



***Reintroduction of the otter:
hidden life revealed by non-
invasive genetic monitoring***

Alterra, Centre for Ecosystems

Hugh Jansman

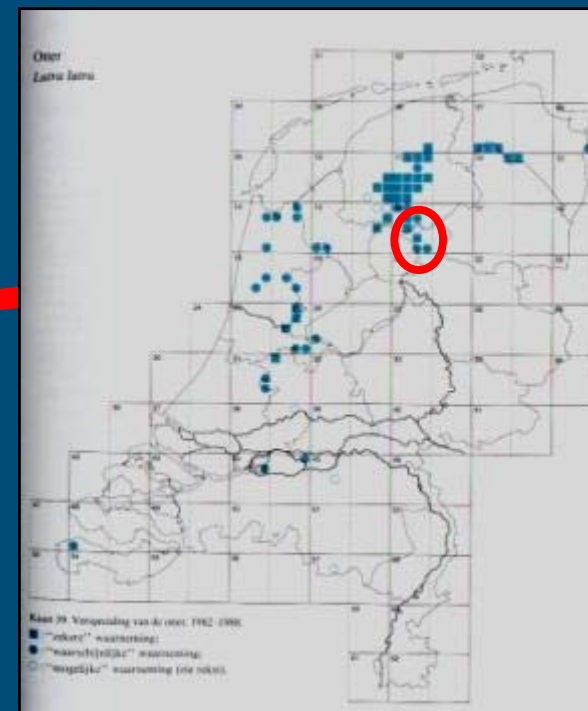
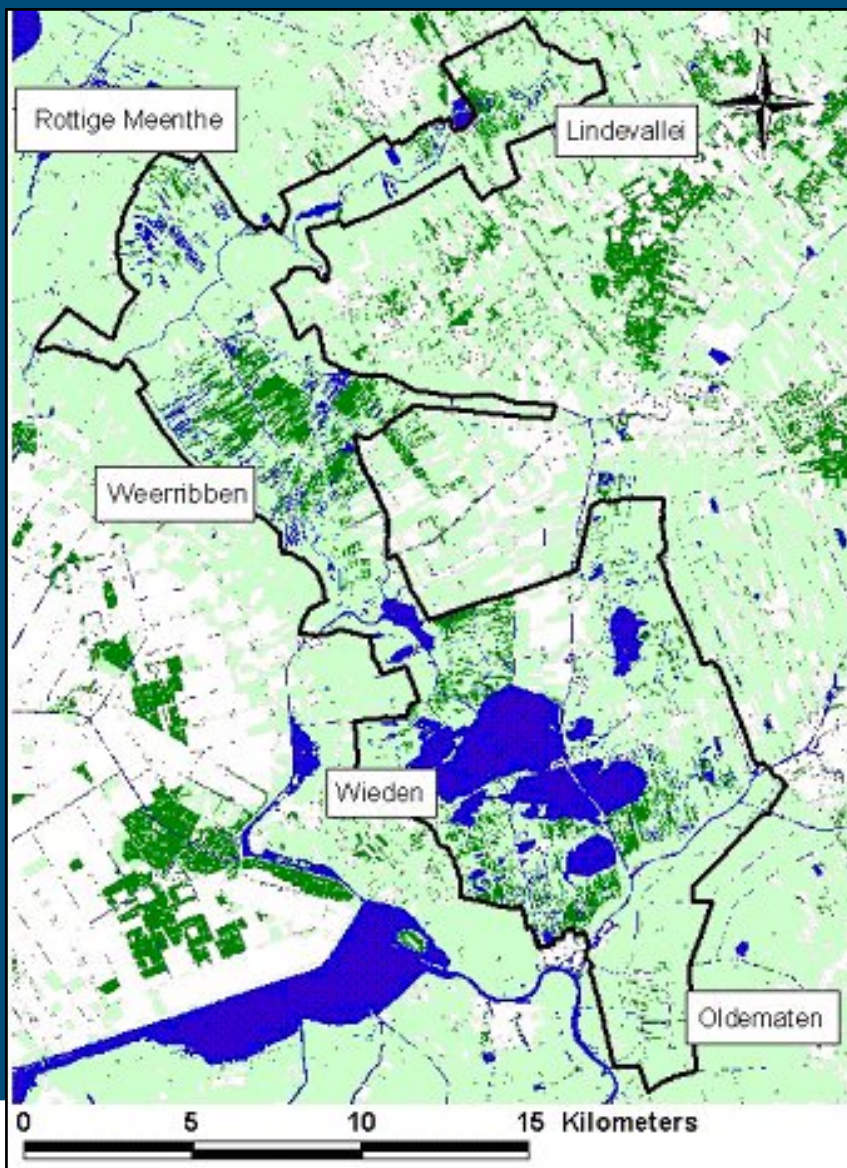
Freek Niewold

Dennis Lammertsma

Hans Peter Koelewijn

Loek Kuiters

Re-introduction area (~200km²)



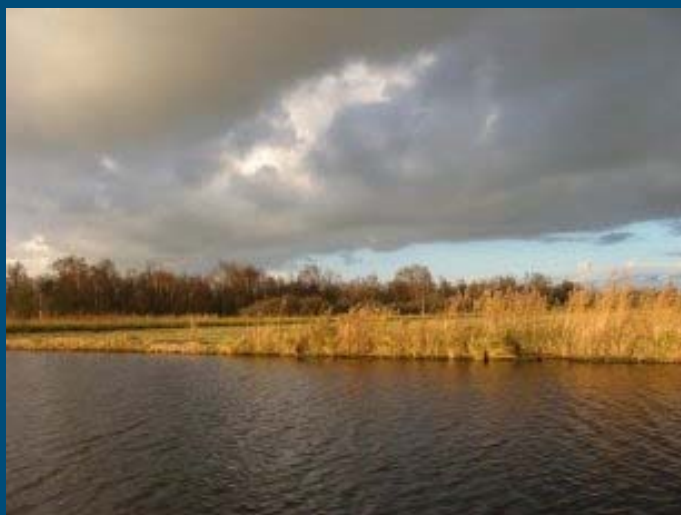
**Distribution area of the
Otter in The
Netherlands (1982-1988)**

(from: Broekhuizen *et al*,
1992)



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Re-introduction area



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Reintroduction

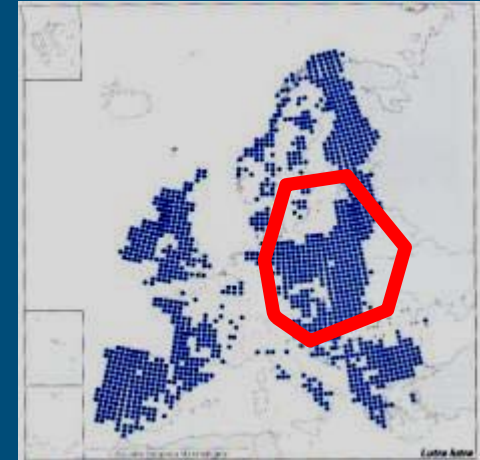
Otter extinct in NL in 1988

2002: start reintroduction (plan: 40 otters in 4-6 years)

2002-2008: 31 otters released

- *Caught: Latvia, Belarus, Poland*

- *Bred (EEP) / rehabilitation: Czech republic, Sweden, Russia, Germany*



	Males	Females	total
Wild caught	5	12	17
Captive bred / rehabililtation	6	8	14
total	11	20	31

Monitoring

Goal: how are the animals doing?

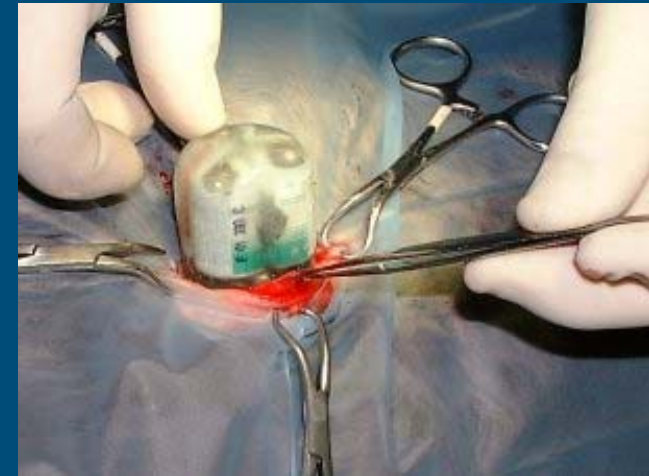
- **Location**
- **Home range / habitat use**
- **Reproduction / PCB's**
- **Bottlenecks > adjust**

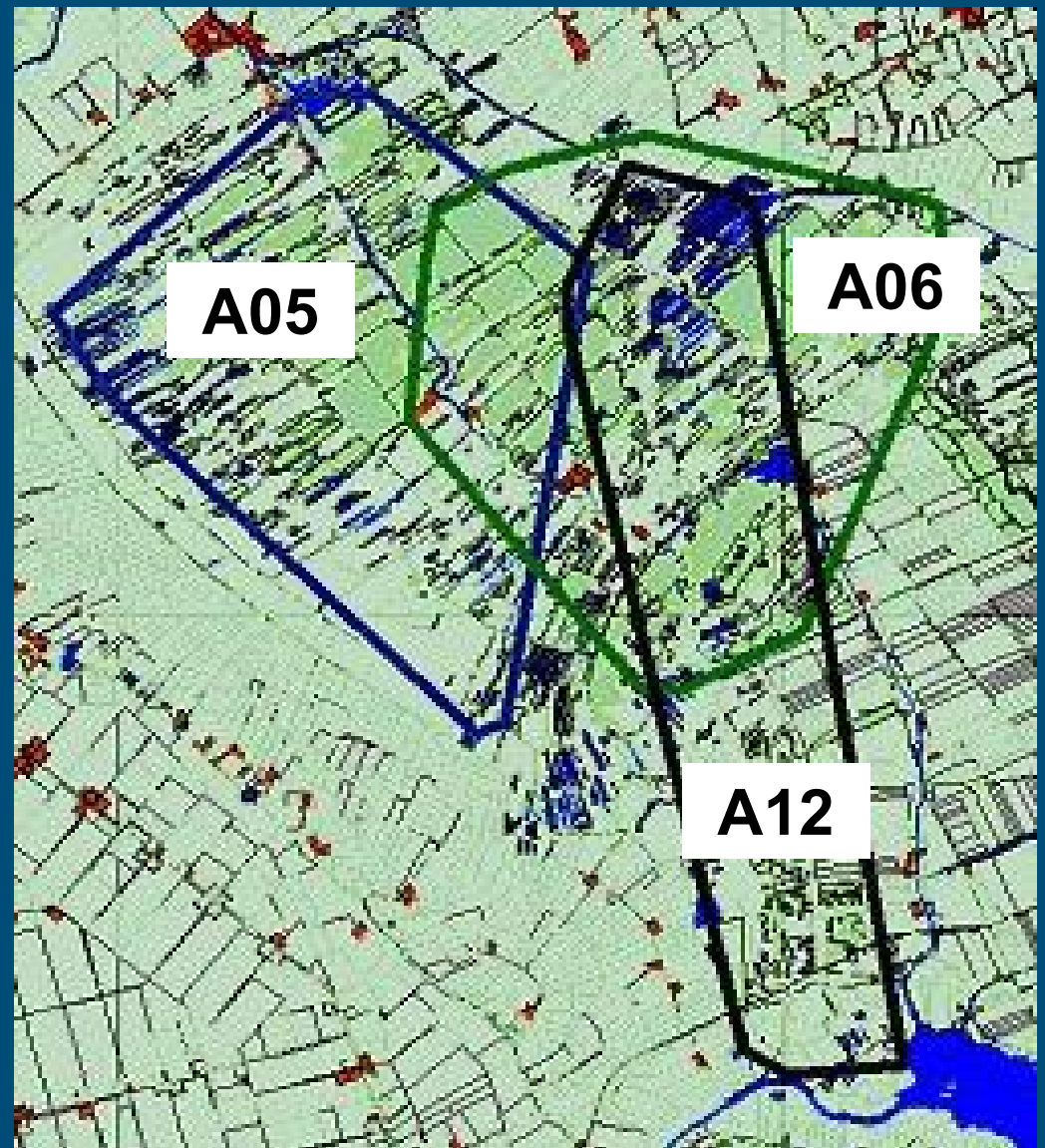


Transmitters:

- duration ~1 year
- range ~1 km

→ actual location
& status (life-dead)





Newborn

NB1 ♂

NB2 ♀

NB3 ♂

NB4 ♀

NB7 ♀

Parentals

(A01*A05)

(A03*A12)

(A03*A12)

(A02*A06)

(A03*A12)

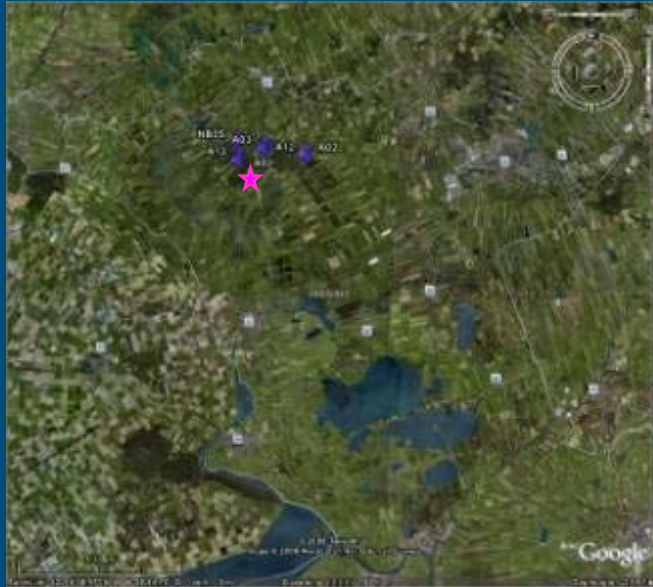
Female otters

Male otters

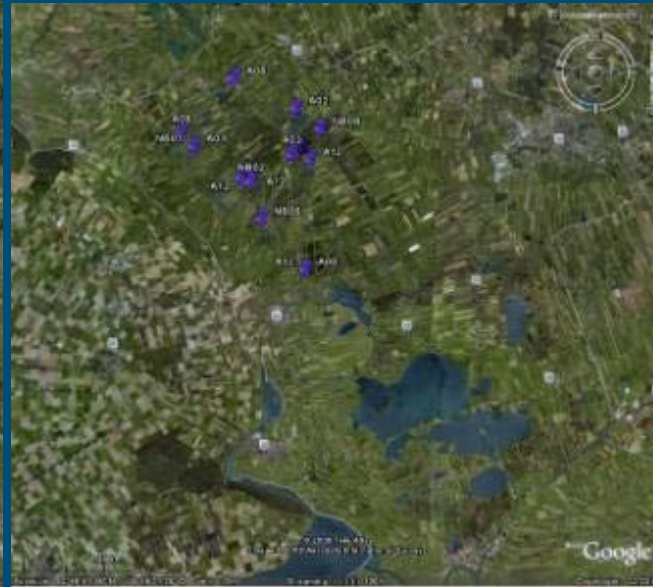
Genetical monitoring

15 otters released
in NP Weerribben
in 2002

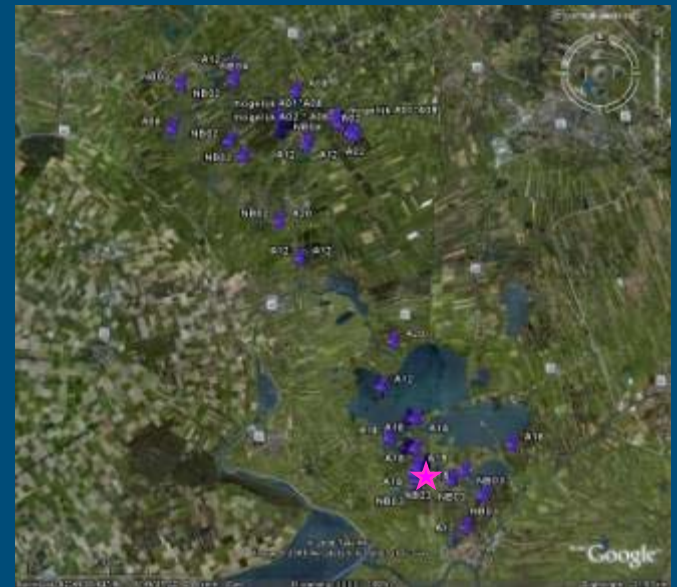
6 otters released
in NR de Wieden
in 2004



2002-2003



2003-2004



2004-2005

★ ~Release site



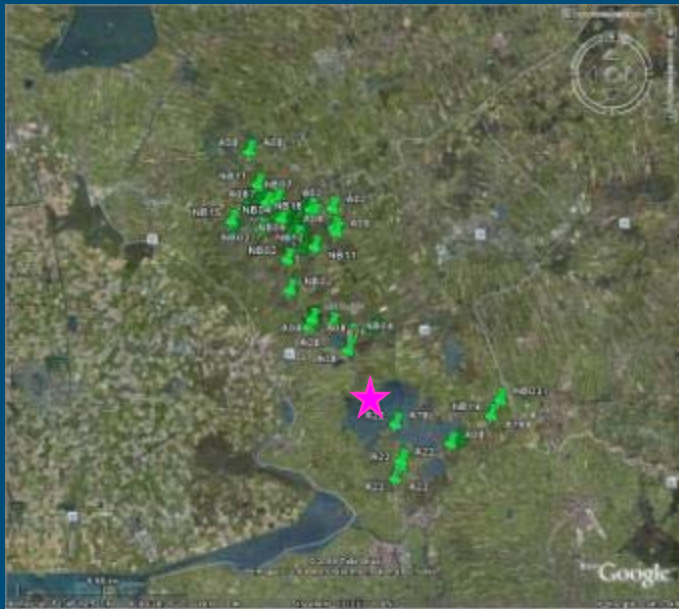
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Genetical monitoring

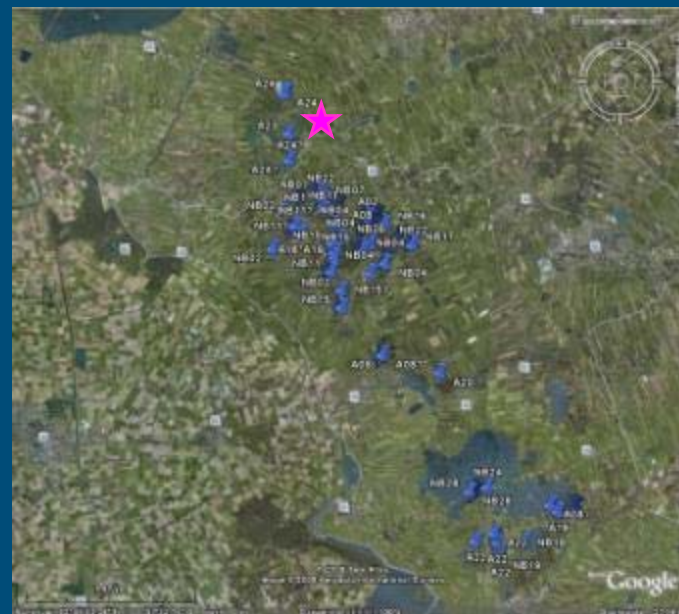
2005: 2 otters supplemented in NR Wieden

2006: 3 otters supplemented in NR Rottige Meente

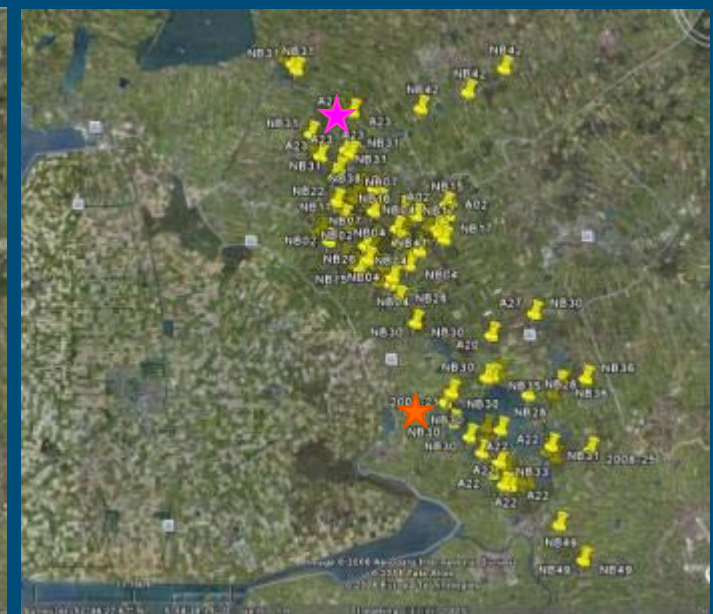
2007: 3 otters supplemented in Rottige Meente



2005-2006



2006-2007

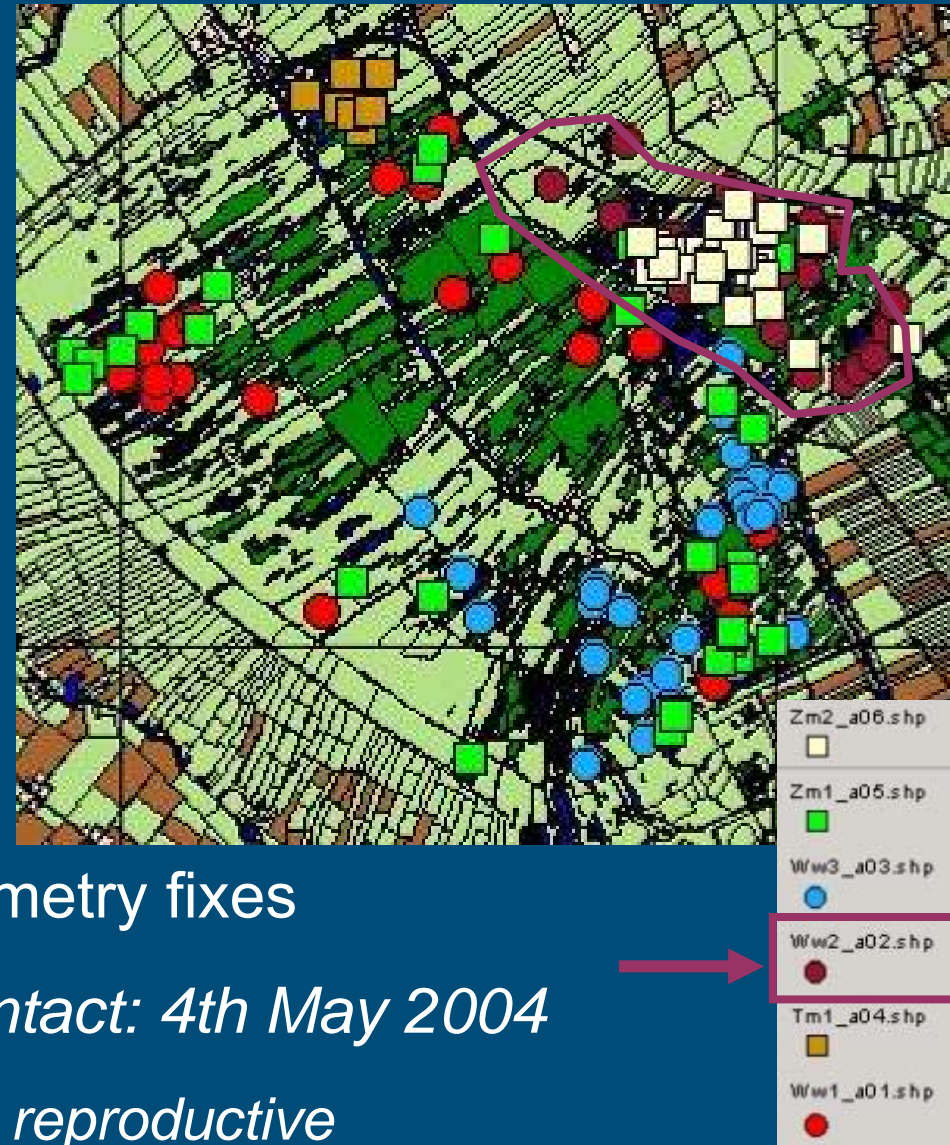
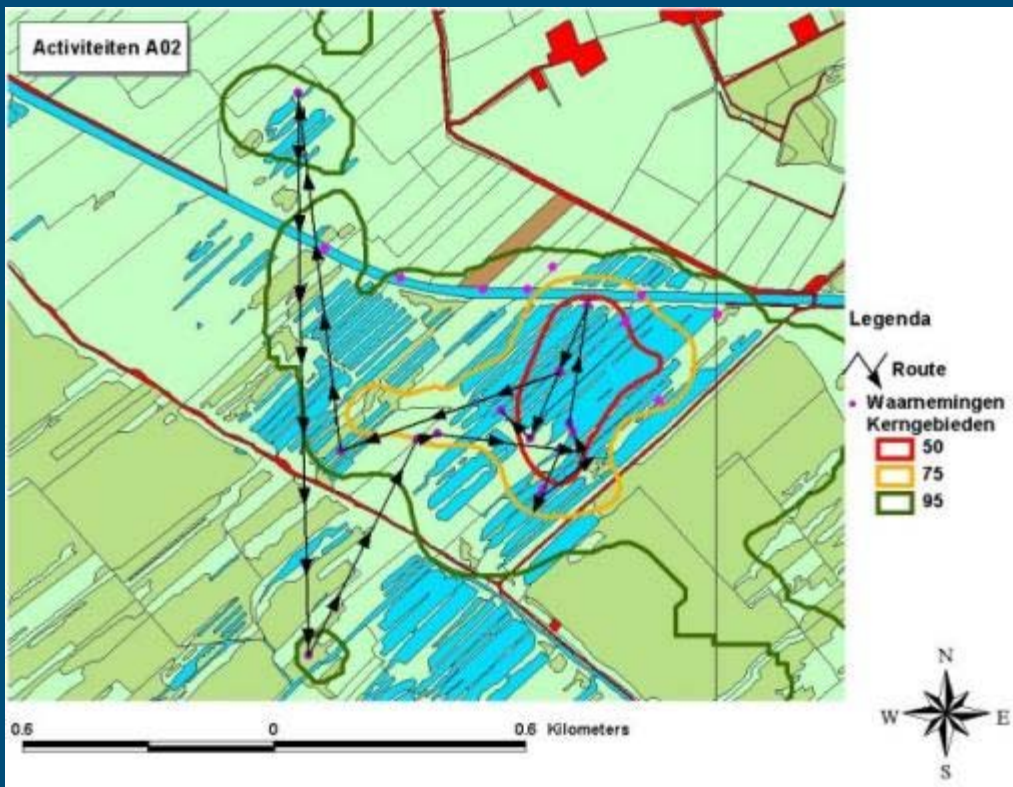


2007-2008

★ ~Release site

★ 2008: + 2 otters

Female A02 2002-2004: telemetry



Home range of A02 based on radio-telemetry fixes

Released: 7 July 2002; last radio contact: 4th May 2004

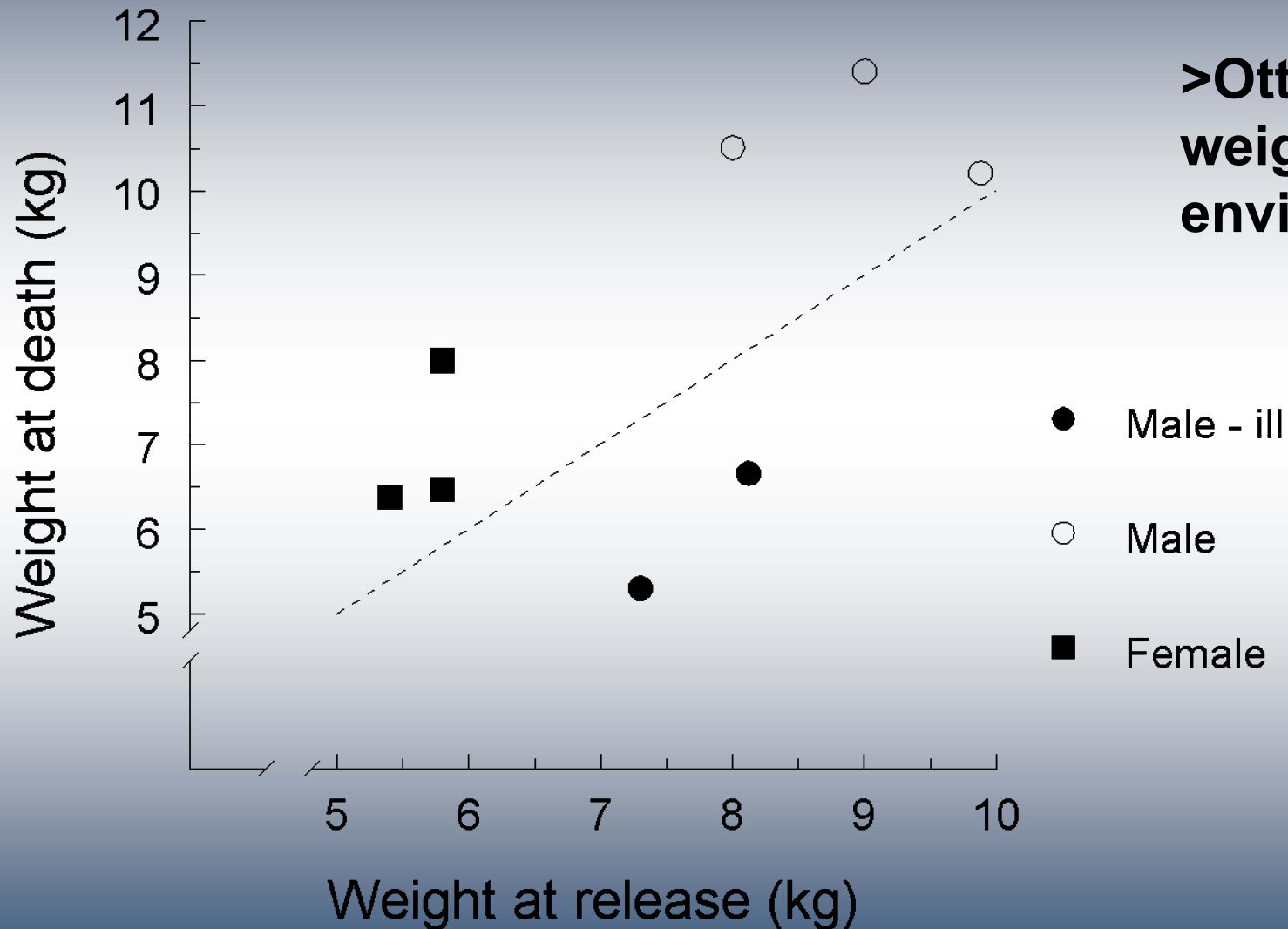
Season 2007-2008: still present & probably reproductive

Cause of death

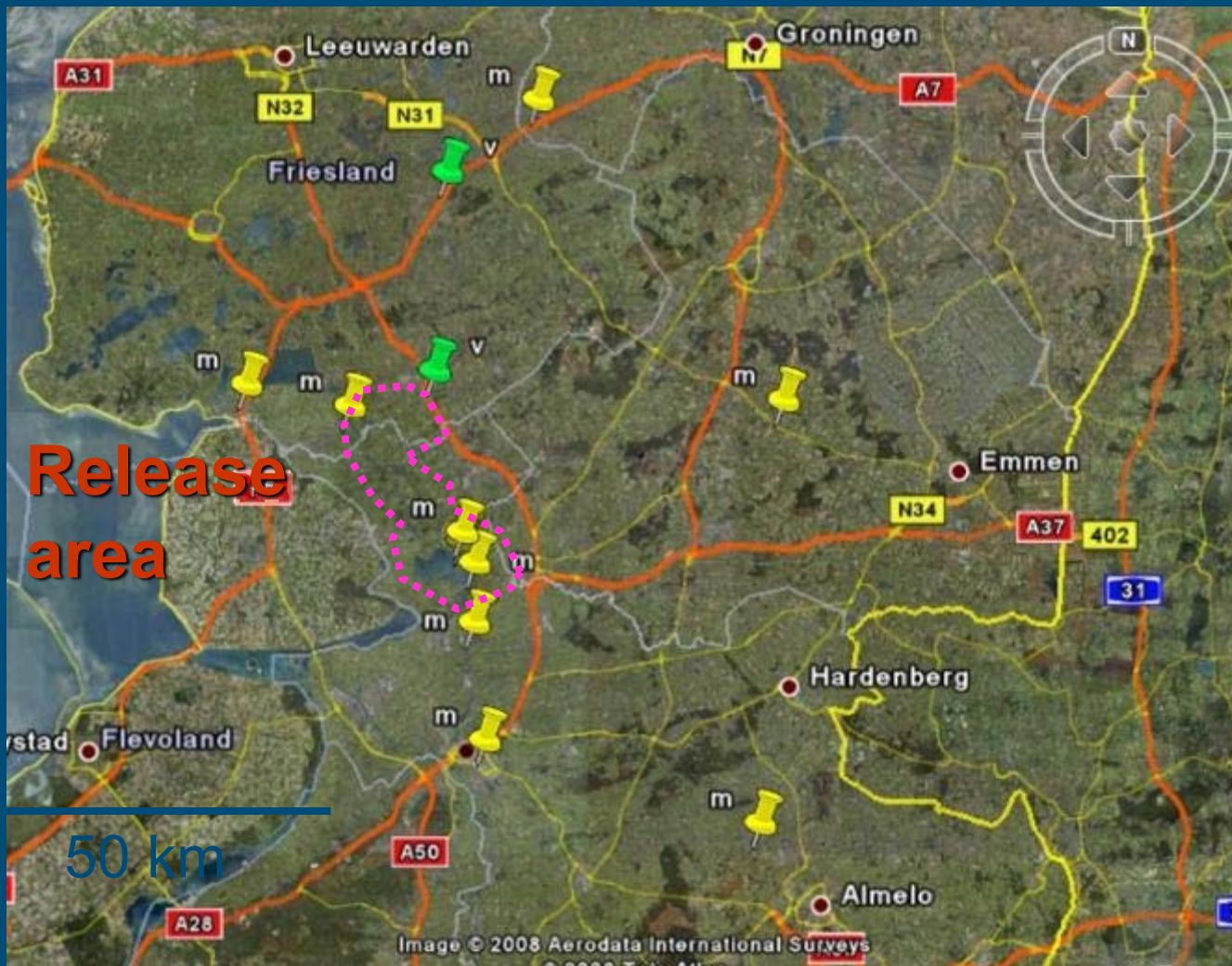
Traffic	28 _{20nb +8}
Dissease	2
Bite-wound (dog / fox / otter ??)	1
Drowning	2
Muskrat trap	1
Fyke	0
Unknown	1
Total	35



Weight



Dispersal & mortality of newborns



Resident 8 : 3

Dead 2 : 9

Missing 3 : 3

Total 13 : 15

Data januari 08



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% success

		3 months after release				1 year a.r.
Category	released	Settled	Dispersed	Death	Tame / recaught	mortality
Wild caught	17	47% (8)	47% (8*)	6% (1)	-	41% (7)
Rehab. EEP	12	67% (8)	8% (1)	8% (1)	17% (2)	42% (5)

** Most >3 years of age at release*



Genetical monitoring

Communication via Spraints

—→ ~easy to find

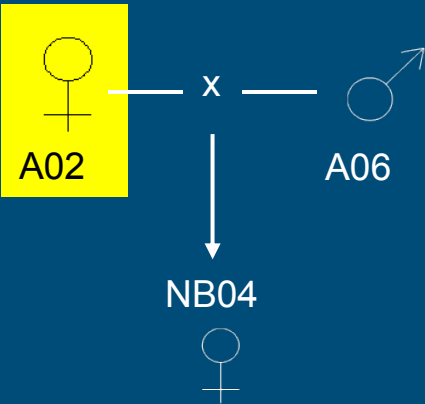
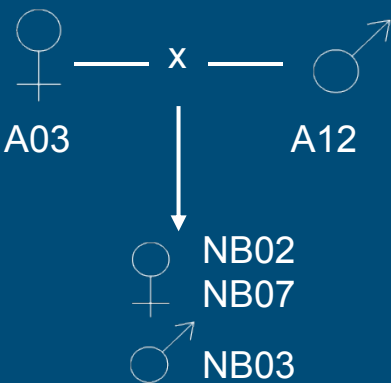
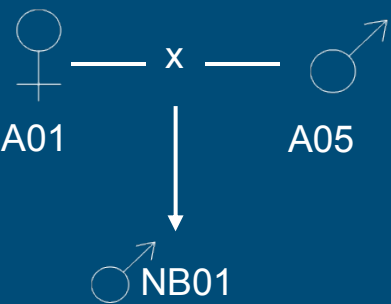
Sampling period: October-March



- Otter specific DNA primers
- ~60% success rate
- *Correction for FA & ADO*



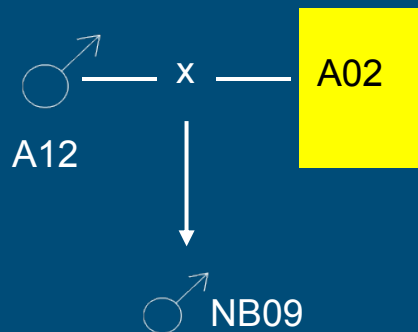
Relations – 2003



2003



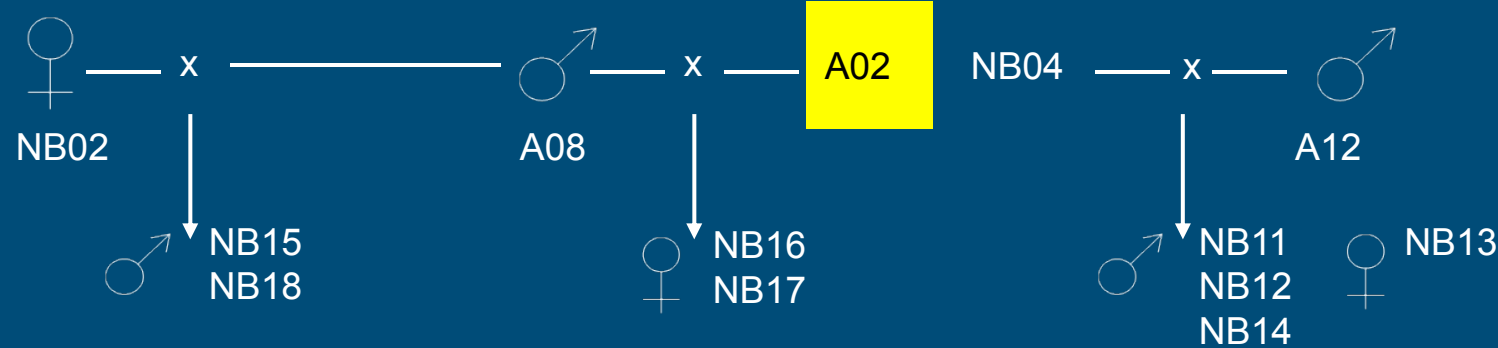
Relations - 2004



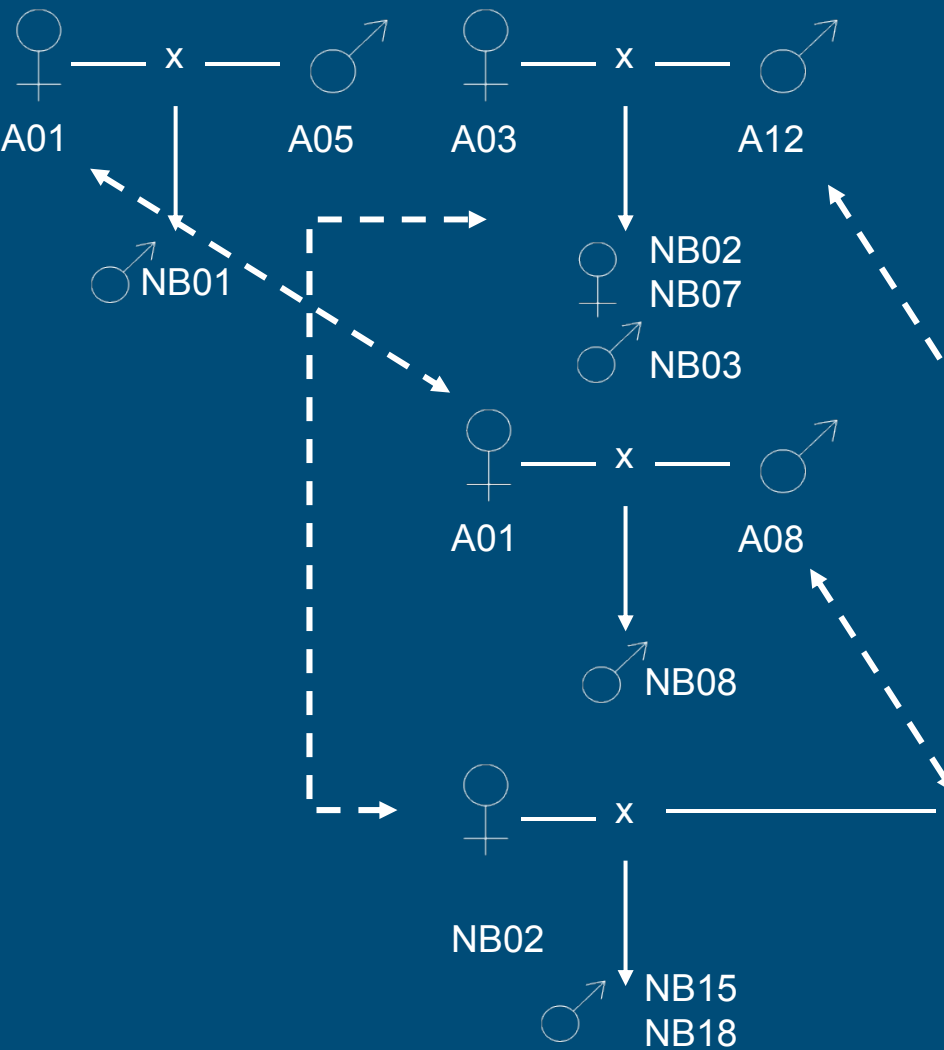
2004



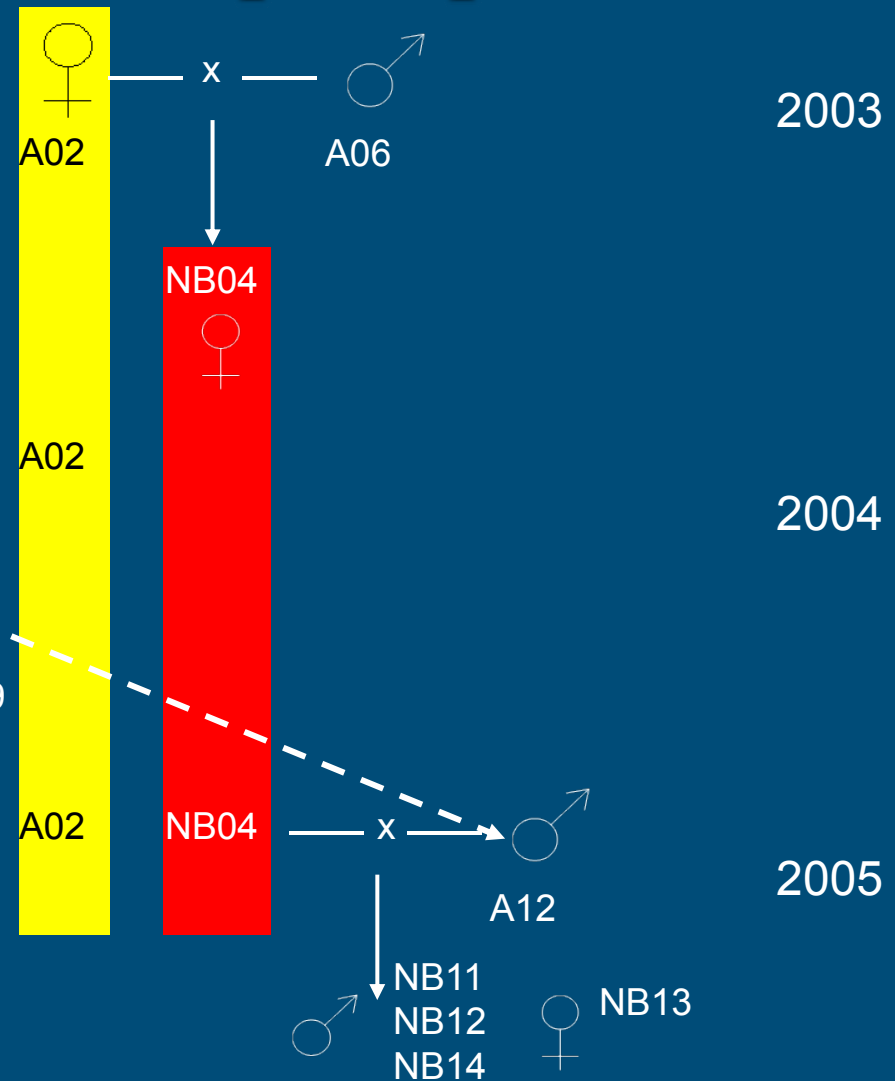
Relations - 2005



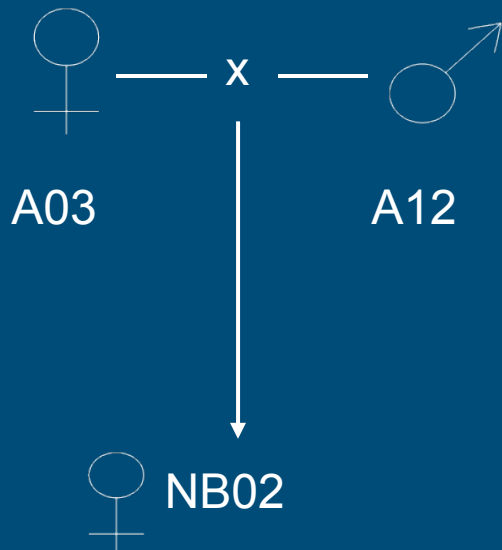
Mating structure



Complex pattern



Determinating cubs



A03 & A12: released 2002



Spring 2004: young NB02 detected

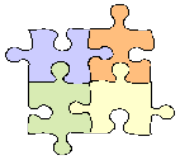
Summer 2004: A03 dies in traffic: 3 placenta scars (~3 young born)

♀ NB07

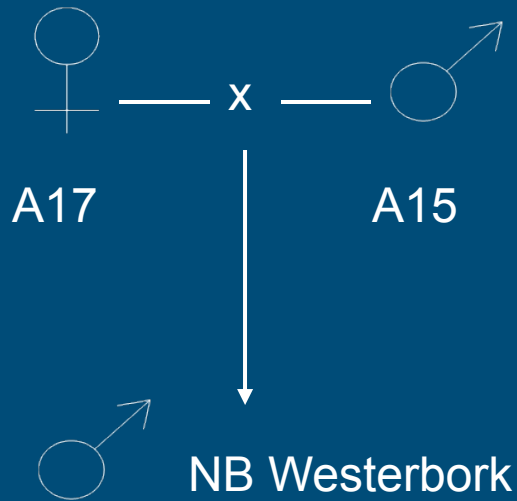
Spring/summer 2005: NB07 and NB03 detected

♂ NB03

> Difficult to detect young otters!



To solve the Puzzle!



June 2004: A15 & A17 released

31-08-'04: A15 dead (traffic)

30-04-'05: A17 dead (traffic)

7-12-'05: dead otter at Westerbork

➤ ~10 kg weight!

➤ Sexually mature!

Mating must have been in juli/august 2004

> Otter is ~13-15 months old



Genetical monitoring

2007-2008:

Spaints:
313 analysed
63% success

Detected:
6 original (Axx)
33* newborns

* Underestimated due to
incomplete profiles etc

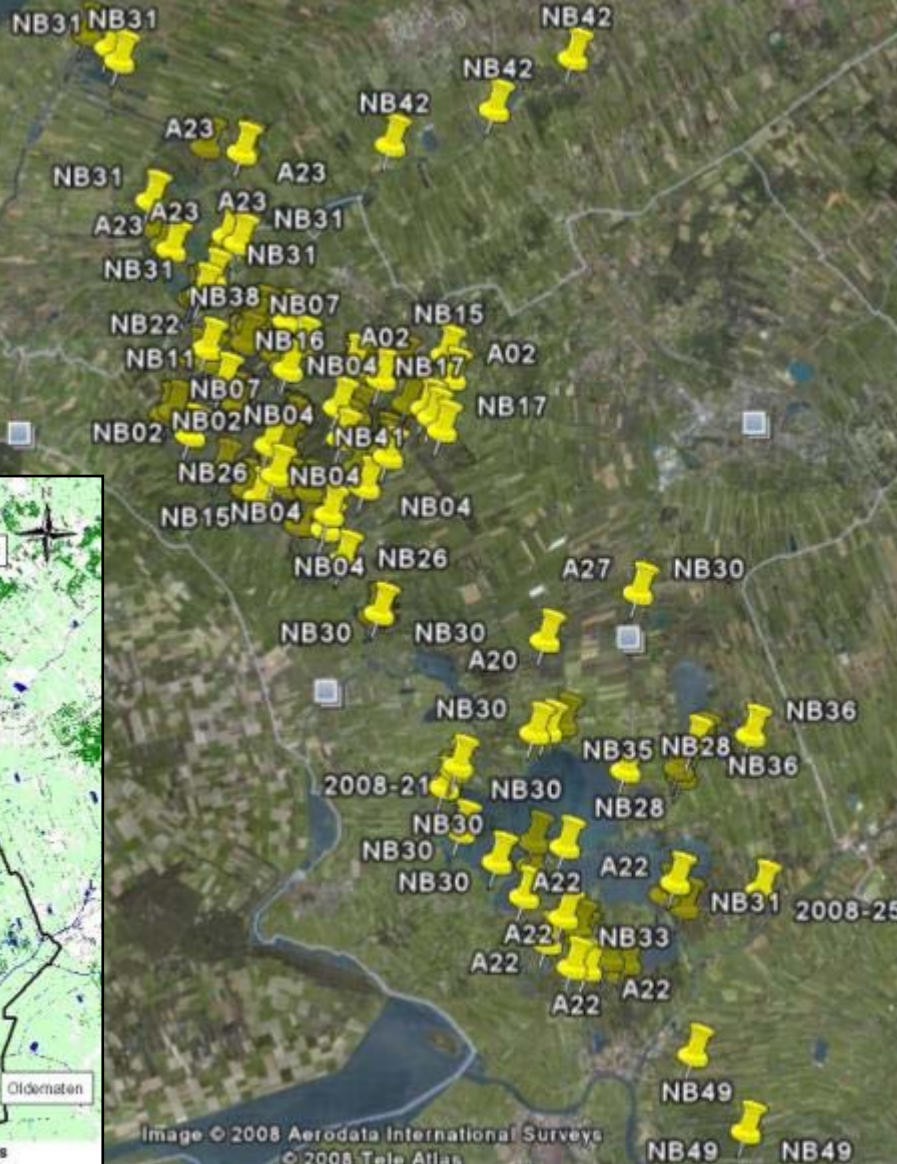
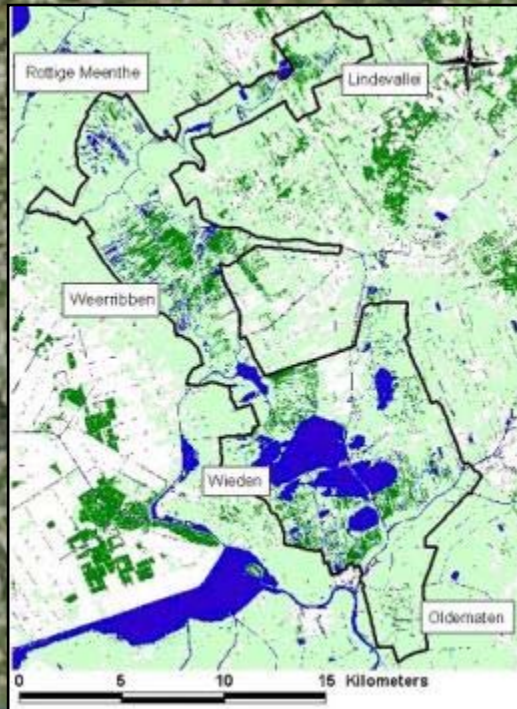


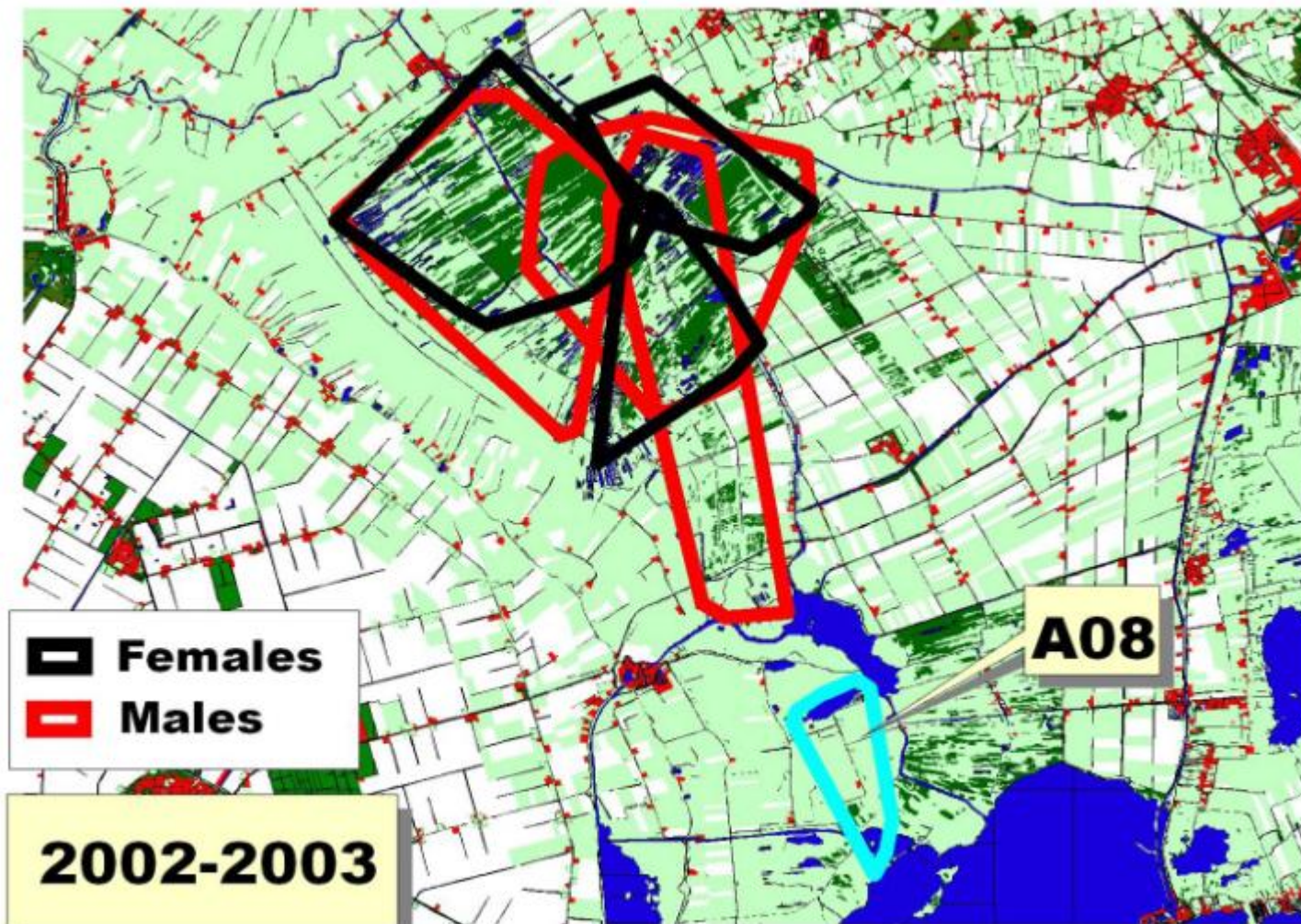
Image © 2008 Aerodata International Surveys
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Distribution

2002-2003



Initial release :

Adults

Male - 4

Female - 7

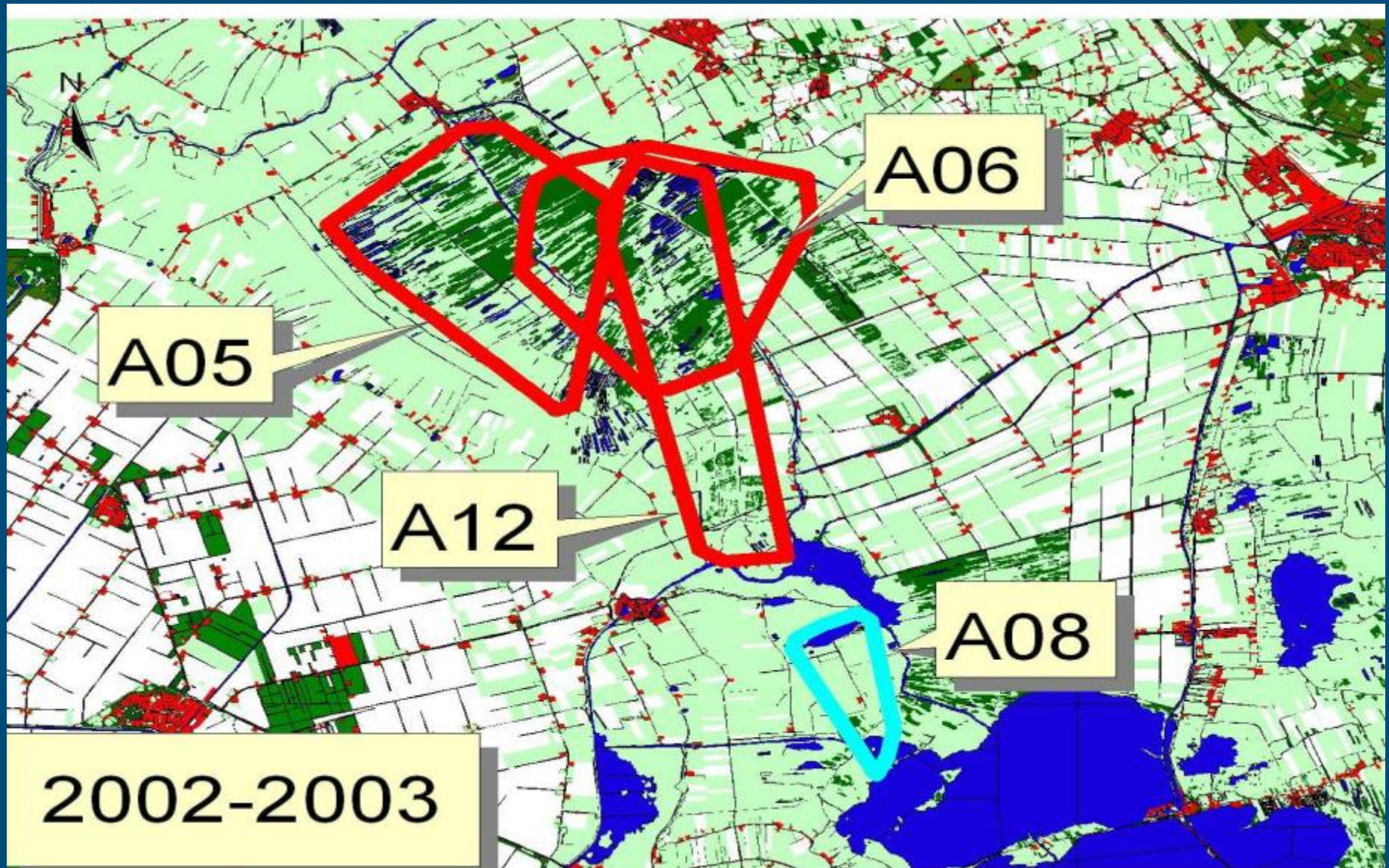
Juveniles

Male - 1

Female - 3

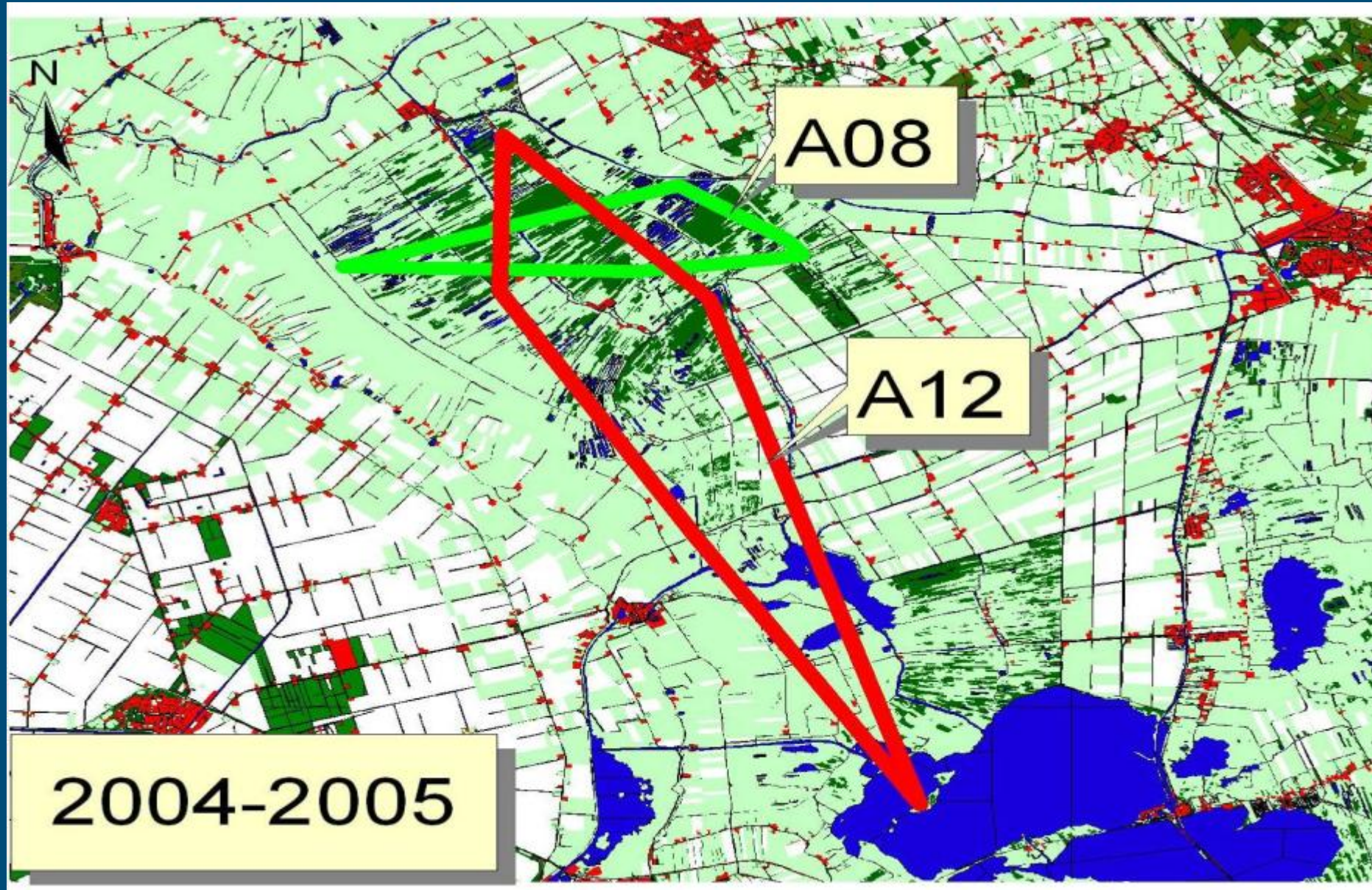
Distribution

A08



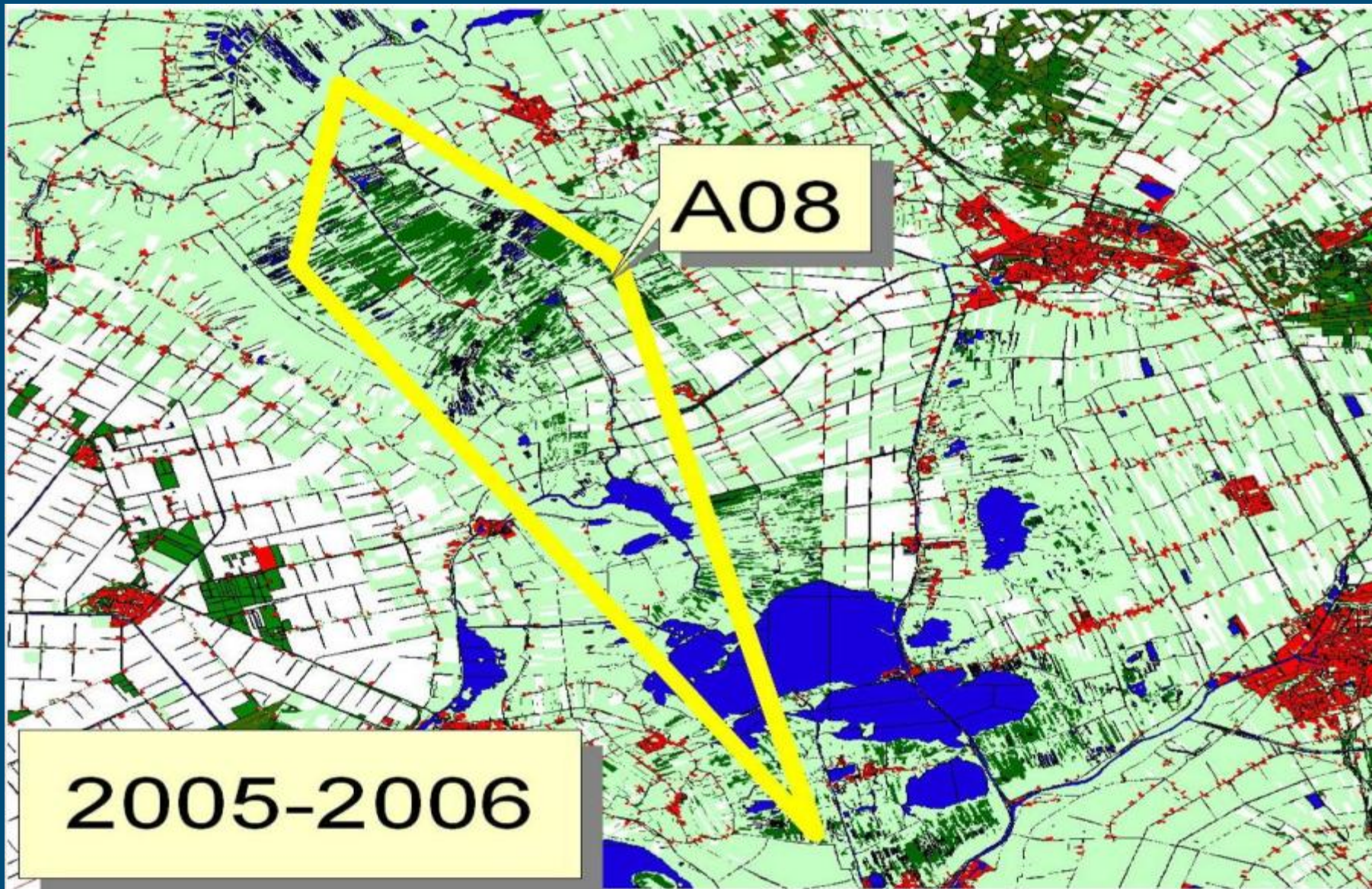
Distribution

A08



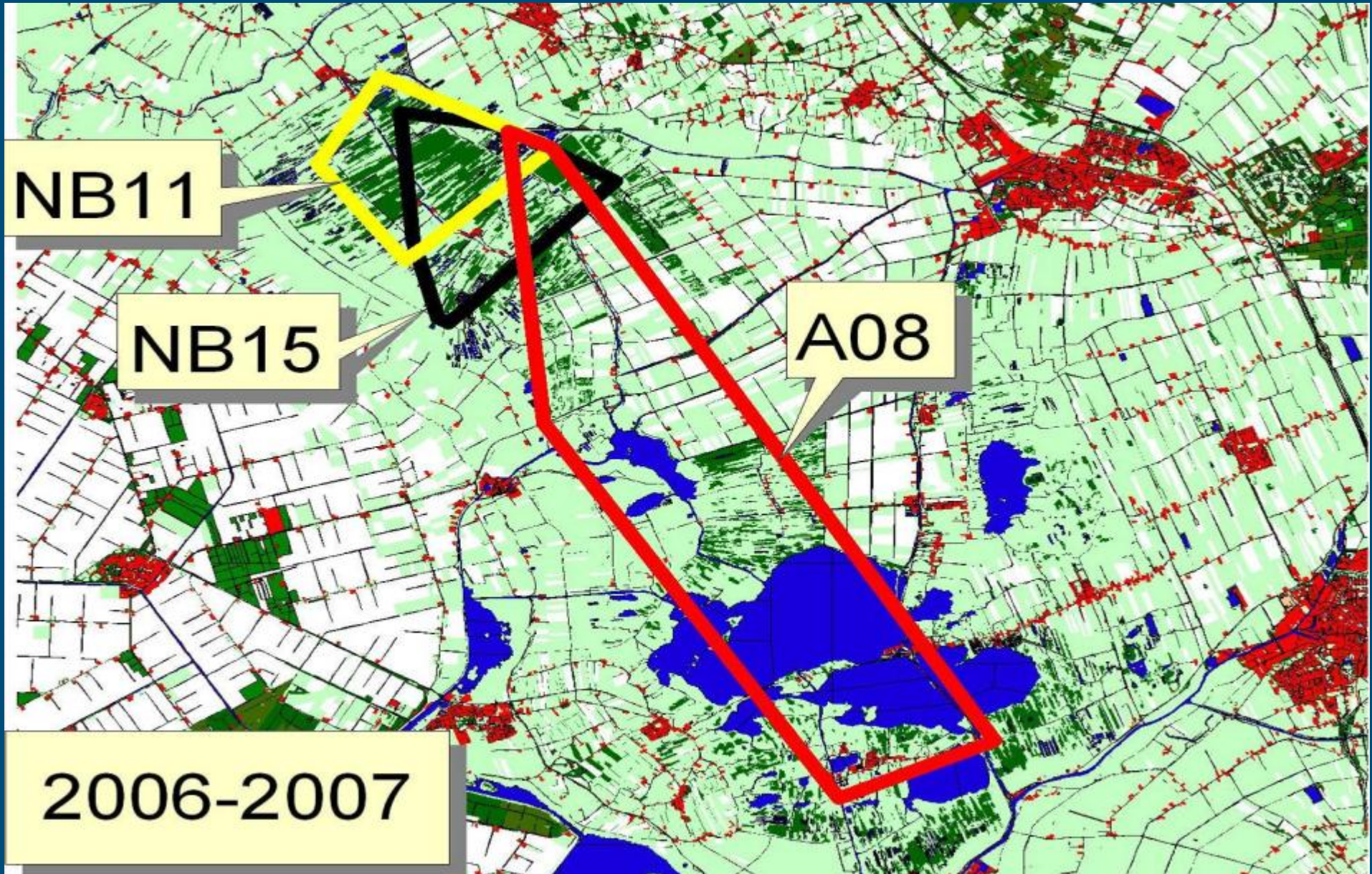
Distribution

A08

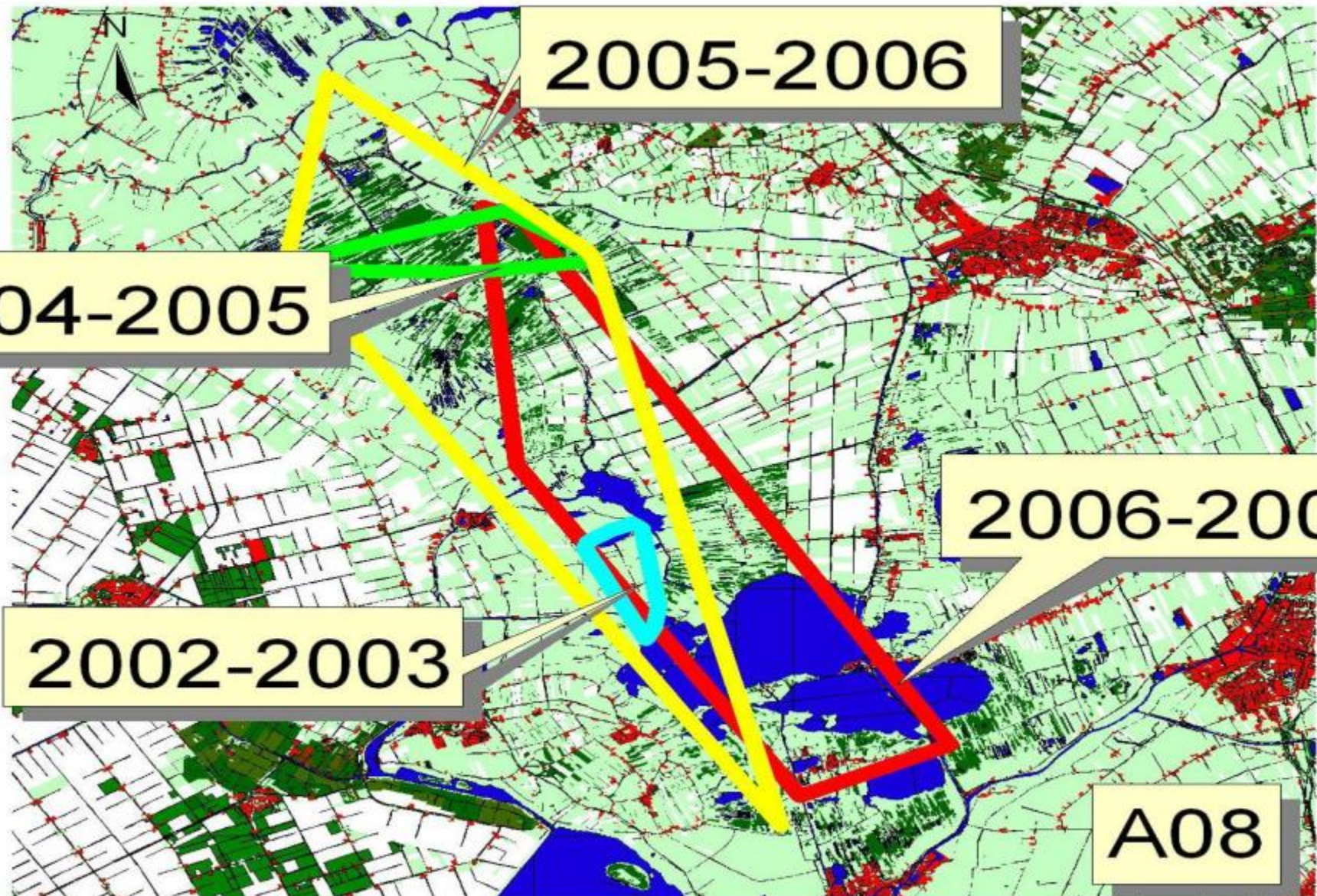


Distribution

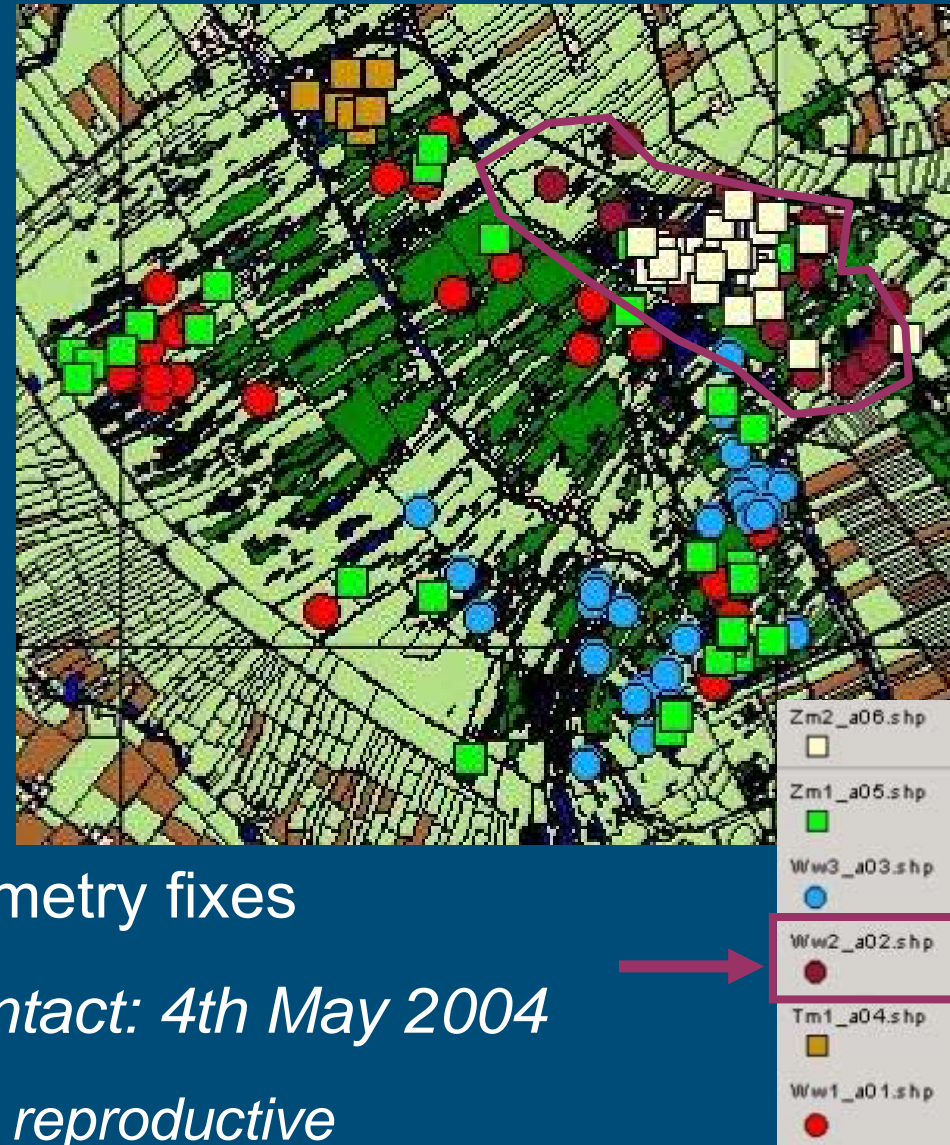
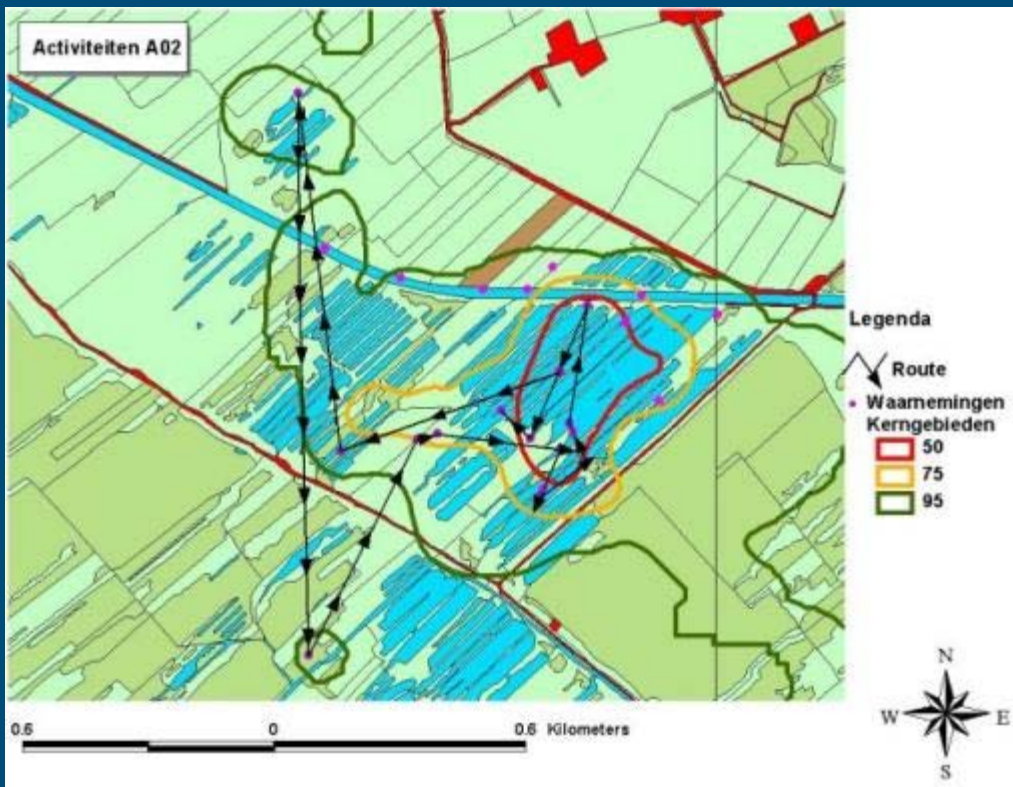
A08



A08 - Dynamics of territory size



Female A02 2002-2004: telemetry

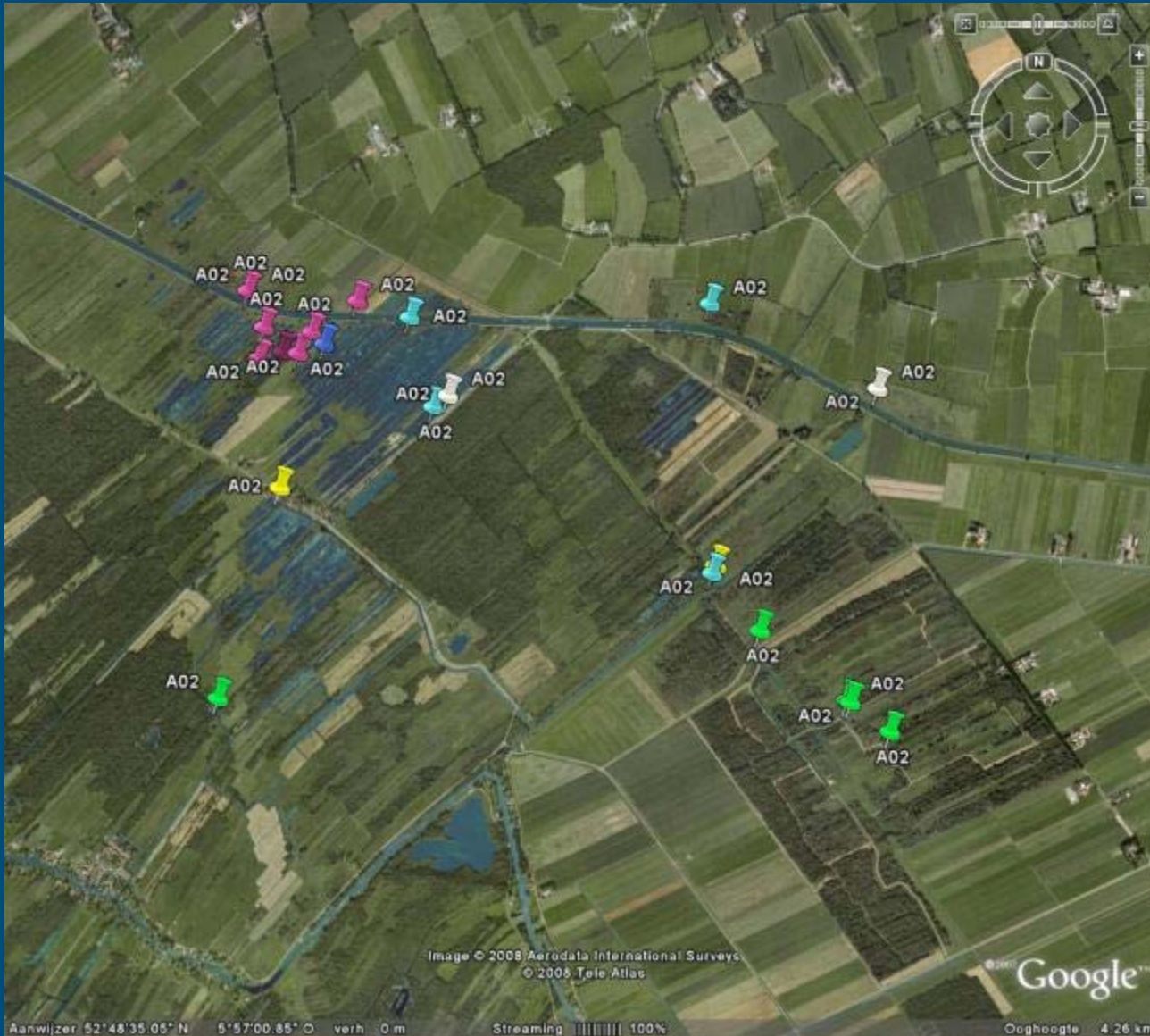


Home range of A02 based on radio-telemetry fixes

Released: 7 July 2002; last radio contact: 4th May 2004

Season 2007-2008: still present & probably reproductive

Female A02 2002-2008: Spraint DNA



Female A02 '02-'08

2002-2003*

2003-2004*

2004-2005

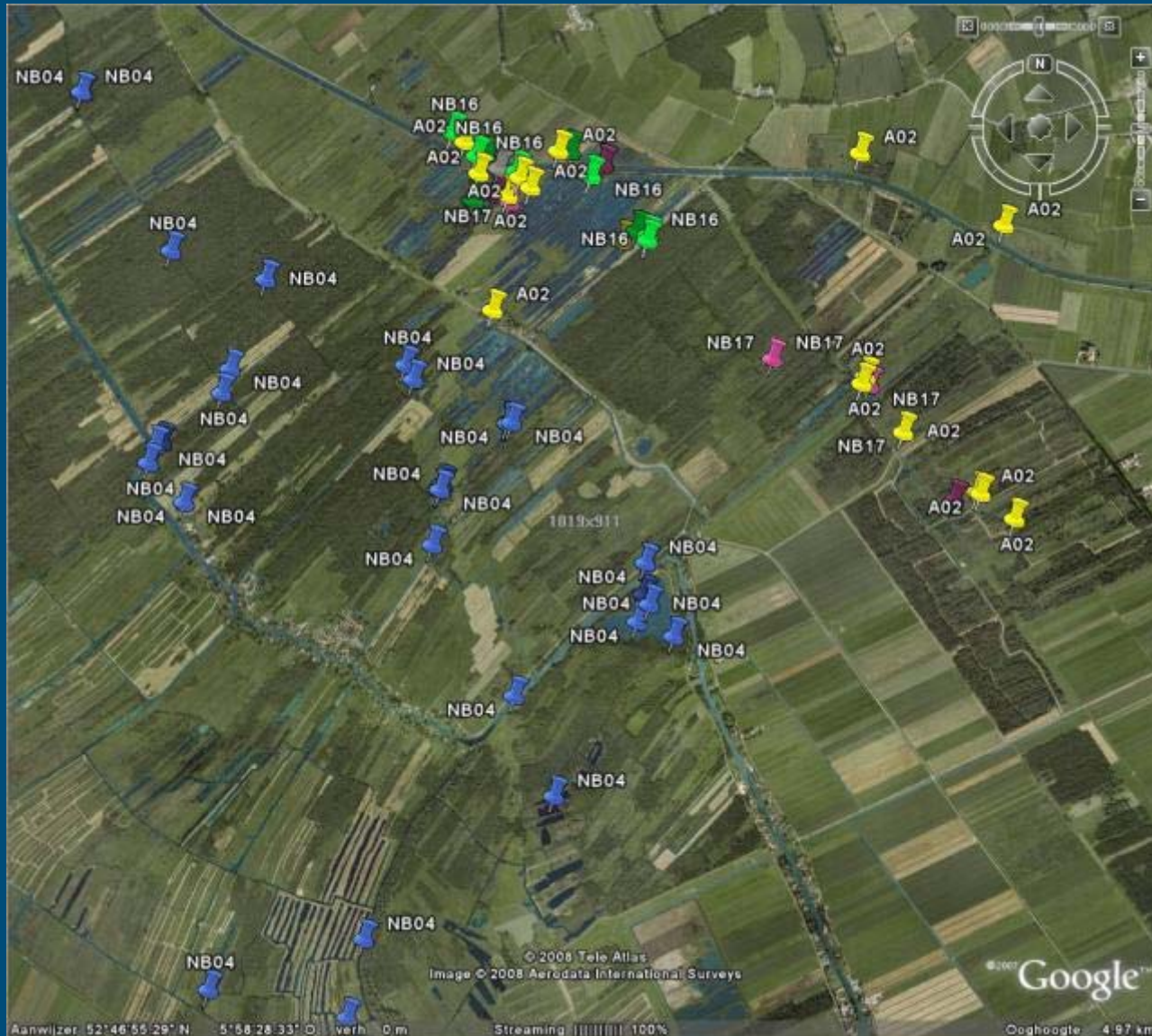
2005-2006

2006-2007

2007-2008

*: Monitoring mainly with
radio-telemetry

Female A02 & Daughters



A02 (Mother)

NB04 (xA06; 03/04)

NB16 (xA08; 05/06)

NB17 (xA08; 05/06)

NB23 (xA08; 06/07 dead)

Female A02 & Daughters (zoom)

A02 (Mother)

NBxx (father, year*)

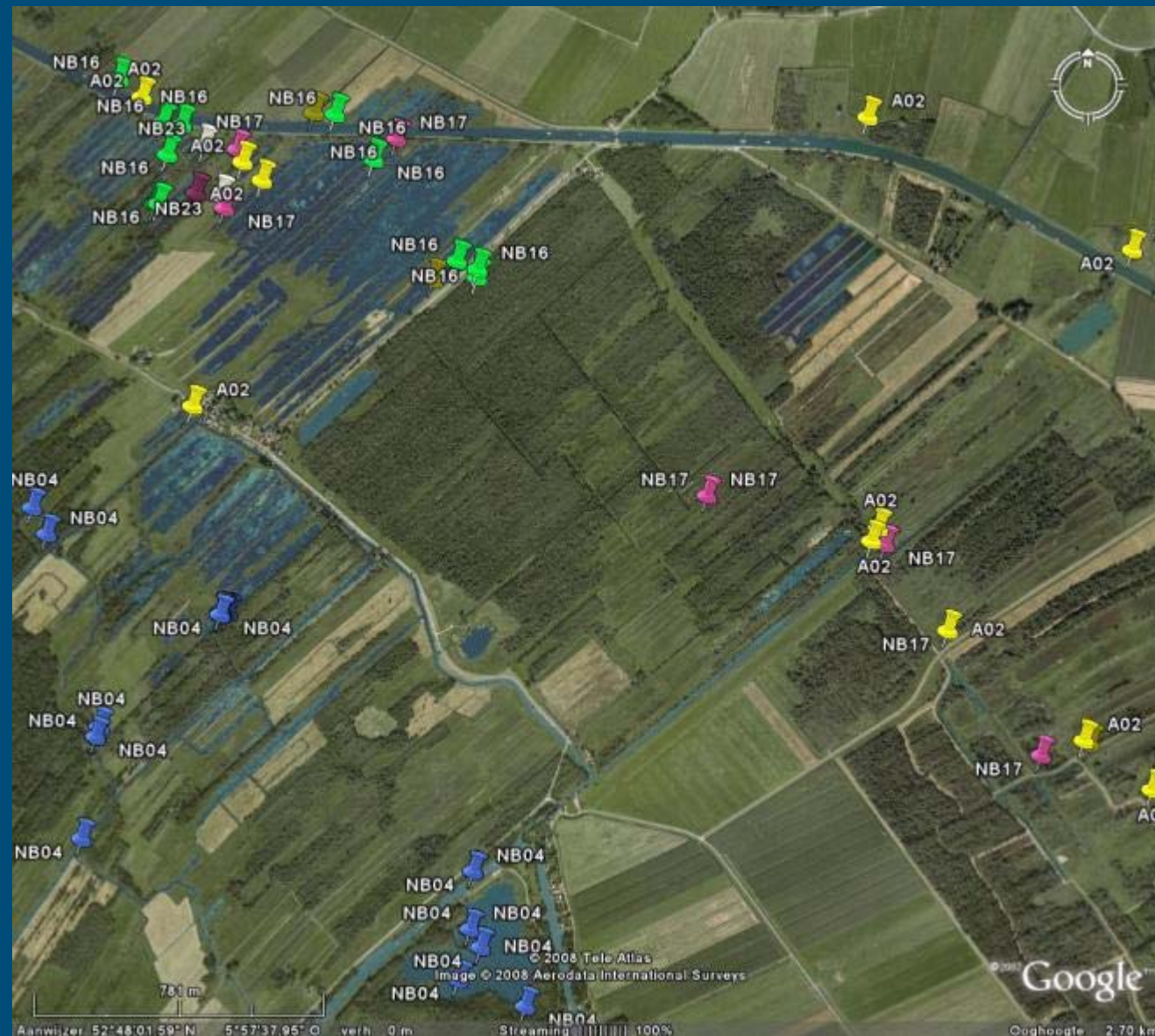
NB04 (xA06; 03/04)

NB16 (xA08; 05/06)

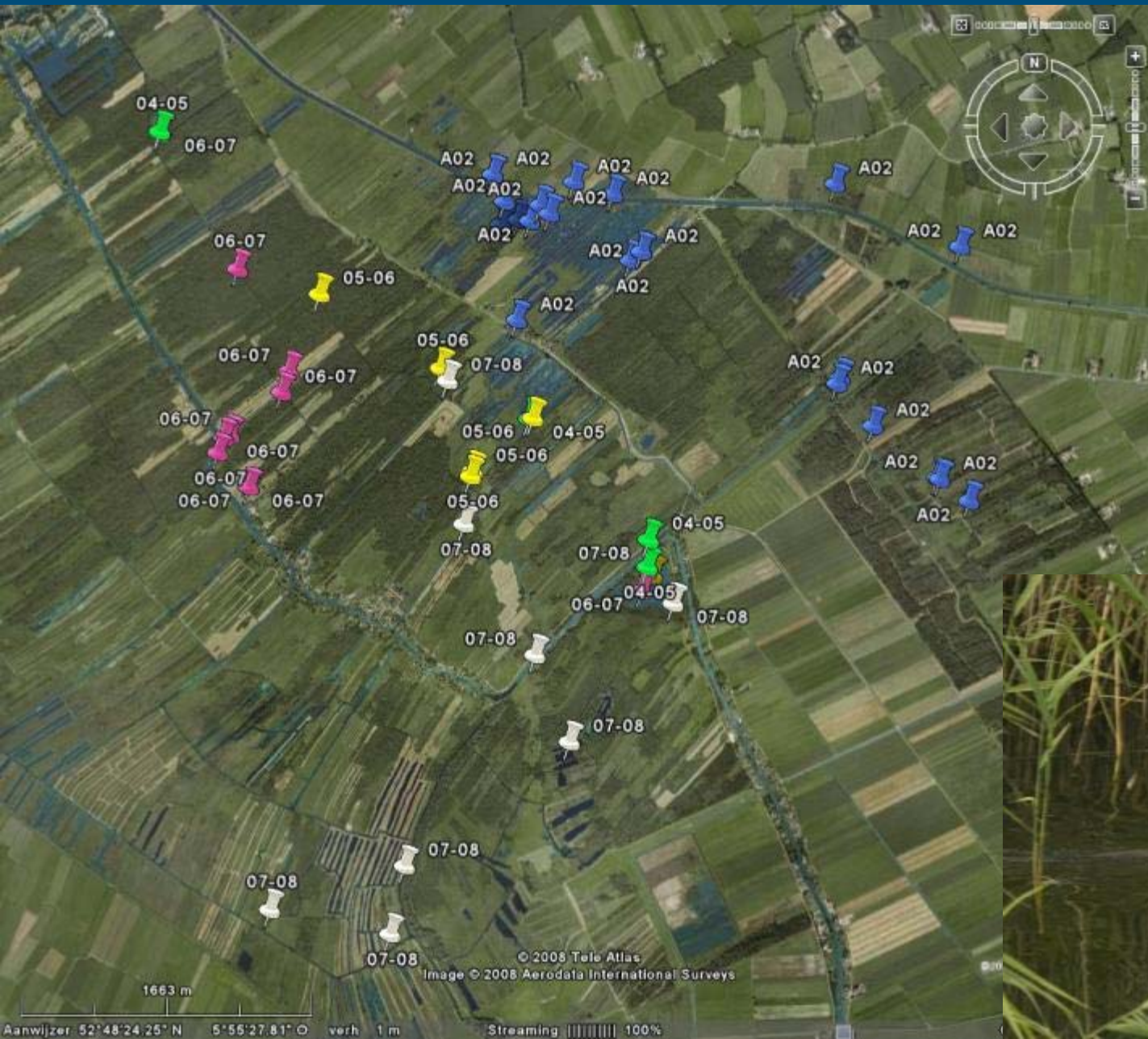
NB17 (xA08; 05/06)

NB23 (xA08; 06/07 _{dead})

*Year = sampling season
1th spraints of NB found!



NB04 (f) 2003-2008 & Mother A02



Mother A02 (02-08)

04-05

05-06 (sexually mature)

06-07

07-08



NB04 (f) & offspring

NB04 (2003-2008)

sexually mature: 2005

NB13, f, xA12, 05/06, ?

NB11, m, xA12, 05/06

NB26, f, xA08, 06/07

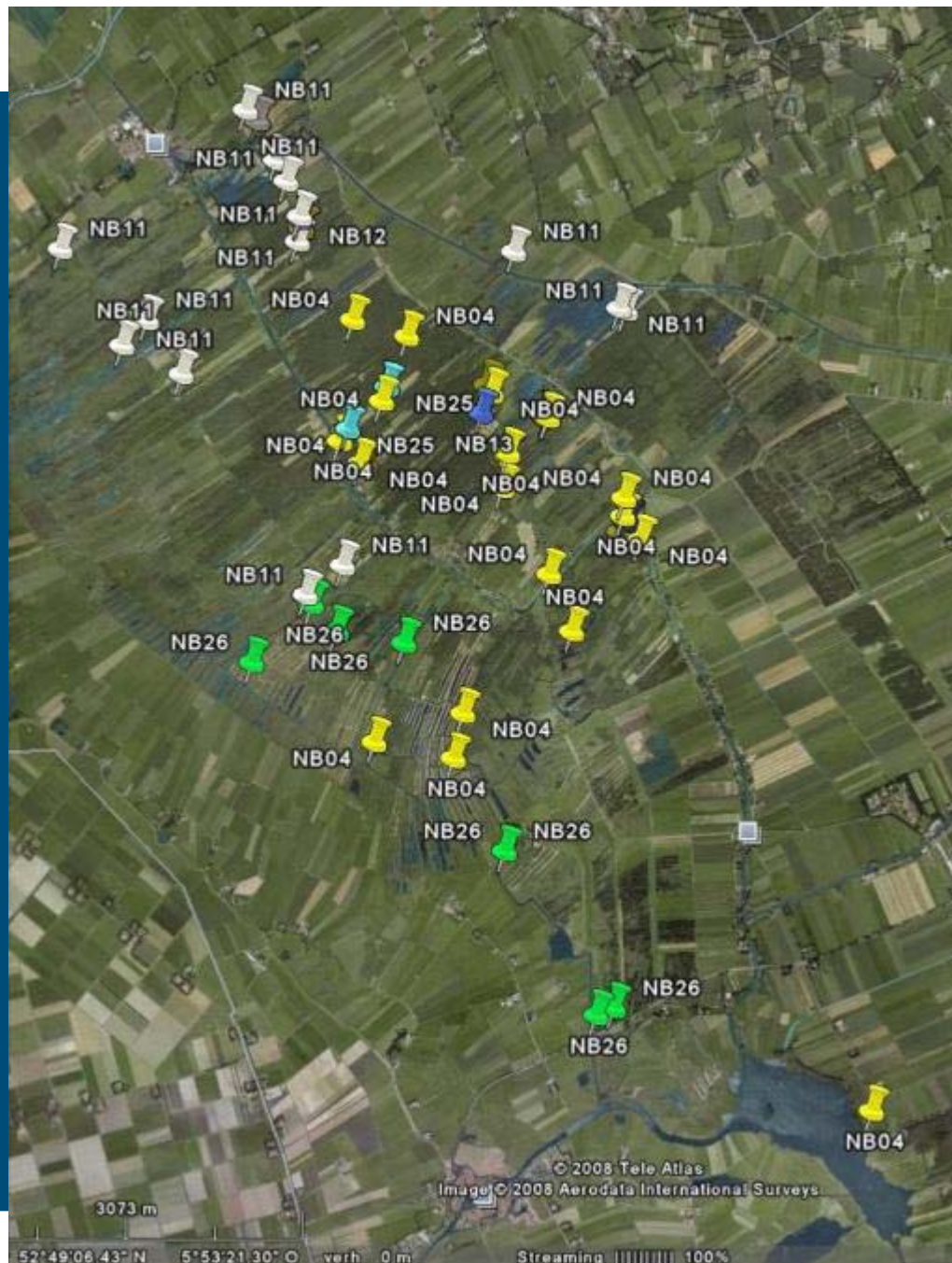
NB25, m, xA08, 06/07, dead

NB12, m, xA12, 05/06, ?

Nb45, m, xNB15, 07/08 dead

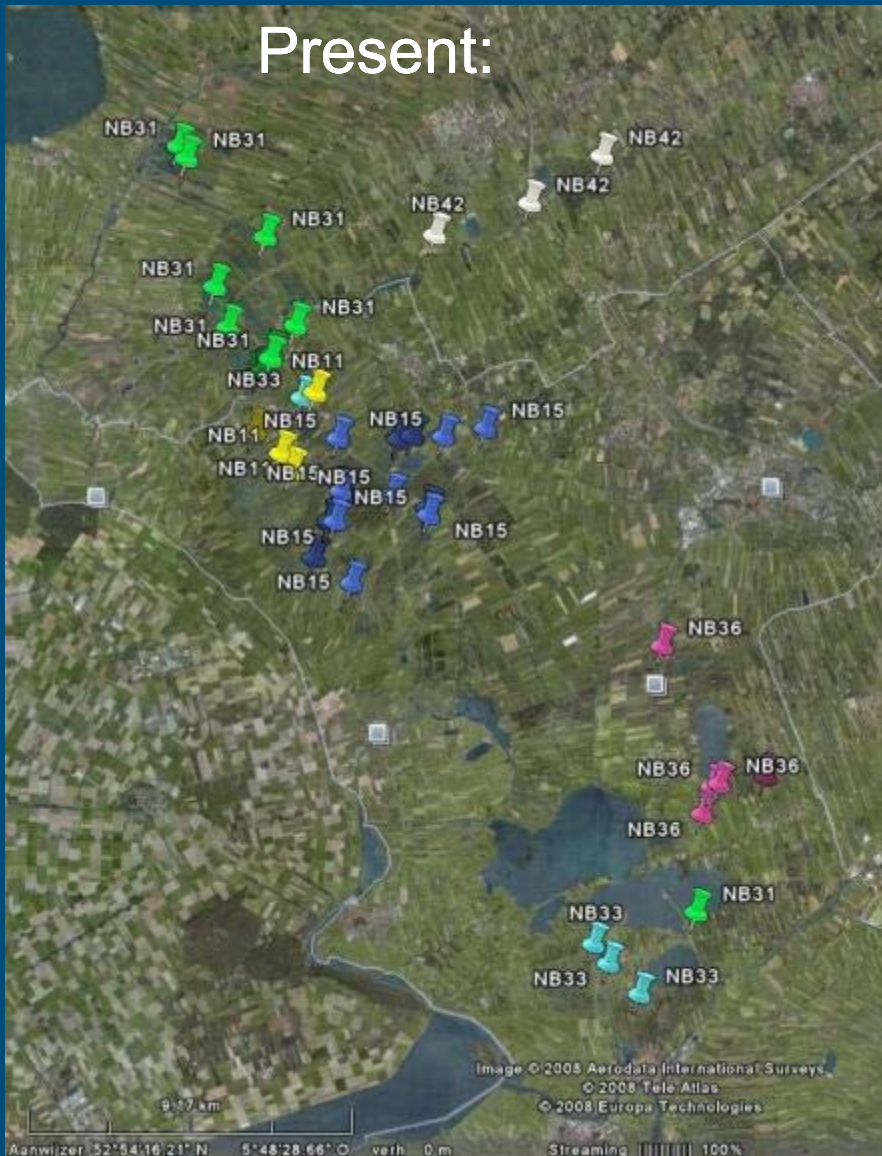
Nb51, m, xNB15, 07/08 dead

Nb44, m, xNB15, 07/08 dead



Dominant males 2007-2008

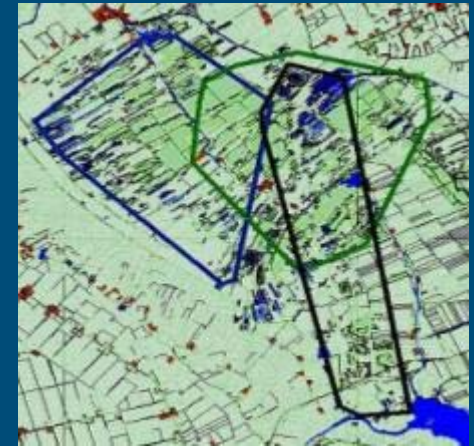
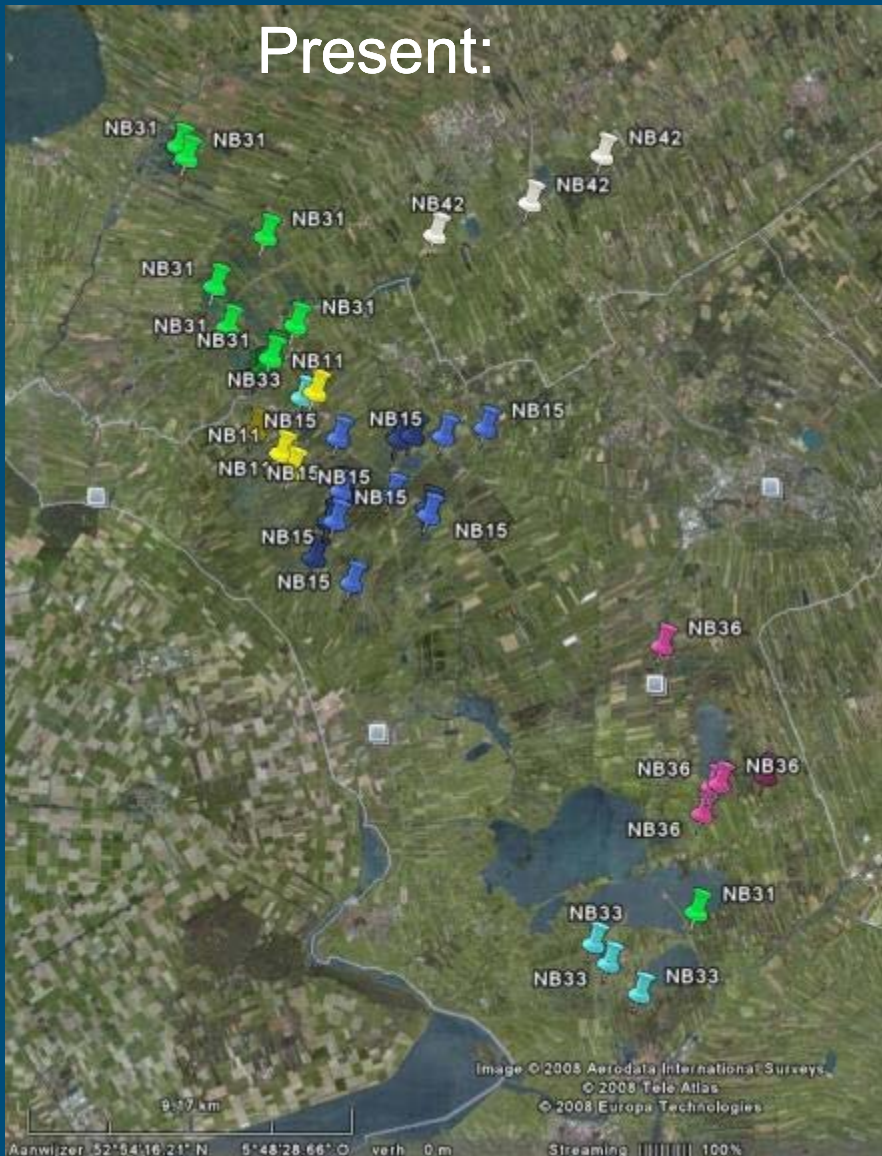
Present:



Based on DNA typing of spraints, 2007-2008

Dominant males 2007-2008

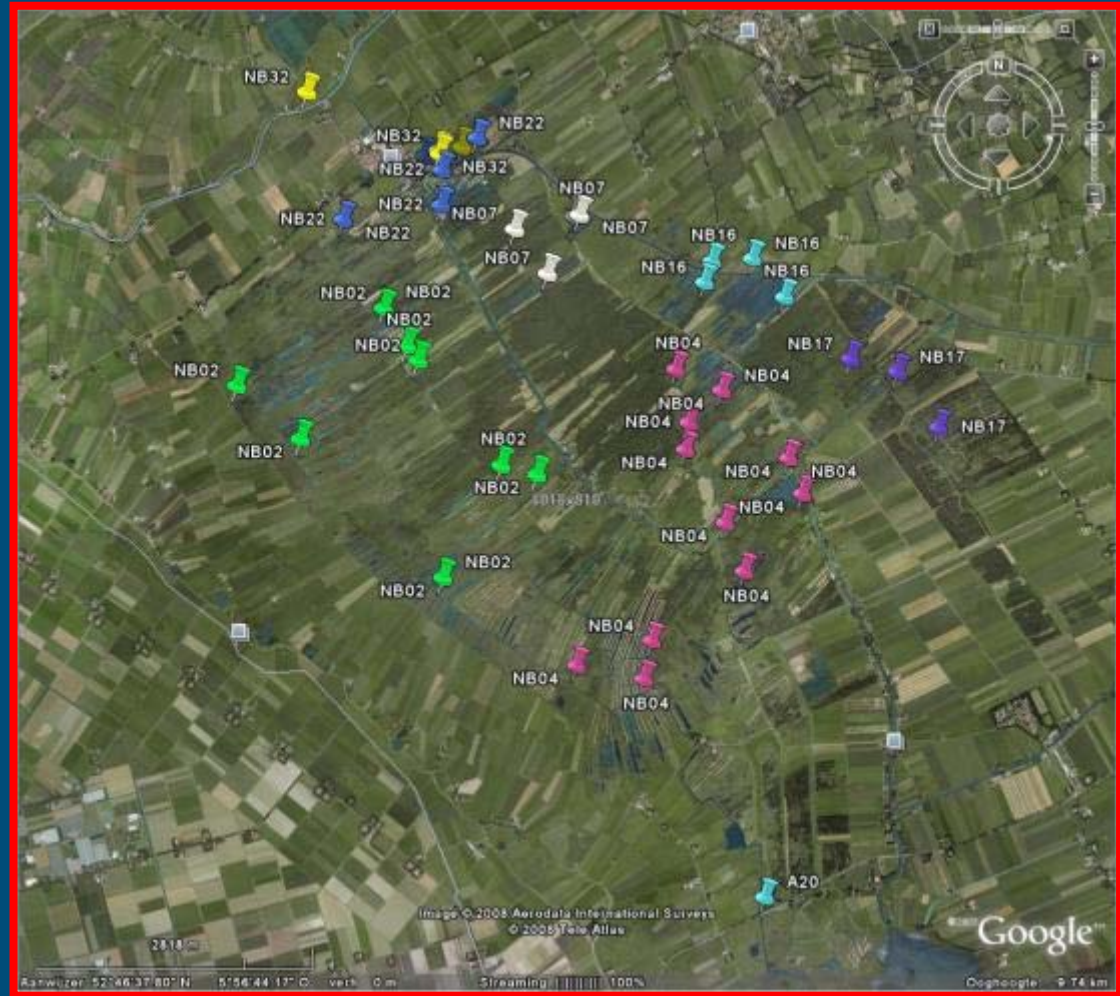
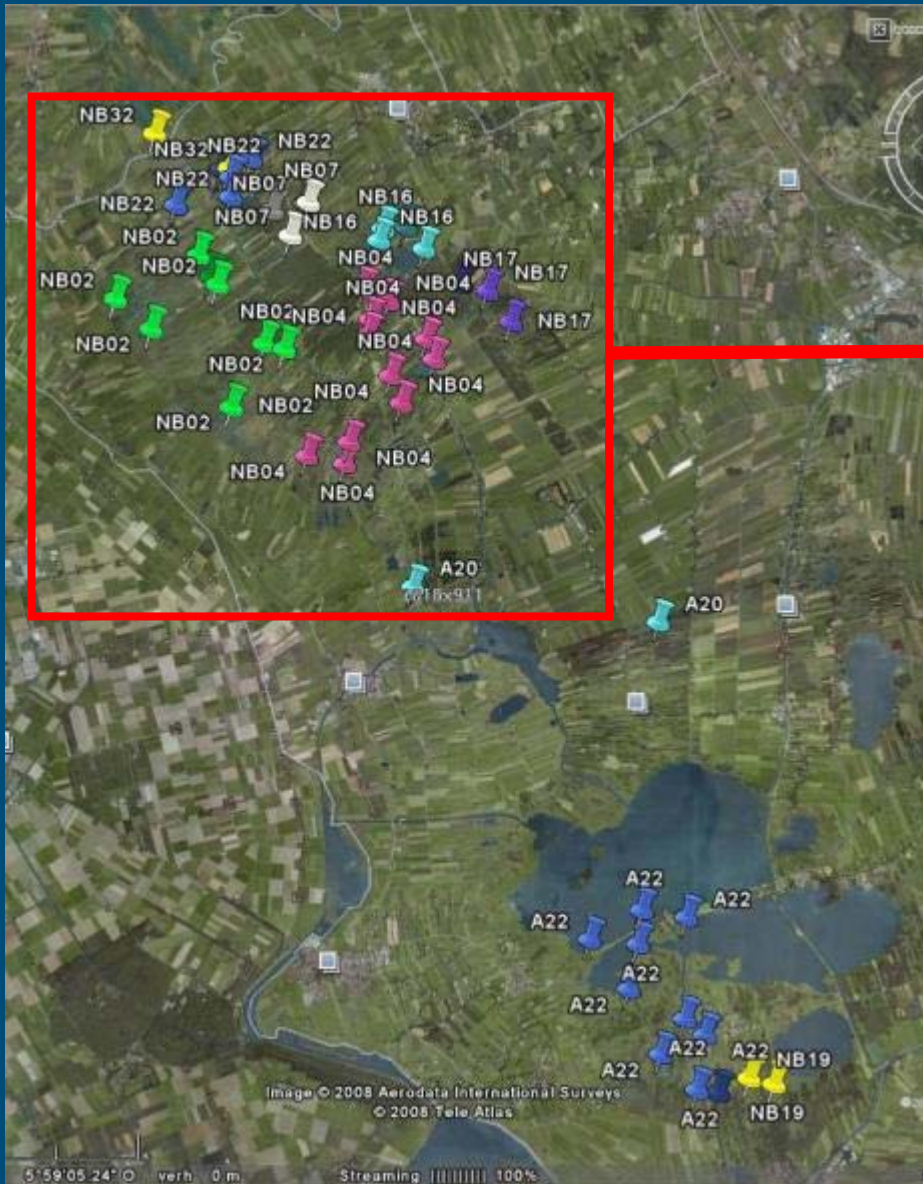
Present:



Male NB30 died
in Januari 2008
(traffic)

Based on DNA typing of spraints, 2007-2008

Reproducing females 2007-2008



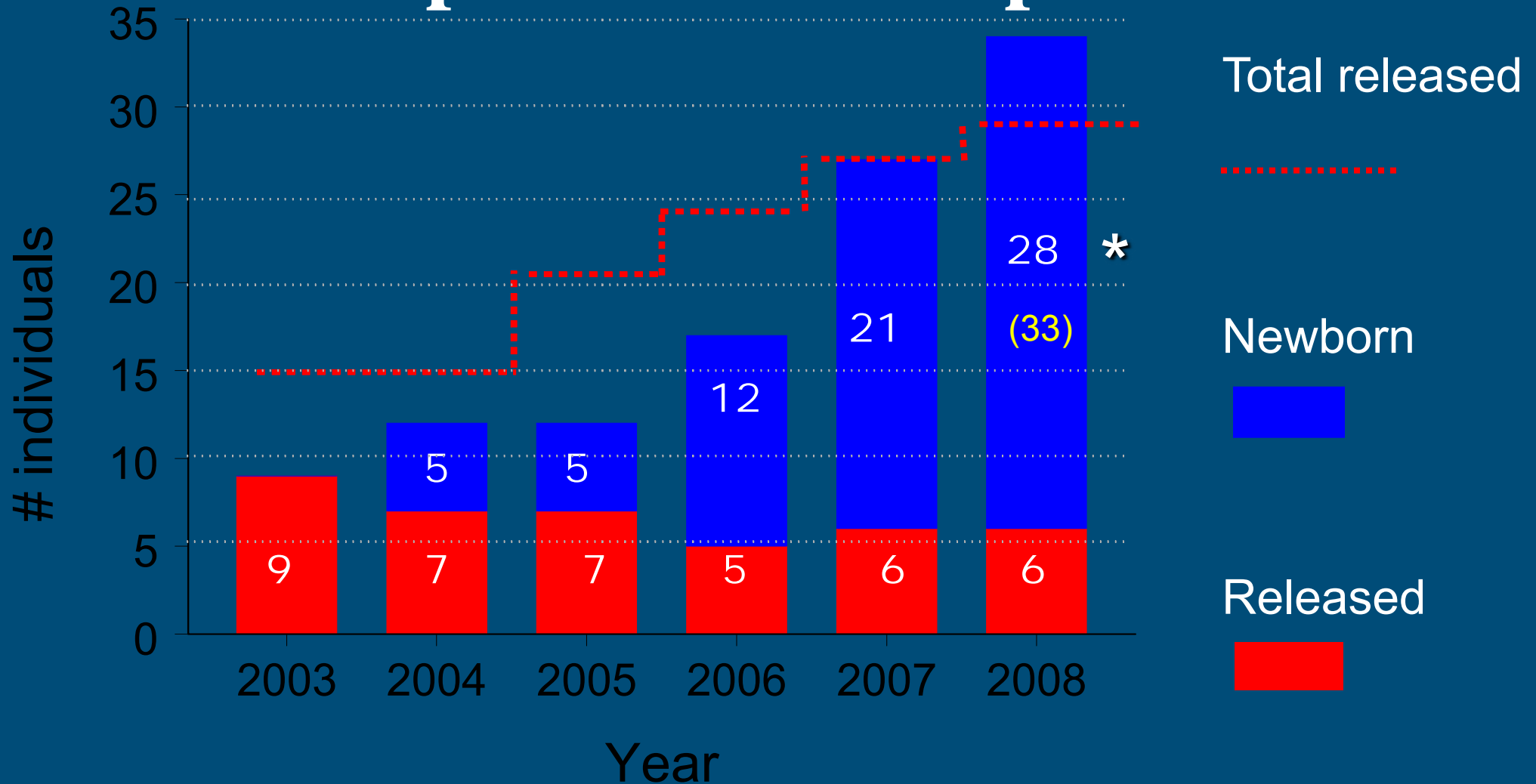
NP Weerribben (~40km²):

7 females, 2 males



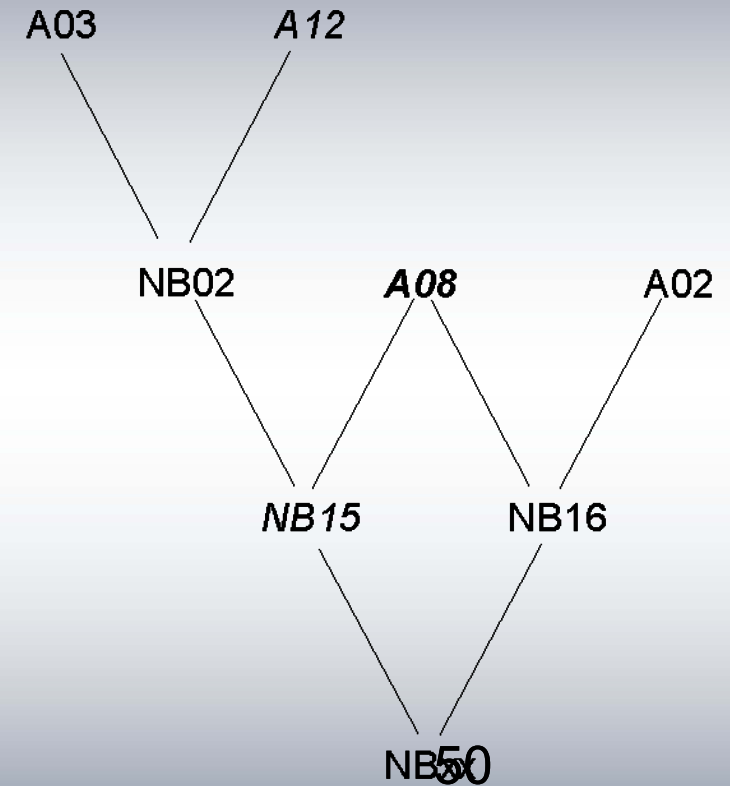
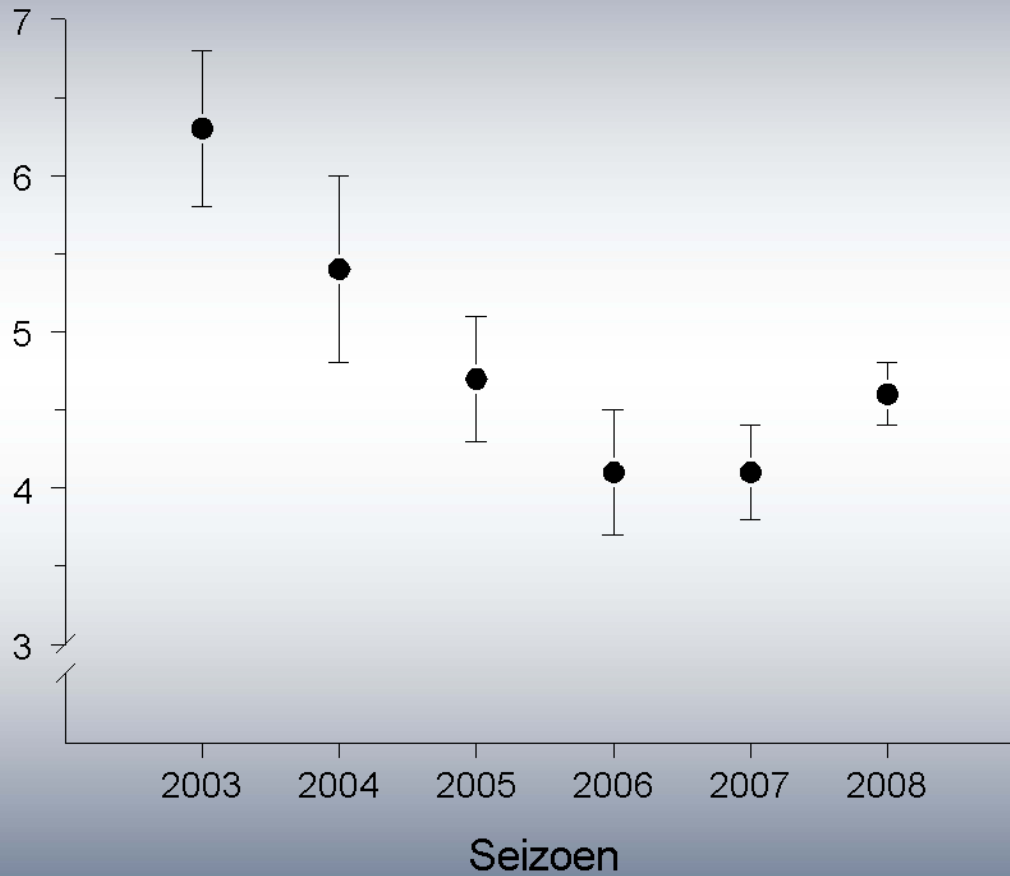
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Population development



Genetic erosion & inbreeding

n alleles



Conclusions

The reintroduced population is doing fine

Otters from captivity can be released efficiently

DNA typing from spraints is a valuable monitoring tool

Sex related dispersal (avoiding inbreeding / competition)

Reproductive rate \gg mortality (detected: 53 NB born / 23 NB dead)

Small populations are prone to inbreeding

NL Otter population: effective population size \ll total population size

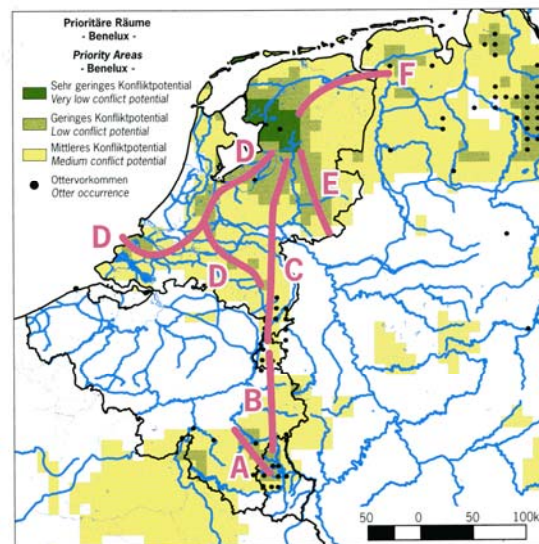
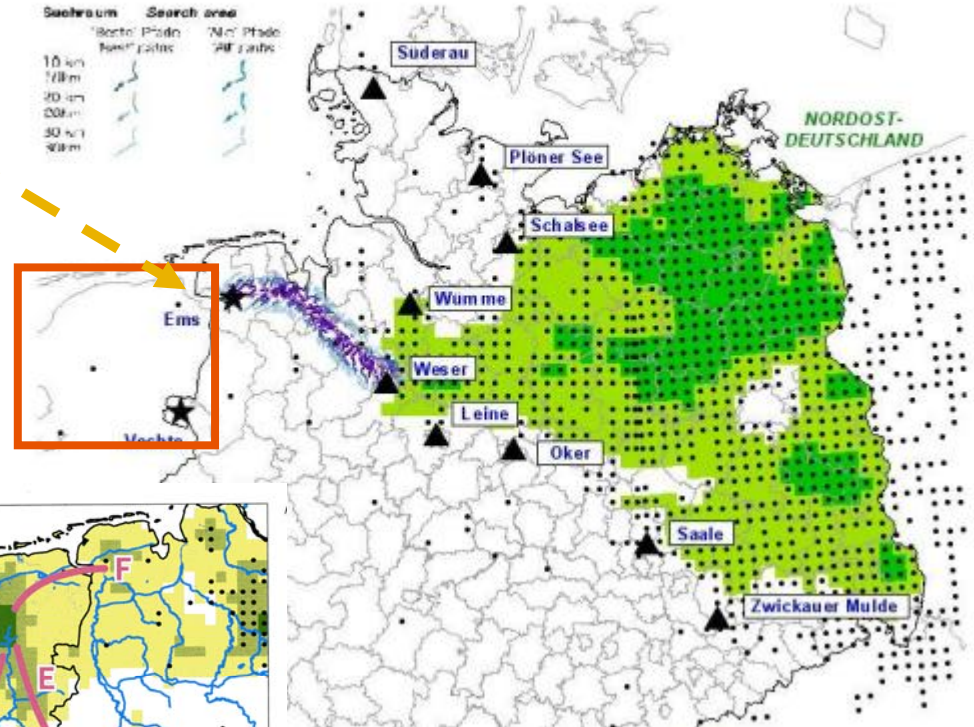


Focus: connection & gene flow



Map: Alterra

SUCHRAUM: Weser - Ems (Pfad Nr. 3)
SEARCH ZONE: Weser - Ems (Path no. 3)



Maps: www.otterzentrum.de



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Acknowledgements

Thanks to everybody who assisted in this project & research!

Team monitoring otter Alterra:

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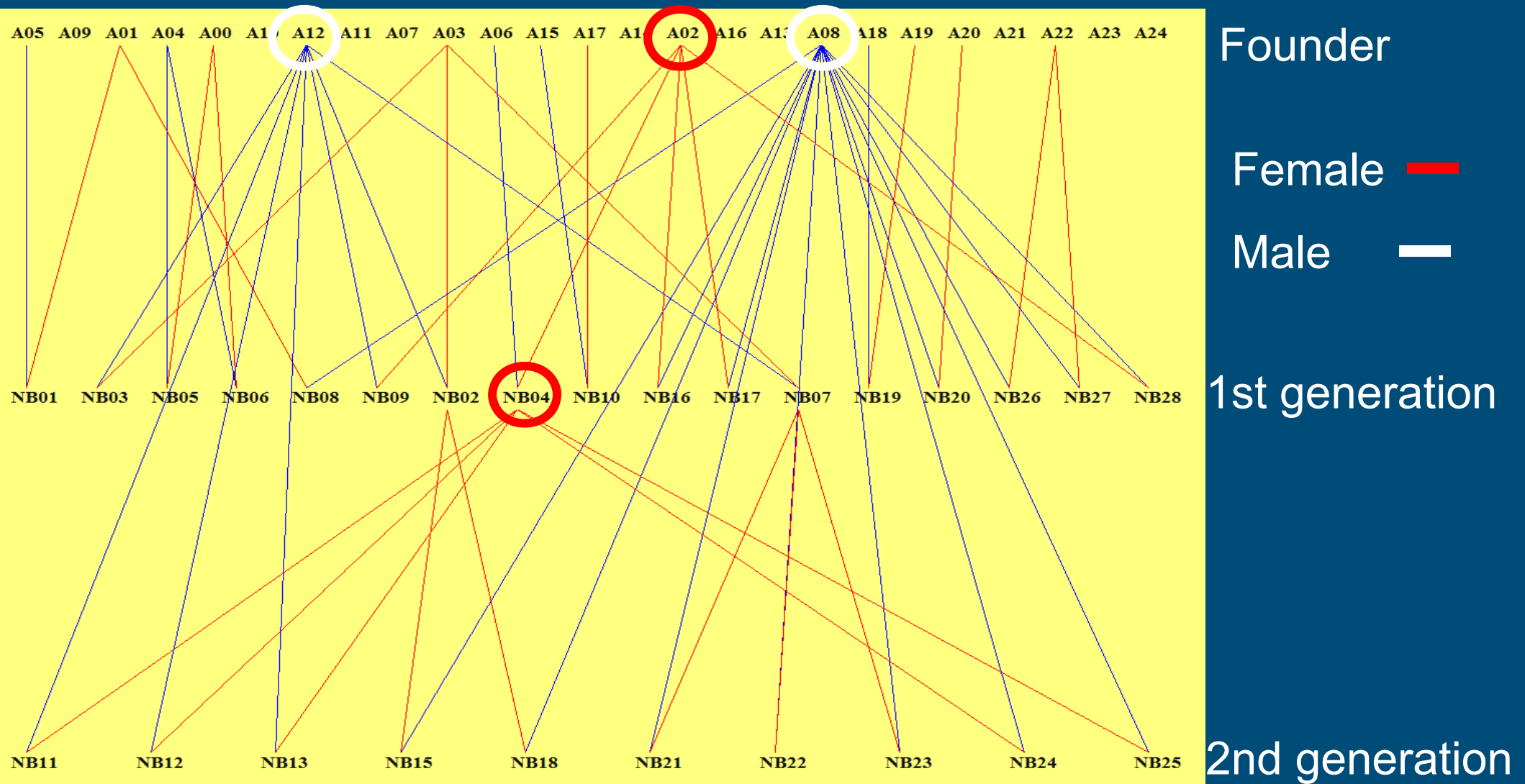
www.alterra.nl

www.otter.wur.nl



restanten

Mating structure

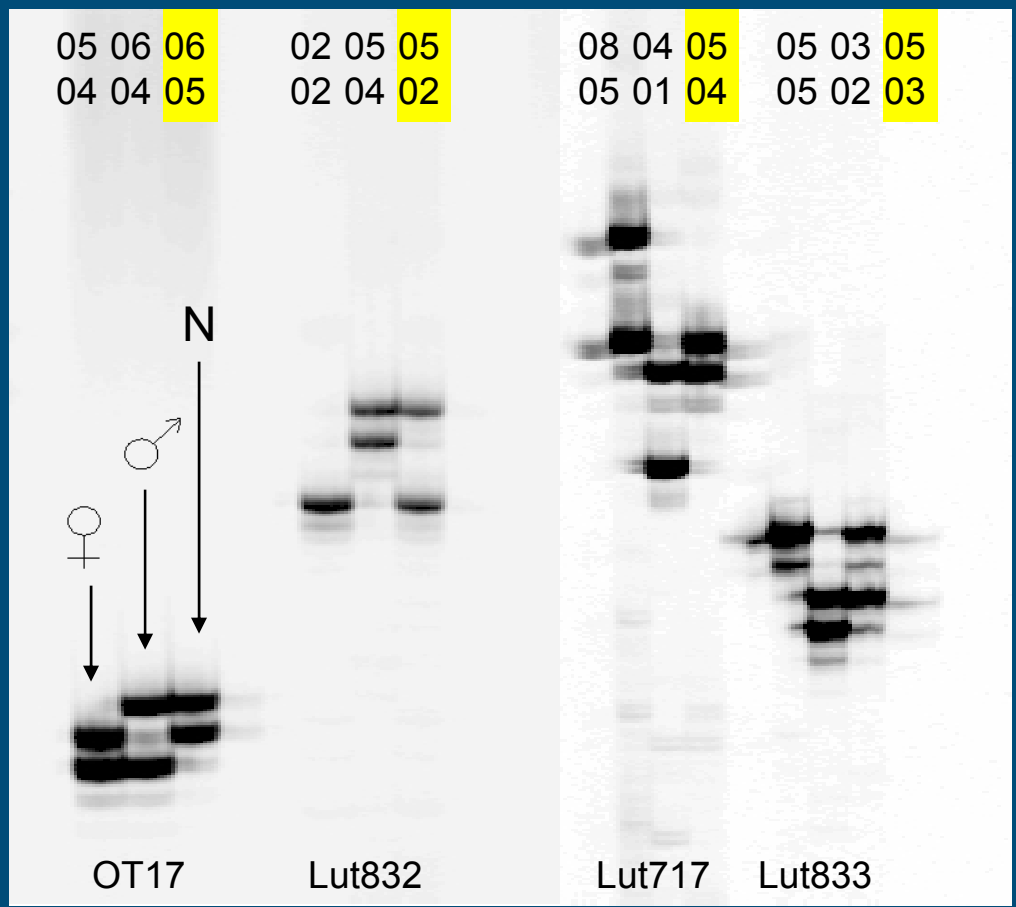




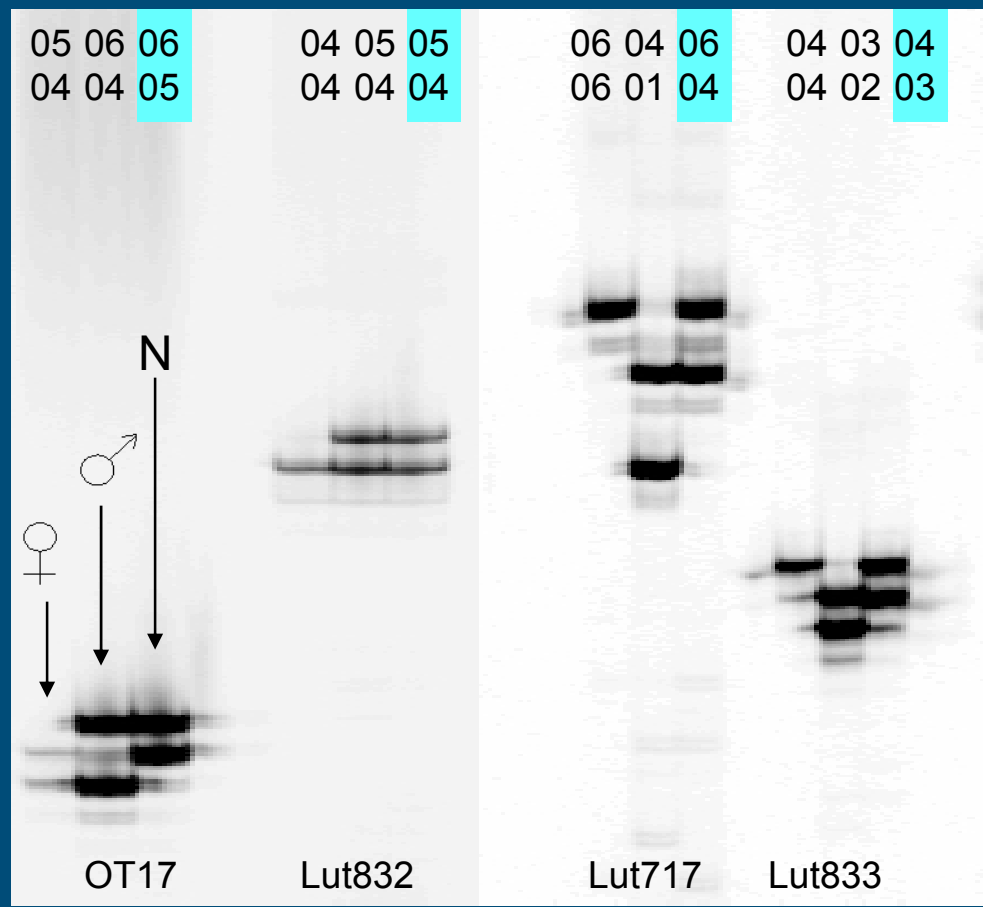
Change of partner & who are your parents?



♀ ♂
NB03 = A03 * A12



♀ ♂
NB10 = A02 * A12



HPK 3

Mating structure

Observed progeny

Male

Female

	A04	A05	A06	A08	A12	A15	A18	Total
A00	2							2
A01		1		1				2
A02			1	3	1			5
A03					3			3
A17						1		1
A19							1	1
A20				1				1
A22				2				2
NB02				2				2
NB04				2	3			5
NB07				3				3
Total	2	1	1	14	7	1	1	27

Data: ~2006