

CAFF 2018, 9-12 October 2018, Rovaniemi, Finland

Status and conservation goals for the critically endangered Arctic fox in Scandinavia. When is the mission completed?



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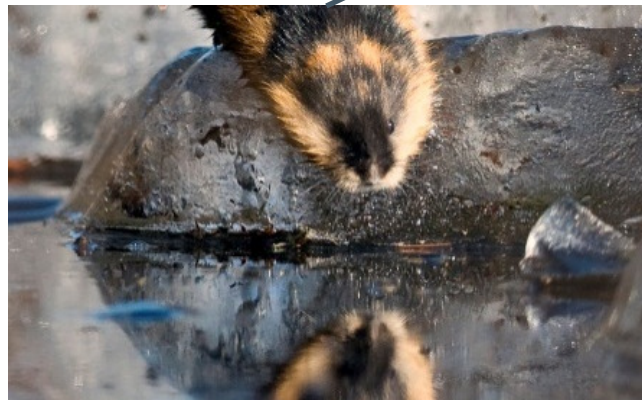


Why critically endangered, despite 80 yrs protection?



Foto: Henrik Eira

I – small population



II – lack of lemmings



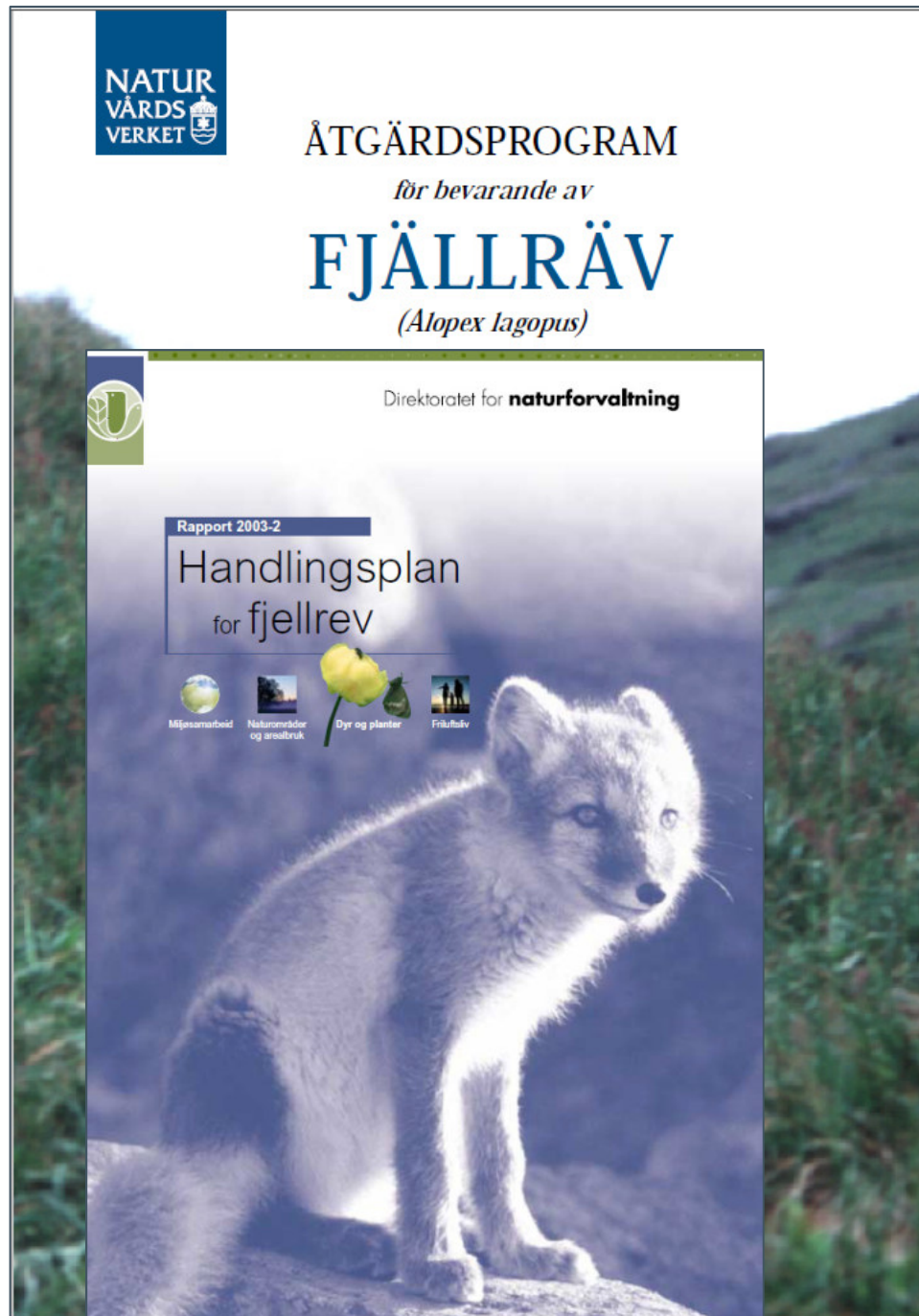
III – more red fox

+

-

-

+



CR Critically endangered

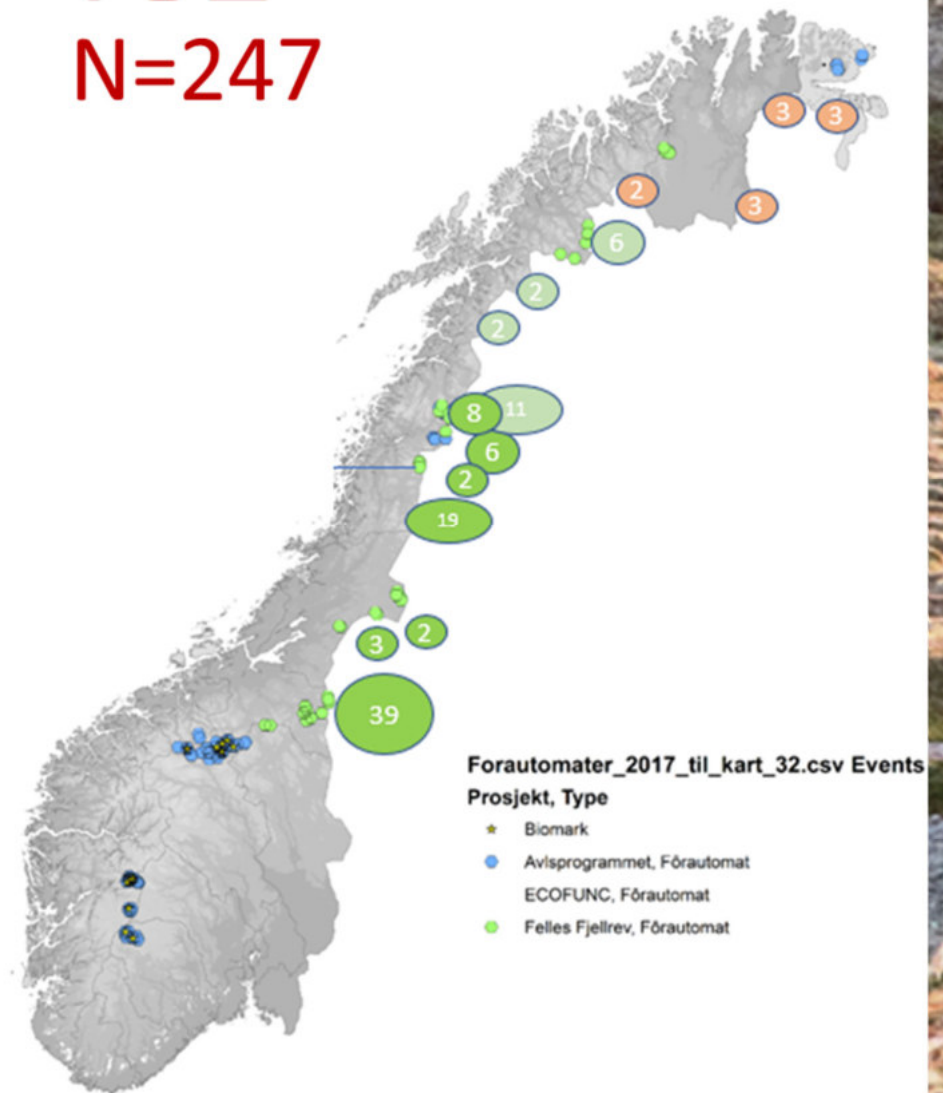
national & regional
red lists

Conservation measures starts

1998..2005..2011..running

Supplemental feeding

N=247



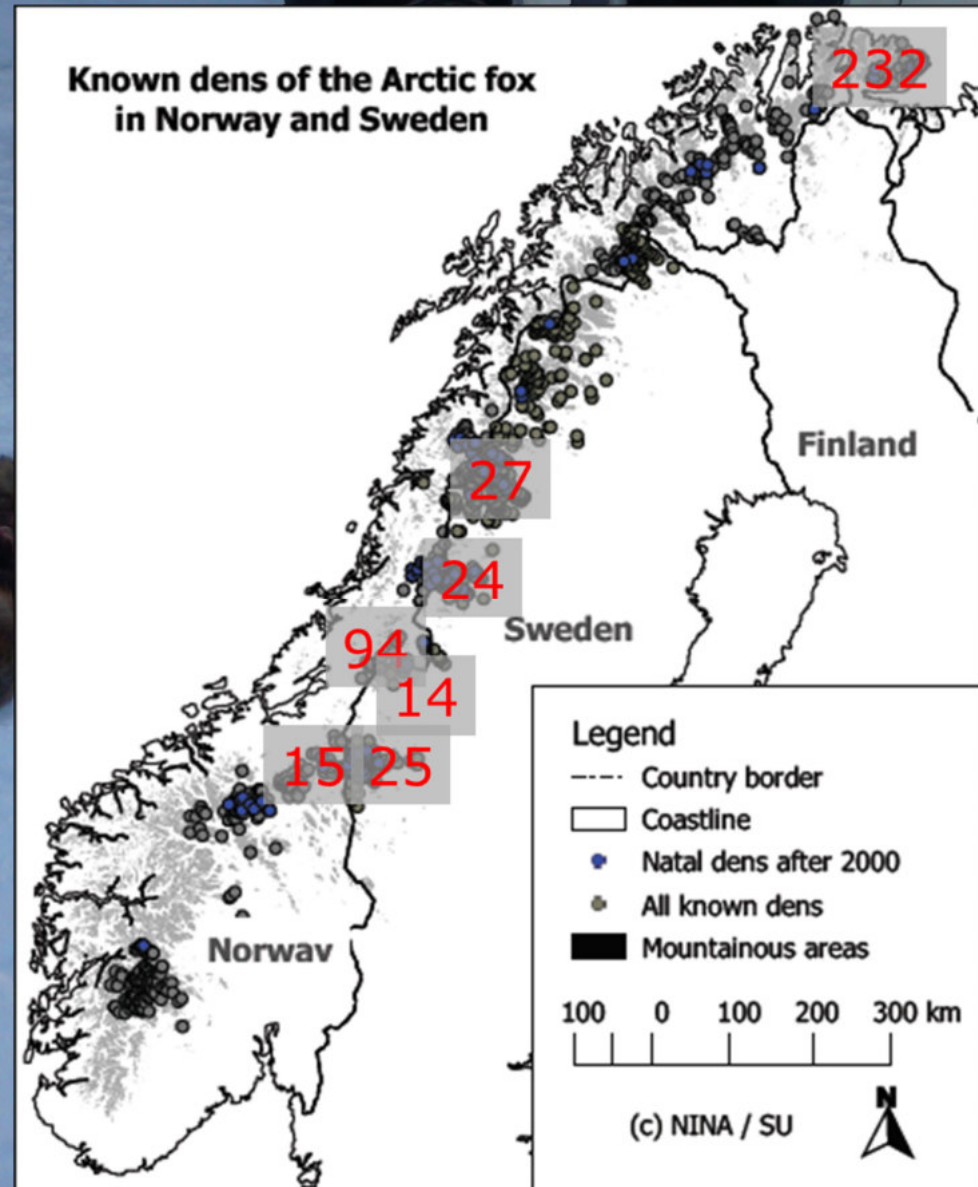
Supplemental feeding

30.000 kg dry dogpellet/yr



Red fox culling

N= 4750



Captive breeding and release (2005 ->)



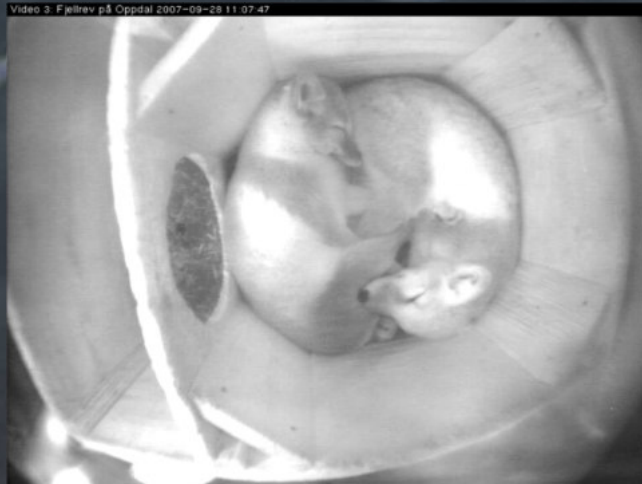
Captive breeding and release

2006- 1 litter, 6 cubs
2007 – 4 litters , 20 cubs
2008 – 7 litters, 32 cubs
2009 – 6 litters, 39 cubs
2010 – 9 litters, 71 cubs
2011 - 7 litters, 42 cubs
2012 – 6 litters, 27 cubs
2013 – 6 litters, 41 cubs
2014 – 6 litters, 24 cubs
2015 - 7 litters, 31 cubs
2016 – 5 litters, 17 cubs
2017 – 7 litters, 51 cubs
2018 – 7 litters, 48 cubs

Totally > 453 valper

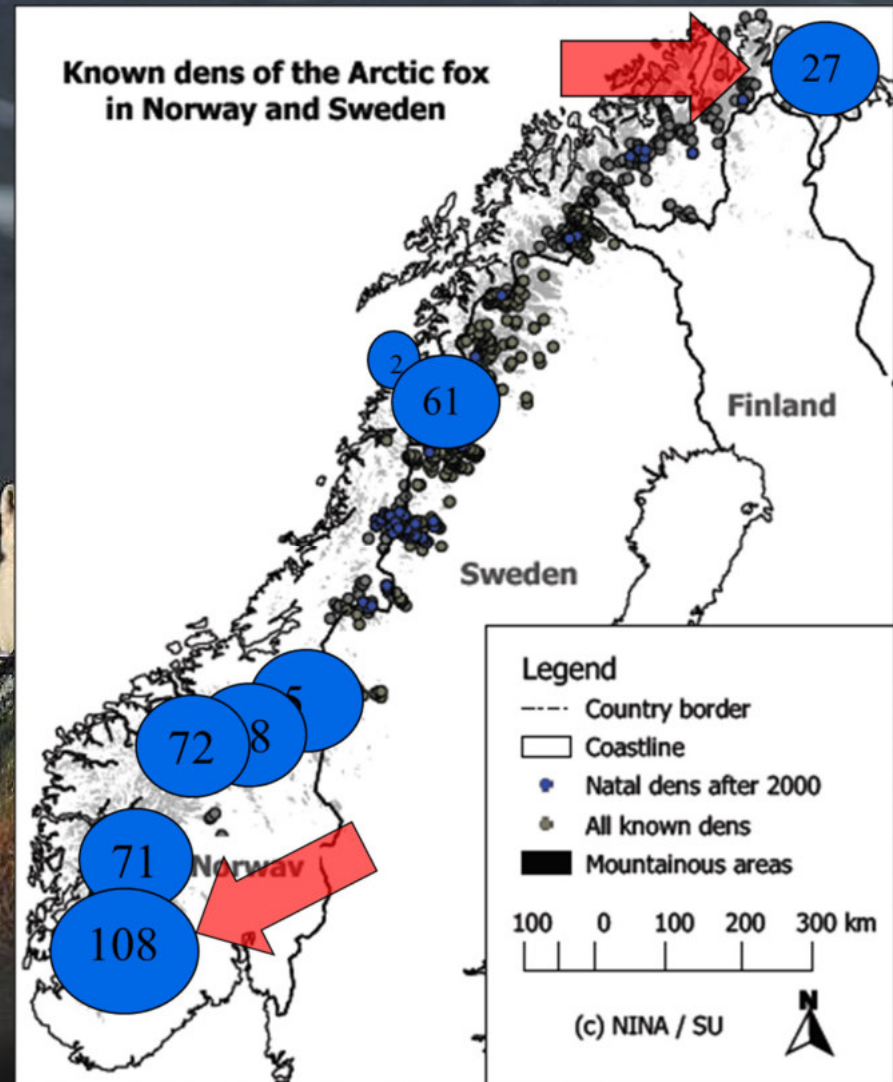


Captive breeding and release



N=368 released

(48 to be released in 2019)



Captive breeding and release

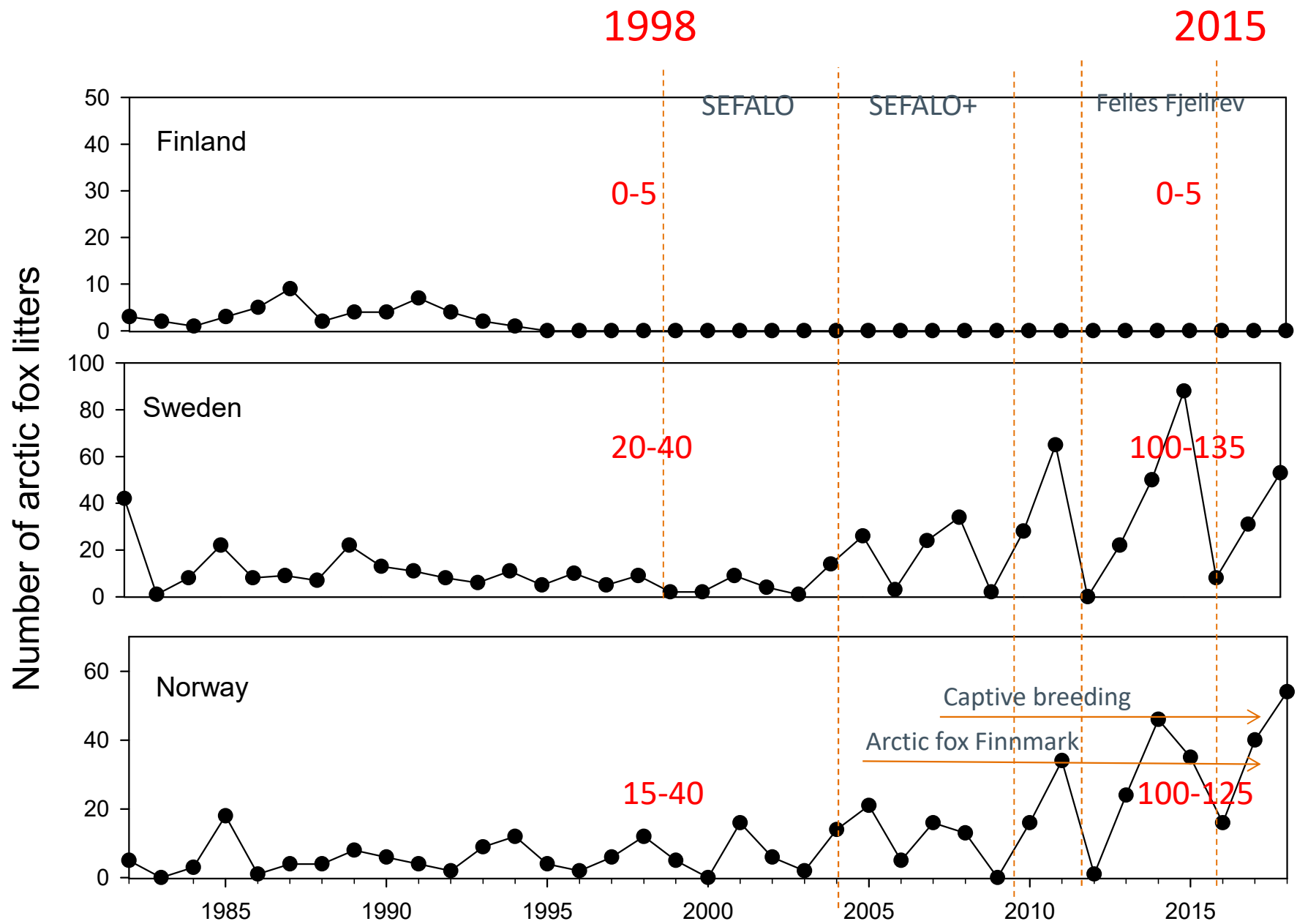
Supported by: artificial den sites



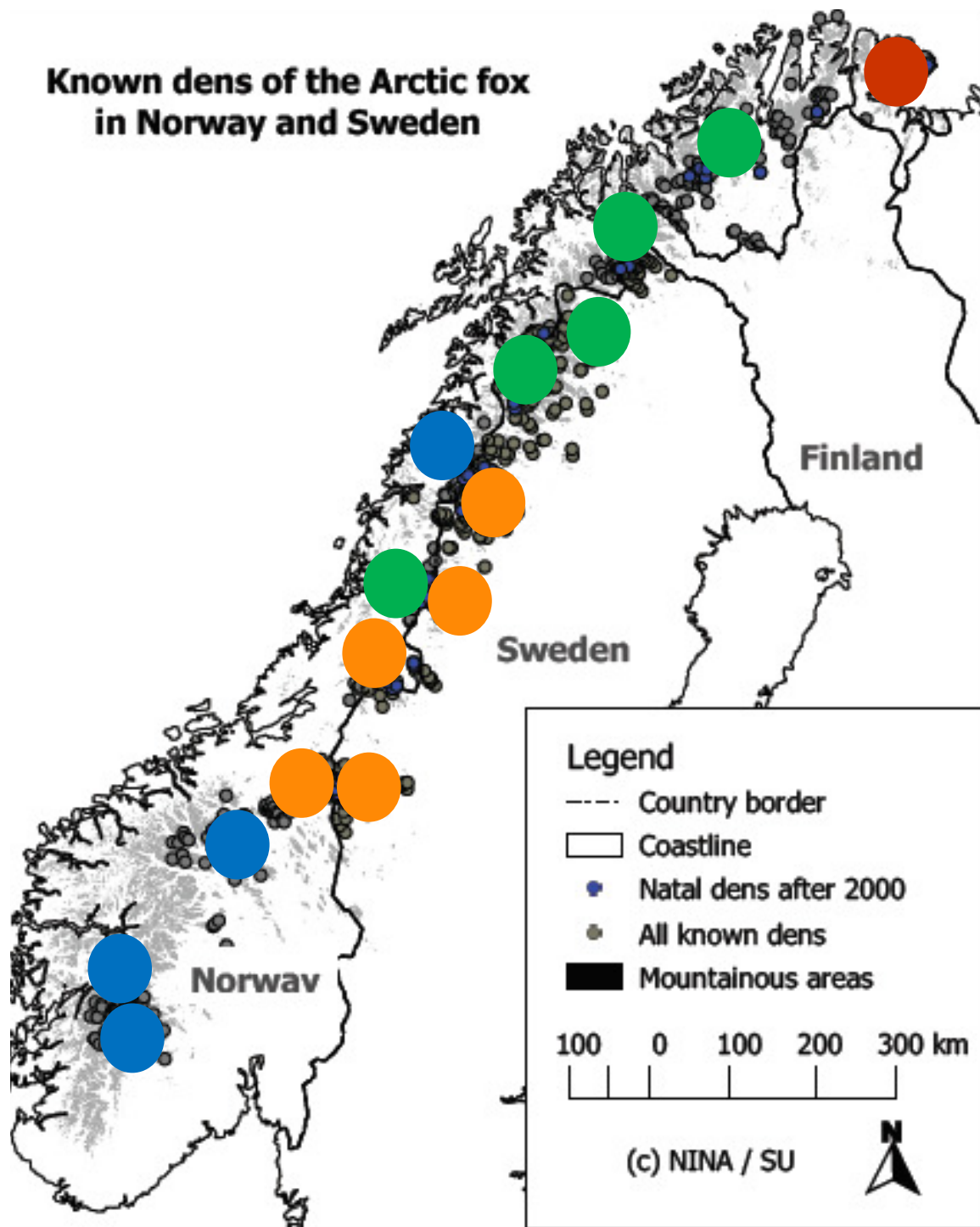
Captive breeding and release

Supported by: feeding stations

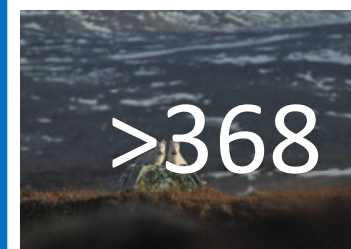
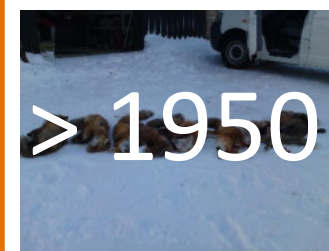
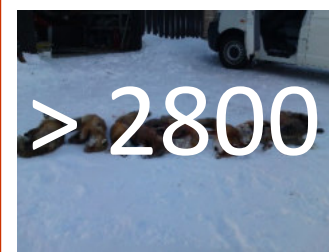


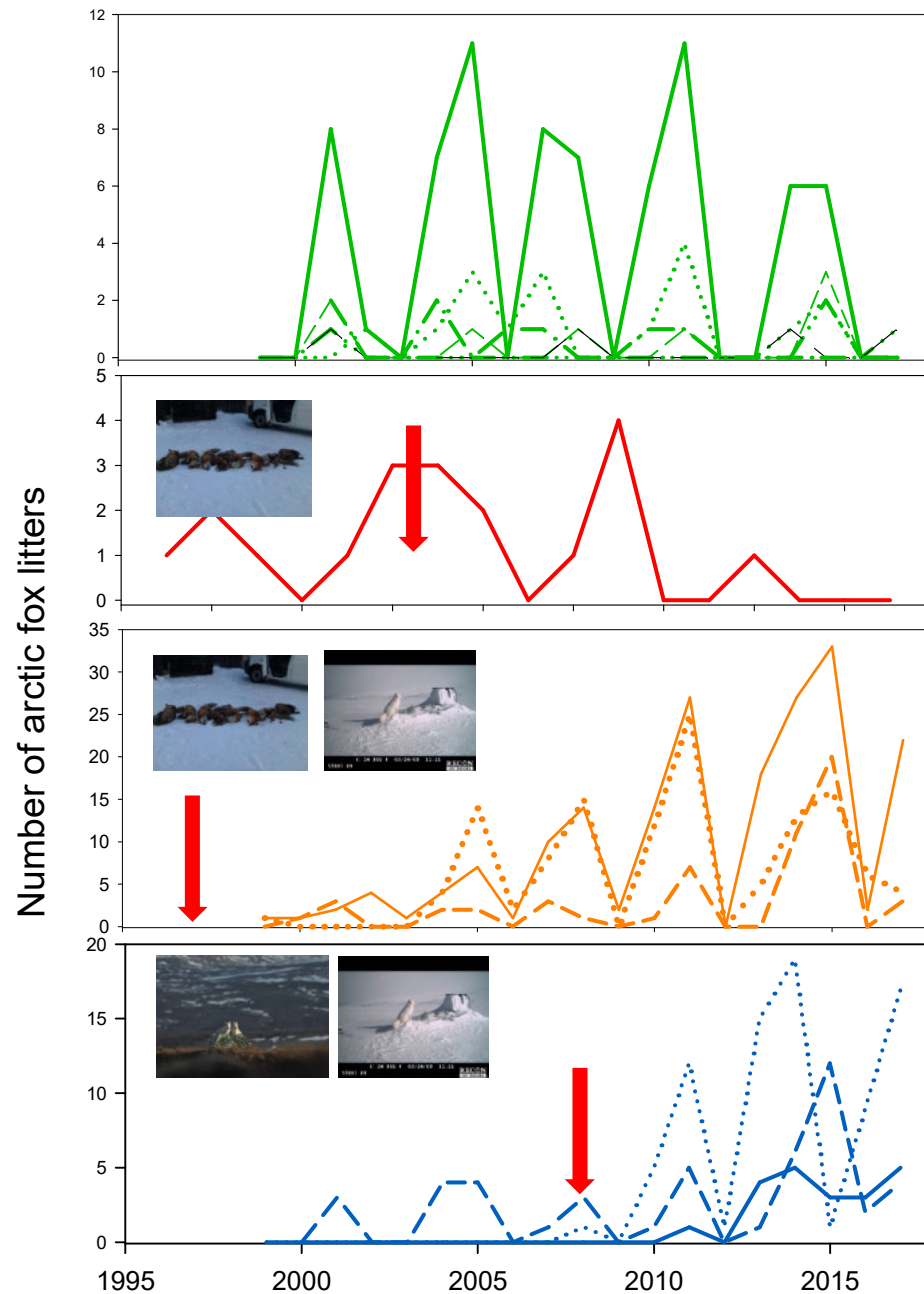


Known dens of the Arctic fox in Norway and Sweden



COMBINATIONS OF ACTIONS





GROWTH RATES IN SUB POPULATIONS (from increase year to increase year)

Growth rate/phase = 1,08 (6 sub. pop)

Growth rate/phase = 1,18 (1 sub. pop)

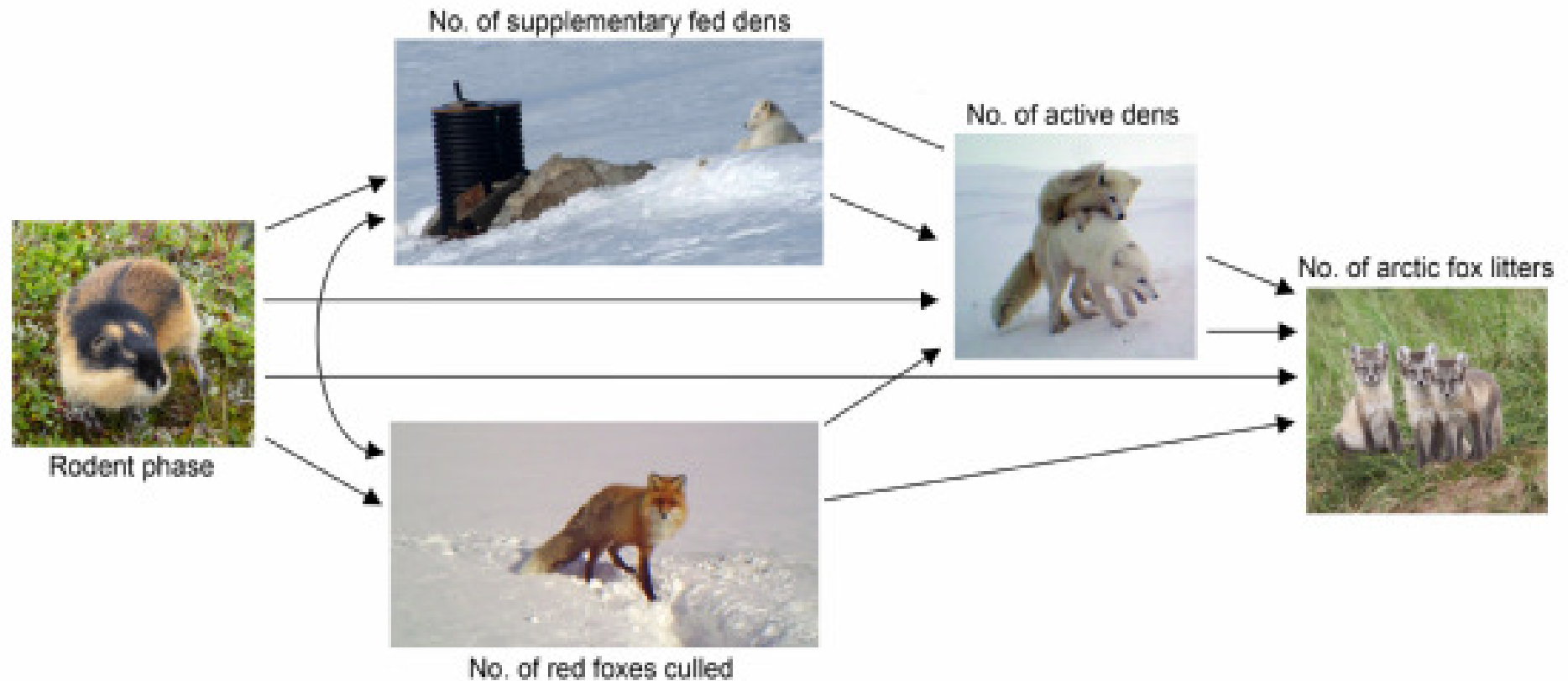
Growth rate/phase = 1,99 (4 sub. pop)

Growth rate/phase = 2,90 (3 sub. pop)

↓ *Start of conservation measures*

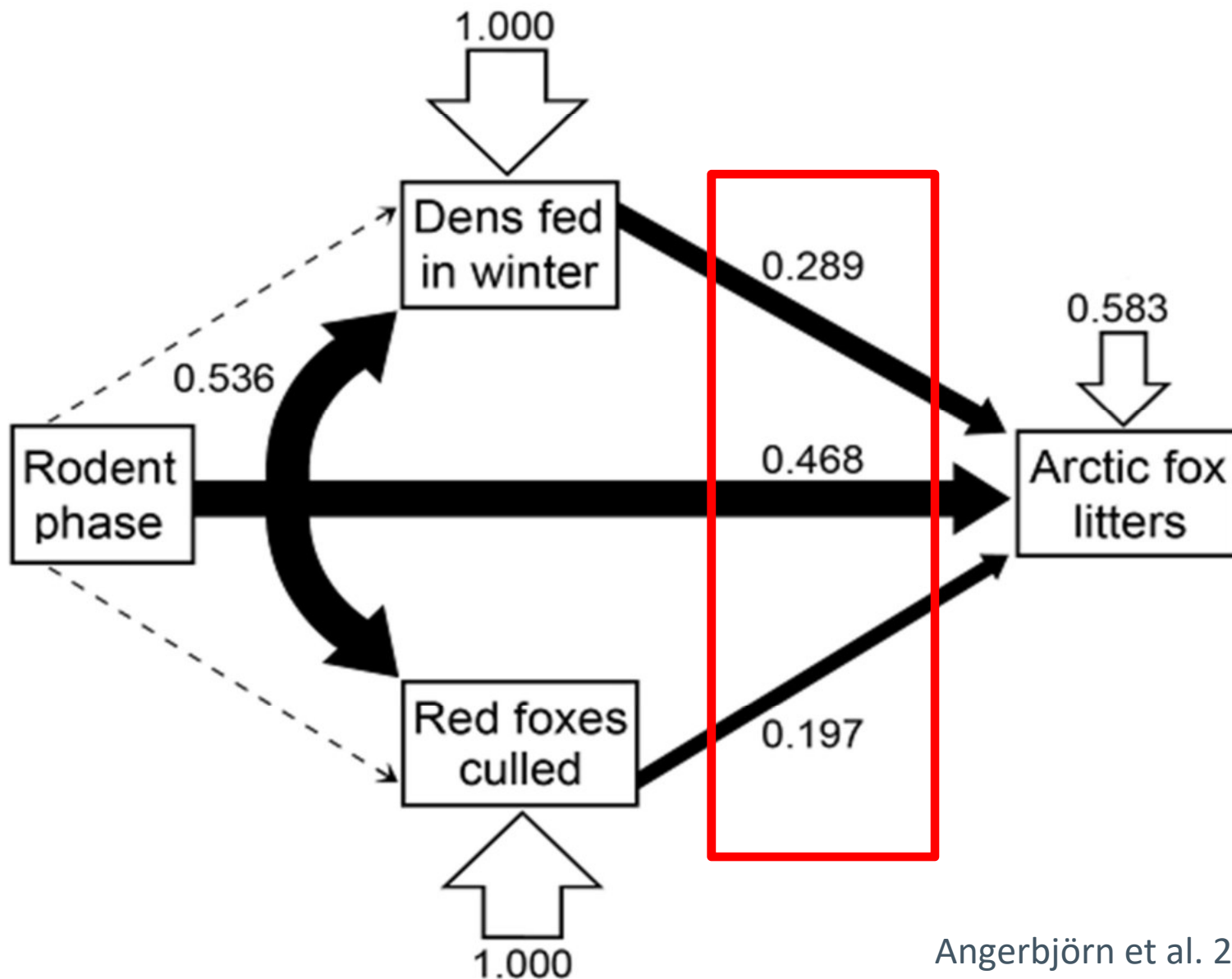
Does the measures have effect?

(a) *A priori* interactions between conservation actions and species



(b) Best model of the Grand study ($n = 125$)

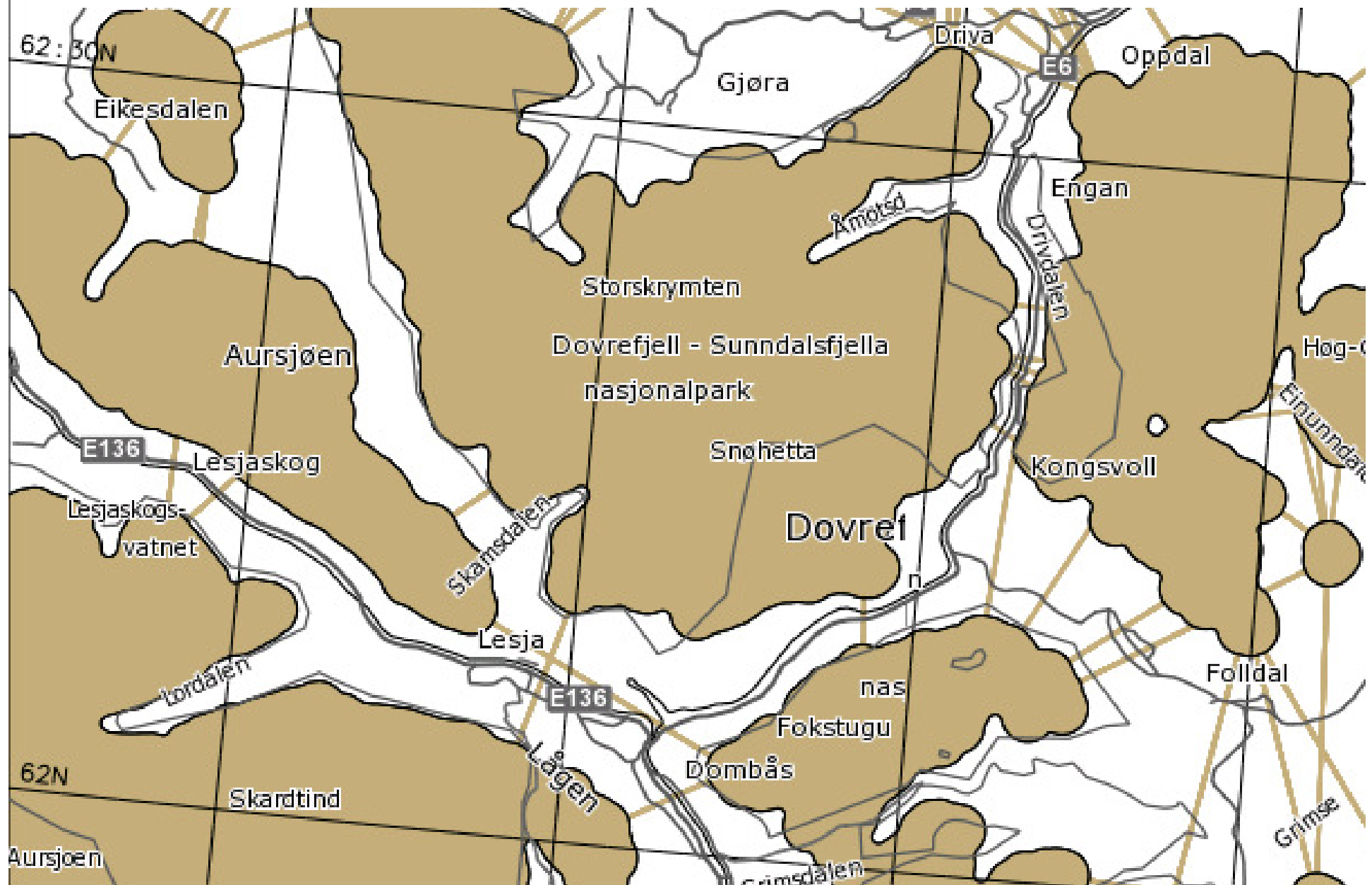
$\chi^2 = 0.808$, $df = 2$, $P = 0.668$, GFI = 0.997, BIC = -8.848



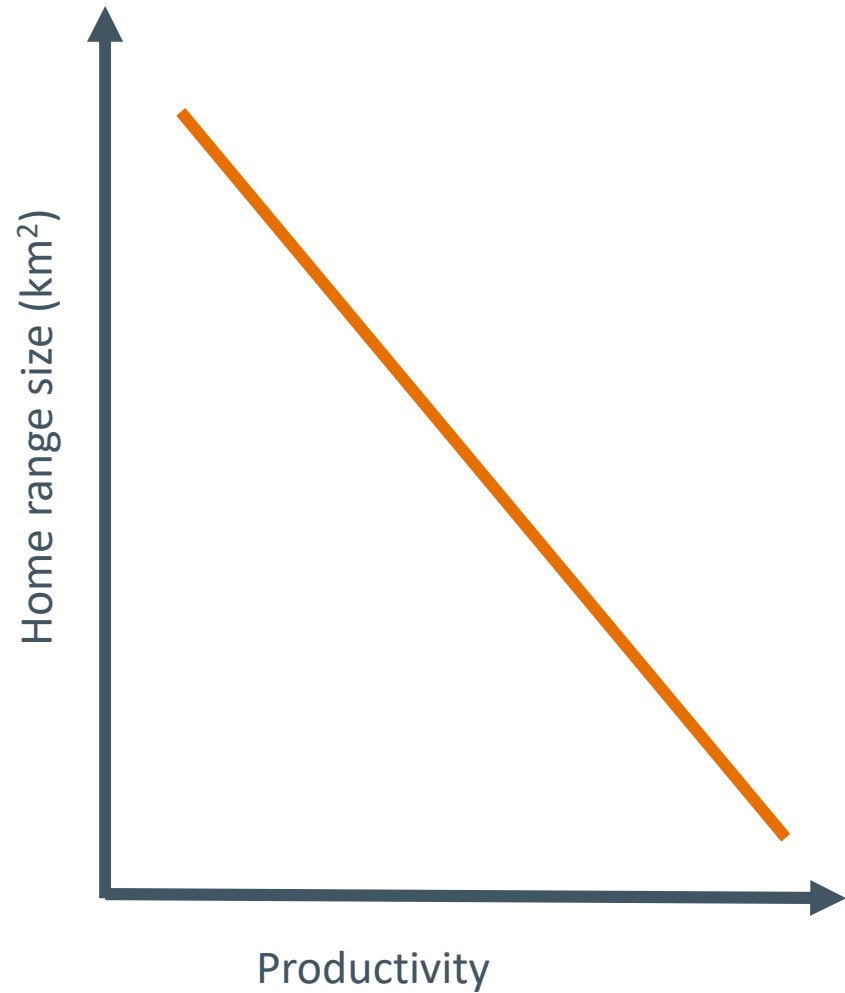
Defining a goal for further conservation work – visions and goals



How many foxes could a mountain fragment host?



How many foxes could a mountain fragment host?



How many foxes could a mountain fragment host?

Area / Home range x 2



Area / 75 km² x 2

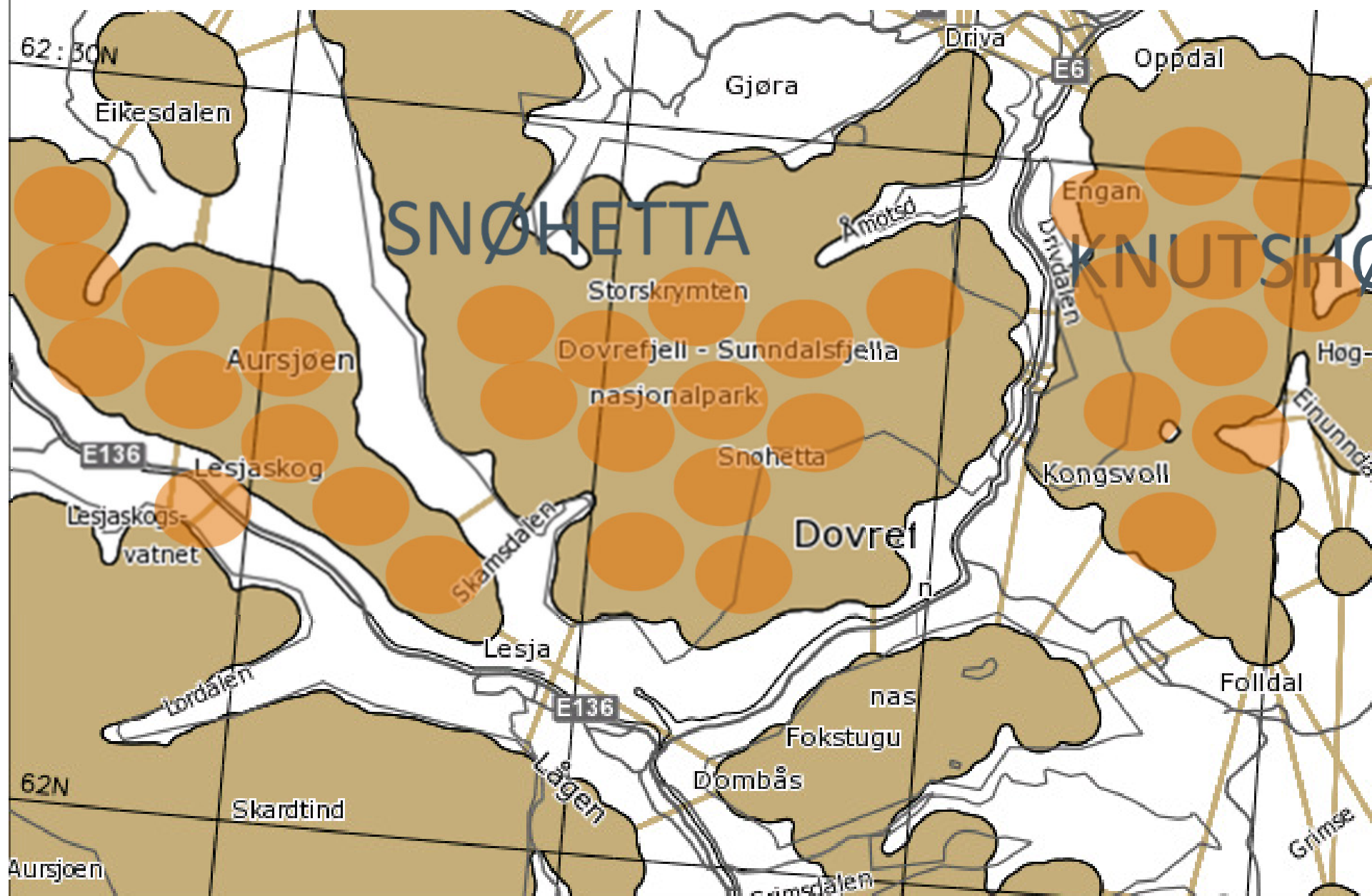
Area / 50 km² x 2

Area / 25 km² x 2

SUM

Minimum saturated population
size of the mountain fragment
(number of reproducing individs)

How many foxes could a mountain fragment host?



A photograph of an Arctic fox standing in a snowy, rocky landscape. The fox is facing left, looking towards the horizon. Its fur is a mix of brown, grey, and white, typical of its winter coat. The background is a soft, out-of-focus greenish-grey, suggesting a distant shoreline or a body of water under a pale sky. The foreground shows dark, jagged rocks partially covered in snow.

The Nature index of Norway – The Arctic fox

(Eide et al 2010)

The Nature index of Norway, Nybø 2010

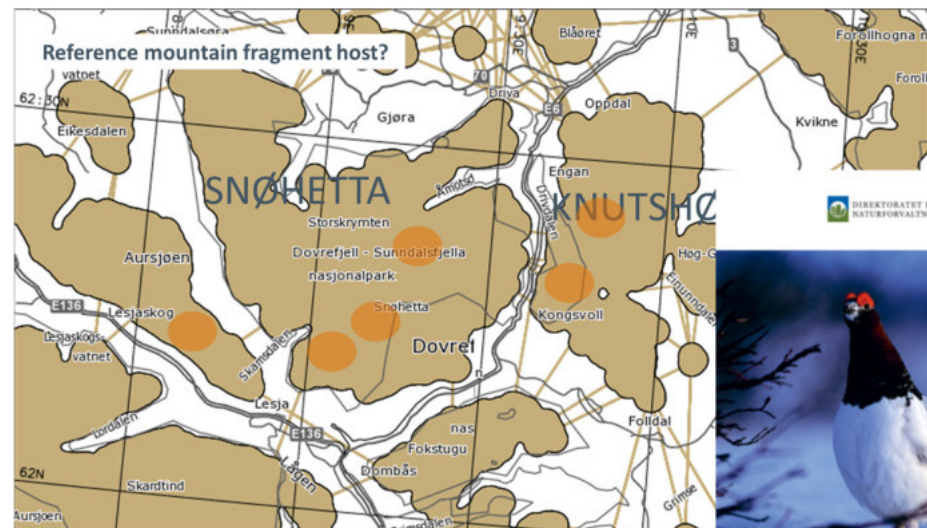
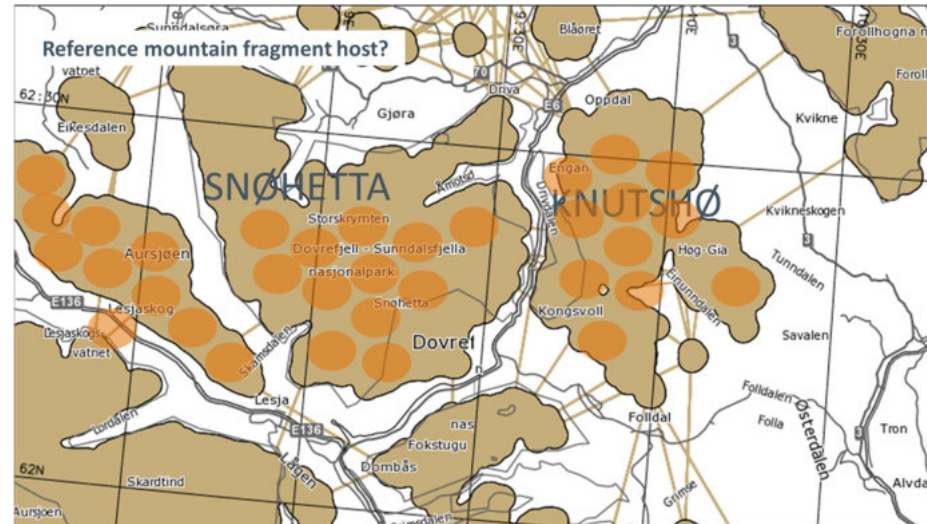
NI = Reference state
in a natural ecosystems

Conservation goals

Viable population

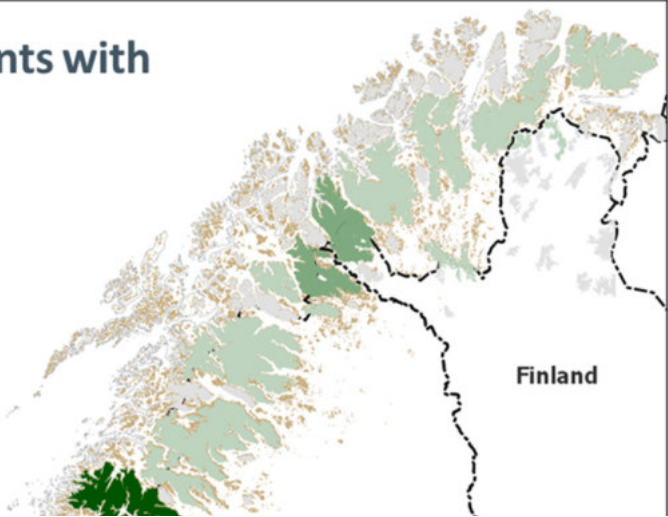
Critically endangered (CR)

Extinct population



© Naturinnsats 2010
Naturinnsats for Norge 2010

Mountain fragments with
arctic fox dens

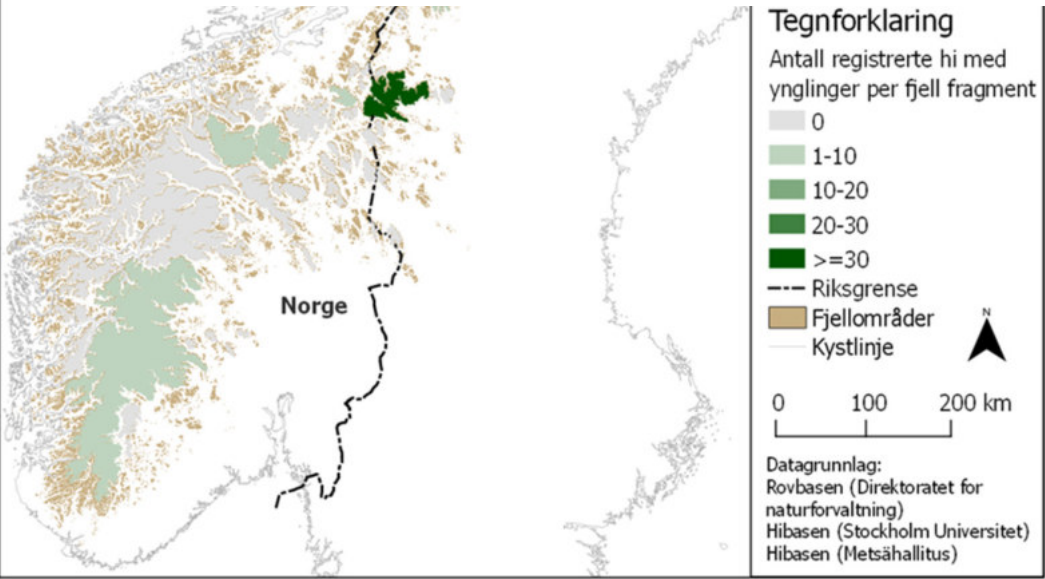


Sum of MAX Reprod ad HR 2X (use as K)	Sum of MAX Floaters HRx4	Sum of MAX PROD increase phase (HRx6)
1400,00	2800,00	4200,00
104,60	209,20	313,80
561,82	1123,64	1685,46
227,62	455,25	682,87
159,19	318,38	477,57
192,40	384,80	577,20
29,08	58,16	87,24

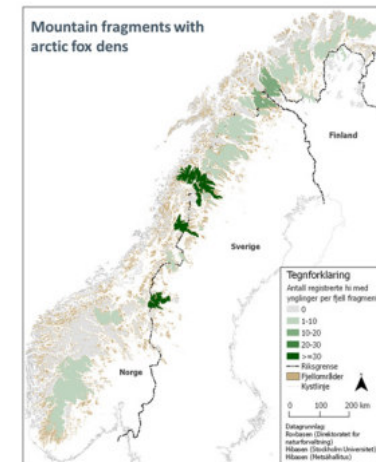
Number of reproductive foxes in saturated population 6745

Number of floaters that could respond 13491

Number of pups produced in lemming years 20337



9,60		
4,75		
0,08		
4,10		
9,64		
542,24	1084,48	1626,73
492,56	985,13	1477,69
268,95	537,90	806,86
624,66	1249,31	1873,97
85,81	171,61	257,42
3,41	6,82	10,23
4,00	7,99	11,99
6,07	12,15	18,22
341,89	683,79	1025,68
300,36	600,72	901,09
169,37	338,75	508,12
352,47	704,94	1057,41
6745,91	13491,81	20237,72



Carrying Capacity of each subpopulation

K



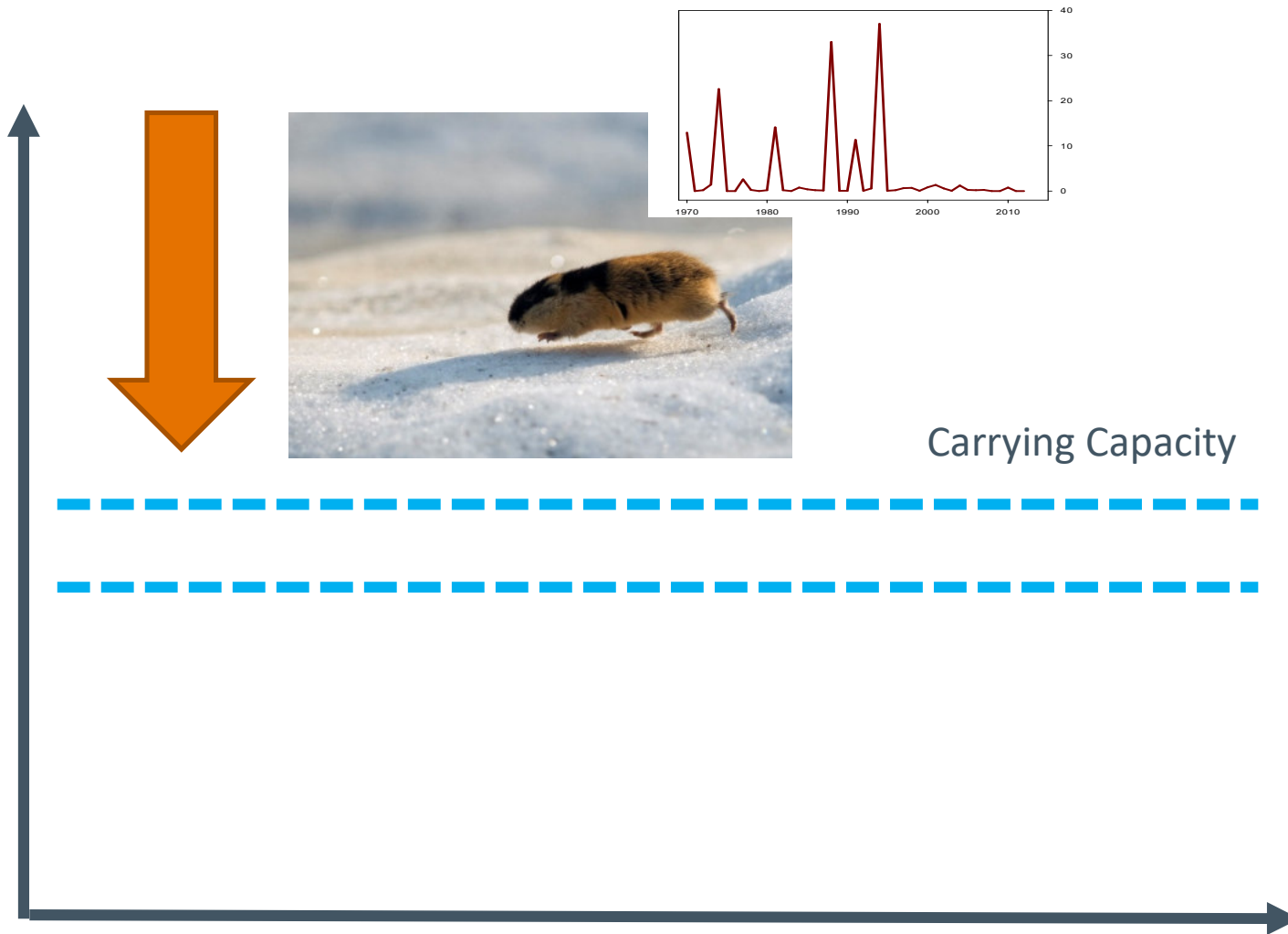




Foto: : Bård Bredesen





A tale of two foxes, Don Gutoski



Foto: Olav Strand

A young fox with brown and white fur stands alert on a rocky, grassy hillside. The background shows a blurred mountain range under a clear blue sky. The text "HOW FAR FORM REACHING K?" is overlaid in white capital letters on the right side of the image.

HOW FAR FORM REACHING K?

Foto: Anne-Mathilde Thierry

CR Critically endangered

national & regional
red lists



RAPPORT

M-794 | 2017

Handling

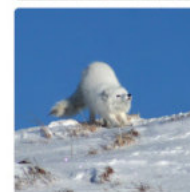
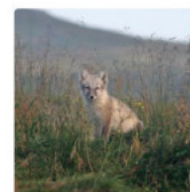
(*Vulpes lagopus*)
Norge – Sverig



Åtgärdsprogram
för fjällräv,
2017–2021

(*Vulpes lagopus*)

RAPPORT 6780 • JULI 2017

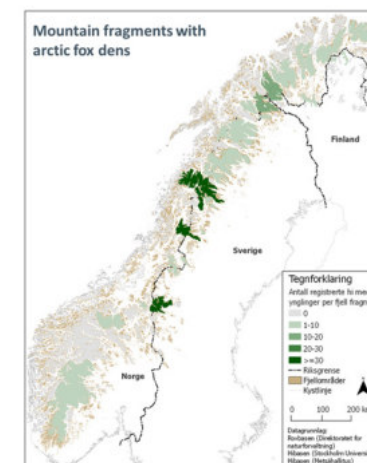


Fjellområde	Sum of MAX Reprod ad HR 2X (K)	Sum of MAX Floaters HRx4	Sum of MAX PROD increase phase (HRx6)
Finse (NO), Hardangervidda (NO)	1400,00	2800,00	4200,00
Rondane (NO)	104,60	209,20	313,80
Ottadalen Nord (NO)	561,82	1123,64	1685,46
Knutshø (NO), Snøhetta (NO) 	227,62	20 breedings 2014	
Forollhogna (NO)	159,19	318,38	477,57
Helags (SE) Sylan (NO) Kjølifjellet (NO) 	192,40	33 breedings 2015	
Funäsdalen (SE)	29,08	58,16	87,24
Blåfjellet (NO), Sösjöfjällen (SE) Hestkjølen (NO) Hotagen (SE) Skjækerfjella (NO)	146,53	293,07	439,60
Børgefjell (NO), Borgafjällen (SE) Södra Storfjället (SE)	228,25	456,50	684,75
Artfjellet (NO), Artfjellet (SE),	26,69	53,39	80,08
Saltfjellet (NO), Junkeren (NO), Arjeplog (SE), Vindelfjällen (SE), Norra Storfjället (SE)	461,37	922,73	1384,10
Oviksfjällen (SE)	16,55	33,09	49,64
Padjelanta (SE), Sarek (SE),	542,24	1084,48	1626,73
Sitas (NO), Sitasjaure (SE), Indre Troms (NO)	492,56	985,13	1477,69
Indre Troms (NO), Råsto (SE)	268,95	537,90	806,86
Käsivarsi (FI), Reisa Nord (NO), Reisa Sør (NO)	624,66	1249,31	1873,97
Pöyrisjärvi (FI), Anarjohka (NO),	85,81	171,61	257,42
Andre områder i Sør Norge (NO)	3,41	6,82	10,23
Sjaunja (SE)	4,00	7,99	11,99
Väretsfjället (SE)	6,07	12,15	18,22
Porsanger Vest (NO)	341,89	683,79	1025,68
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Grand Total	6745,91	13491,81	20237,72

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Grand Total	6745,91	13491,81	20237,72

17 % to K

34 % to K



Carrying Capacity of each subpopulation

K

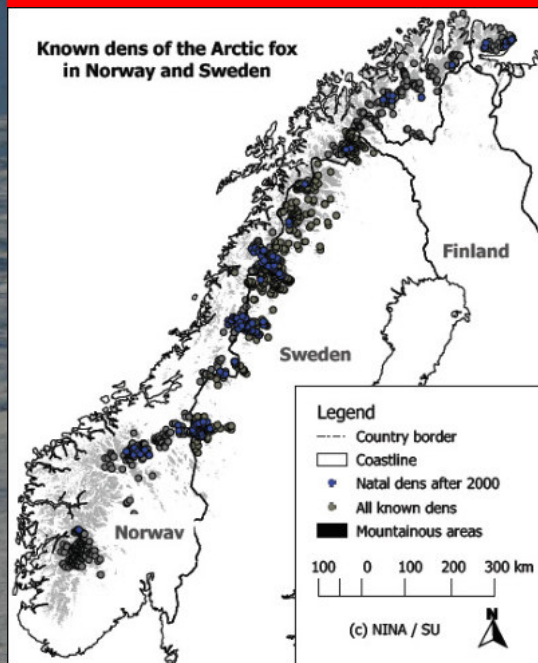


Viable populations = mission completed

MVP



Minimum viable
population
500



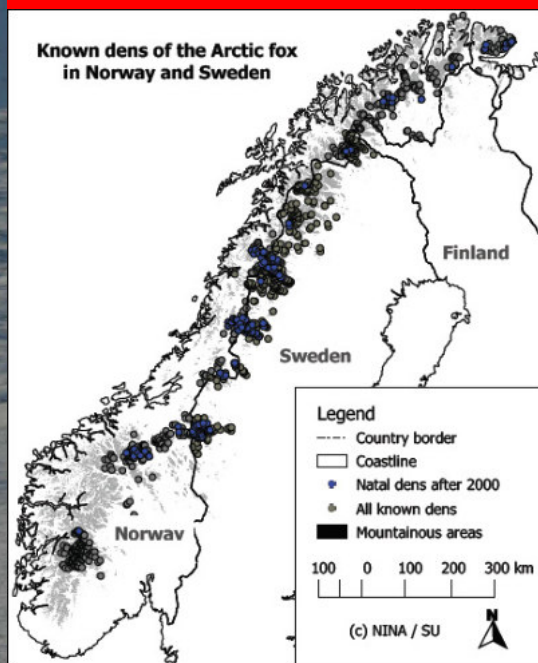
Robust
viable population
2000

Defining goals for the practical conservation work and arctic fox i Scandinavia (action plan)

Flagstad, Bruford *in prep.*

Foto: Lars Liljemark

Minimum viable
population
500



Robust
viable population
2000

2015 – 200 individuals
2019 – 358 individuals
2023 – 640 individuals

8-10 yrs

AVERAGE GROWTH RATE OF SUB POPULATIONS GIVEN TO DAYS
INTENSITY OF CONSERVATION EFFORTS

No Actions	1,09
Red fox culling	1,18
Red fox culling and feeding	1,99
Captive release	2,89

1,79

2027 – 1145 individuals
2031 – 2050 individuals

16-20 yrs

- **How did the focus on the threatened species in your case study originate?**

Action plan for the critically endangered species, non-governmental engagement for the species as well as personal engagement among researchers

- **Does the conservation initiative apply to ecosystem-based management?**

No and Yes. From management authorities little focus on ecosystem-based management (single species focus), but national monitoring programs on other species fill in, and many research initiatives extend to what could become a ecosystem management.

- **When and how did an ecosystem perspective appear?**

In the research environment this perspective has always been there. The new action plan spell it out, but not yet in truly handed in practice (drivers)

- **What did or what could an ecosystem-based approach add with regard scientific understanding? And with regard to management?**

Having focus on ecosystem-based management would indeed give quicker results (increase in the population of the threatened species), and also more lasting results.

- **Did the case benefit from the species-specific focus?**

To raise funding and interest yes, and there is very little conflicts that make obstacles for conservation measures. And the case of the arctic fox is a scholar example which make it easy to explain the complexity of an ecosystem.

CUMULATIVE IMPACT (SAMLET BELASTNING)

WP 1 - Forest expansion

Climate change

WP2 Boreal invasion

Grazing pressure (livestock)

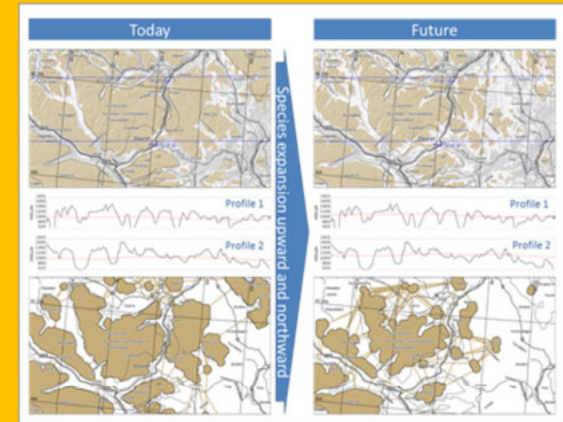
WP3 Alpine retreat

Human development
(infrastructure, land use)

WP4 Fragmented landscapes

Active species management
(large carnivores, ungulates)

WP5 What is the future of
Fennoscandian Mountains?



ECOFUNC (2015-2019)

