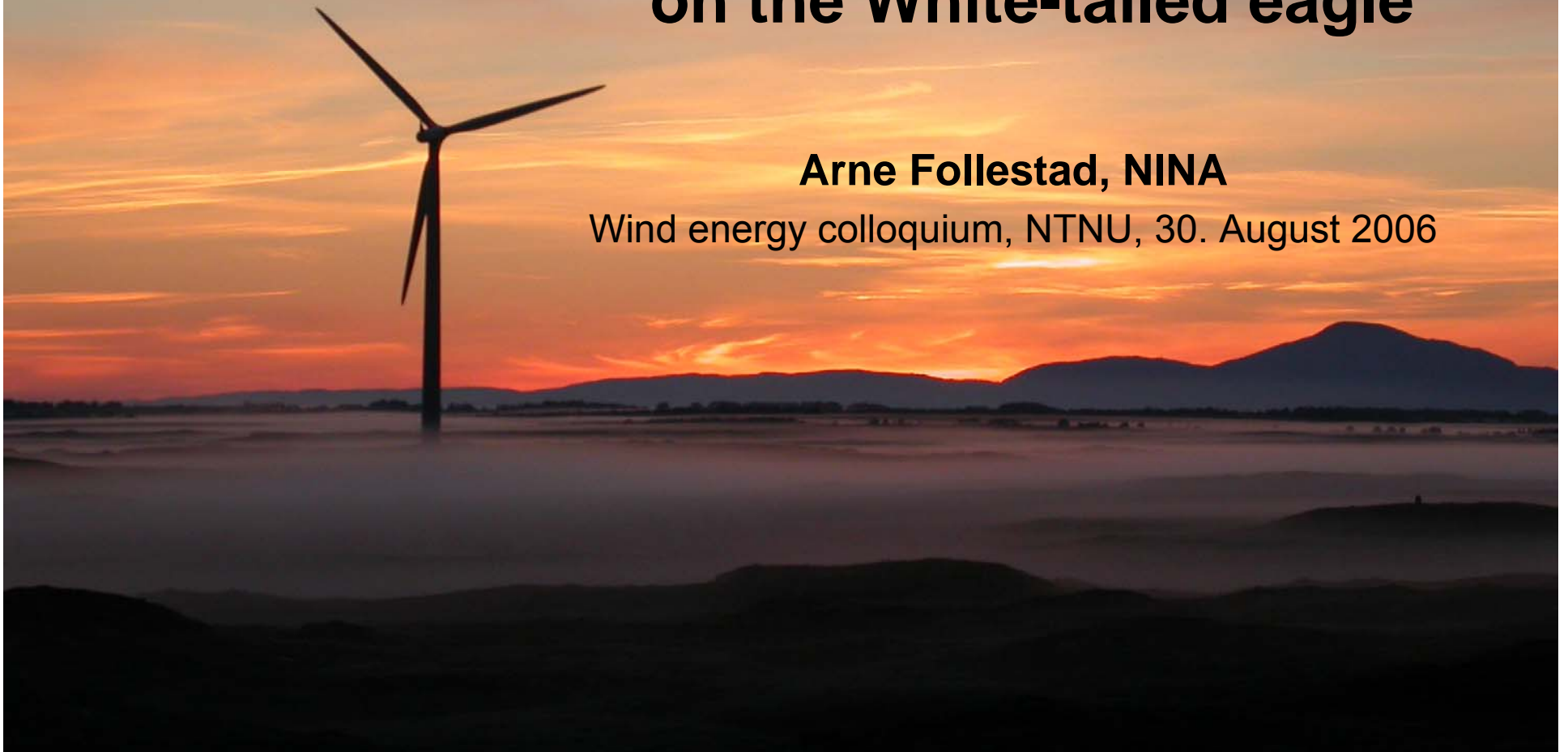



White-tailed eagle studies at Smøla

**Experiences from a wind
farm at Smøla on the effects
on the White-tailed eagle**

Arne Follestad, NINA

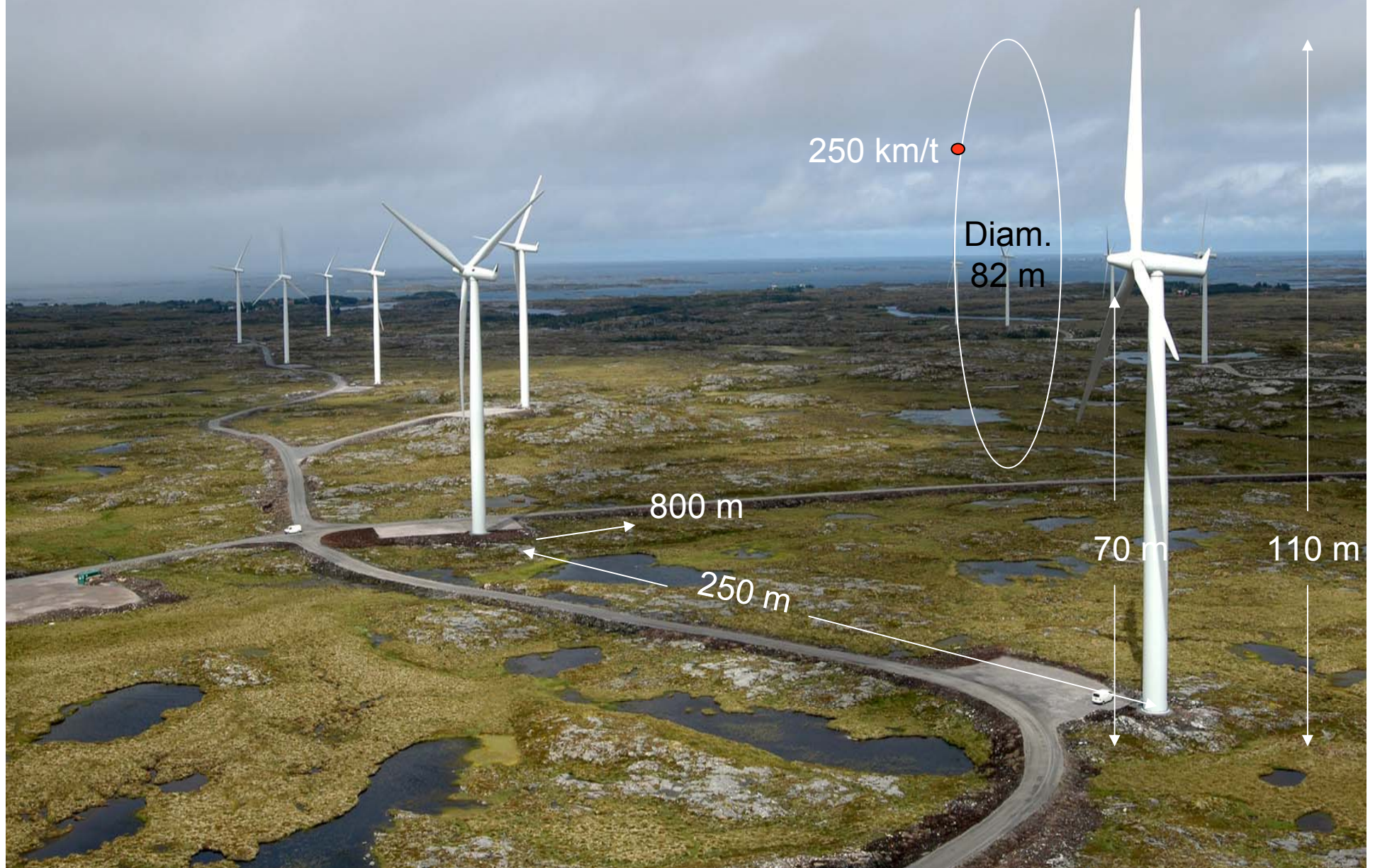
Wind energy colloquium, NTNU, 30. August 2006

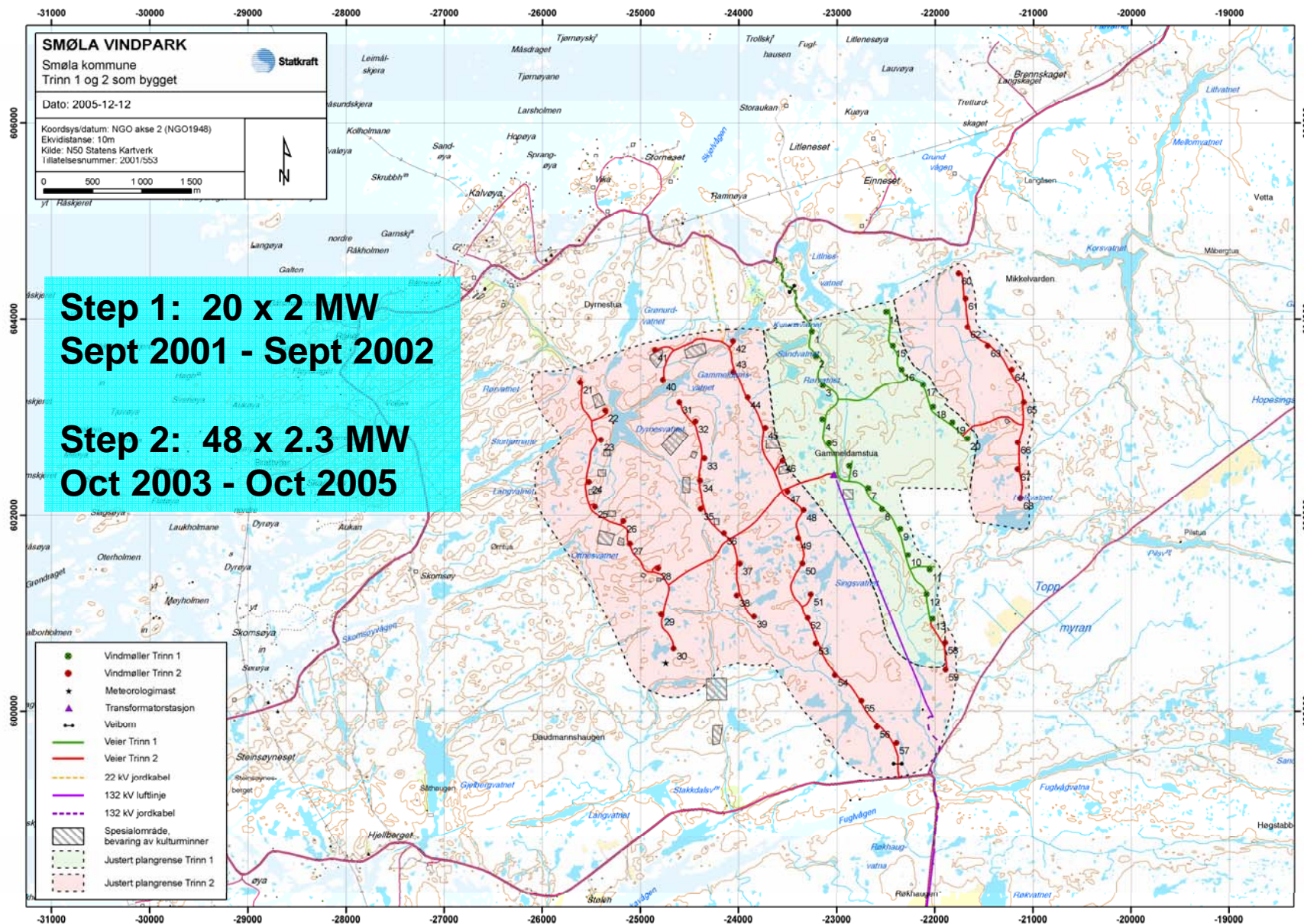


A photograph of a wind turbine on a rocky island at sunset. The sky is a mix of blue, orange, and red. The ocean is visible in the background, and the foreground shows the dark, silty landscape of the island.

Land area	274 sq. km
Total shoreline	1913 km
No. of islands and skerries	5846
No. of lakes, tarns, potholes	7752
Highest point	70 masl
Main elevation	20-40 masl
<i>Landscape:</i>	
Moors and heathers, bogs and marshland	

Smøla wind farm





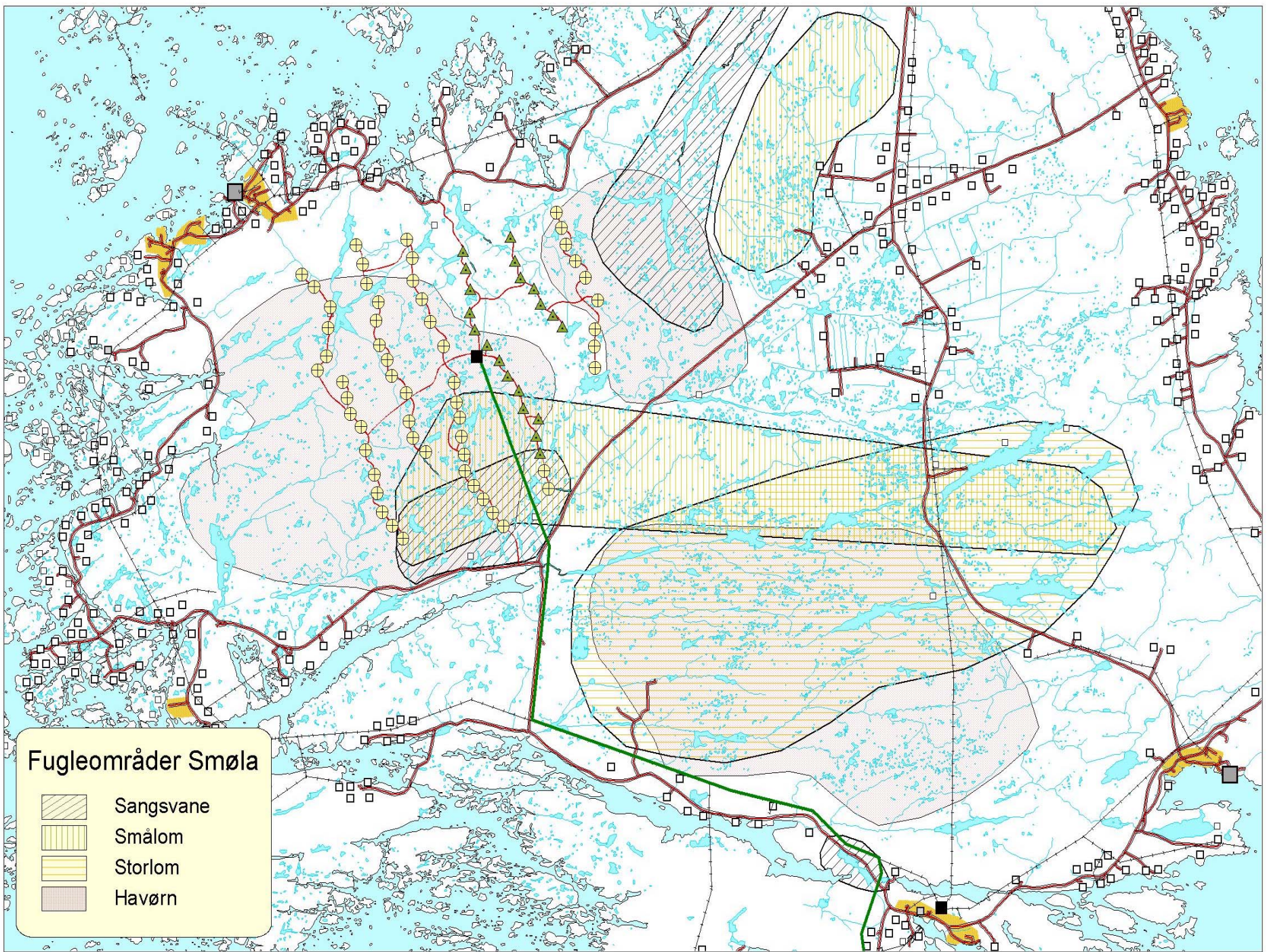
Smøla archipelago as IBA

WINTERING SPECIES:

Great Northern Diver
White-billed Diver
Red-throated Diver
Red-necked Grebe
Grey Heron
Whooper Swan
Velvet Scoter
Long-tailed Duck

BREEDING PAIRS:

Red-throated Diver	40
Black-throated Diver	5-10
Grey Heron	3-400
White-tailed Eagle	65-70
Smøla Willow Grouse	??? *
Golden Plover	x.100
Dunlin (C. a. schinzii)	x.100*
Whimbrel	x.10



How wind-power may effect birds

- Collisions with windmills (and power lines)
- Turbulence from rotating blades
- Disturbance from rotating blades, noise
- Disturbance from human activities
- Changes in habitat quality
- Loss of habitat, fragmentation
- Barriers (windmills, roads, power lines)



An eagle nest in a typical part of the Smøla landscape.

White-tailed eagle

POSSIBLE IMPACTS:

Lower population by:

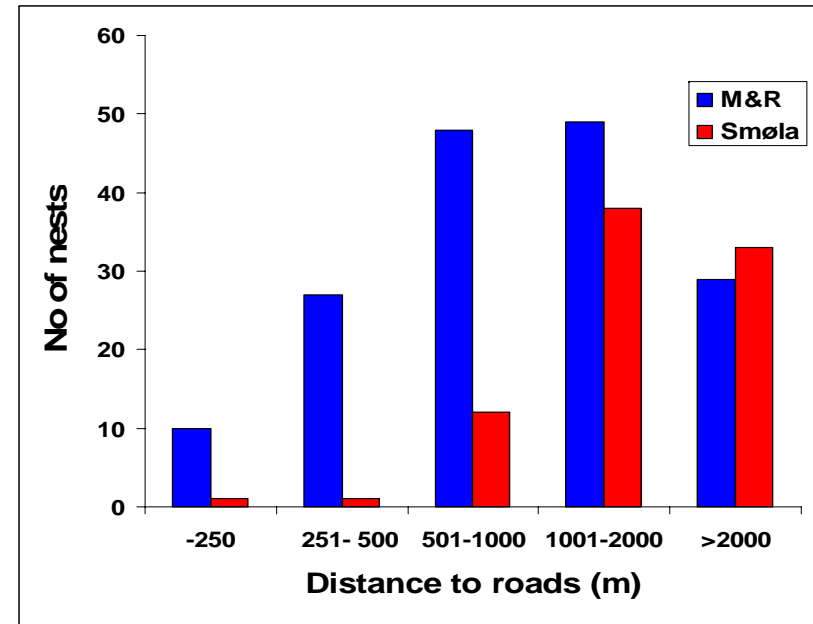
- Habitat loss

Lower reproduction by:

- Habitat loss
- Disturbance

Increased mortality by:

- Windmill collisions
- Power line collisions and electrocution
- Territorial fights



Background for the eagle studies

- Post-construction studies of conflicts between birds and wind turbines in coastal Norway - who is responsible?
- Three applications to NFR, studies of several species
- A limited continuation of the eagles studies (NVE, Statkraft, EBL og MD/DN siden 2003).
- Planed expansion from 2007 (NVE and others)
- New projects as a result of nine dead eagles found at Smøla

Application to NFR 2007-

Obtain an improved information base and tools for the energy industry and environmental and energy authorities to use in determining siting and conflict reduction of new wind turbine projects.

Subgoal

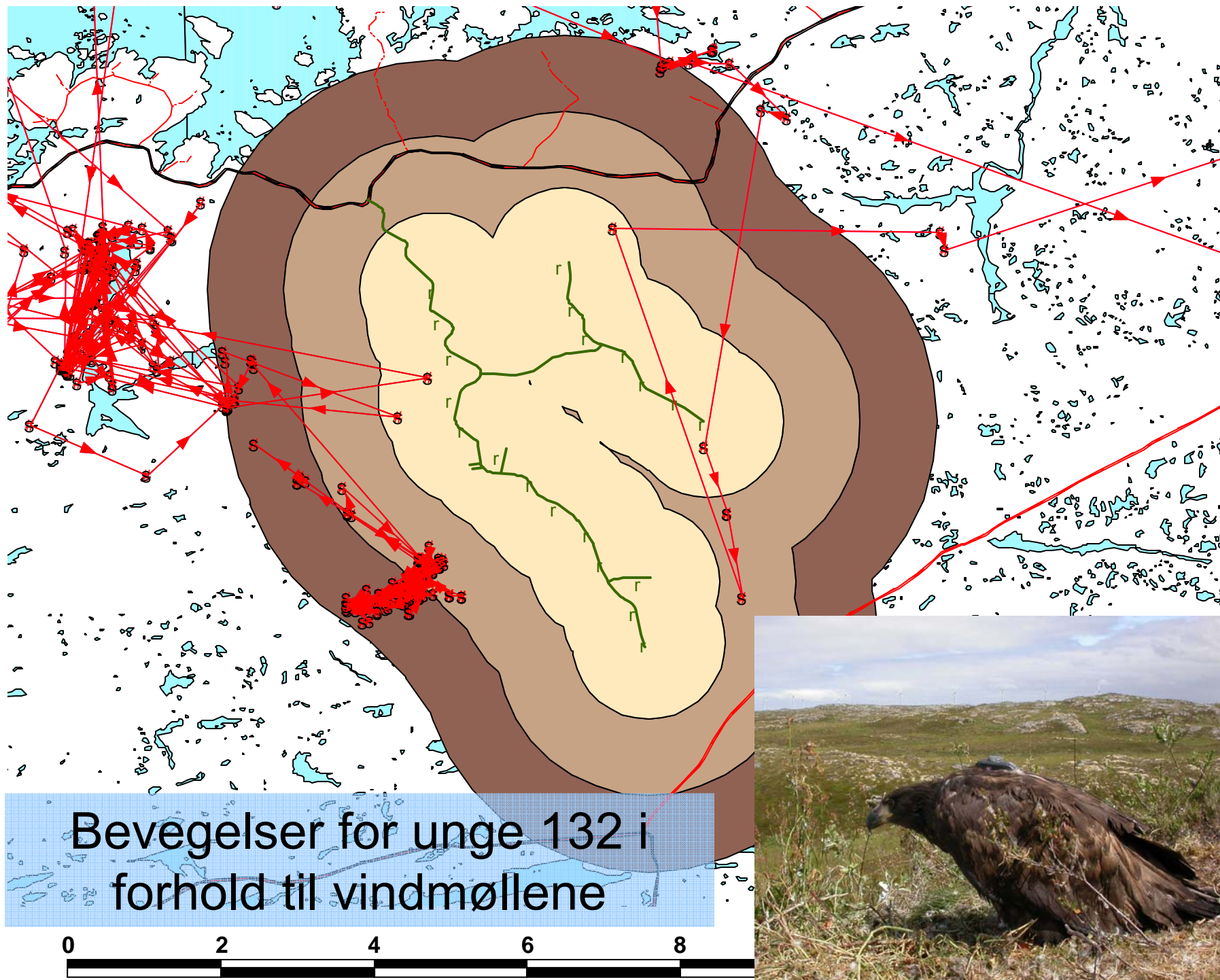
- Identify the biological, species specific, ecological and external factors which make birds vulnerable to wind turbines (e.g. manoeuvrability, aerodynamic constraints, visual perception, hunting techniques, bird age, nesting, habituation, feeding, local movement patterns, light and weather conditions, topography and wind turbine location in relation to major and local flyways), and assess the population consequences of wind turbine induced bird mortality.

Ongoing and new studies

- Monitoring breeding population and reproduction
- Activity patterns of juveniles by use of GPS
- RSPB - behavioural response to wind turbines on Smøla
- Search for collision victims (now by use of dogs)
- Use of radar to collect data on bird behaviour and major and local flyways
- Mitigating measures
- Video camera to study activity patterns at nest
- DNA-studies to study adult mortality and territories for dead birds

Why these studies??

- Most important mitigation measurements:
 - Siting and design before the wind farm is planned - which conflicts are possible?
 - What should be done as part of the EIA process? And how may these be more informative?
- When the wind farm is built and problems arise:
 - Do we have any mitigating measurements?
 - What will be the effect of a reduced population, reduced reproduction and increased mortality - both locally and on a national scale?
 - **Cumulative effects!** More than 100 wind farms planned...
- Canary birds...





Juveniles in a nest only 32m
from a turbine in 2005

**2005: 4 territories in the wind farm
has been given up (of 15-16) - had
expected more...**

- But - only one territory in 2006?
- High site fidelity
- After several years without successful breeding - low productivity.
- Increased collision risk?
- When do they give up?
- What happens when no pairs are breeding inside the wind farm - will this become a “free” area for non-breeding birds?

Reproduction in the WTE at Smøla in 2005 and the rest of Møre og Romsdal

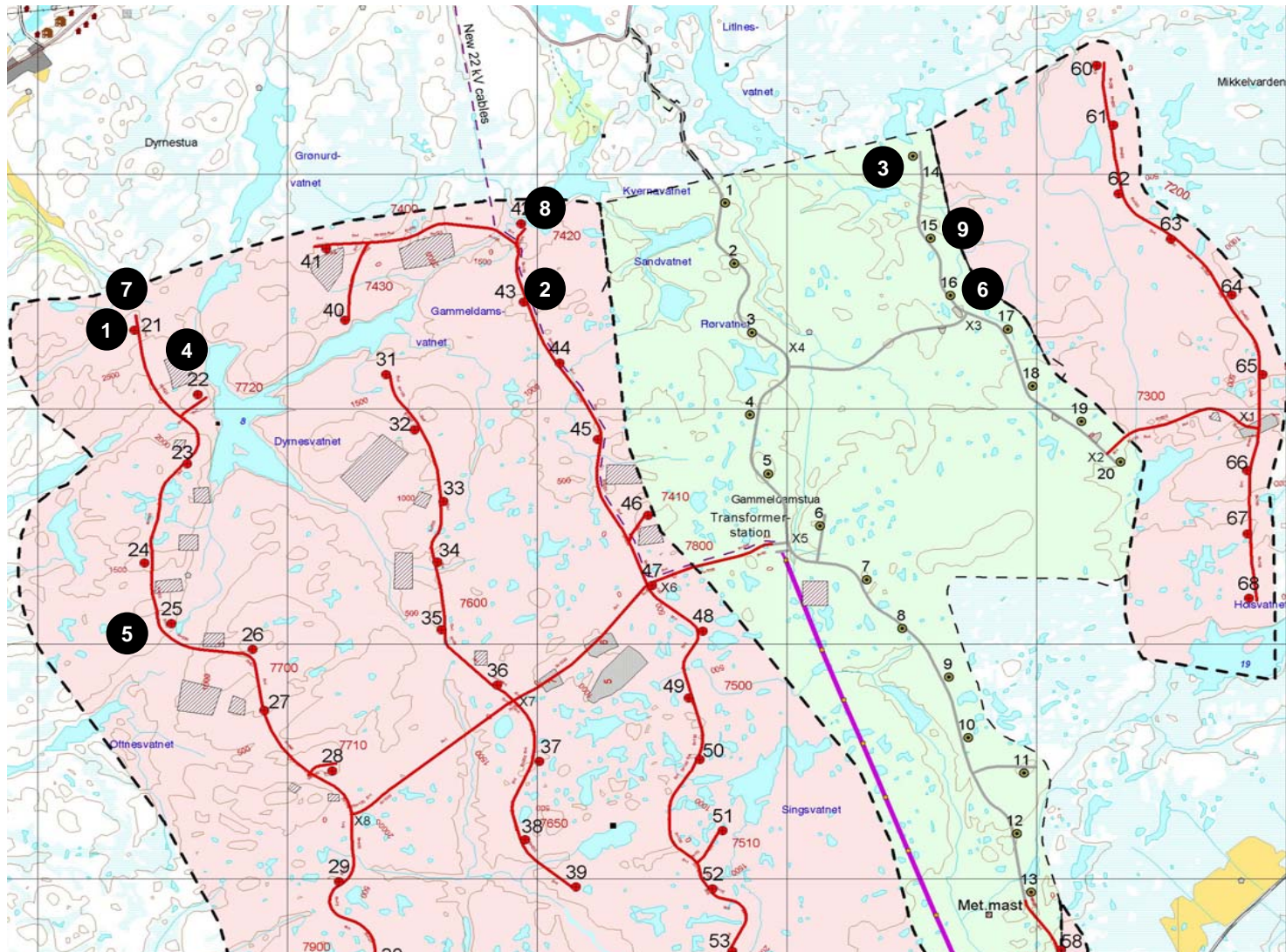
Status	Smøla	M&R rest*
Territories checked	66	126
Successful	14	53
Prop. successful	0,21	0,42
Juveniles	18	77+
No of territories	66	82
Production	0,27	0,94
Clutch size	1,29	1,55



Dead WTE found at Smøla

Date found	Turbine number	Age
2005		
1 03.08	21	Adult
2 10.10	43	Adult
3 31.10	14	Juvenile
4 30.12	22	Adult
2006		
5 09.04	25	Juv. from 2005
6 28.04	16	Juv. from 2005
7 03.05	21	Adult
8 04.05	42	Adult
9 05.05	15	Adult

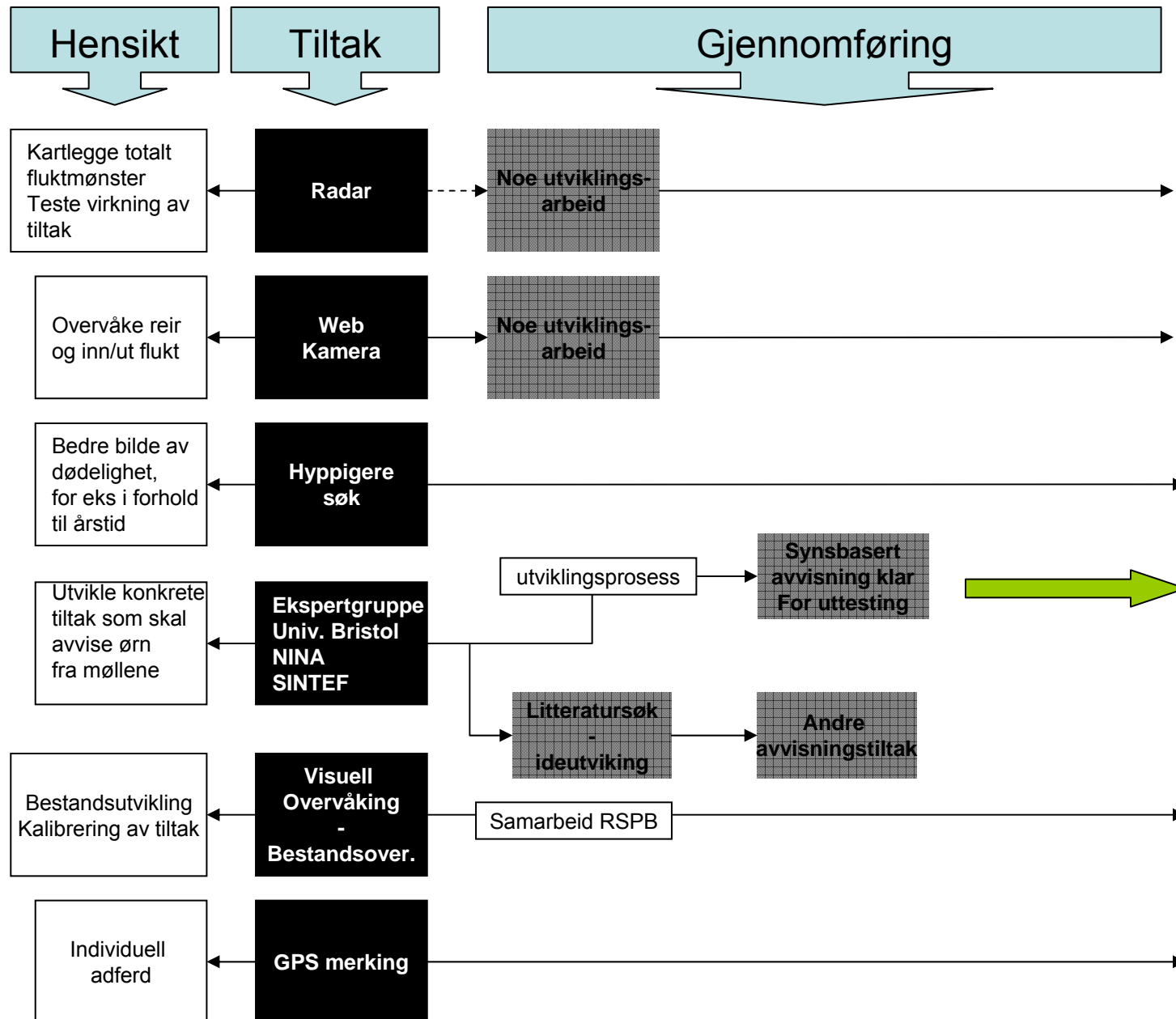




Two patterns??

- Three juv. killed by turbines close to nest (3: autumn, 5,6: next spring).
- Six adults are all killed by turbines north in the wind farm.









August 2006: A dead WTE reported from Hitra



Only bones and feathers, have been dead for 1 or 2 years.



Fracture in the left leg.

Statkraft has requested us to do a complete search for corpses in the Hitra wind farm this week.

Increased focus also on bats

List by Species of the 475 Bats Found During Once-a-week Searches of 44 Turbines at WV Windplant from April to November, 2003

Red Bat (<i>Lasiurus borealis</i>)	198
Hoary Bat (<i>Lasiurus cinereus</i>)	89
Eastern Pipistrelle (<i>Pipistrellus subflavus</i>)	87
Little Brown (<i>Myotis lucifugus</i>)	60
Silver-haired (<i>Lasionycteris noctivagans</i>)	28
Long-eared (<i>Myotis septentrionalis</i>)	6
Big Brown (<i>Eptesicus fuscus</i>)	2
Myotis sp.	2
Unknown	2
 Total carcasses found	 475

However, the number of fatalities (475) is only a small fraction of the total number of bats likely killed this year at the WV windplant covering over 4 miles atop Back-bone. The avian mortality study at this facility documented that searchers found on average only 25% of all carcasses present.

The first bat found on Smøla...



Found by a specially trained dog. Would probably not have been detected in a search by humans.

When found on Smøla, where else may bats be found?

