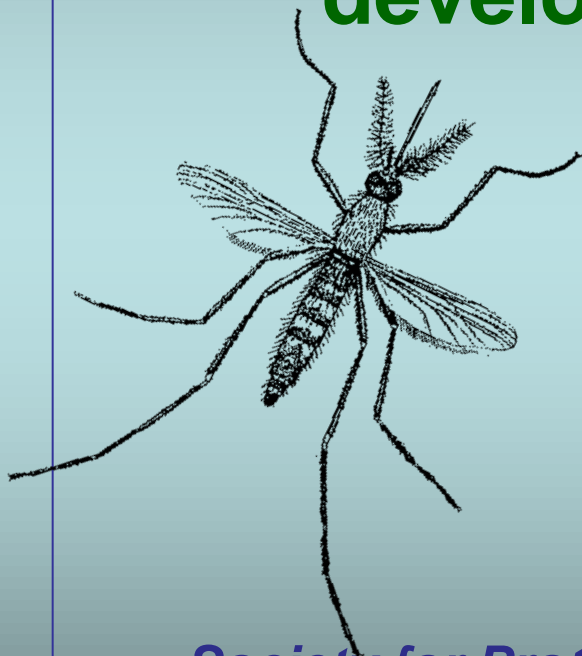


Biological Mosquito Management in Wetlands:

a selective method for health care, tourism
development and acceptance of
conservation



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THE PROBLEM - MOSQUITOES



**Regular pluges in
settlements near to
wetlands**



Eggs

The Torturer

Mosquitoes: without blood - no offspring!



Only female bite
- Need blood for eggs to develop!



The male suckle only on plants – no organs to bite!

A little bit of Biology: different types of mosquitoes

Flood Mosquitoes	Fever Mosquitoes	House Mosquitoes
<p>Mass reproduction in flood areas of rivers, lakes, and marshes</p> <p>Eggs in humid soil – survive for 8 years</p>	<p>Reproduction in shallow permanent waters</p> <p>Eggs singularly on watersurface</p>	<p>Reproduction in small permanent waterbodies like barrels, tires, bins, rainwater drainages etc inside settlements</p> <p>Egg packages</p>
<p>Migrate more than 10 km, mass pluges in nature and settlements</p>	<p>migrate 1 km</p>	<p>Migrate little, but born in settlements</p>
<p>Bite extremely agressivly mainly at dusk and dawn – Make your life impossible outdoors, recently desease transmitters of viruses</p>	<p>Bite very painfully, mainly during the night</p> <p>Malaria transmitters – about 1 mil death/year</p>	<p>Bite mainly during the night and enter houses</p> <p>Transmit viruses</p>
<p>Control measures after every flood - only</p>	<p>Regularly all 2 weeks near settlements</p>	<p>Reproduce permanently – need control all 10 – 14 days</p>

Main breeding habitats of Mosquitoes

Flood mosquitoes



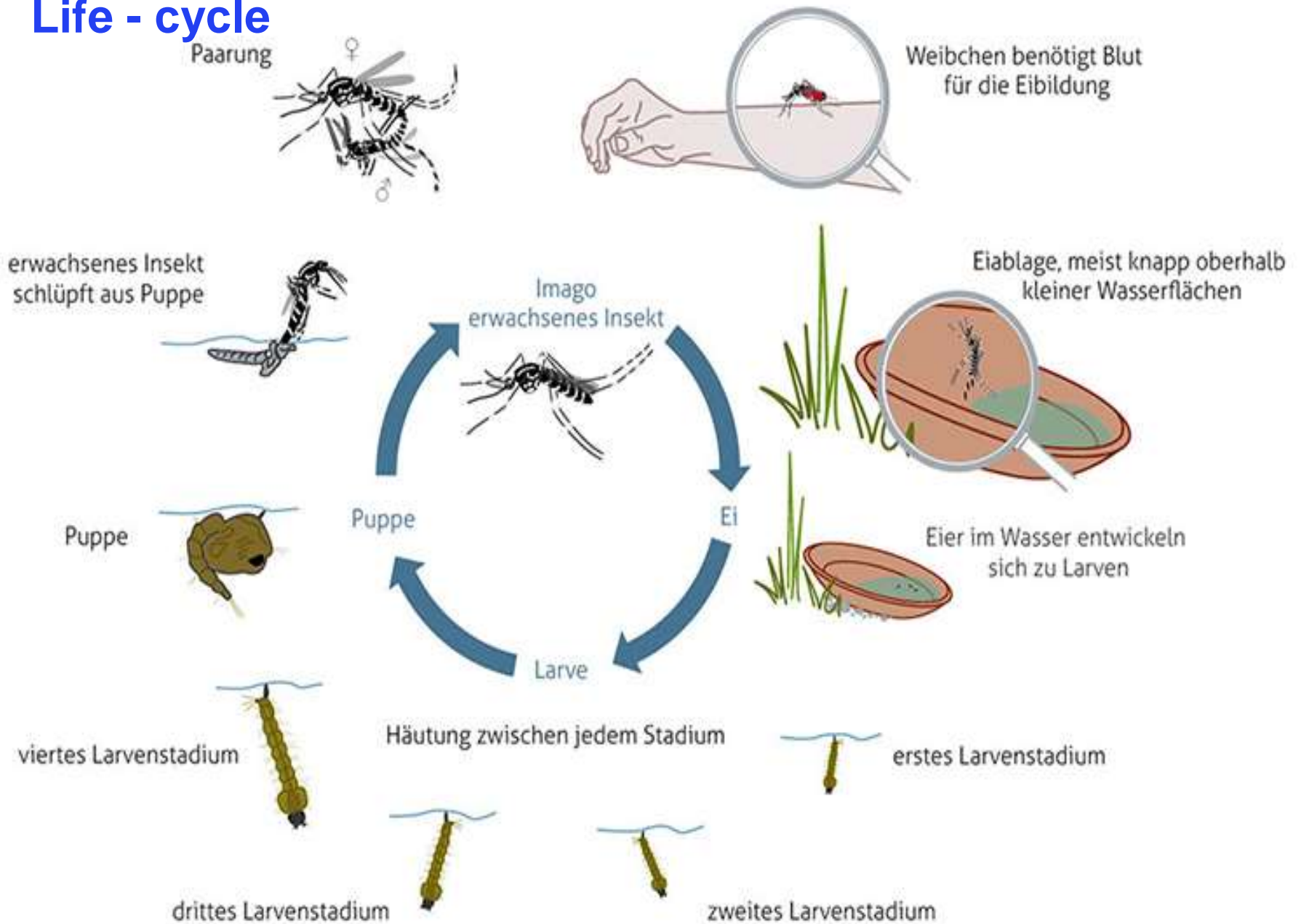
Fever Mosquitoes



House Mosquitoes



Life - cycle





Nest of house mosquito 300 - 400 eggs



Larvae of flood mosquitoes



Pupae of mosquitoes 1-3 days



Emerging from the water...



Worldwide about 3500 species

Mass reproduction of flood mosquitoes

up to 200.000 larvae per square meter =
2.000.000.000 per hectar – 2 Bil. Mosquitoes !

Mosquitoes in a changing World

Globalization brings new species and threats

- trade of goods – transport of species,
- mobility carries „ illegal immigrants „

Climate change brings health risk like Malaria and various virus infections (Dengue 37 death in Greece, West Nile, Chikungunya, etc:

- because pathogens and vectors expand due to favorable climatic conditions
- imported pathogens/parasites can survive



Tiger-mosquito



Japanese Mosquito

The concept of biological mosquito control in many European countries

Exclusively regulation of larvae inside the breeding sites with (micro-) biological environmentally friendly method using a protein-crystal, produced by a bacterium: “*Bacillus thuringiensis israeliensis BTI*”



**The goal:
Reduction of mosquitoes
inside the settlements by 90 %**

Unbehandelt
Kühkopf

11.200 Stechmücken/Nacht/Falle
14.9.2005

Behandelt
Au am Rhein

151 Stechmücken/Nacht/Falle
14.9.2005

BTI is :

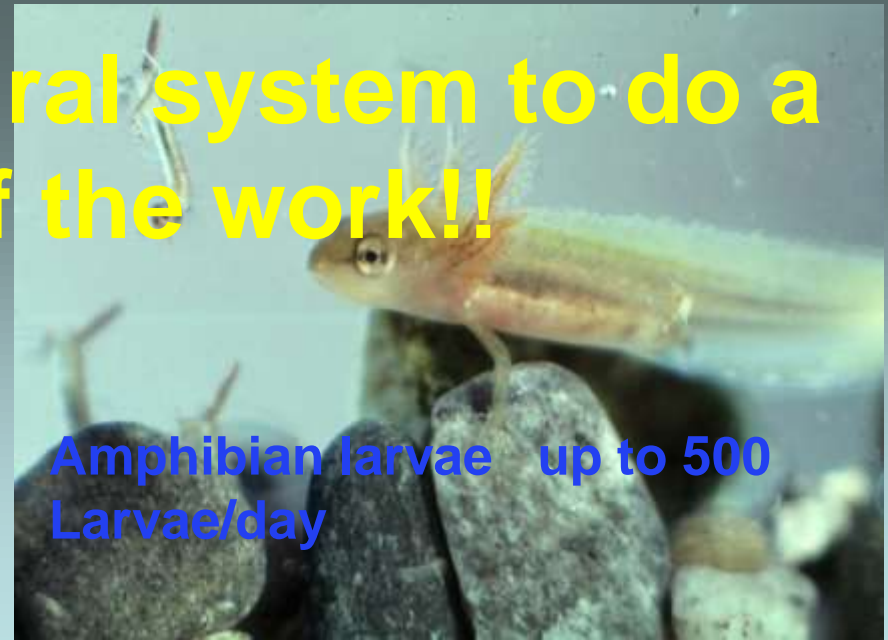
- Extremely selective to mosquitoes – only,
- Is not poisonous or acidic (WHO drinking water reservoirs),
- No living bacillus used – only protein crystals,
- Disappears in nature within 30 hours without any residues or dangerous derivatives,
- Water solutable and washable,
- No resistances after 33 years of usage

BTI allows the natural system to do a good part of the work!!

Fish up to 700 Larvae/day



Amphibian larvae up to 500 Larvae/day



Water beetles
> 30 Larvae/day



Water bugs
> 30 Larvae/day



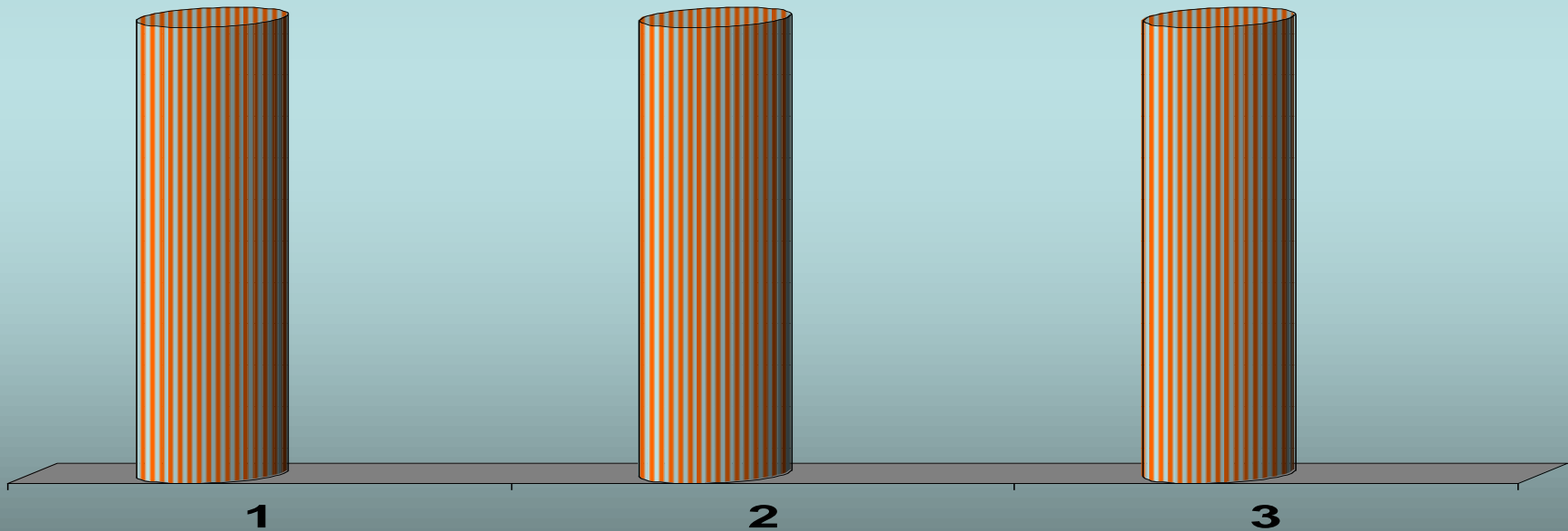
Water fleas
1-2 Larvae/day

The three pillars of Action

Ground –
„troops“
with back
spreyers

Regulation
with
Helicopter

House
mosquitoes
per
community



1. Pillar: ground troops organized by each community

- Volunteers, students and community service employees with back-pack sprayers in case of floods,
- Regular monitoring of potential breeding sites,
- 1 responsible per community as organizer and rapporteur
- All are trained every year





Beginning with snow melt mosquitoes March - April

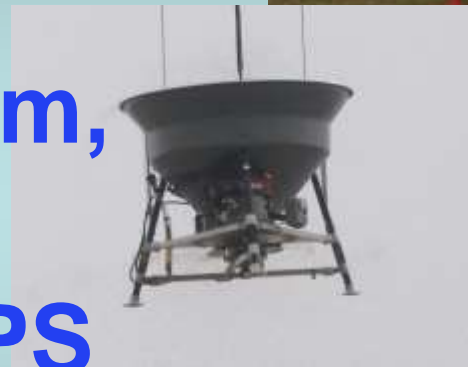
2. Pilar: Control with helicopter

Only when large breedings sites are to be treated.



Equipment for Helicopter:

- Application mechanism
- Heli GPS-System,
- Software for GPS and office,



3. Pilar: House Mosquito control



Each community self - organized:

- mapping / registering of breeding sites,
- regular control measures,
- involving house and ground owners,
- distribution of BTI-tablets for garden use,
- public awareness and media work





Garden areas



Used tires as waste and as goods for trade



*Free BTI
tablets from
the
communities
for garden
use*

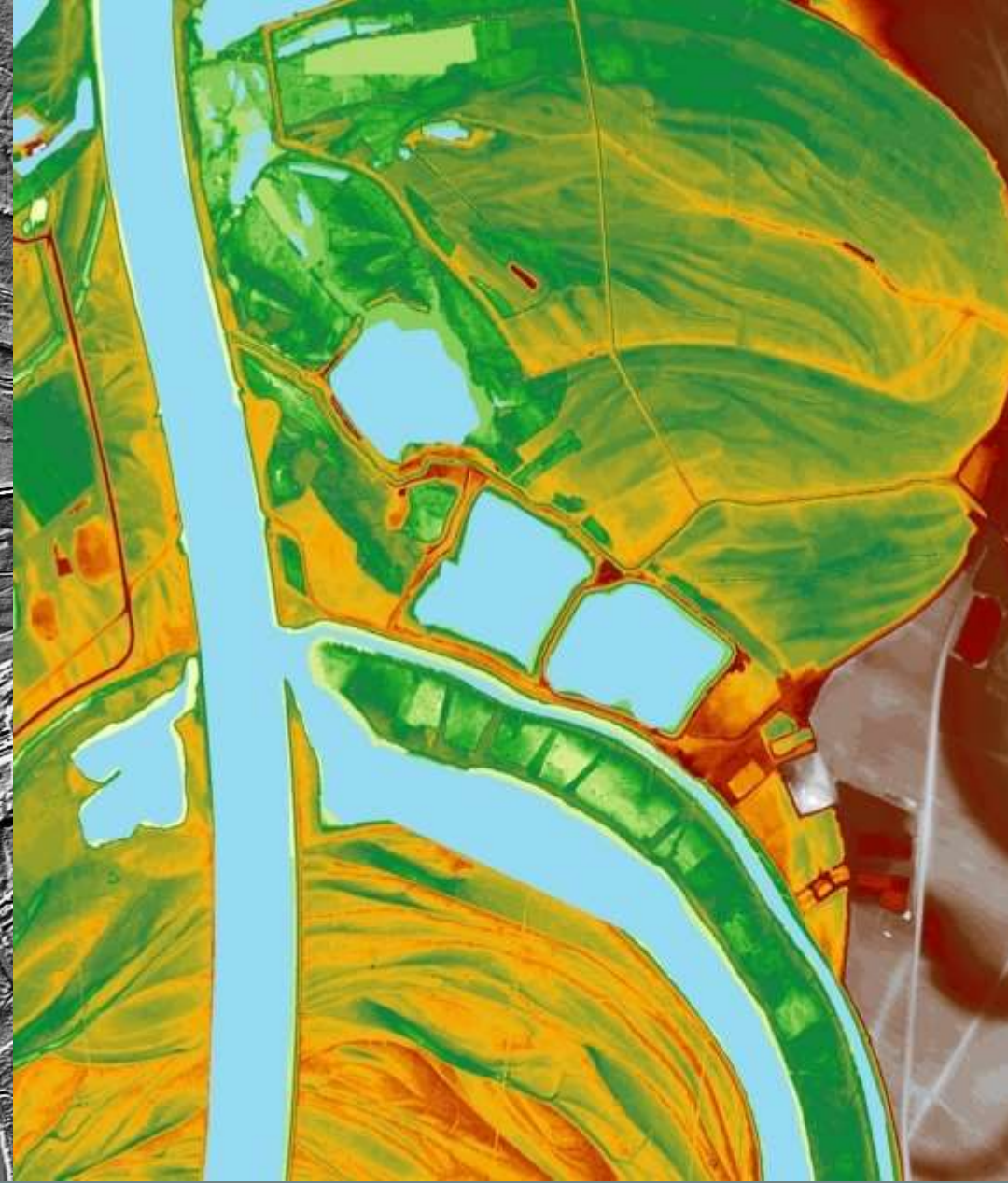


Culindex Tab

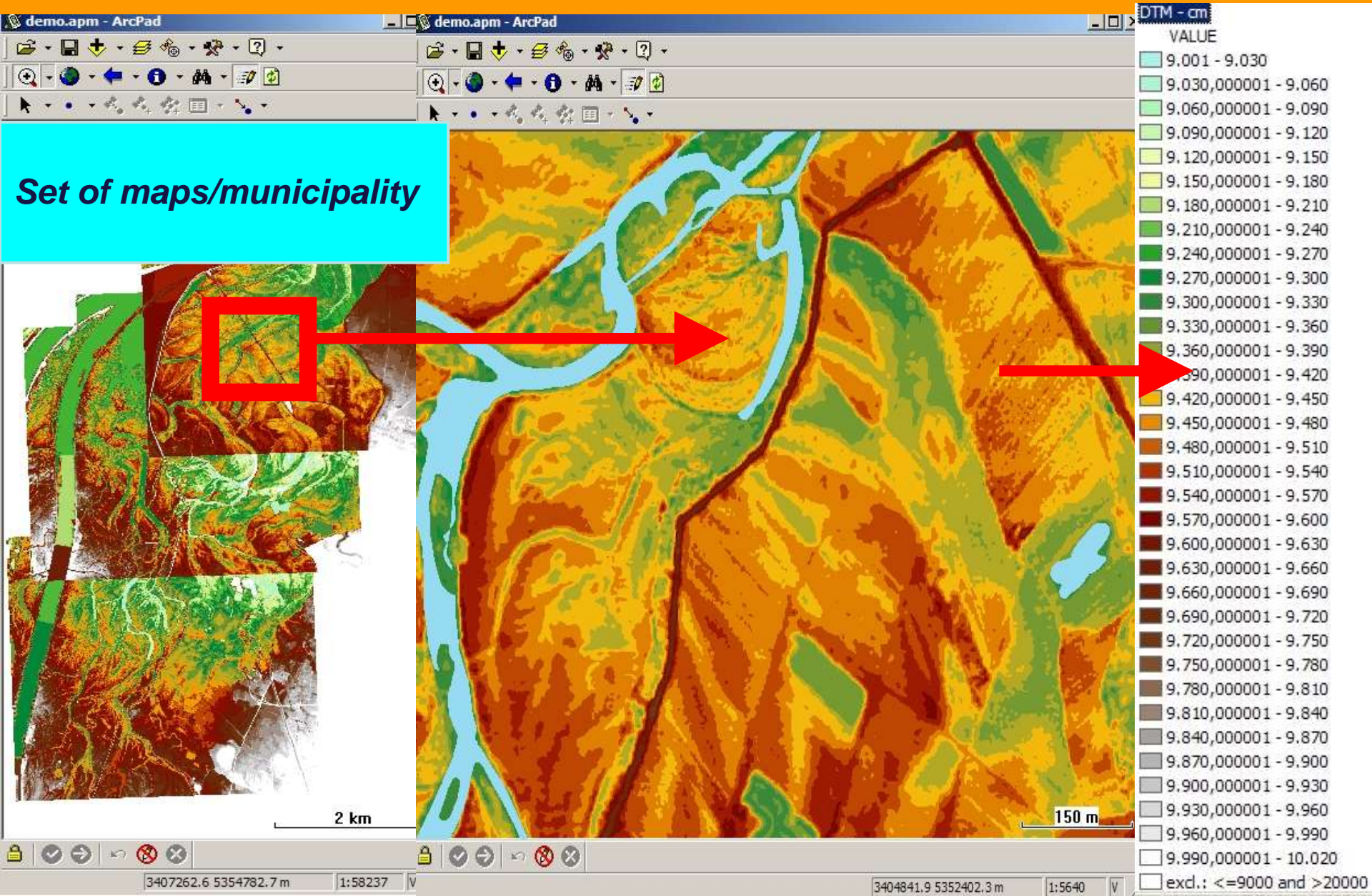
**Radar – based
elevation cataster
with 1m resolution**

**elevation resolution
of 10-20 cm**

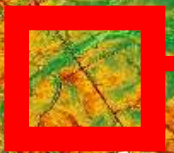
**= best analysis of
topography**



DTM (digital topographical model) hypsometric maps



Set of maps/municipality

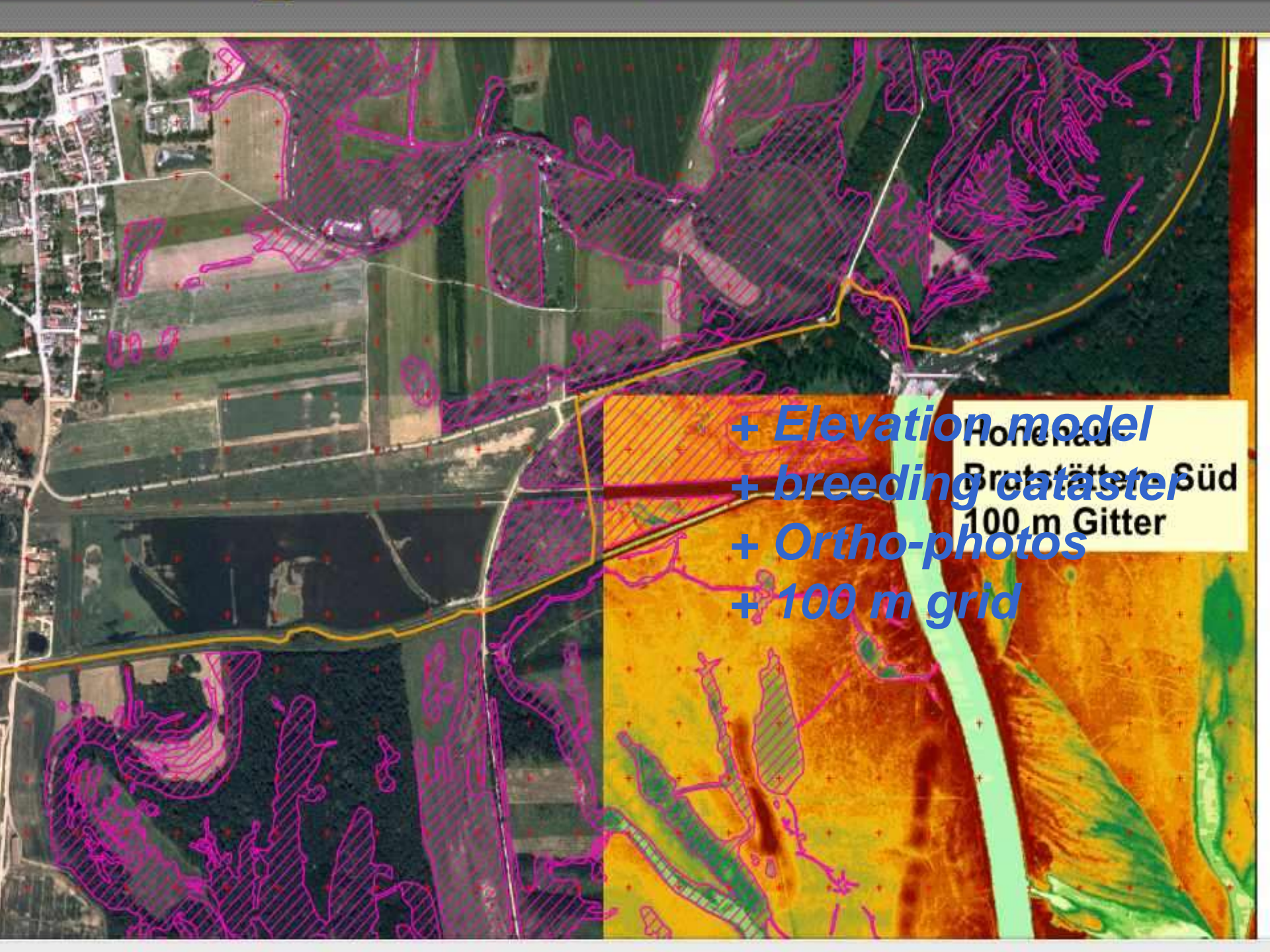


2 km

150 m

Supporting field mapping and digitalization, than elaboration of GIS maps with Arcview / ArcGis / ArcPad Software





- + *Elevation model*
- + *breeding catastrophe*
- + *Ortho-photos*
- + *100 m grid*

Hohenau
Brutstätte Süd
100 m Gitter

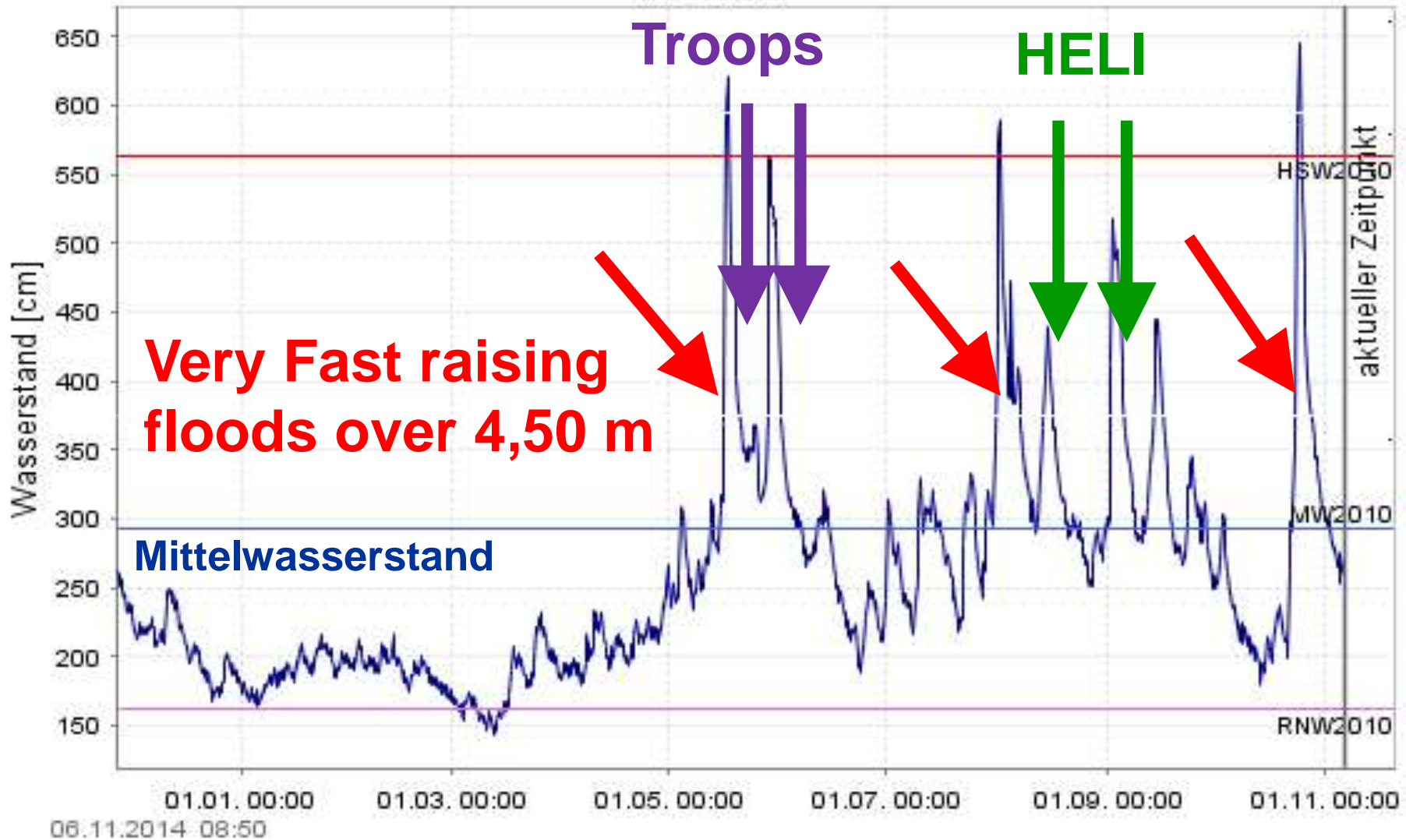
Tabu-zones for endangered bird species like eagles, herons and storks



DANUBE

Wildungsmauer - Wasserstand

— Messwerte







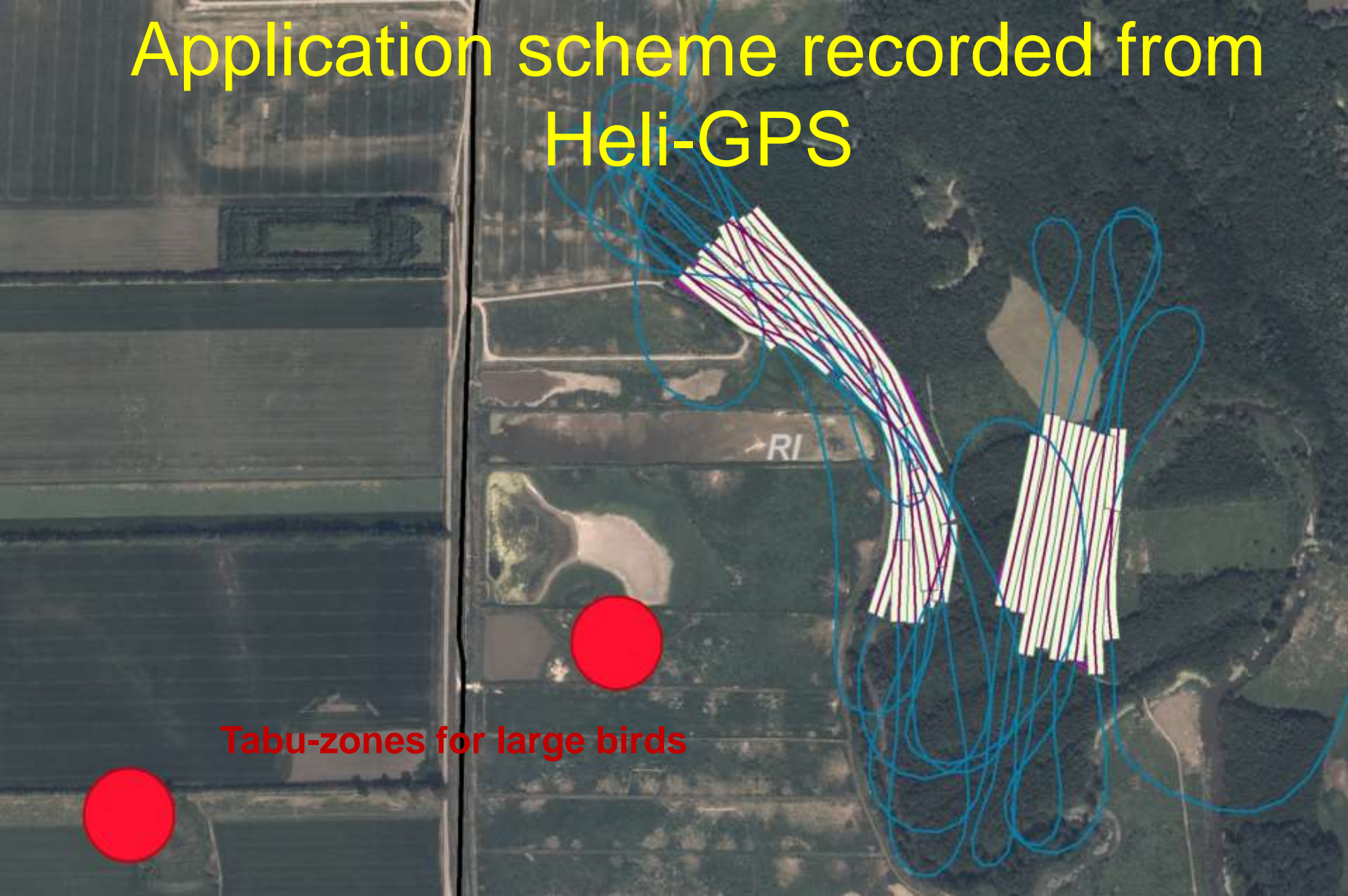




Application with helicopter near the village



Application scheme recorded from Heli-GPS



Scientific and technical Monitoring

Water, non target organisms, birds, mosquitoes

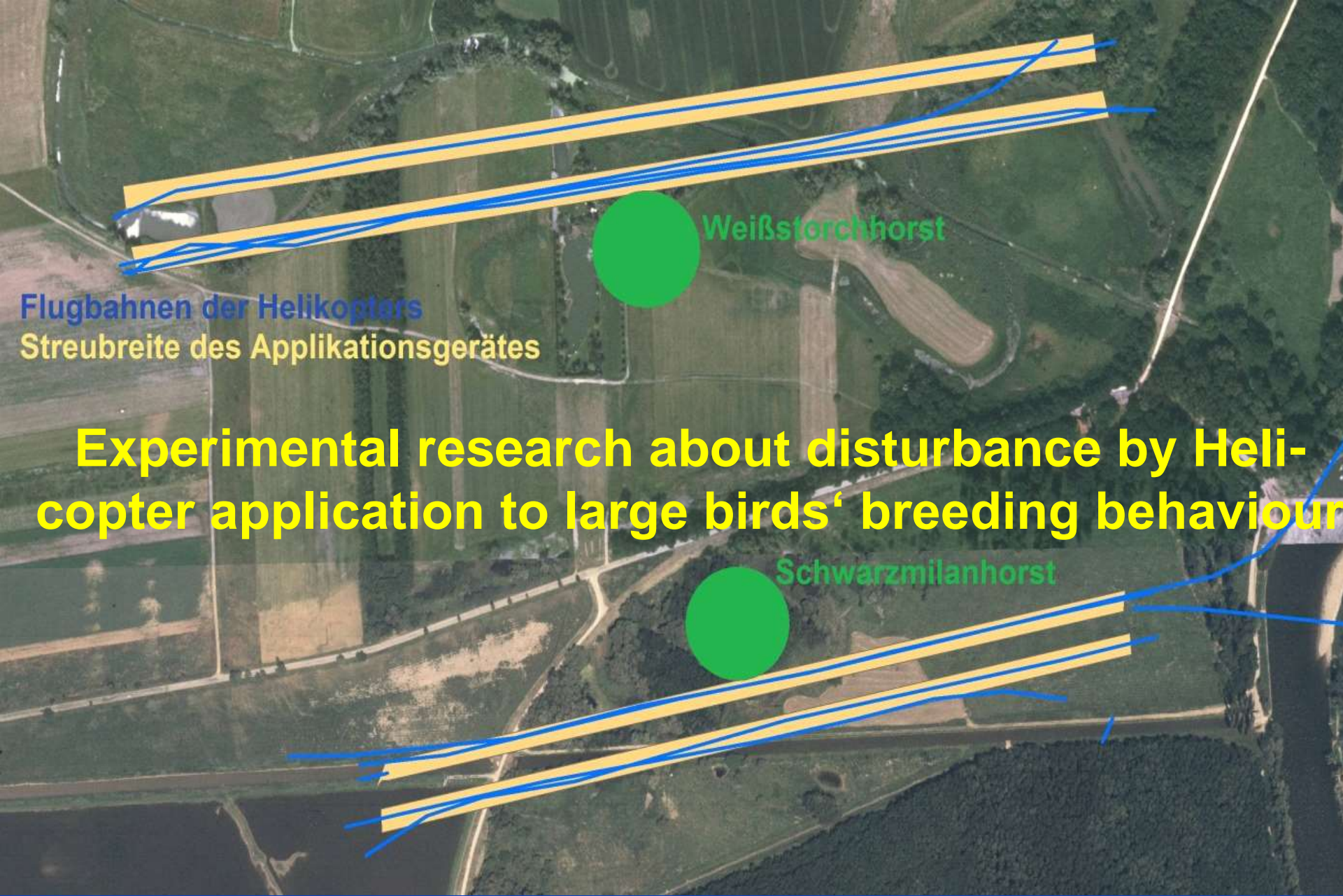


**Mosquito
Trap**





International standards for “tolerable nuisance”
max 100 Mosquitoes per night in trap in settlements,
In natural areas and outside settlements 300-500
Mosquitoes per night and trap,
after floods untreated up to 106 X inside settlements....



Flugbahnen der Helikoptars
Streubreite des Applikationsgerätes

Weißstorchhorst

Schwarzmilanhorst

Experimental research about disturbance by Helicopter application to large birds' breeding behaviour



**Unfortunately others do it still
with highly toxic chemicals that
are ecologically disastrous !**



Thank you for your Attention!

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