tree species

- *B. pubescens* 99.9%
- *S. aucuparia* < 0.1%
- *P. tremula* < 0.0001%
B. pubescens

+ B. nana

= Introgressed Icelandic birch
Sustainable forestry with native birch?

• The three pillars of sustainability:
  – Ecological – yes
  – Social – not really
  – Economic - no
Icelandic forestry depends on exotic tree species

- If we want to have production forestry
- If we want fast growing trees
- If we want diversity for added security against climate change
- If we want diversity for amenity
- If we want forests that tolerate the pressures that we place on them.
Strong connections between gardening and forestry

- Forestry ➔ gardens
  - *Betula pubescens*
  - *Picea spp.*
  - *Pinus mugo*
- Gardens ➔ forestry
  - *Populus trichocarpa*
  - *Salix spp.*
  - *Sorbus aucuparia*
Planting in Icelandic forestry 2009 – Total seedlings planted: 4.9 million

Species with more than 100,000 seedlings planted annually:

- Betula pubescens: 29% (1.4 m)
- Picea sitchensis/P. x lutzii: 22% (1.1 m)
- Larix sukaczewii: 16% (0.76 m)
- Picea engelmannii: 6% (0.29 m)
- Populus trichocarpa: 3%
- Sorbus aucuparia: 2%
- Others: 10%
- Pinus contorta: 10% (0.5 m)

After: Einar Gunnarsson 2010
Species with 10,000 – 100,000 seedlings planted annually

- **Pinus sibirica / P. cembra;** 75,000
- **Pinus uncinata;** 40,600
- **Picea glauca;** 70,800
- **Alnus incana / A. Tenuifolia;** 82,100
- **Betula pendula;** 39,500
- **Alnus sinuata;** 39,500
- **Larix decidua;** 19,300
- **Picea abies;** 58,800
- **Other species;** 68,000
- **Still others;** 2,935,000

Symbols:
- **Betula pendula**
- **Alnus sinuata**
- **Picea abies**
- **Pinus uncinata**
- **Pinus sibirica**
- **Larix decidua**
- **Pinus contorta**
- **Betula pubescens**
- **Picea sitchensis**
- **Salix spp.**
- **Sorbus aucuparia**
- **Picea engelmannii**
- **Populus trichocarpa**
- **Others**
Still others include:
Sorbus spp.
Pinus aristata
Abies lasiocarpa
Abies sibirica
Ulmus glabra
Acer pseudoplatanus
Various shrubbs

Species with 10,000 – 100,000 seedlings planted annually

- Larix decidua; 19,300
- Still others; 68,000
- Alnus incana / A. Tenuifolia; 82,100
- Pinus sibirica / P. cembra; 75,000
- Picea glauca; 70,800
- Betula pendula; 39,500
- Alnus sinuata; 39,500
- Pinus uncinata; 40,600
- Picea abies; 58,800
- Others 10%

Betula pubescens 29%
Picea engelmanni 4%
Picea pungens 2%
Pinus contorta 10%
Larix sitchensis / P. x lutzi 22%
Pinus contorta 10%
Salix spp. 2%
Other Salix includes: S. viminalis, S. pentandra, S. lasiandra, and others.

For those who like willows:

- **S. alaxensis**: 33500
- **S. borealis**: 20500
- **S. caprea**: 6600
- **S. lanata**: 6800
- **S. phylicifolia**: 20500
- **Other Salix**: 9300

Other species include:
- Larix sukaczewii: 16%
- Picea sitchensis / P. x lutzii: 22%
- Populus trichocarpa: 6%
- Pinus contorta: 10%
- Betula pubescens: 29%
- *Sorbus* spp.: 2%
- *Picea engelmannii*: 1%
- *P. engelmannii*: 1%
Sitka spruce
(Picea sitchensis and P. x lutzi)

- We use only provenances of Alaskan origin
- Mostly self sufficient in seed
- Breeding programme
Sitka spruce
(Picea sitchensis and P. x lutzii)

• Mostly planted with production goals in mind
  • Lumber
  • Biomass
Sitka spruce
*(Picea sitchensis and P. x lutzi)*

- Amenity
Sitka spruce
(Picea sitchensis and P. x lutzii)

• Shelter
Russian larch
(Larix sukaczewii)

- Have tried many provenances
- We use mostly material from Finnish seed orchards
- Breeding programme
Russian larch
(Larix sukaczewii)

• Mostly planted with production goals in mind
  • Lumber
  • Biomass
Russian larch
(Larix sukaczewii)

- Reclamation
Russian larch
(Larix sukaczewii)

• Amenity
Lodgepole pine
(Pinus contorta)

- Have tried many provenances
- Skagway is best in S and W Iceland
- Rocky Mtn. provenances also good
- Mostly self sufficient in seed
Lodgepole pine
(Pinus contorta)

- Nurse species in production forestry
- Production
  - Biomass
  - Christmas trees
Lodgepole pine
*(Pinus contorta)*

- CO$_2$ sequestration
Black cottonwood

(*Populus balsamea ssp. trichocarpa*)

- Tallest trees in Iceland
- Fastest growing
- We use only Alaskan origins
- Breeding programme
- Trying hybrids
Black cottonwood
*(Populus balsamea ssp. trichocarpa)*

- Amenity
- Shelter
Black cottonwood

*(Populus balsamea ssp. trichocarpa)*

- Production
  - Mostly biomass
Engelmann spruce
(Picea engelmannii)

• Consistently no. 5 among exotics
  – Christmas tree
  – Amenity
Why not more Norway spruce and Scots pine?
Species selection is based on our emphasis in forestry:

**Afforestation of treeless land**

- Usually infertile
- Often exposed
- Sometimes eroded
Many more species can be used if provided with shelter when young

- *Picea abies*
- *Pseudotsuga menziesii*
- Several *Abies sp.*
- *Tsuga mertensiana*
- *Tsuga heterophylla*
- *Thuja plicata*
- *Thuja koreana*
- *Cupressus nootkatensis*
- *Prunus spp.*
- *Malus spp.*
Recent trends

- **Increasing**
  - *Picea sitchensis*
  - *Betula pubescens*
  - *Sorbus aucuparia*
  - *Pinus cembra / sibirica*

- **Stable**
  - *Pinus contorta*
  - *Populus trichocarpa*
  - *Picea engelmannii*

- **Decreasing**
  - *Larix sukaczewii*
  - *Salix spp.*
  - *Alnus sinuata*
If warming continues

• Next 20 years
  – Continued importance of same species as now
  – Increase
    • Betula pendula
    • Pinus sylvestris
    • Poplar hybrids
  – Decrease
    • Salix
    • Picea glauca
    • Sorbus aucuparia
If warming continues

• Mid century
  – Continued importance
    • Picea sitchensis
    • Pinus contorta
    • Hybrid poplars
    • Betula pubescens (reclamation)
    • Larix sukaczewii (higher elevations)
  – Increase
    • Larix decidua
  – Decrease
    • Populus trichocarpa
If warming continues

• Late century (large scale regeneration starts)
  – Continued importance
    • Picea sitchensis (natural regeneration)
    • Pinus contorta (natural regeneration)
    • Hybrid poplars
    • Betula pubescens (reclamation at high elevations)
  – Increase
    • Picea abies
    • Pseudotsuga menziesii
    • Thuja plicata
    • Quercus robur and other broadleaves
  – Decrease
    • Larix
    • Betula (lowlands)
Conclusions

• We will continue to base Icelandic forestry largely on exotic species:
  – Because they provide many more opportunities than the native species
  – Because most people are in favor of them
  – Because without them, sustainable forestry is not possible in Iceland
Thank you!