

Use of FieldMap in the Icelandic NFI and other measurement projects in Iceland

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Icelandic Forest Research
6th FieldMap International User Conference
September 28-30, 2016

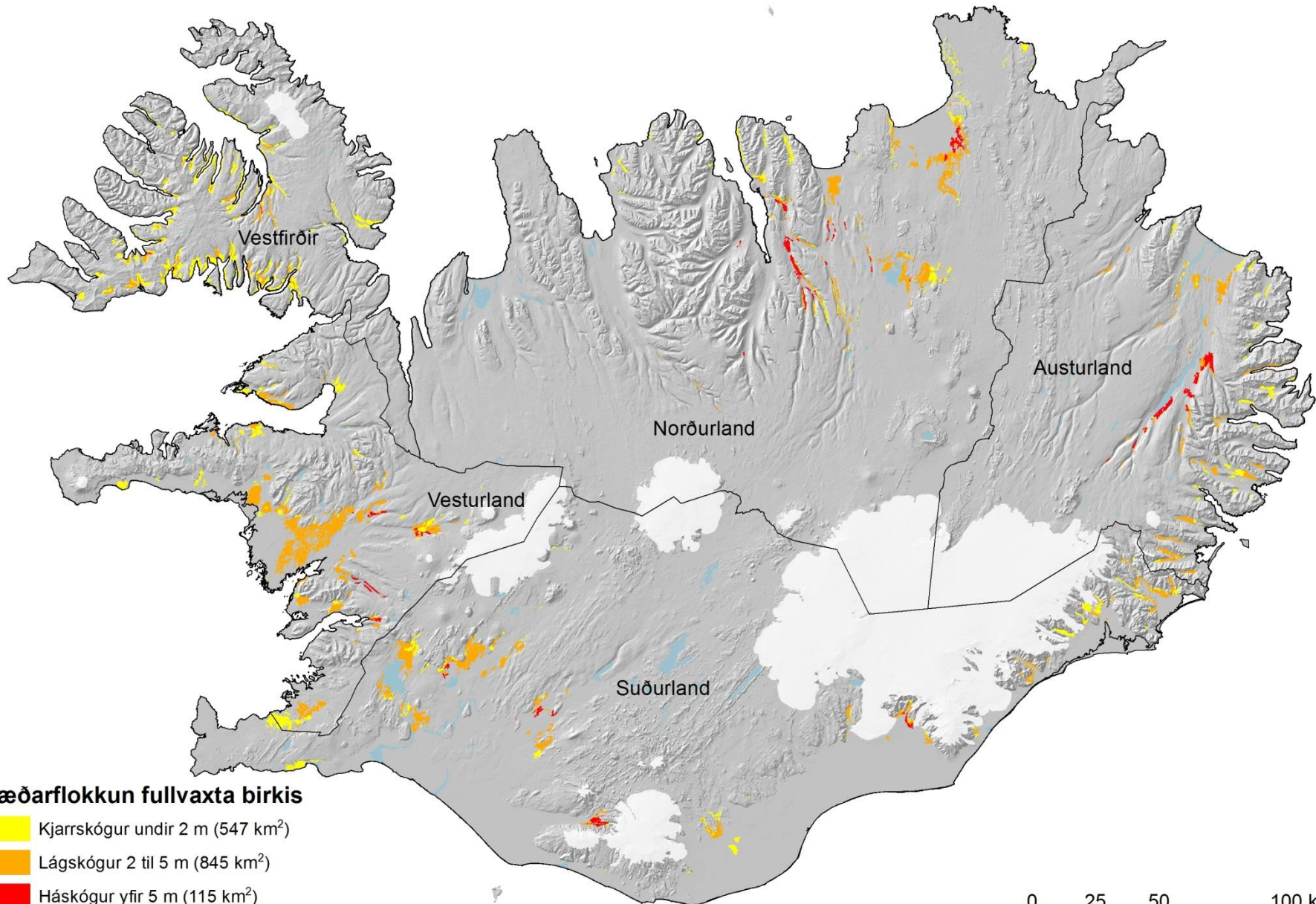


Overview

- State of forest and other wooded land in Iceland
– brief introduction
- The Icelandic NFI
- Use of FieldMap in the NFI
- Further improvement of the NFI-FieldMap project
- Other projects using FieldMap.

Present forest and woodland cover

- natural birch woodland: 151 kha (5 % of original cover and 1.5% of the land area)
 - natural birch forest (height at maturity > 5 m): 11 kha
 - natural birch woodland (height at maturity < 5 m: 140 kha
- cultivated forest: 42 kha
 - thereof native species: 14 kha (mostly native birch, also: rowan, salix ssp. and aspen).

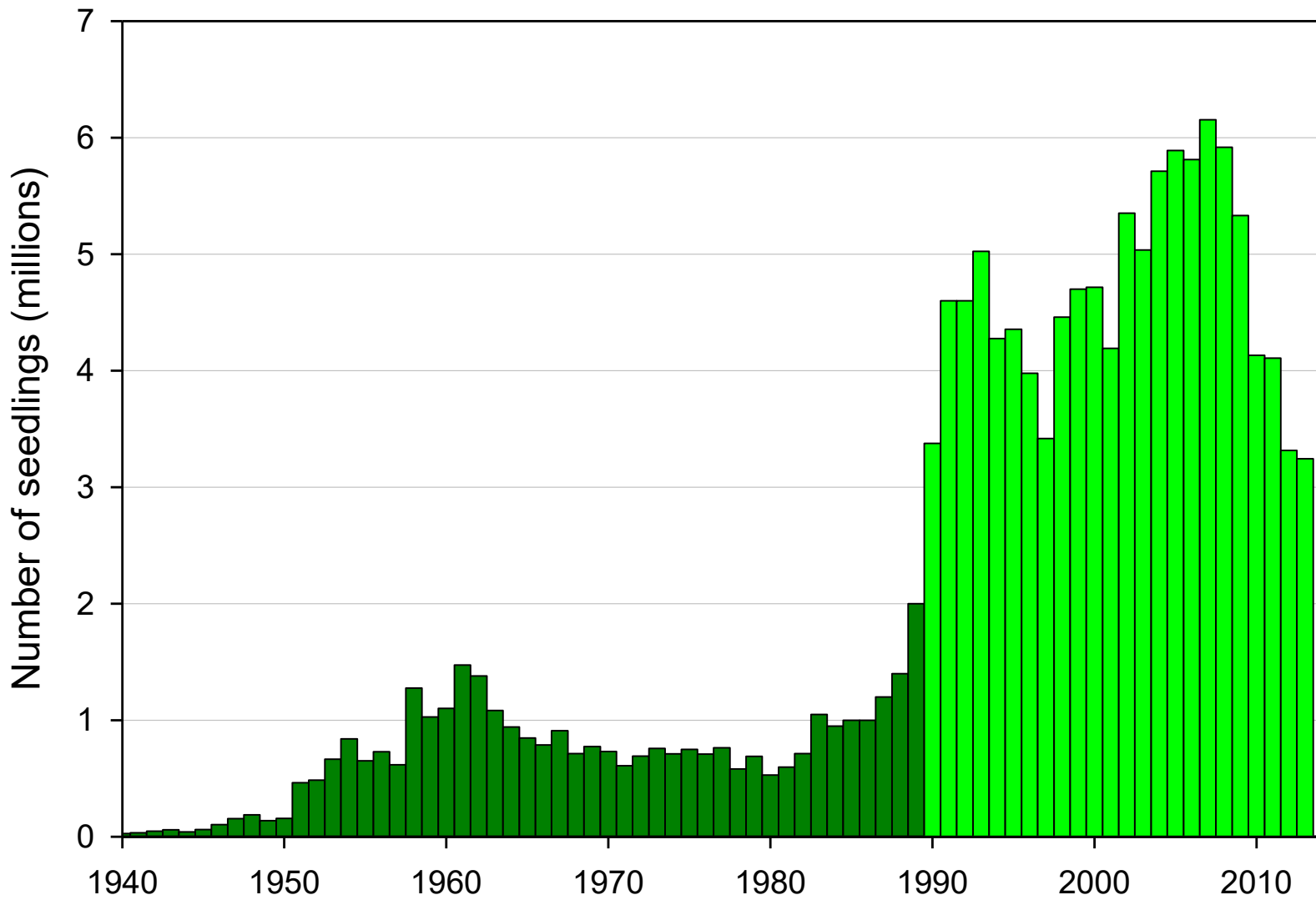


Cultivated forest

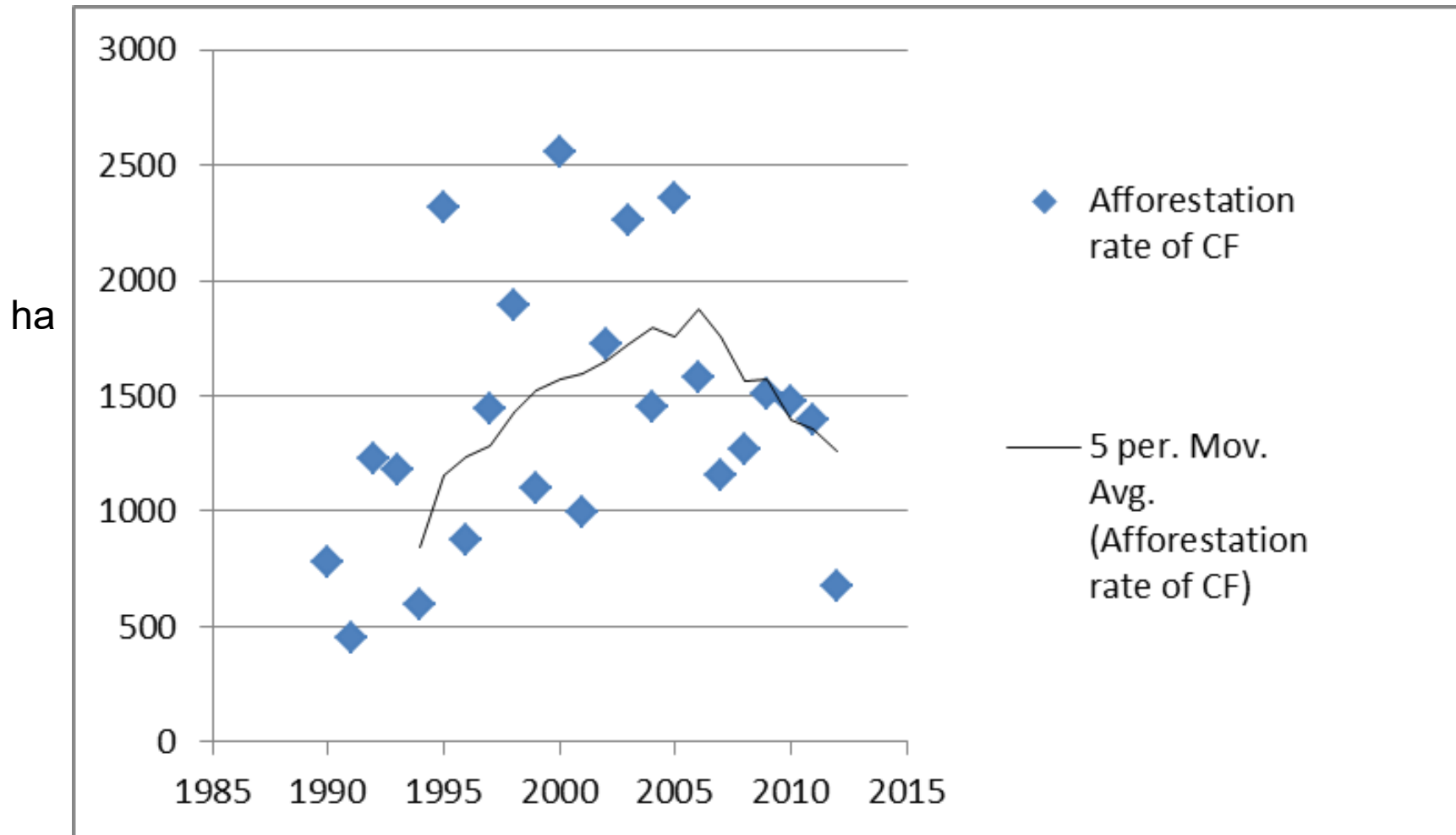
- Mainly plantations but natural regeneration and natural expansion is increasing
- Wide spectrum of afforestation is practiced
 - from intensive biomass or wood production plantation with clonal forestry of black cottonwood
 - to scattered plantations of native birch on deserts around volcanos to mitigate the risk of erosion of the ash after outbreak
 - more intermediate are urban forestry for leisure and shelter where various tree species both native and introduced are used
 - all state funded afforestation has to undergo thorough planning where protected areas are excluded such as old ruins, virgin mires, natural woodlands and young lava-fields.

Funding

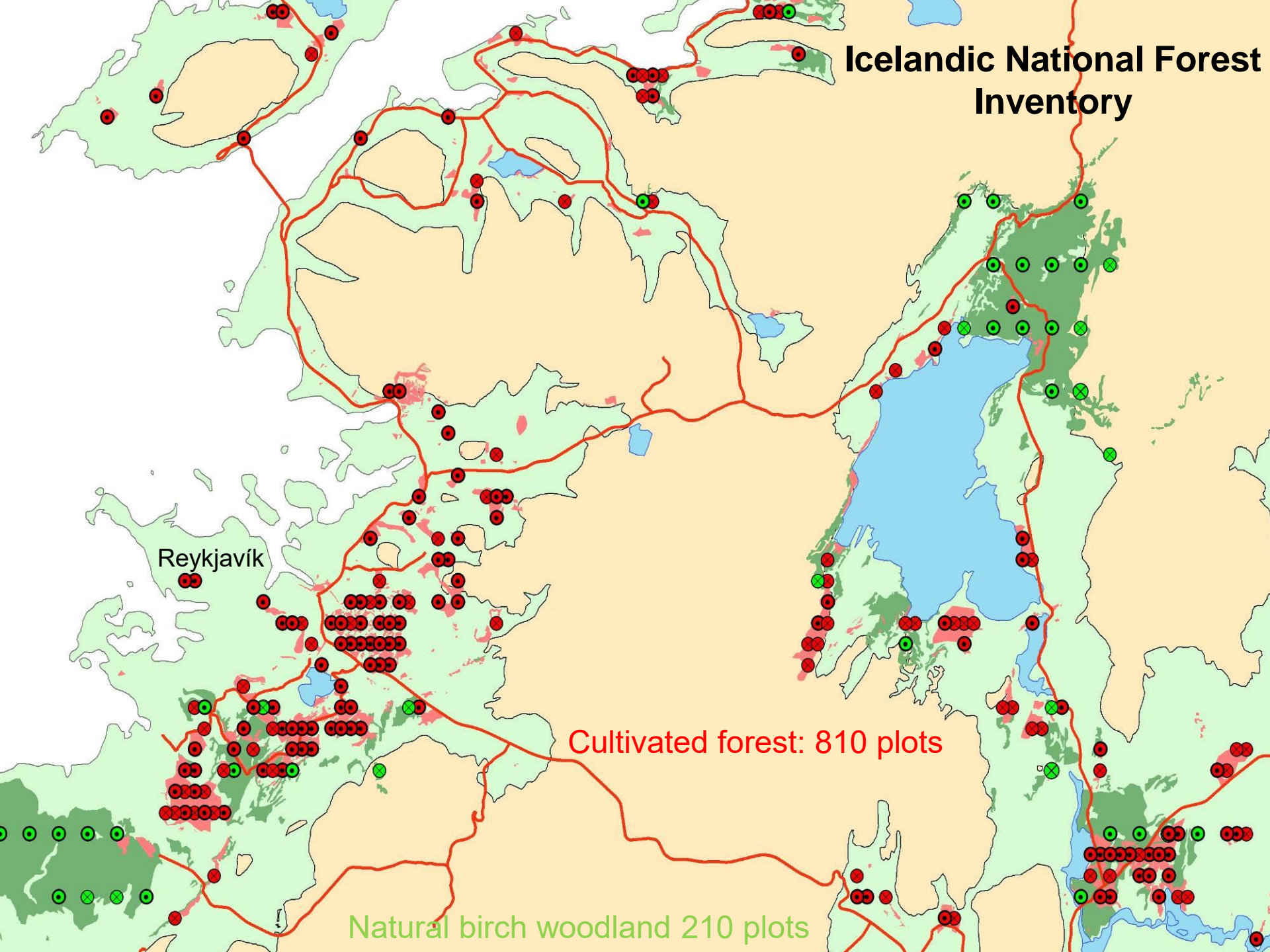
- State funding is the main driver of afforestation
 - afforestation project: 97% direct state funding plus all organization and professional service is without charge
 - land reclamation afforestation: about 70-90% direct state funding



Plantation of forest seedlings



Icelandic National Forest Inventory



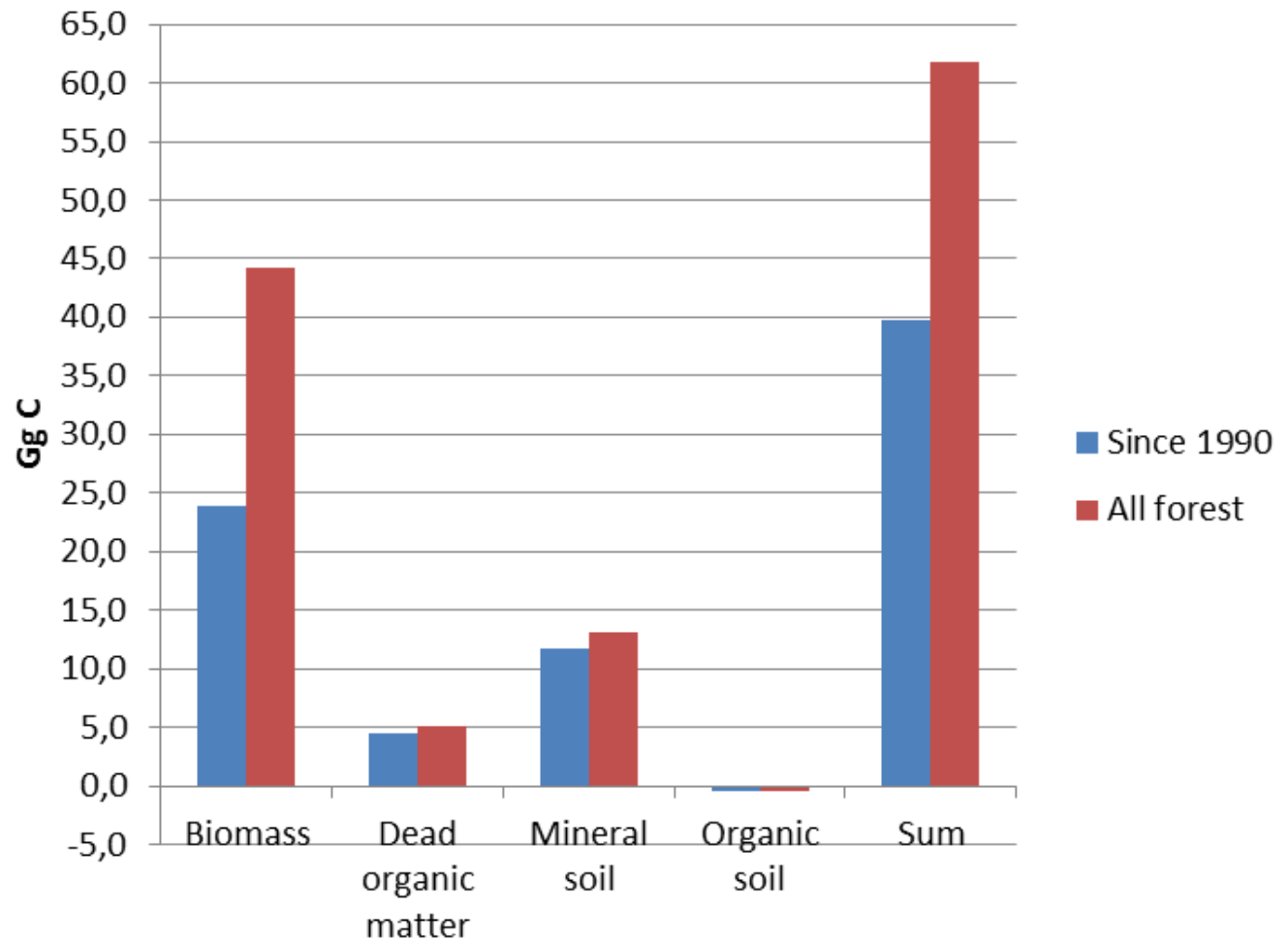
Reykjavik

Cultivated forest: 810 plots

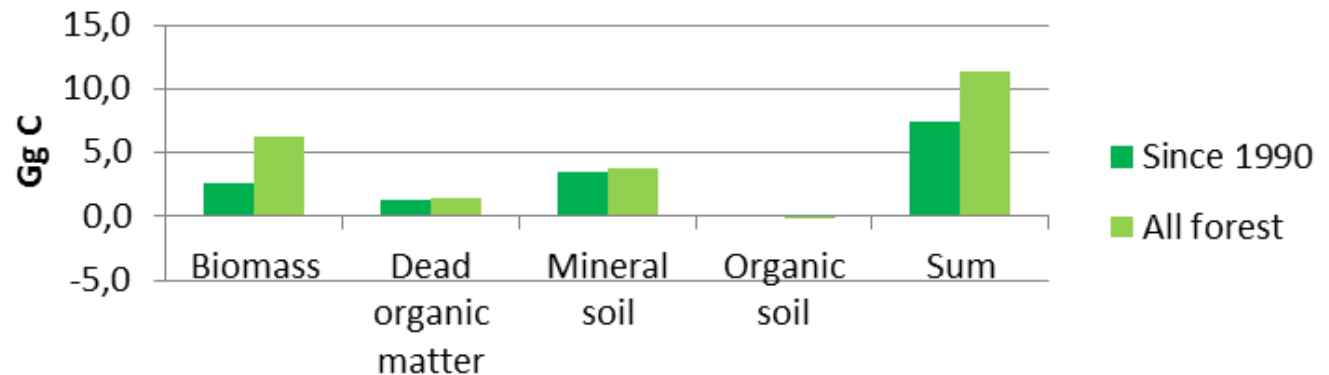
Natural birch woodland 210 plots

GHG estimates 2012

Cultivated forest:
84% of net removal
since 1990



Natural birch forest:
16% of net removal
since 1990



Chronology of FieldMap use

- Bought our first FieldMap package in spring 2004
- Measured a small dendropark in the summer of 2004
- Started measuring the first round of NFI 2005
- Bought the second FieldMap package in 2008
- Started to use Armor field computer instead of the old Hammerhead in 2015.
- Bought third hardware package in 2015 and started to use it in special occasions in the this year NFI and as a reserve



Plots (Trjáæflötur)

ID	value1	value2
0	Undefined	
100	S-Trjágróður < 1,3m	S-Trees grown area < 1.3 m
200	S-Trjágróður 1,3-2m	S-Trees grown area 1.3 -2 m
250	S-Trjágróður 2-3m	S-Trees grown area 2-3 m
300	S-Trjágróður 3-5m	S-Trees grown area 3-5 m
400	S-Trjágróður >5m	S-Trees grown area > 5 m
500	S-Rjóðurfellt skóglendi	S-Cler cut area
600	S-Dautt skóglendi	S-Dead forest
700	S-Oltið um koll	S-Wind blown forest
800	S-Rjóður <500m2	S-Clearing < 500 m2
900	S-Garður <500m2	S-Garden < 500 m2
1000	S-Timburhlaði <500m2	S-Woodpile <500m2
1100	S-Byggingar <500m2	S-Buildings <500m2
1200	S-Stígur <4m breiður	S-Path <4m wide
1250	S-Stígur <4m breiður ógr.	S-Path <4m wide no vegetation
1300	S-Slóði <4m breiður	S-Track <4m wide
1350	S-Slóði <4m breiður ógr.	S-Track <4m wide no veg.
1400	S-Lækur <4m breiður	S-Bench <4m wide
1500	S-Annað <500m2	S-Other <500m2
1600	O-Opið svæði 500-5000m2	O-Treeless area 500-5000m2
1700	O-Garður 500-5000m2	O-Garden 500-5000m2
1800	O-Byggingar 500-5000m2	O-Buildings 500-5000m2
1900	O-Stöðuvatn <5000m2	O-Lake <5000m2
2000	O-Stígur 4-20m breiður	O-Path 4-20m wide
2100	O-Slóði 4-20m	O-Track 4-20m
2200	O-Vegur 4-20m	O-Road 4-20m
2300	O-Raflína <20m	O-E.line <20m
2400	O-Straumvatn 4-20m	O-River 4-20m
2500	O-Annað	O-Other
2600	U-Úthagi	U-Range land
2700	U-Ræktað land	U-Cultivated land
2800	U-Garður	U-Garden
2900	U-Þéttbýli	U-Settlement
3000	U-Stöðuvatn	U-Lake
3100	U-Vegur	U-Road
3200	U-Raflína	U-E.line
3300	U-Straumvatn	U-River
3400	U-Trjáholt <500m2	U-Treegrove <500m2
3500	U-Skjólbelti <20m	U-Shelterbelt <20m
3600	U-Annað	U-Other

← **LandType_2 (Landflokkun2)**

LTdescript_2 (LFlysing2)

← **NatShrubs_2 (Nátt**

NativeBirch_2 (Nát

SelfRegeneration_2

← **SpeciesMixture_2**

← **PlantOrigin_2**

TreeDescript_2 (Trjágr.L

TreeCoDes_2 (Trjáreitak

← **TreeSpecies1_2 (T**

TreeLayer2_2 (Trjá

← **TreeSpecies2_2**

Thinning_2 (Grisju

← **FNAWS_2 (Ekkviðarmýr**

field:

Net forest area

field:

LandType

field:

NativeShrubs

field:

NativeBirch

field:

Gross forest area

field:

LandType

field:

Trees

field:

AgeStructure

field:

Land outside forest

field:

FAWS

ForestDescription_2 (Skógarlýsing2)

← **VegFrame_2 (Gróðurrammar2)**

← UnVegCover_2 (ÓgróiðYfirborð2)

conditional layer appearance

master field: UnVegCover

SoilSample_2 (Sýnataka2)

conditional layer appearance

master field: FrameDirection

← NativeReg_2 (NáttEndurNýjun2)

conditional layer appearance

master field: SelfRegeneration

← PlantType_2 (Plöntugerð2)

← Shrub_2 (Runnar 0,5-2m 2)

conditional layer appearance

master field: Shrubs

← **Tree_2 (Trjáælingar2)**

conditional layer appearance

master field: TreesPresent

GMTree_2 (GMTré2)

conditional layer appearance

master field: Candidates

CoreLabel_2 (KjarnaMerking2)

conditional layer appearance

master field: TreeCore

← Damage_2 (Skemmdir2)

conditional layer appearance

master field: Damage

← **NewPlotSize (Nýr TFlötur)**

conditional layer appearance

master field: ChangePlotSize

← **NatCandidates_2 (NáttPróftaré2)**

conditional layer appearance

master field: NaturalRegeneration

Layer attributes of "Tree_2 (Trjá mælingar2)"

Attribute name	Attribute type	Required	Visible	
<Crown_Surface_m2>	<Number>	No	Read-only	Crown surface,m2
<DBH_mm>	<Number>	Yes	Read-only	DBH,mm
<Height_m>	<Height>	No	Read-only	Hæð (m)
<CrownBase_m>	<Height>	No	Read-only	Hæð f.5árum
<DeadCrBase_m>	<Height>	No	Read-only	Neðsta lif.grein
<Tree_Length_m>	<Number>	No	Read-only	Lengd (m)
<Crown_Length_m>	<Number>	No	Read-only	5 ára hæðarvöxtur
basal_area_mm2	Number	Yes	Visible	Grunnflötur (mm2)
D50cm	Number	Yes	Visible	D0,5 (mm)
BasalArea50cm	Number	Yes	Visible	Gr.fl.50cm
Dstumpheight	Number	Yes	Visible	ÞStubbh. (mm)
stumphbasalarea	Number	Yes	Visible	StubbGrunnFl
Candidates	Lookup list (numeric ID)	Yes	Visible	Prófttré
YearGrowthStatus	Lookup list (numeric ID)	Yes	Visible	StaðaHæðarvaxtar
YearHeightGrowth	Number	Yes	Visible	H.vöxt.árs cm
Species	Lookup list (numeric ID)	Yes	Visible	Trjátægund
PlantType	Lookup list (numeric ID)	Yes	Visible	Plöntugerð
DeadTree	Lookup list (numeric ID)	Yes	Visible	Tré dautt?
▶ QualityClass	Lookup list (numeric ID)	Yes	Visible	Timburgæði
ForkTree	Lookup list (numeric ID)	Yes	Visible	Margstofna
StemNo	Number	Yes	Visible	Stofn Númer
Vitality	Lookup list (numeric ID)	Yes	Visible	Trjáheilsa
Dieback	Number	Yes	Visible	Kalhæð(m)
Length	Number	Yes	Visible	Lengd (m)
LengthGrowth	Number	Yes	Visible	L.vöxt5ár cm
YearLengthGrowth	Number	Yes	Visible	L.v. ársins cm
Damage	Lookup list (numeric ID)	Yes	Visible	Skemmdir?
Note	String	Yes	Visible	Athugasemdir

- **Exposition (Skjólfar)**
 - **North (Norður)**
 - **NorthEast (Norðaustur)**
 - **East (Austur)**
 - **SouthEast (Suðaustur)**
 - **South (Suður)**
 - **SouthWest (Suðvestur)**
 - **West (Vestur)**
 - **NorthWest (Norðvestur)**

← **Stumps_2 (Stubbar2)**

conditional layer appearance

master field: Stumps

← **DeadWood_2 (DauðurViður2)**

conditional layer appearance

master field: DeadWood

— **Marking (Merkingar)**

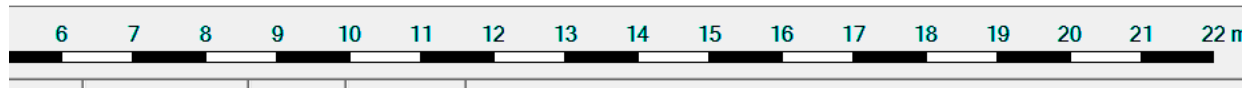
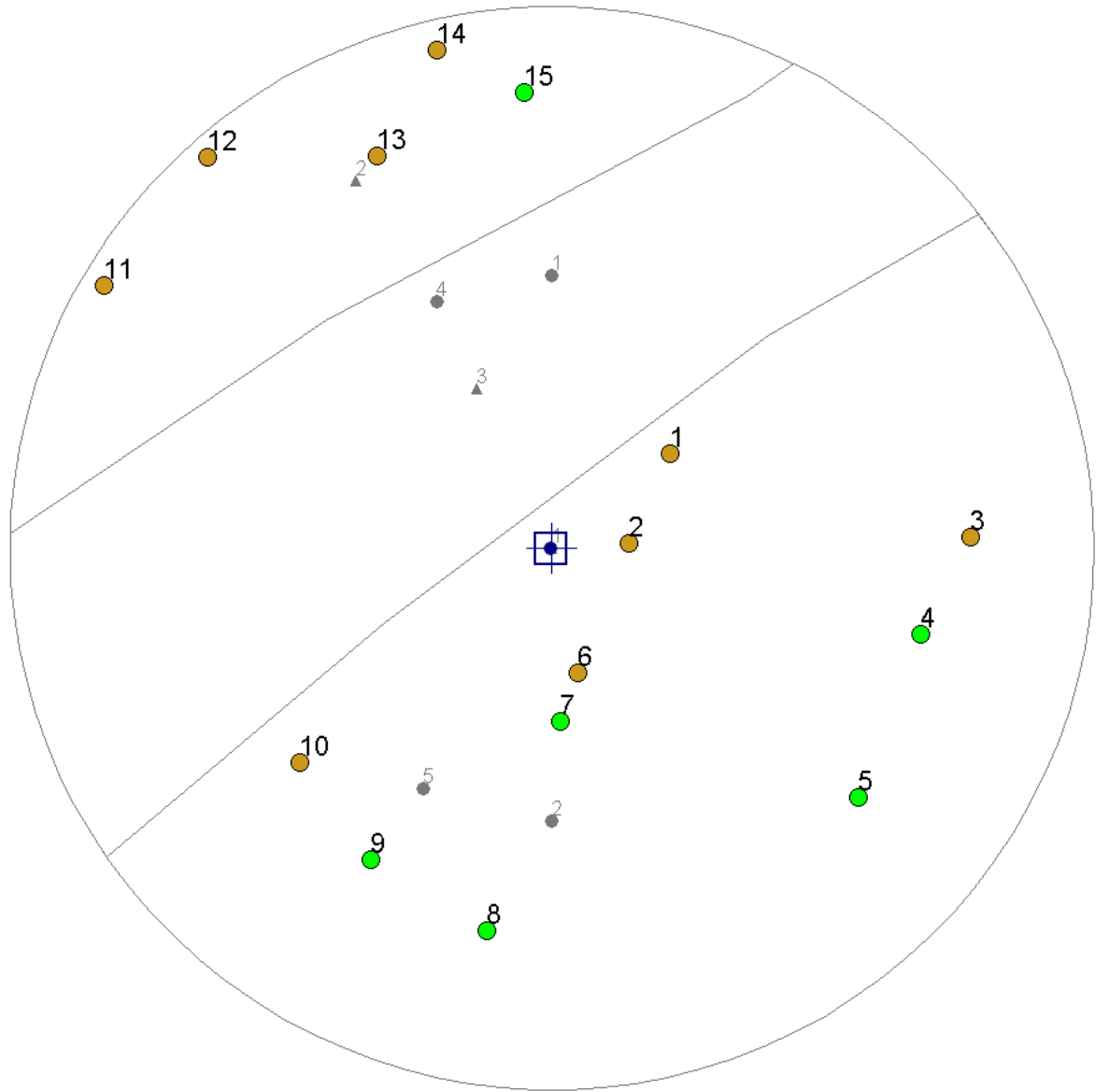
← **Grid (Mæliflatarmiðjur)**

conditional layer appearance

master field: PlotType

In

- Connect tree information with landtype polygons – is it possible automatically?



Improvements

- Connect tree information with landtype polygons
 - is it possible automatically?
- Set up a standardized SQL databases
 - One for tree data and major calculated figures as biomass and volume
 - One for plot data and with major calculated figures as biomass and volume per area unit and upscaled to represented area.
- New scripts for picking out candidates for height measuring etc.
- Writing a field-manual for the NFI.

FieldMap in other projects

1. 2004: The mapping and measuring of the treepark of Múlakot South Iceland
2. 2008: Systematic sample plot project in Reykjavik. Measuring and estimating the C-stock and C-stock change in urban trees and shrubs. BSc study.
3. 2010: Stratified random sample plot project on two afforestation estates to assess C-stock and C-sequestration in afforestation and to develop methods for C-bookkeeping of forestry estates MSc study.
4. 2010: Measurements of chronological plots of native birch forest in South Iceland. A multidisciplinary research of the dynamics of CO₂ sequestration in native birch forest. An external funded research program.
5. 2010: Stratified random sample plot project on forest owned by the Mosfellbær Forest Association.
6. 2011: Stratified random sample plot project on three forests owned by the Landsvirkjun (National power company of Iceland) to estimate C-stock and C-sequestration in afforestation – contract service.
7. 2011: Systematic sample plot project of a natural birch woodland that will be drowned under water in hydro powerplant dam. Measuring and estimating the C-stock and C-stock change. – contract service.
8. 2015: Re-measurement of chronological research on *Larix sibirica* plantations in east Iceland External funded research project.
9. 2015: Measuring natural expansion of different tree species. External funded research project.
10. 2015 – 2016: Measuring vegetative regeneration of white poplar plantation. External funded research project.
11. 2015 – 2016: Measuring plots around a Flux tower in white poplar plantation on drained organic soil. External funded research project.
12. 2016: Re-measurement of stratified random sample plot project on three forests owned by the Landsvirkjun (National power company of Iceland) to estimate C-stock and C-sequestration in afforestation – contract service.

Thank you for your attention



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