Seeking Long-Term Persistence of Asian Elephants and Tigers in a Connected Landscape

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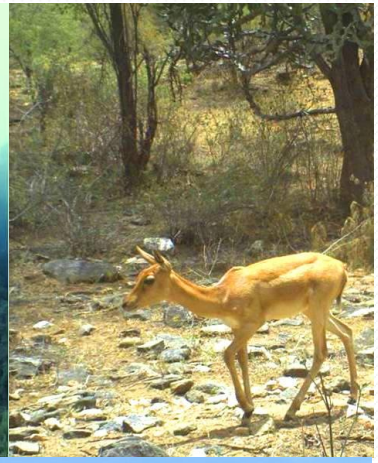
Consultant

Globally Important Conservation Area

- **Biodiversity Hot Spot**, located in the Western Ghats (Mittermeier *et al*.1999)
- **Three of the Global 200 Eco-regions** found here (Olson and Dinerstein, 2002)
- **Worlds largest Asian elephant population** an estimated 8600 elephants (MoEFCC, 2012)
- **Worlds largest tiger population**, 382 (95% CI 354 – 411) tigers (Jhala *et al.* 2011)
- **India's first Biosphere Reserve**

What makes it so good - strengths



- **Large landscape** (~ 15,000 km of connected forests)
- **Large breeding populations** which are genetically viable for long term conservation.
- **Diverse resources** accessible to large mammals
- **Large interconnected PAs network** and Reserve Forests

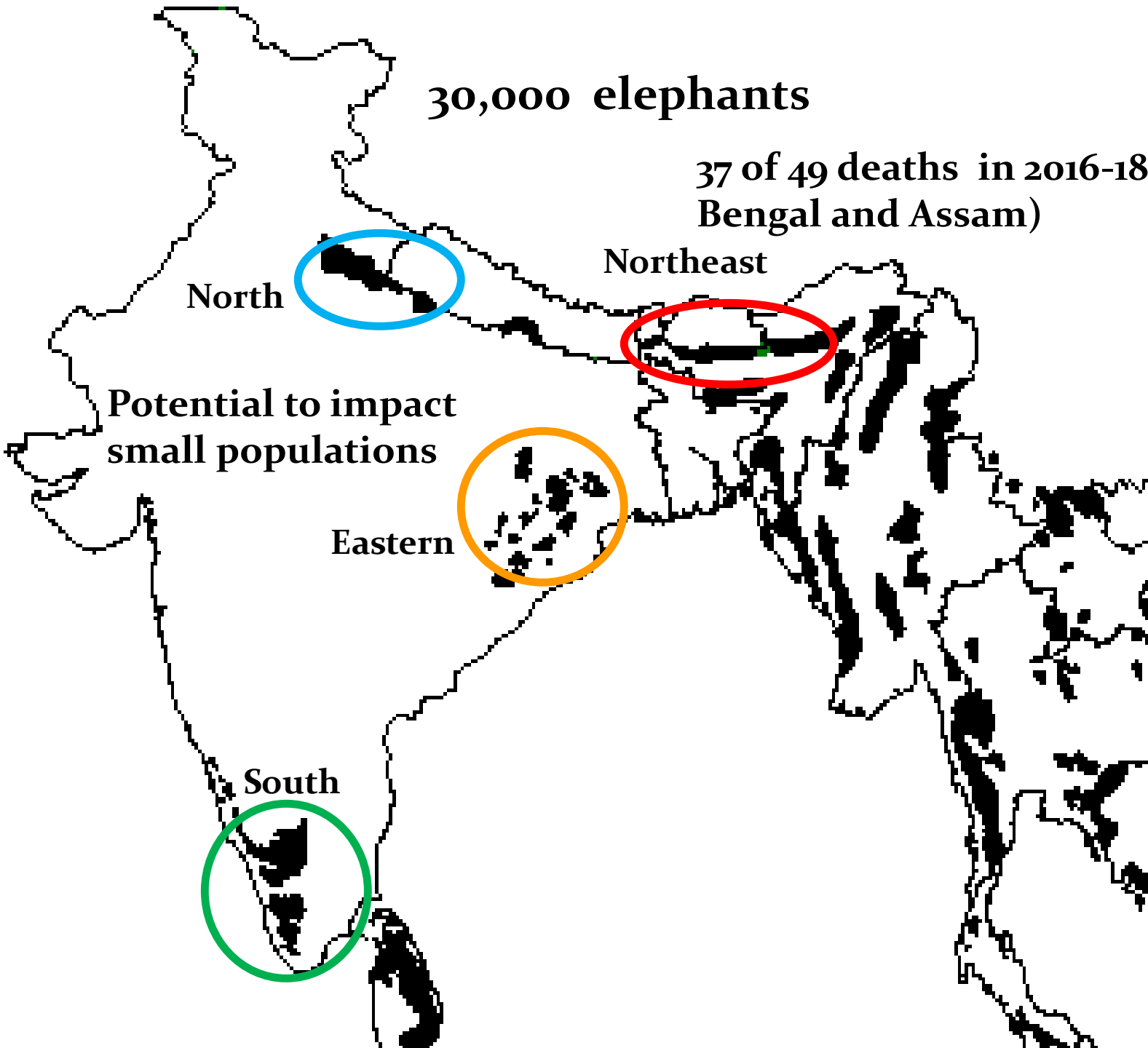
Economically Important Area

- **Ecosystem services**
- **Watershed for Cauvery** and other Rivers (water for Industrial, agricultural and drinking purposes)
- **Hydropower** - 34% of Tamil Nadu's Hydropower comes from the Nilgiris
- **Climate moderation and carbon sequestering**
- **Genetic storehouse** - wild relatives of cultivar species and medicinal plants
- **Home to forest dependent Tribal people**

Railway accidents involving elephants

- Fragments habitat
- 1987 – 2018: 249 (8 annually)
- 2009 – 17: 461 electrocuted (58 annually)
- Why it is important?
  - Increasing: 2016-18 – 49 deaths (16 annually)
  - Adversely impacting small populations
  - Sending a very negative conservation message (public outrage)
  - Derailing of trains (threat to human life)
  - Disrupting of rail traffic (Economic loss)

Derailing of train after accident


30,000 elephants
37 of 49 deaths in 2016-18
Bengal and Assam)
Northeast
North
Potential to impact
small populations
Eastern
South

Why is there an increase in such accidents

- Increasing speed of trains due to gauge conversion, doubling of tracks and better engines
- Increase in number of trains
- Increasing number of lines in wildlife habitat
- Other factors: Habitat loss, fragmentation and degradation
  - Dispersing elephants and increased wandering
  - Increased crossing for resources and crop raiding
  - Population increase

Impacts are cumulative

- Anthropogenic pressure
- Linear infrastructure
- Land use changes
- Poaching
- Weeds
- Diversion of river waters
- Disease
- Pollution
- Human wildlife conflict
- Climate change

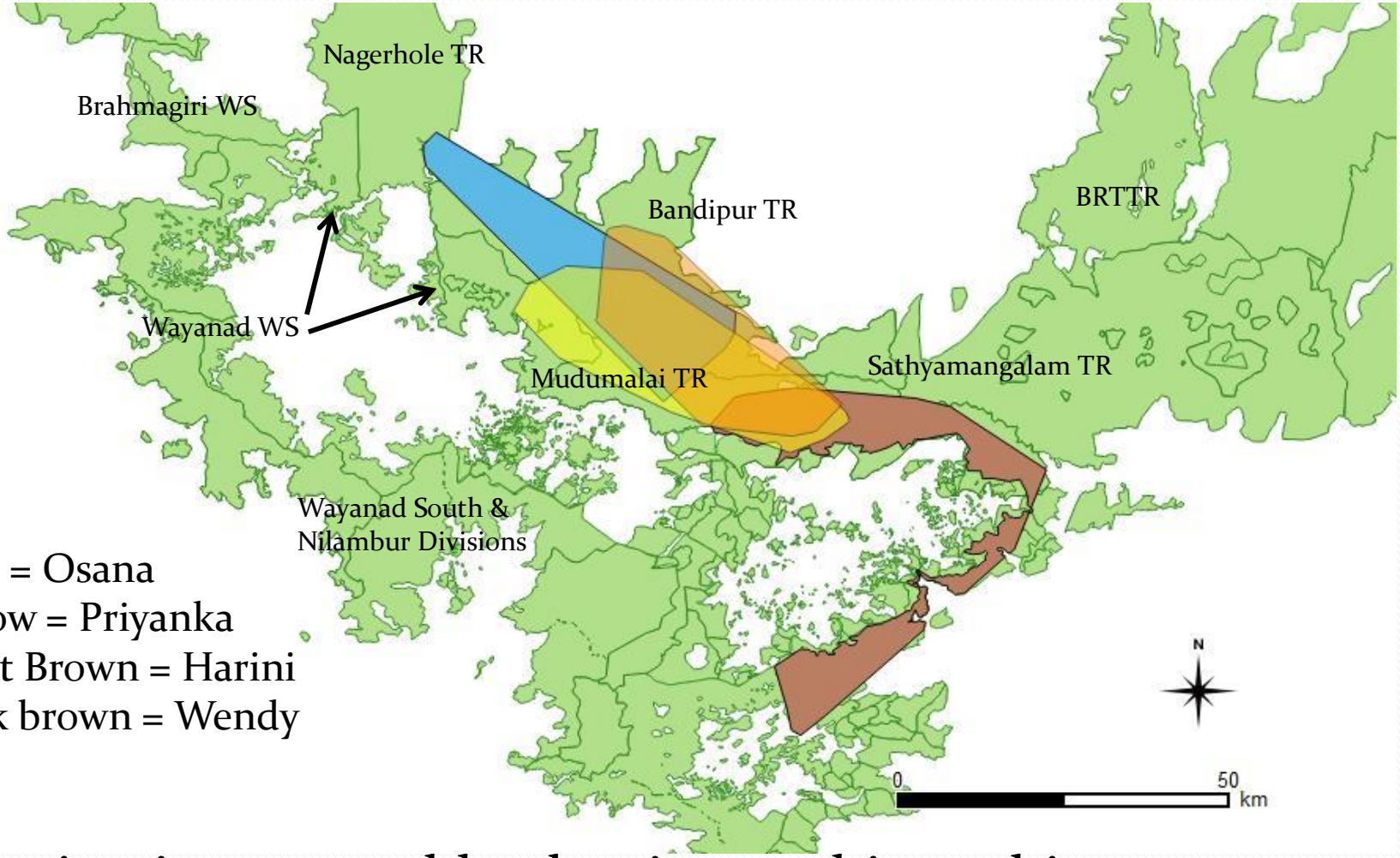
Did the lion read the book!
Knowledge and goal

Issues and challenges

- Elephants need to cross the tracks to secure resources
  - Heavy animal - Negotiates ballast and difficult terrain slowly (especially calves)
  - Embankments are death traps
  - Behavioral response (attack as a more of defense)
- Railways has to keep moving
  - Long braking distance (visual responses limited)
  - Need to maintain speed in hill areas
  - Rail network and schedules (delays upset the system)

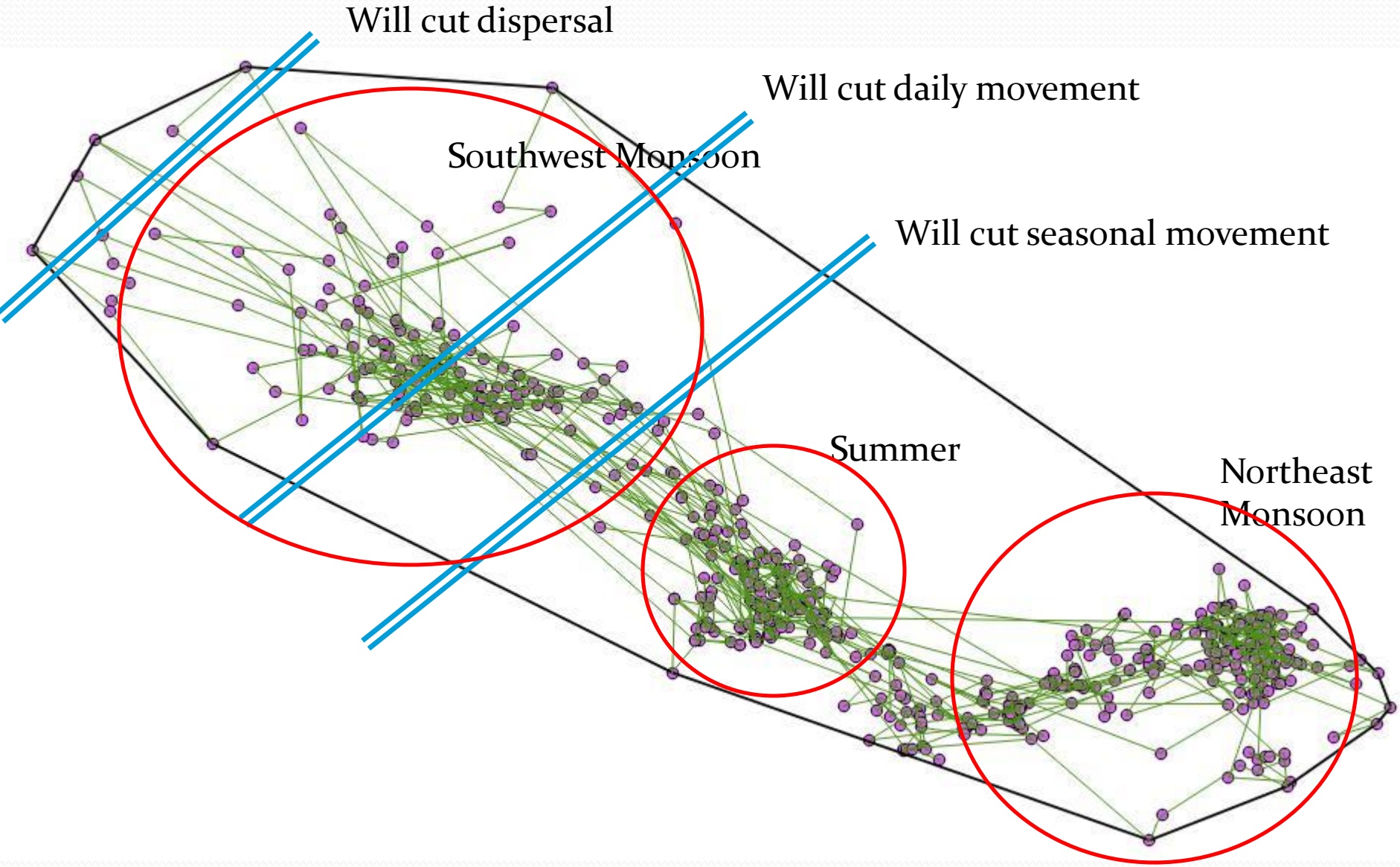
Behavioral aspects

Understanding how elephants move and why

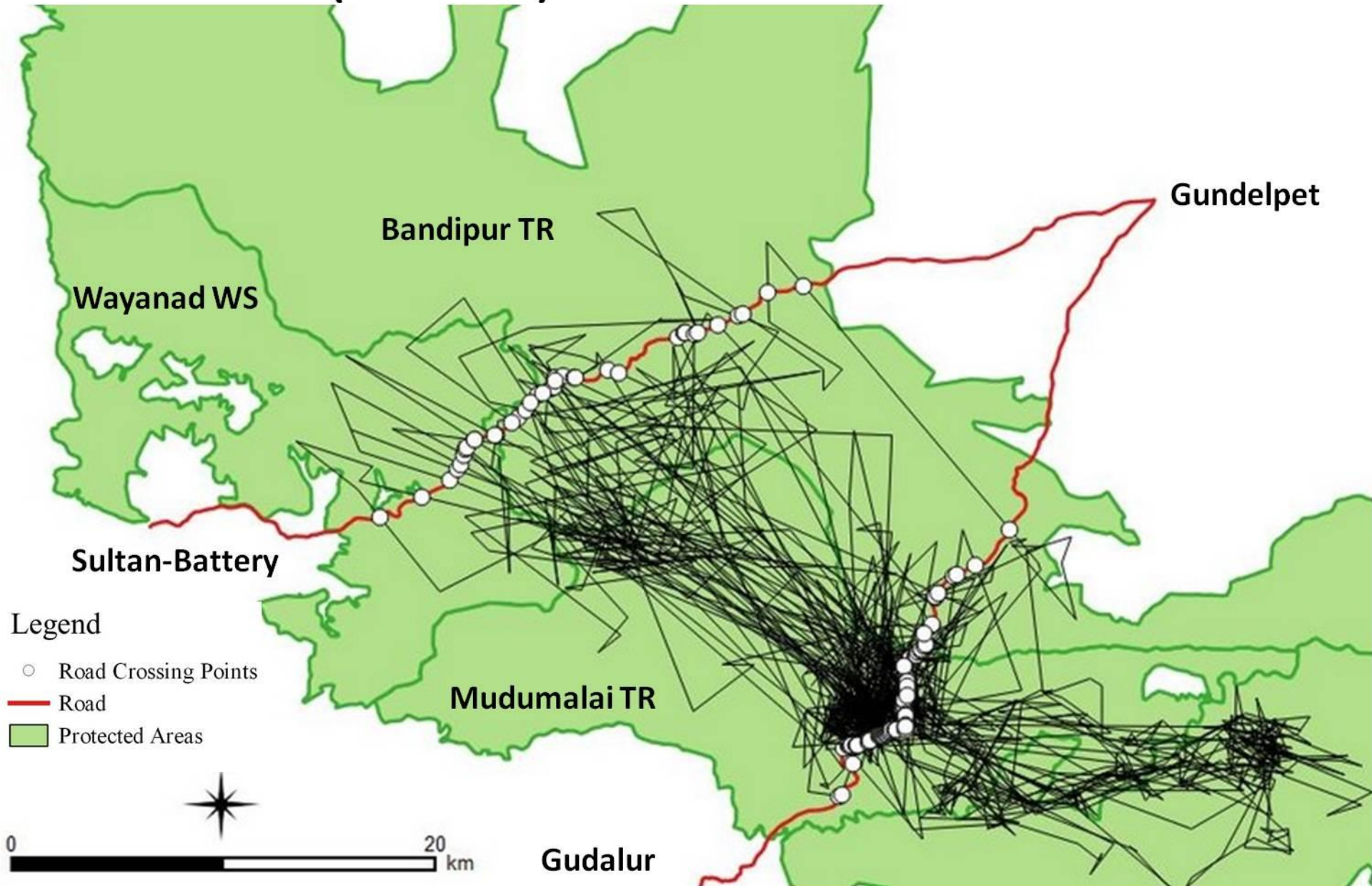


- Ranging is governed by dominance hierarchies

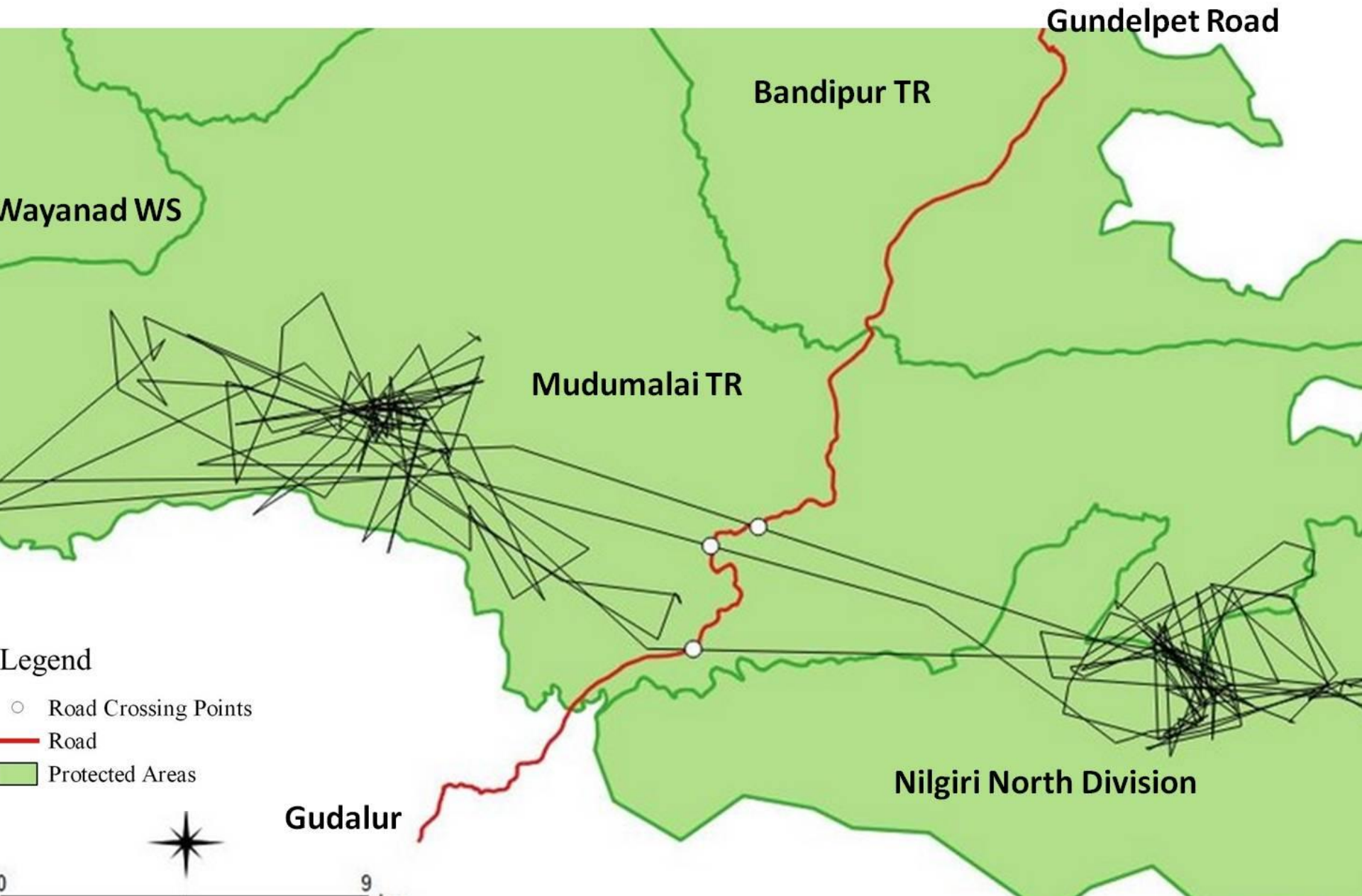
Seasonal ranges within the home range of clan ‘Priyanka’



Ranging tracks of two female clans (Priyanka & Hariai) and one male (Salim Ali) radio-collared in Mudumalai TR



Seasonal movement of Adult male

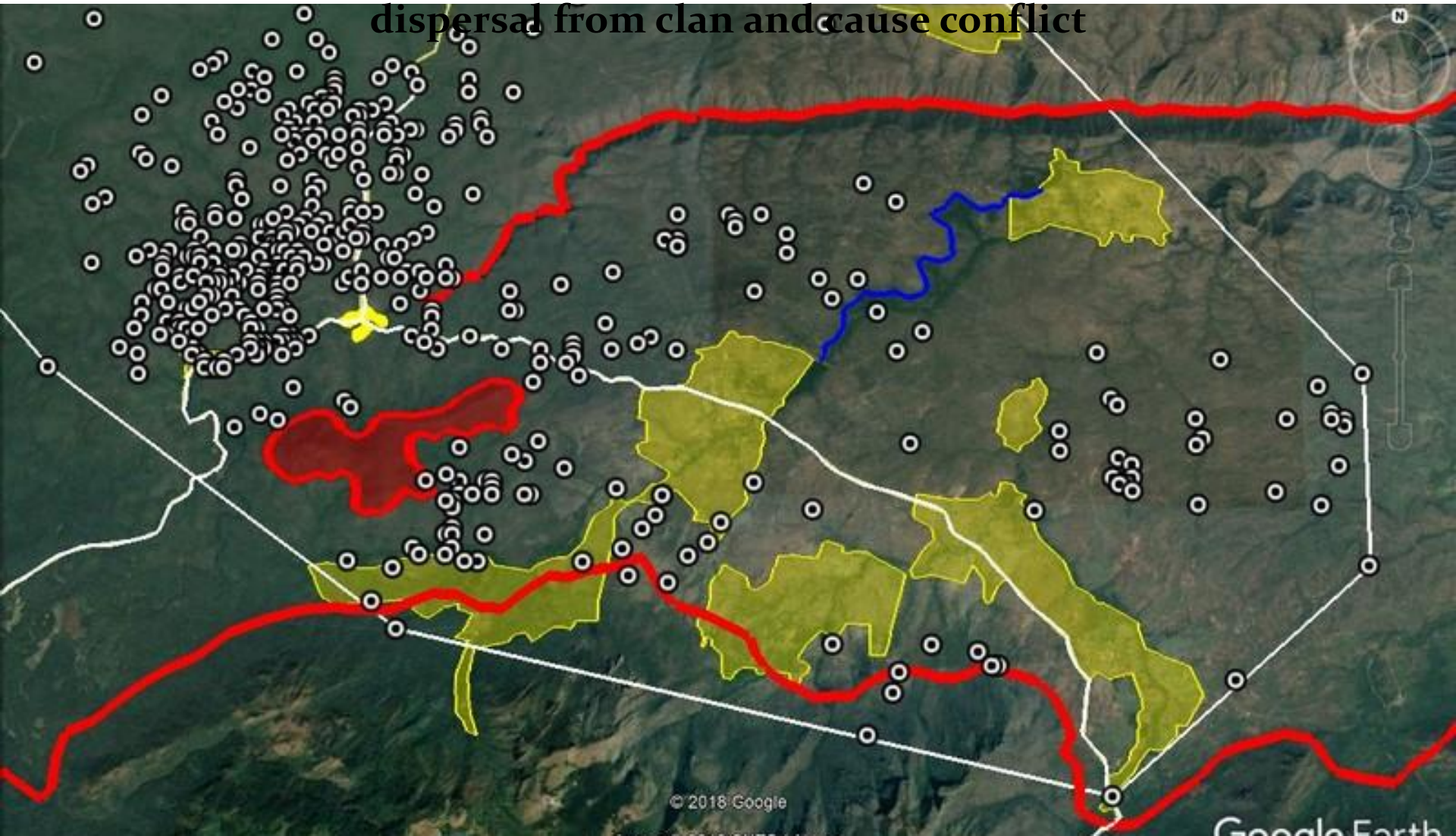


Daily movement of 2 Clans

Human settlements

Different clans and males use different routes

Clan Harini uses both the northern and southern routes of the corridor; uses corridor for movement between seasonal ranges and as foraging area; loss would result in breaking of home range, access to males, male dispersal from clan and cause conflict

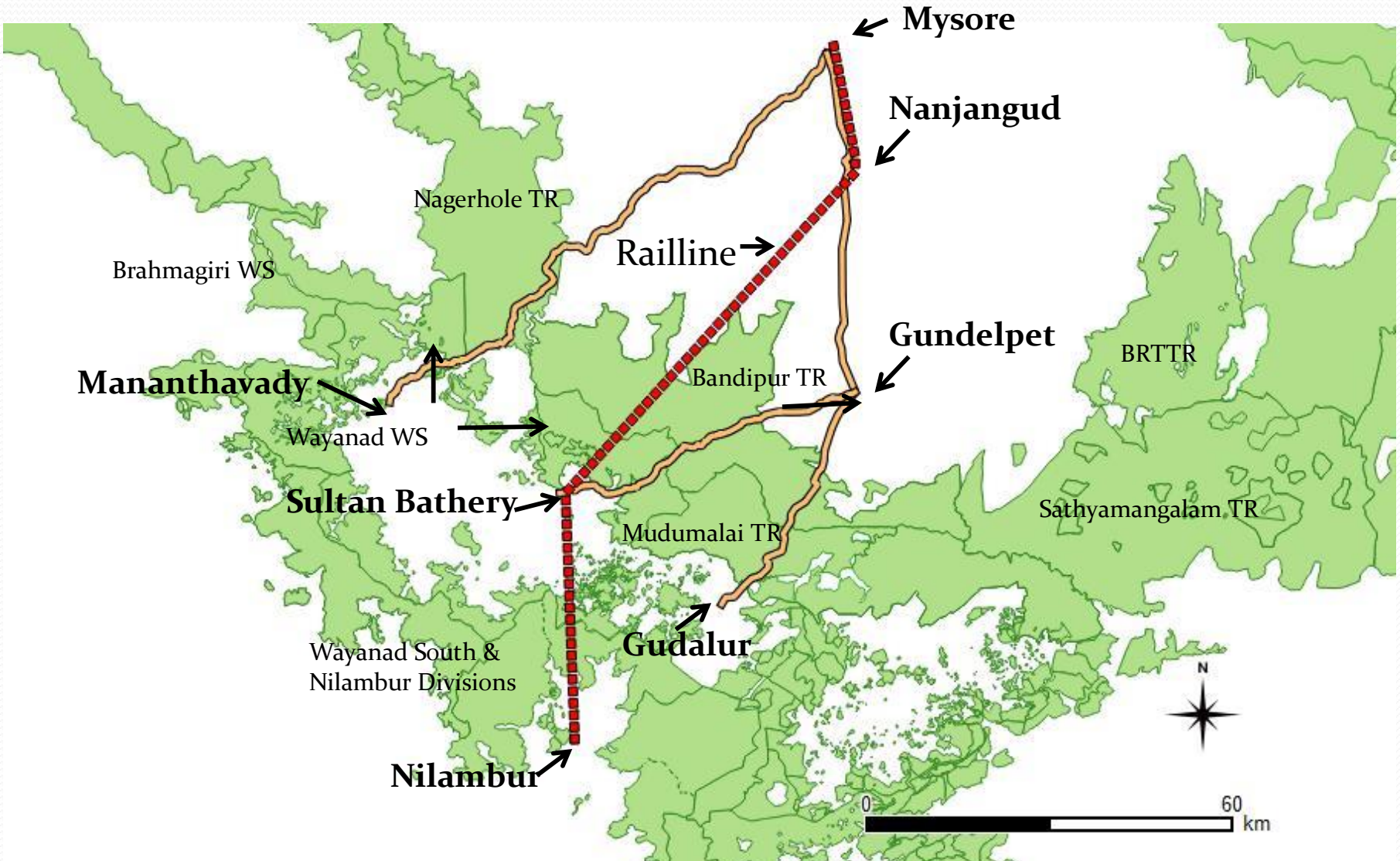


Avoiding accidents

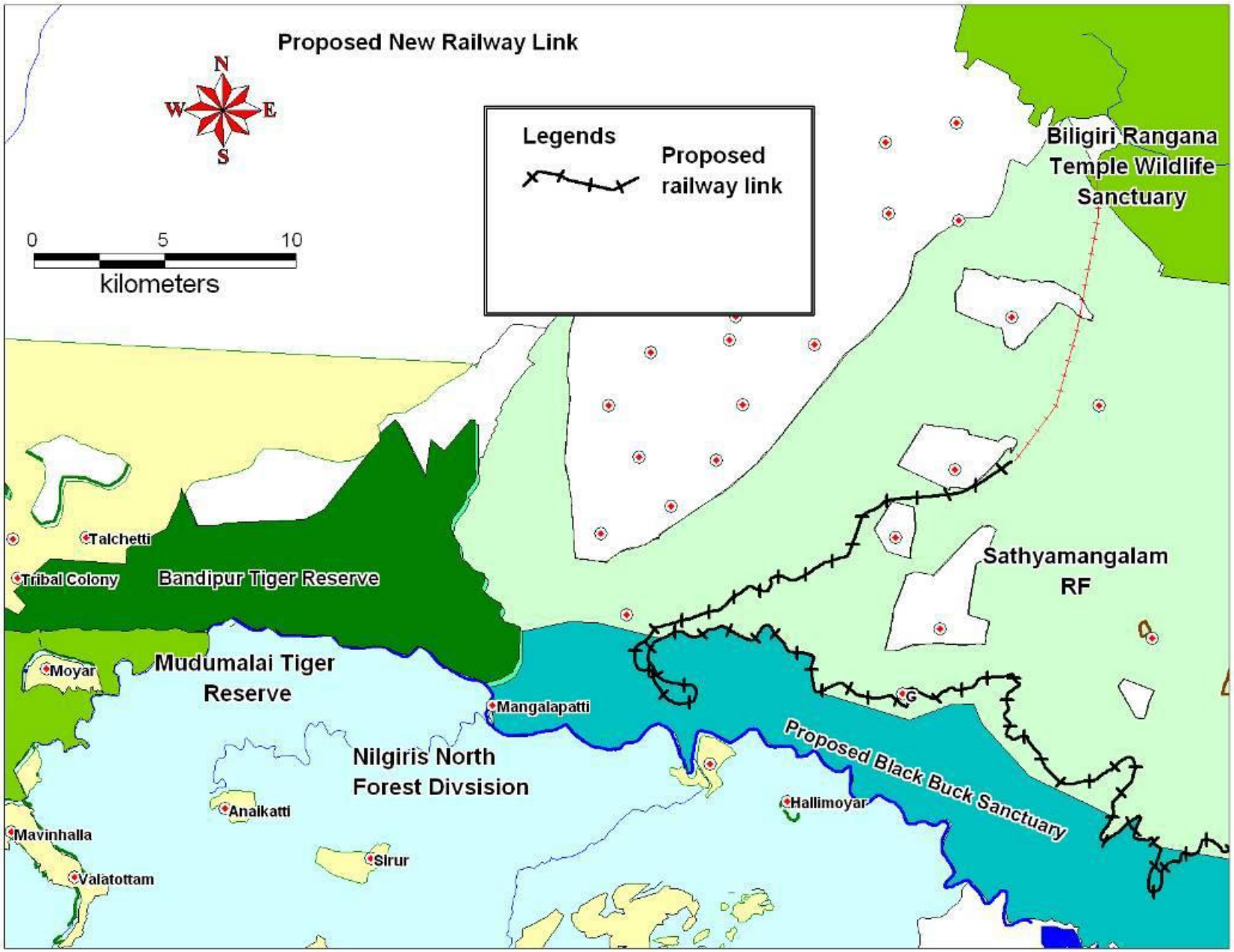
- Minimizing the need for elephants to cross tracks
  - Routing rail line outside the forest
  - Providing resource on one side of track
  - Containing anthropogenic drivers of dispersal
- Facilitating crossing
  - Overpasses and underpasses (expensive)
  - Providing level crossing (low cost)
- Funneling crossing to select sites
- Stopping of crossing at dangerous sites

- Preventive action by moving trains
  - Early warning and alerting systems
  - Identified locations where trains slow down
  - Deterrents (keep elephants away from tracks)
    - Location based
    - Train based

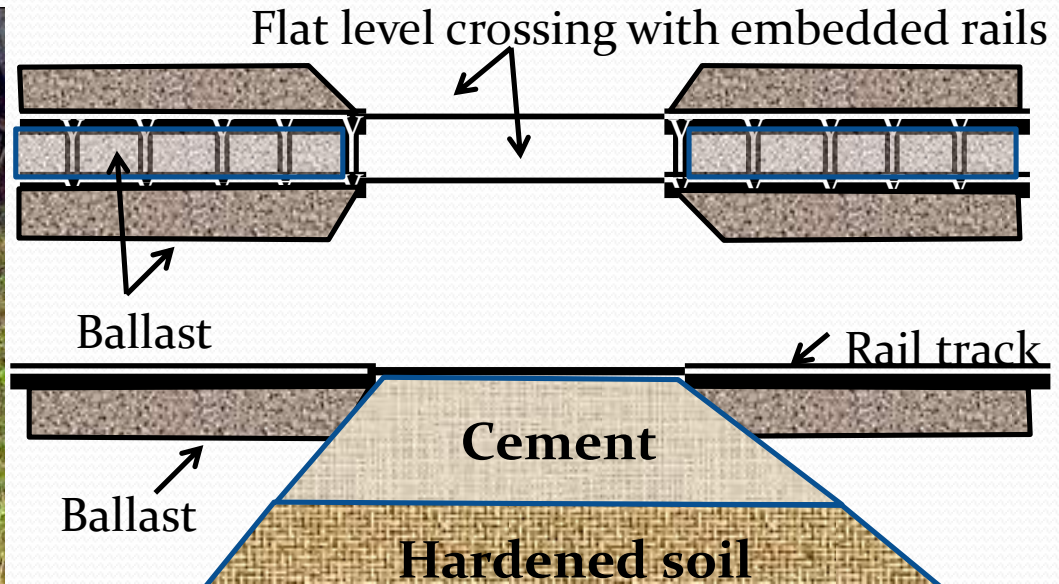
Proposed railway route – Bandipur TR and Wayanad WS



Proposed Sathyamangalam rail link

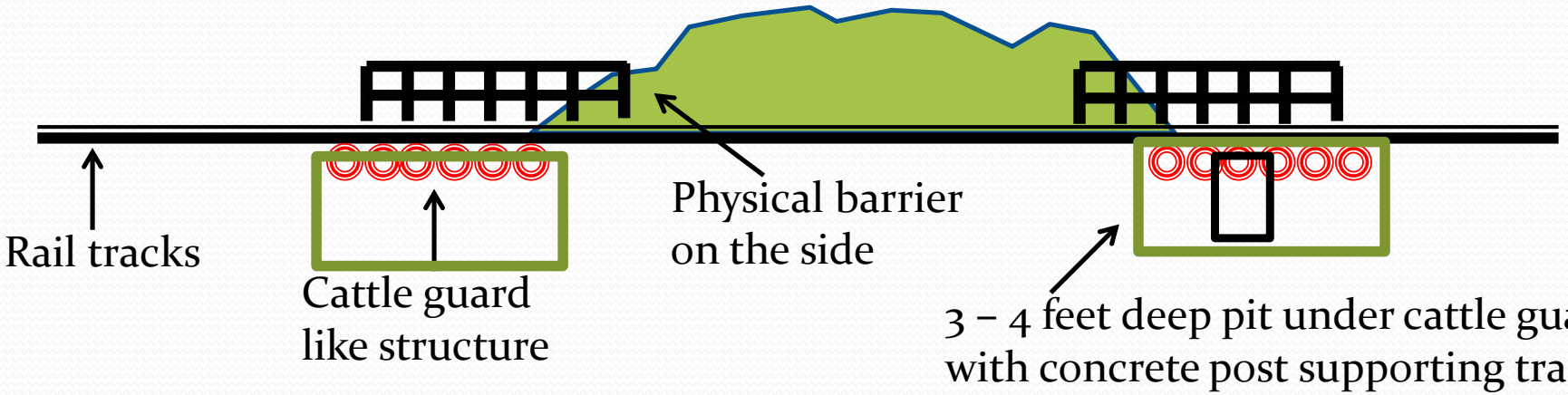


Facilitating easy crossings on regular paths



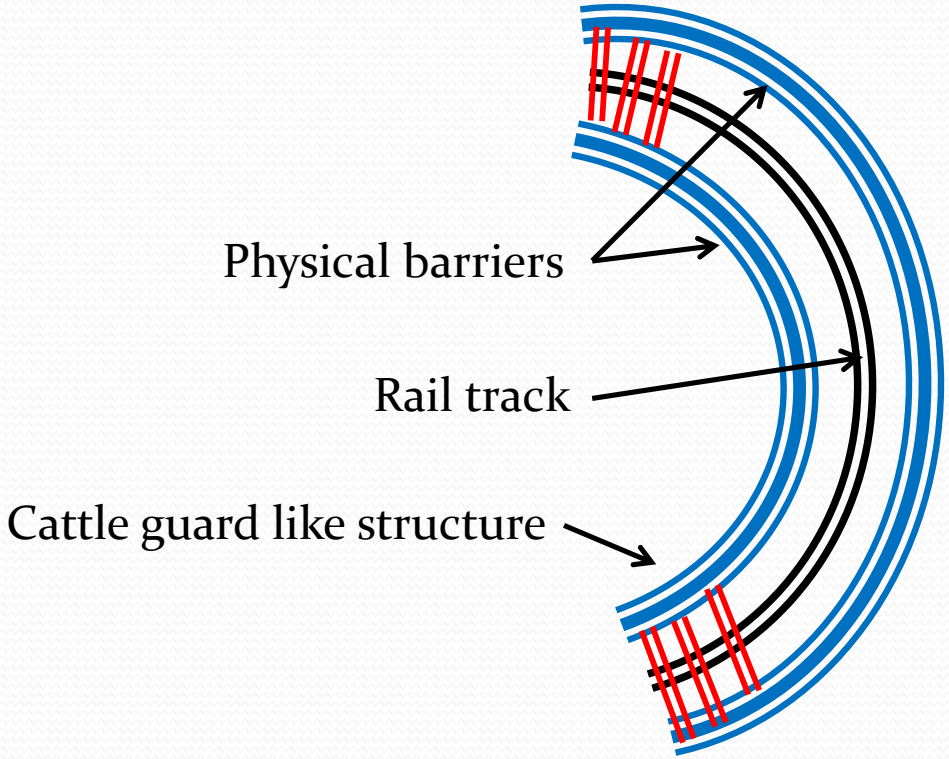
Flat route requires creation of embankments which become death traps

Areas with embankments need to be blocked or sides levelled to facilitate easy escape



Embankments may also provide opportunity for creating crossings

Blind curves

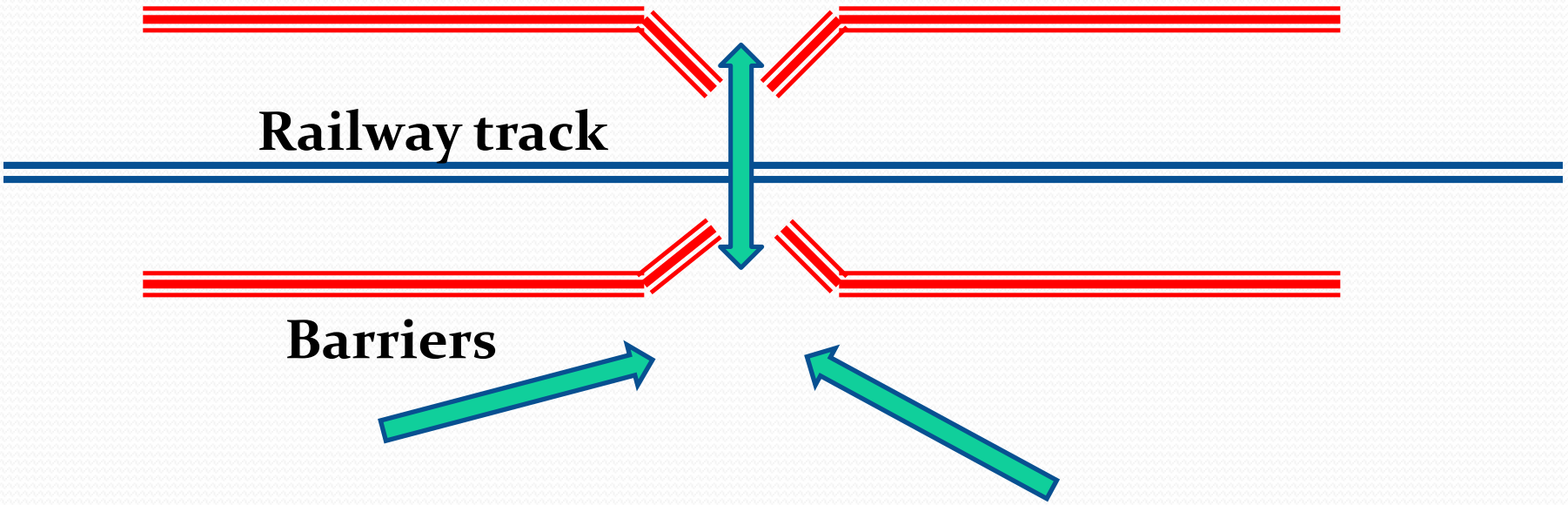


1. Stopping elephants crossing at such locations
2. Clearing vegetation to improve visibility
3. Going slow on such sections

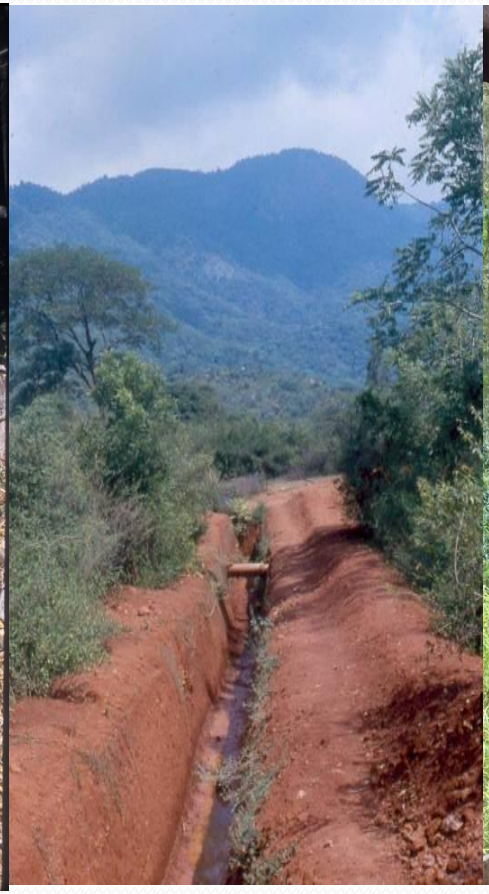
Daily movement of 2 Clans

Funneling or restricting access using barriers

Funneling using barriers



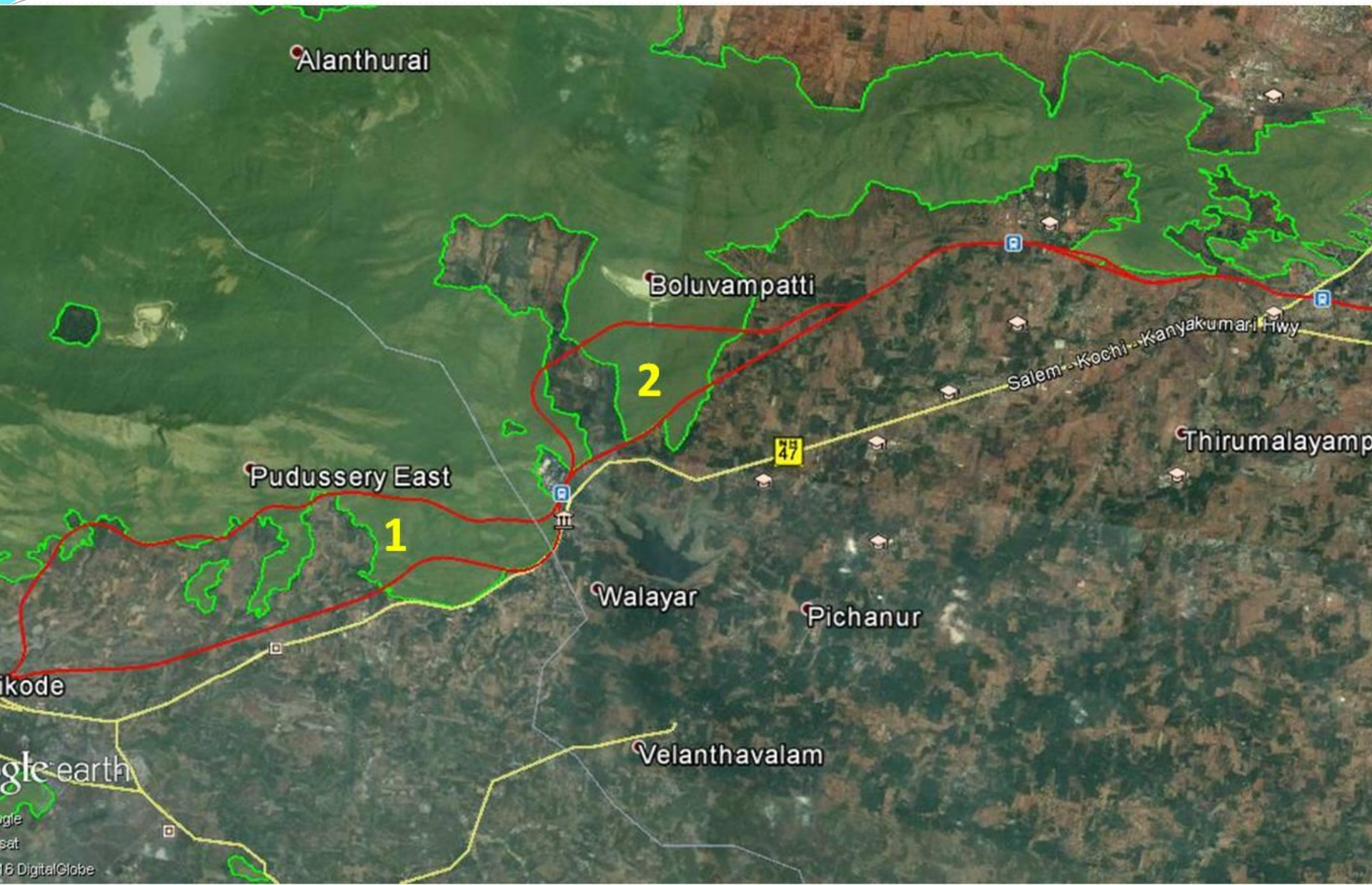
Types of barriers



Poor construction

Elephants are intelligent

Pallakad-Coimbatore Railway line – HEC mitigation

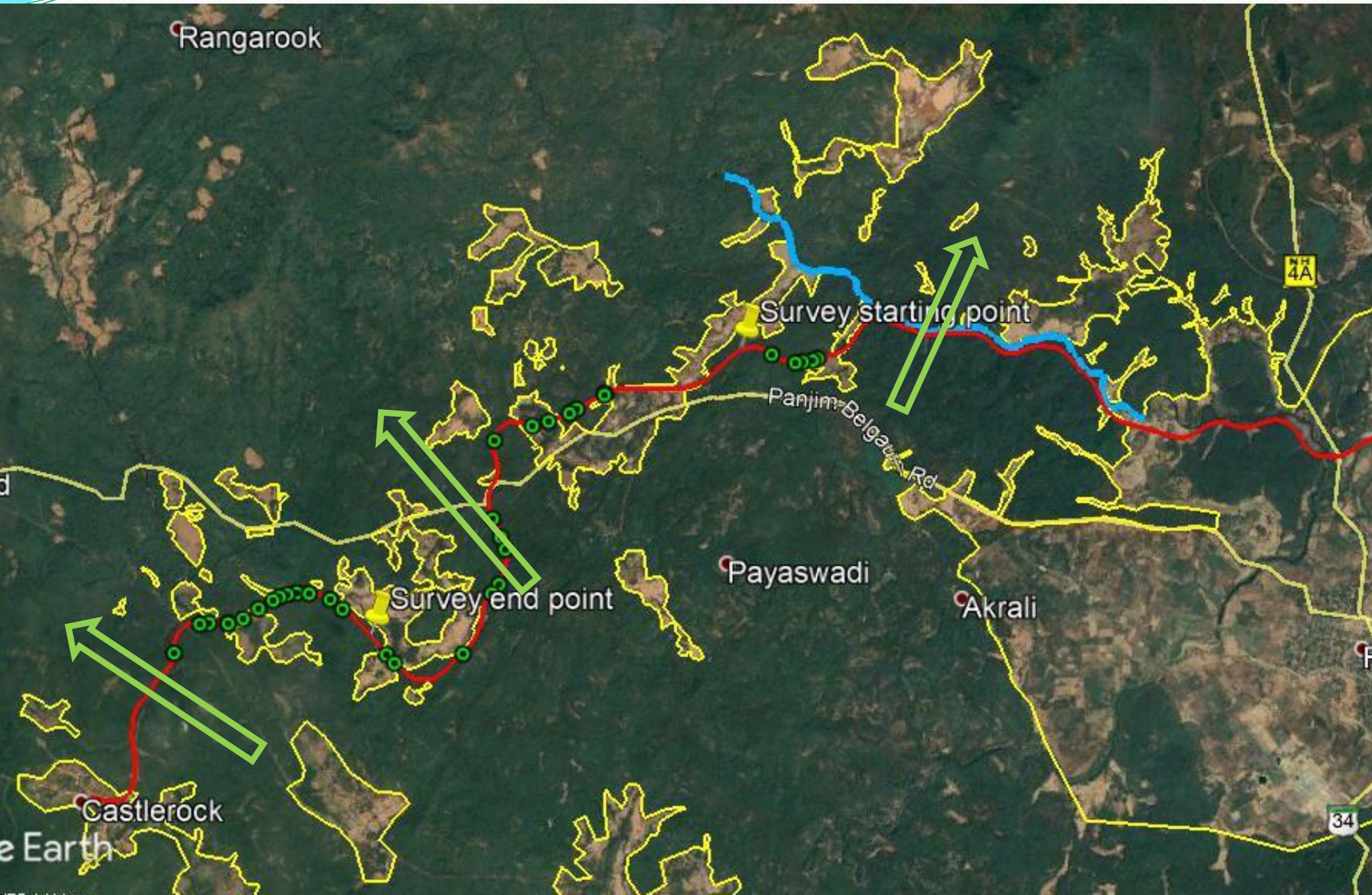


Slowing down of trains

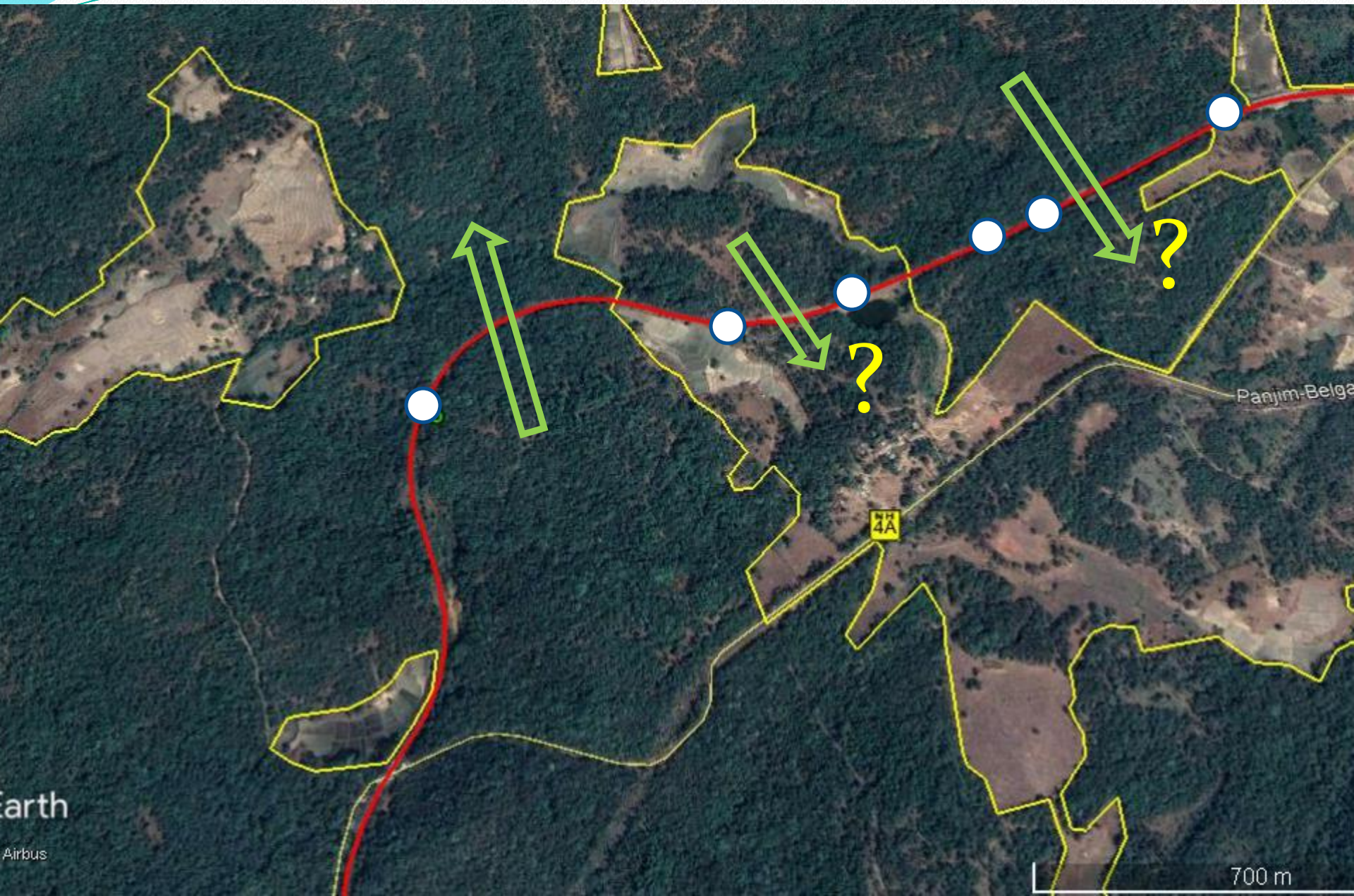
Early warning systems

- Detection and avoidance
  - Geo-sensor, PIR, Camera, People
  - Information delivery to train driver
  - Railway braking distance critical to determine detection distance to be useful
- Deterrents
  - To drive away elephants from track at time of train's arrival (can get habituated)
  - To keep elephants away from track (causes fragmentation of habitat)
- Need to keep certain sections free of elephants by allowing passage at specific locations (habituation to slow speed and reduced disturbance)
- Need to keep buffer time (in case of slowing down)

Selecting locations for mitigation: Landscape level

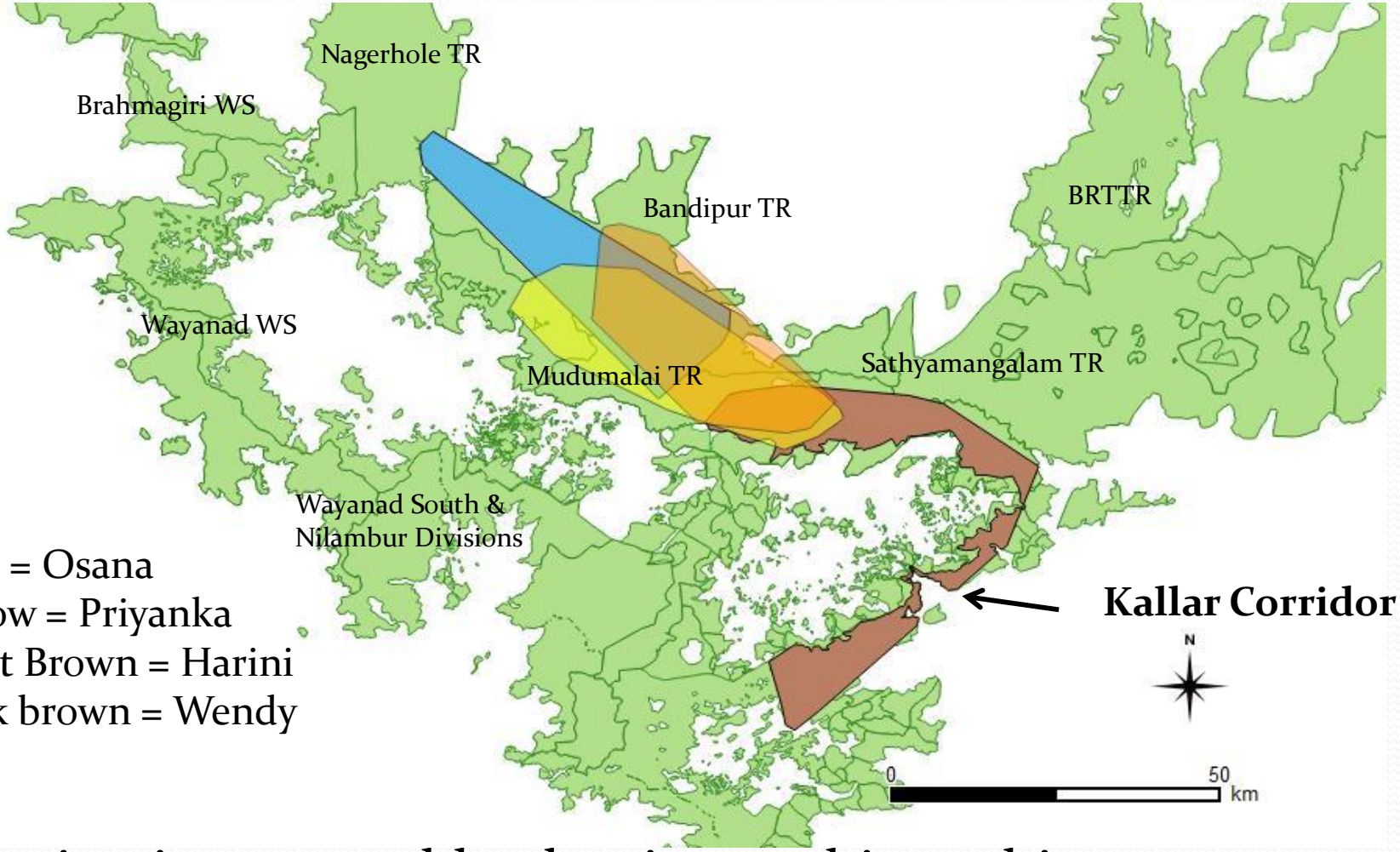


Funcationality



Attention to detail: Animal's needs

Kallar Corridor



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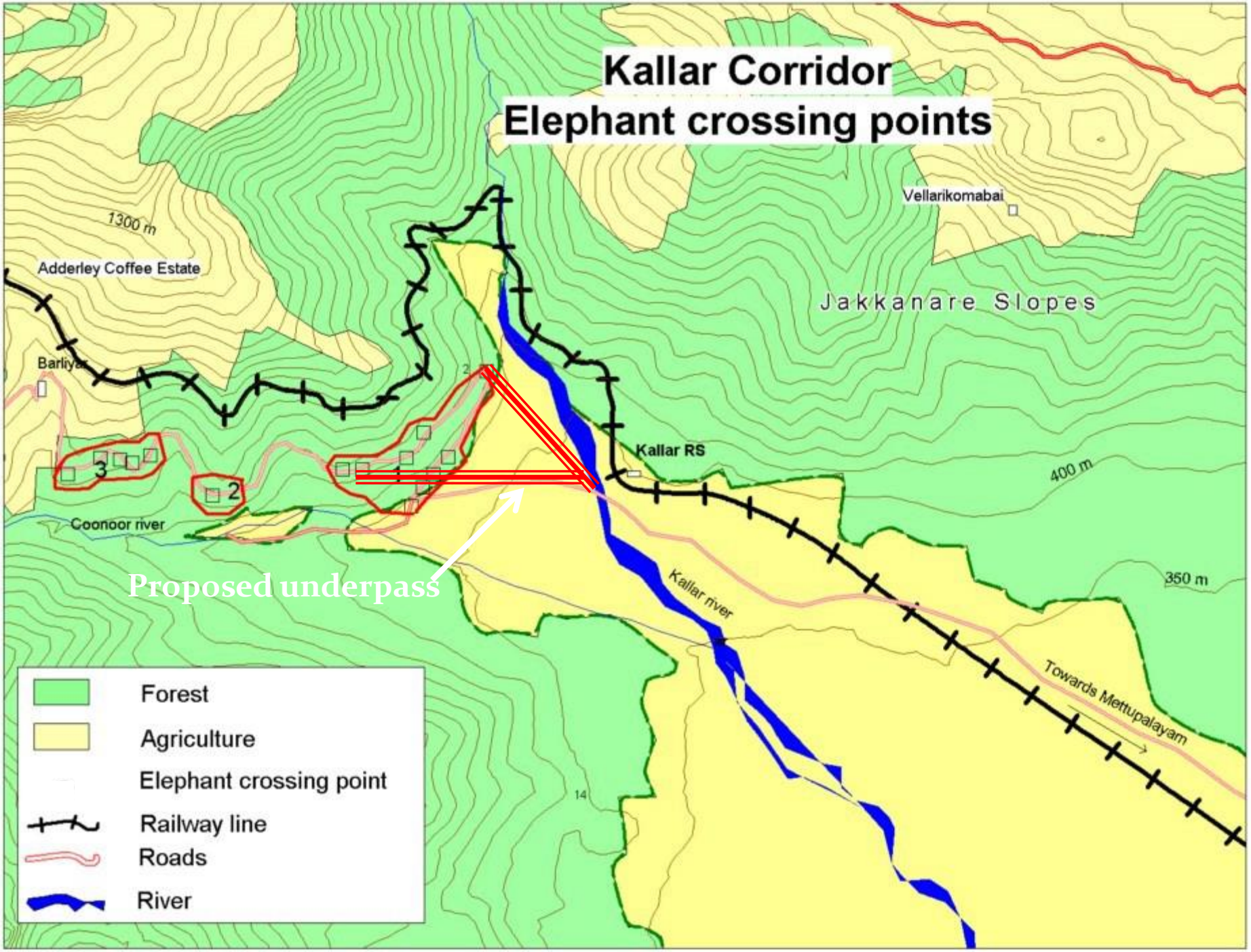
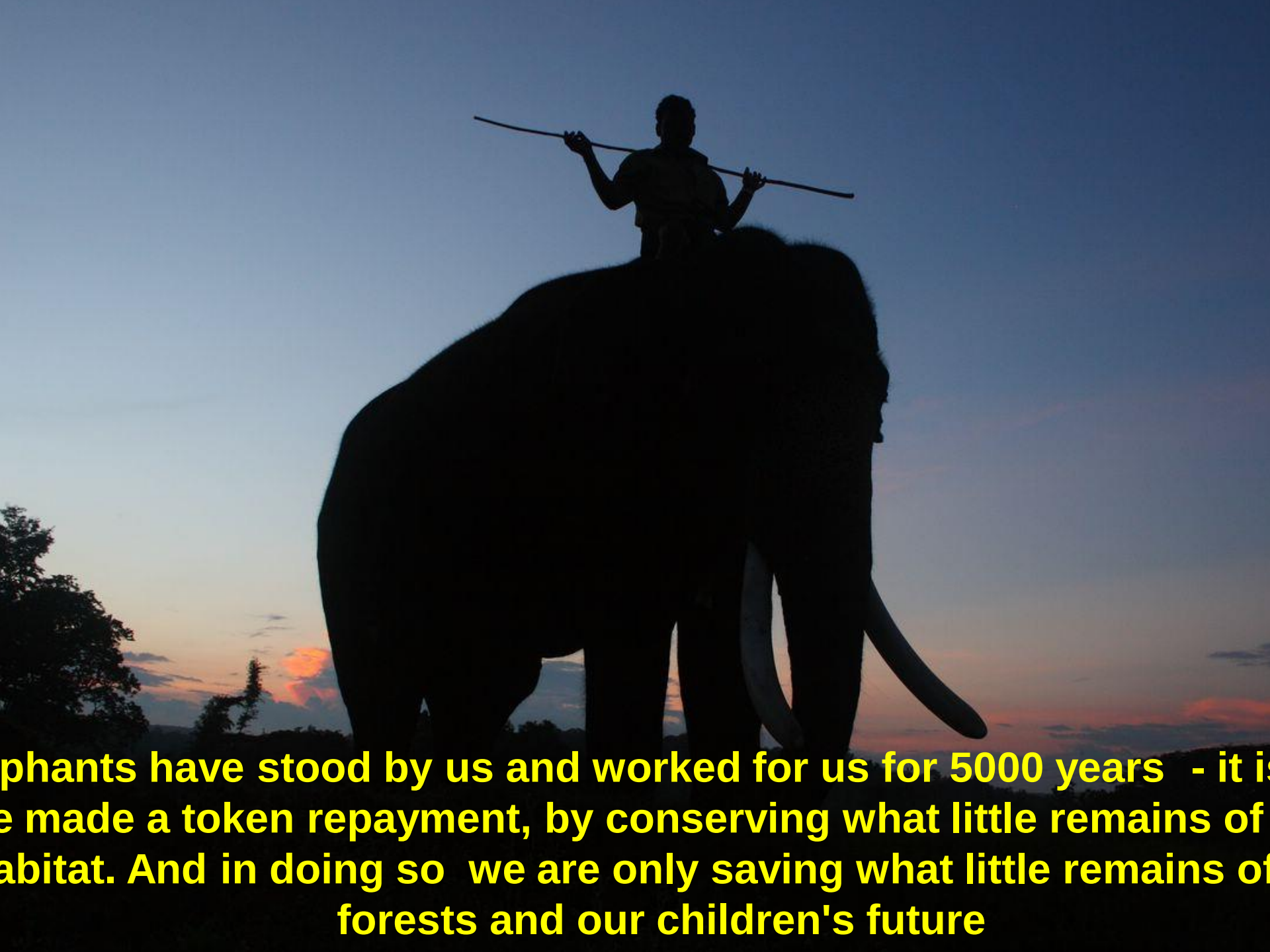

Kallar Corridor
Elephant crossing points
Vellarikombai
1300 m
Adderley Coffee Estate
Jakkanare Slopes
Barliyar
Kallar RS
400 m
350 m
Coonoor river
Proposed underpass
Kallar river
Towards Mettupalayam
Forest
Agriculture
Elephant crossing point
Railway line
Roads
River



phants have stood by us and worked for us for 5000 years - it is
e made a token repayment, by conserving what little remains of
abitat. And in doing so we are only saving what little remains of
forests and our children's future