

National Highway-7 in India

Lessons for conservation and development

Asha Rajvanshi

*Professor & Head, EIA Cell
Wildlife Institute of India*

Vinod B. Mathur,

*Director,
Wildlife Institute of India*

Presentation outline

- Introduction
- Research objectives
- Research methods
- Results
- Conclusions
- Recommendations
- Acknowledgements



http://upload.wikimedia.org/wikipedia/commons/5/5b/Glanum_Roman_Road.JPG

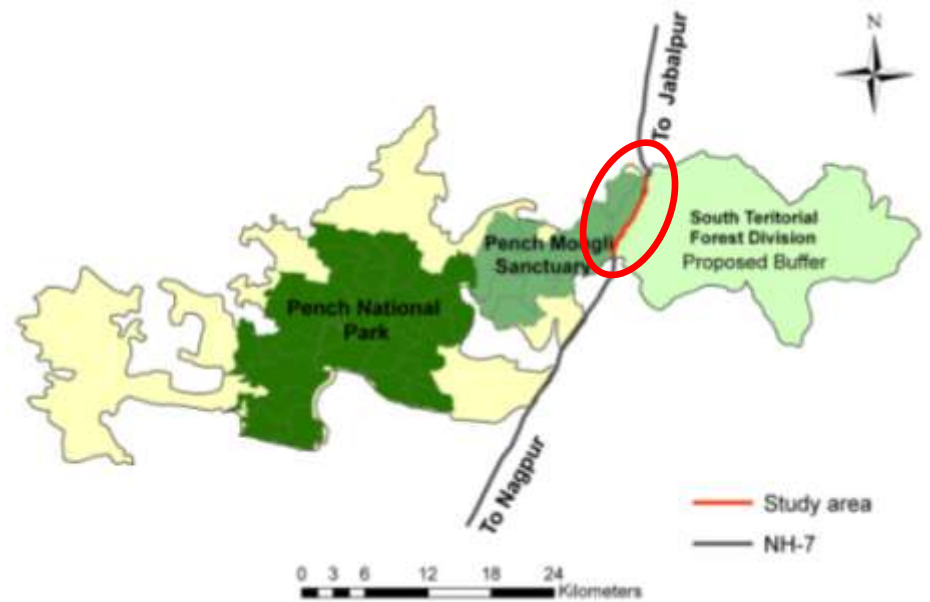


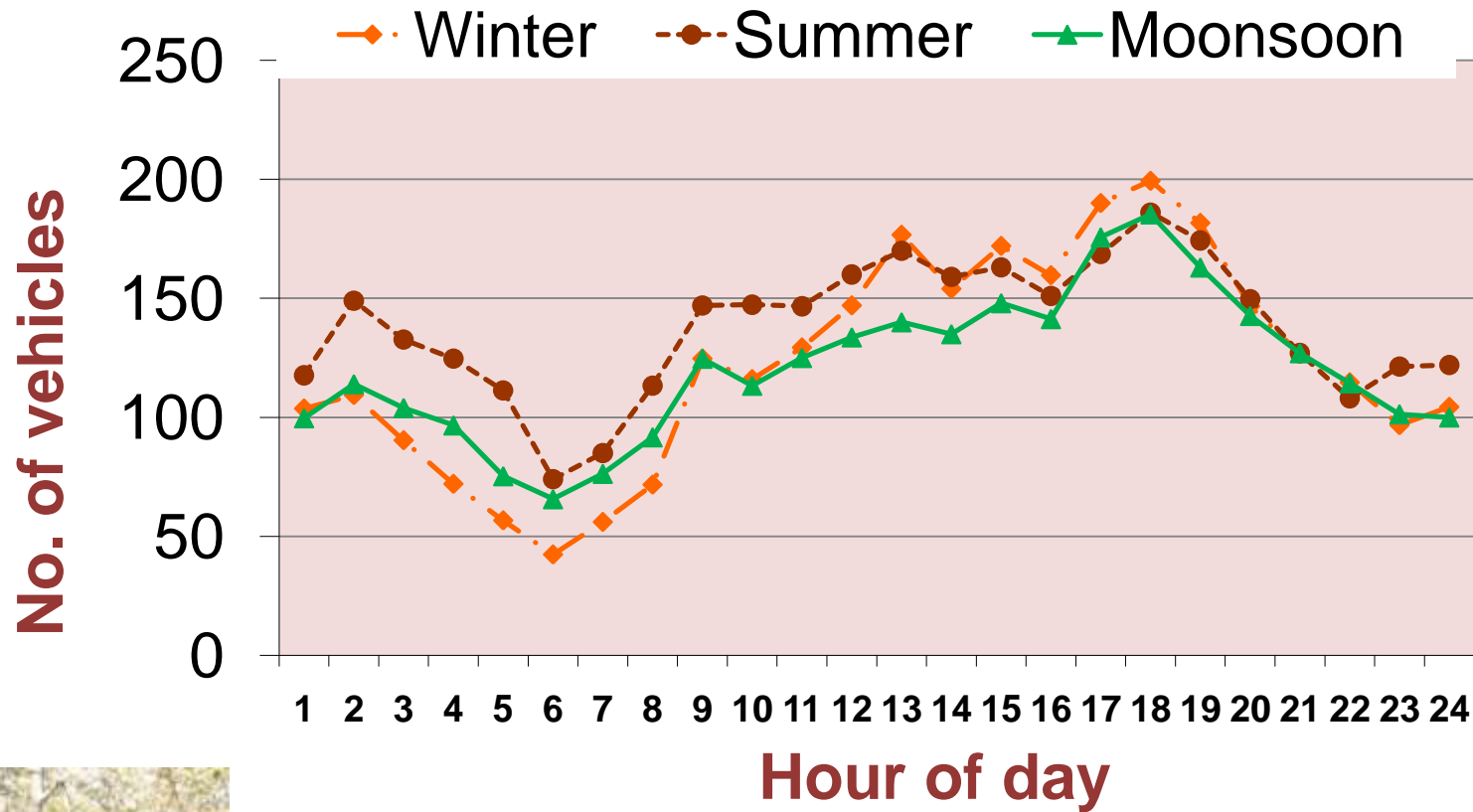
- India has the third largest road network in the world (4.2 million km)
- **26,000 km** through forested landscapes



Roads, not just for humans

Study area





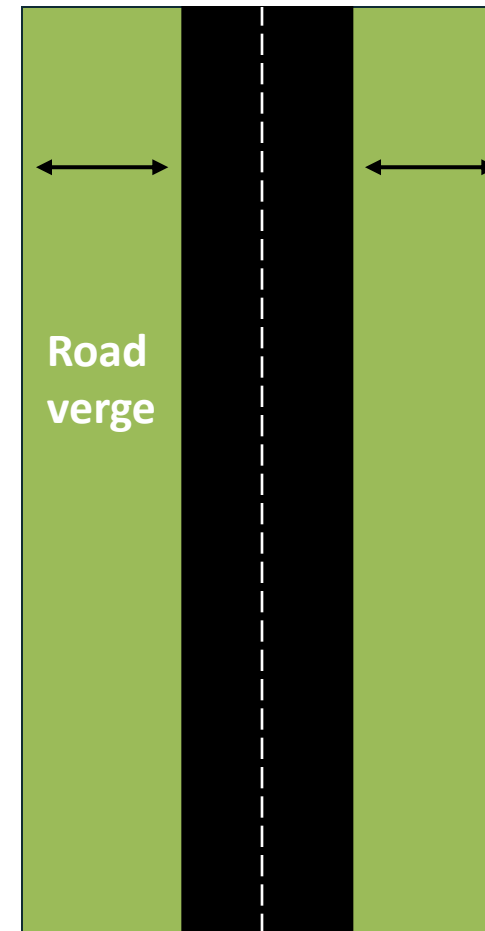
Average annual daily traffic:
3035 274 vehicle/day

Research objectives

- How are wild animals distributed along the road side?
- What is the spatio-temporal pattern of road use?
- What factors influence vulnerability and animal mortality?
- What is the present use of animal crossings and how suitable they are?
- What are the mitigation options for road induced impacts?
- What is the learning for conservation and road planners?

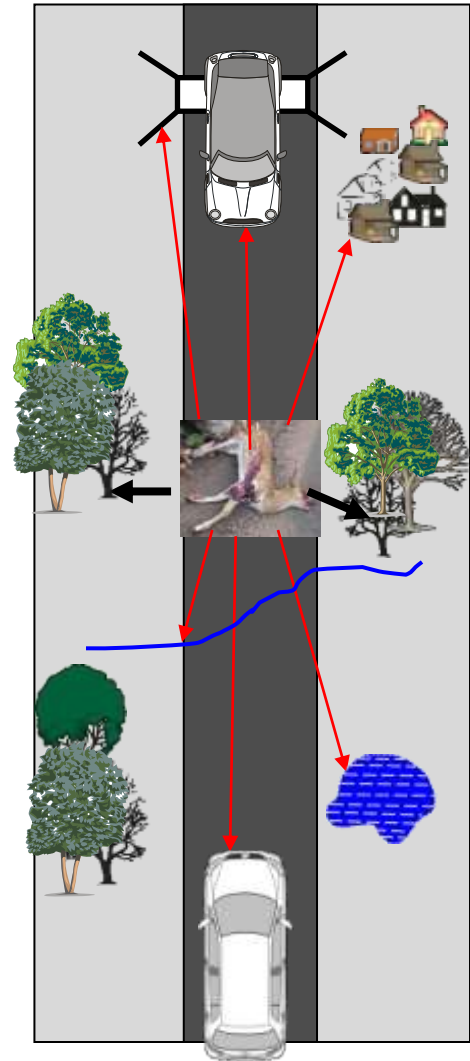
METHODS: Assessment of road and roadside use by wild animals

- **Roadside counts** for assessing the use of road verge and adjacent habitats by wild animals (mammals, birds and reptiles)
- **24 hours monitoring** for assessing road use by animals (3 days in every month)
- **Direct observations** of the animal movements on the road and across
- **Indirect evidences** of animals in the road verge (5-10m)



METHODS: Assessment of mortality

- Estimating road kills: Road survey (effort of 870 km)
- Identification/ Grouping
- Prediction of fatality hotspots: Kernel density
- Factors influencing road kills:
 - *Visibility*
 - *Distance to cover*
 - *Distance to water*
 - *Distance to underpass*
 - *Distance to drainage*
 - *Distance to agriculture*
 - *Altitude and slope*



METHOD: Permeability of wildlife passage

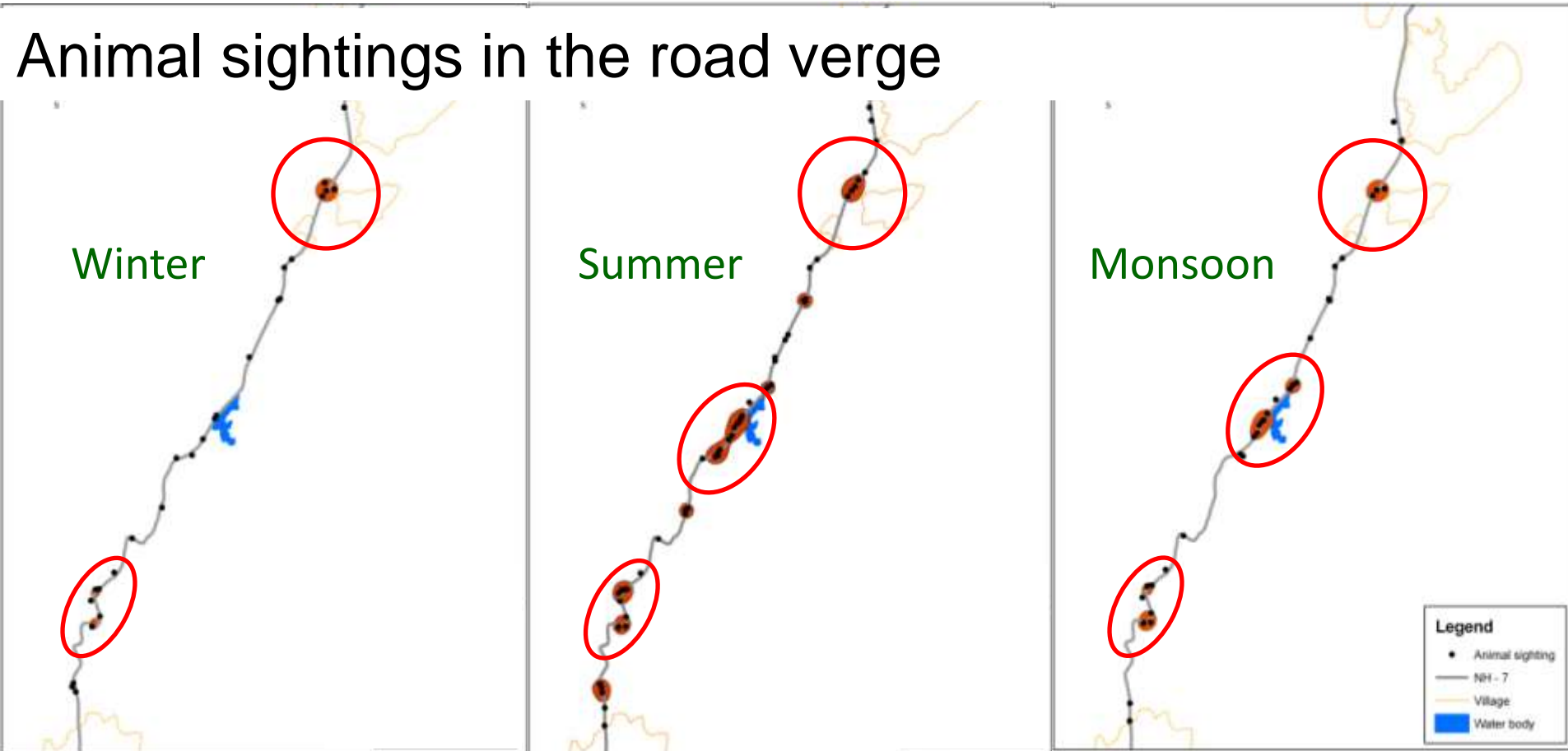
- Direct observations
- PIPs
- Camera trapping



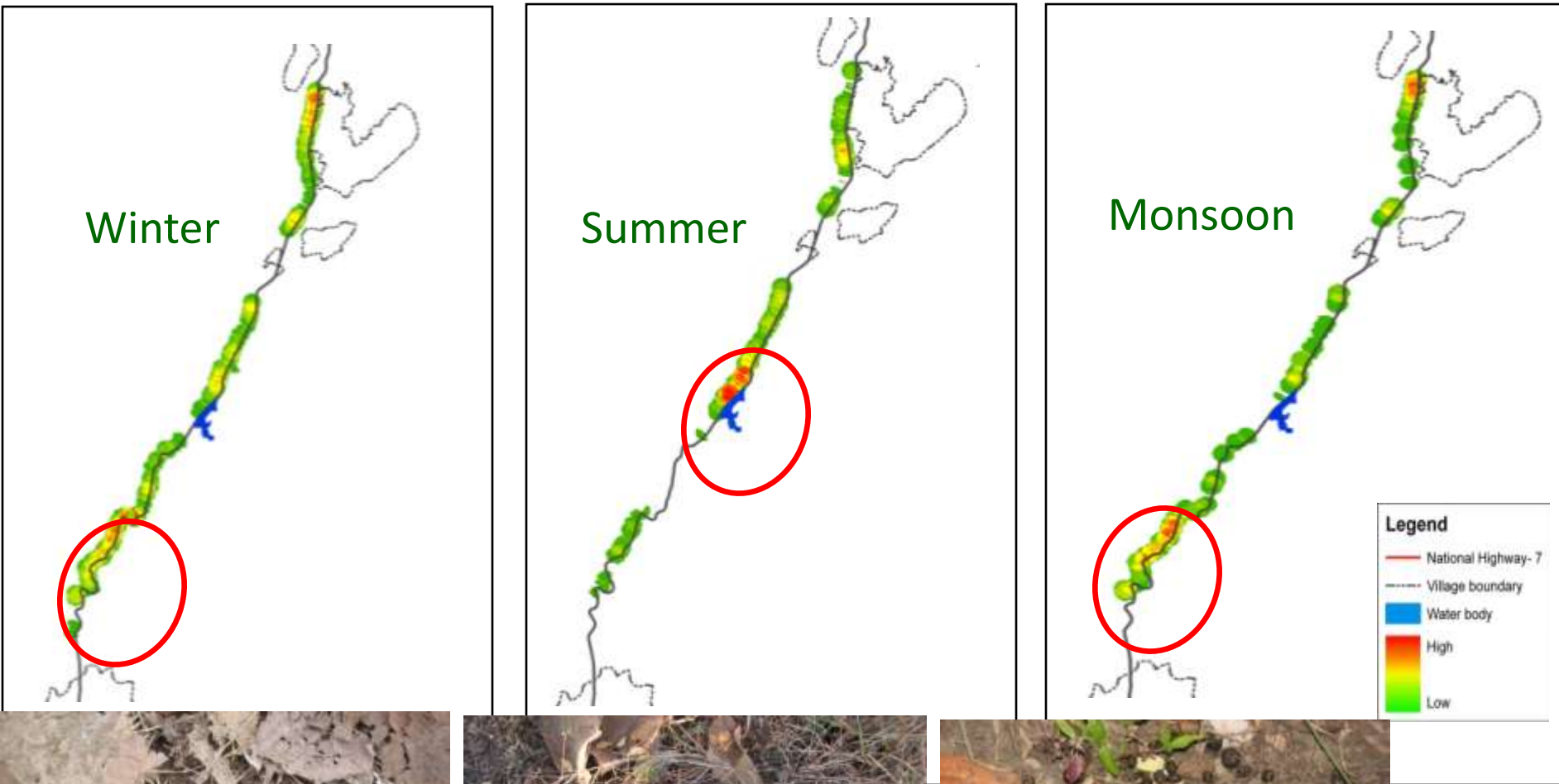
RESULTS

Roadside habitat use by animals

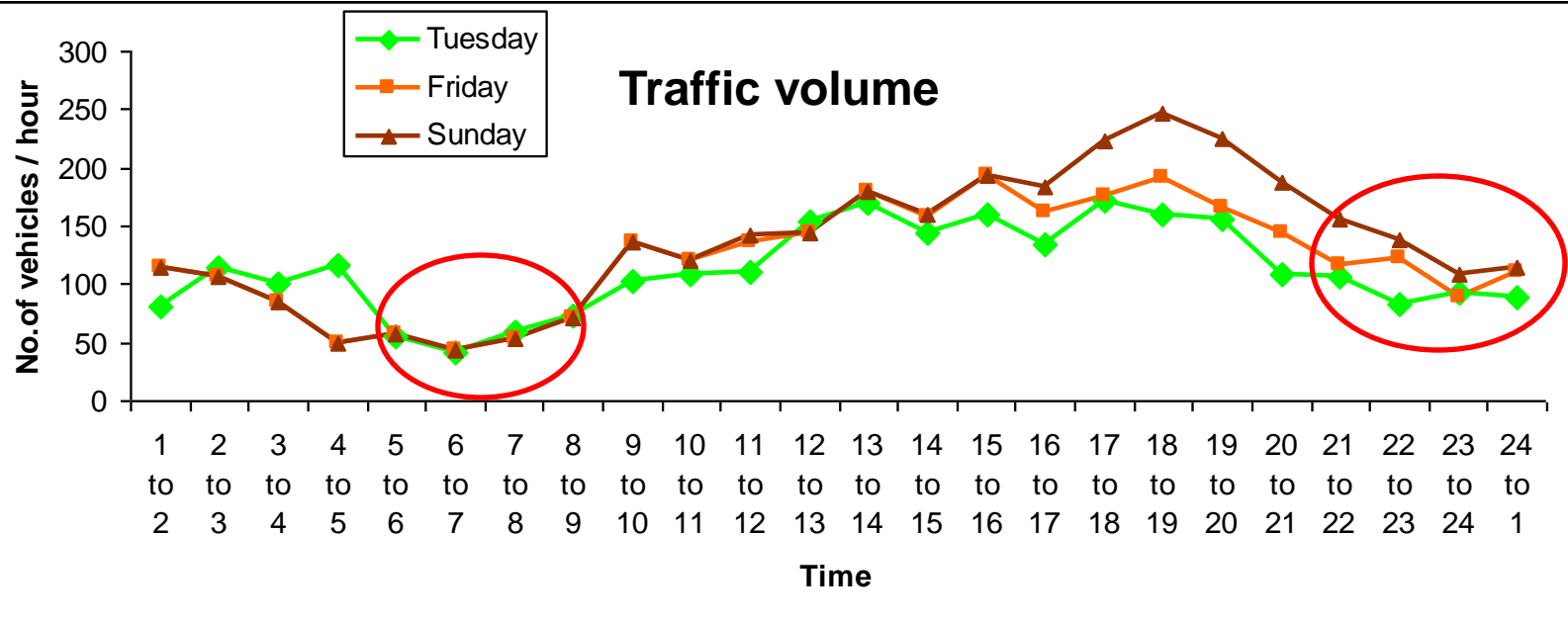
Animal sightings in the road verge



Indirect animal evidences along the road verge

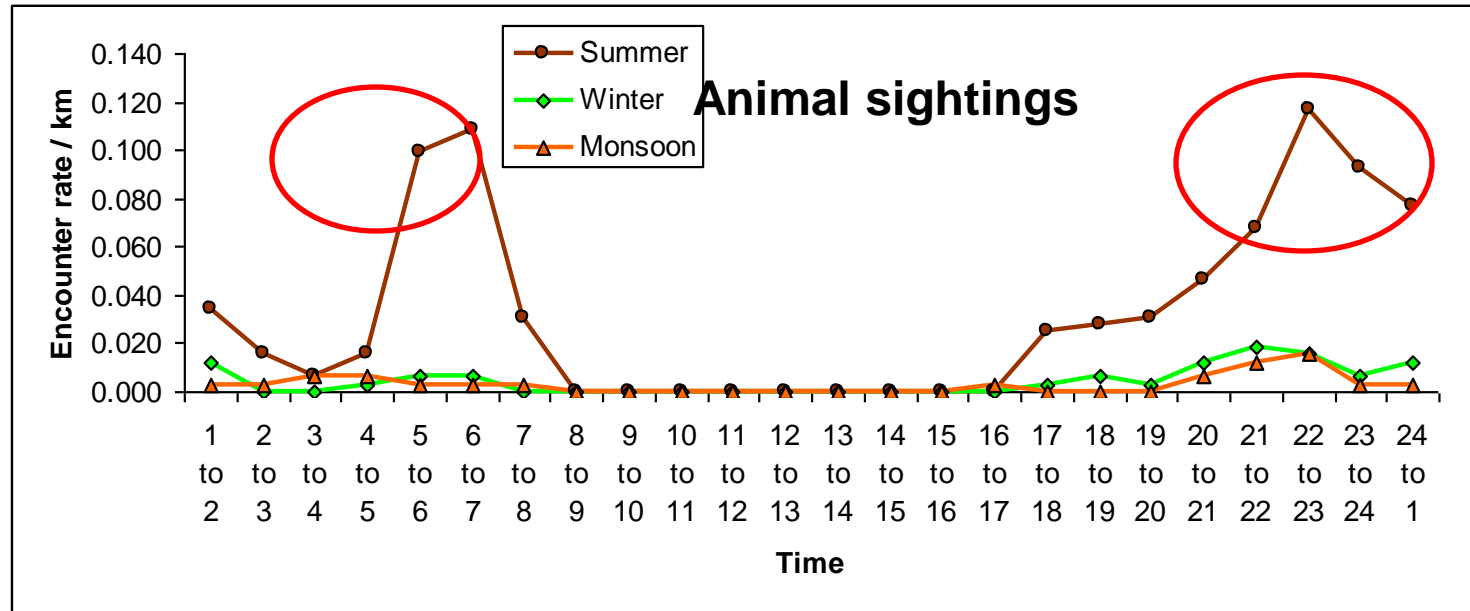


Trends of traffic volume and animal sightings

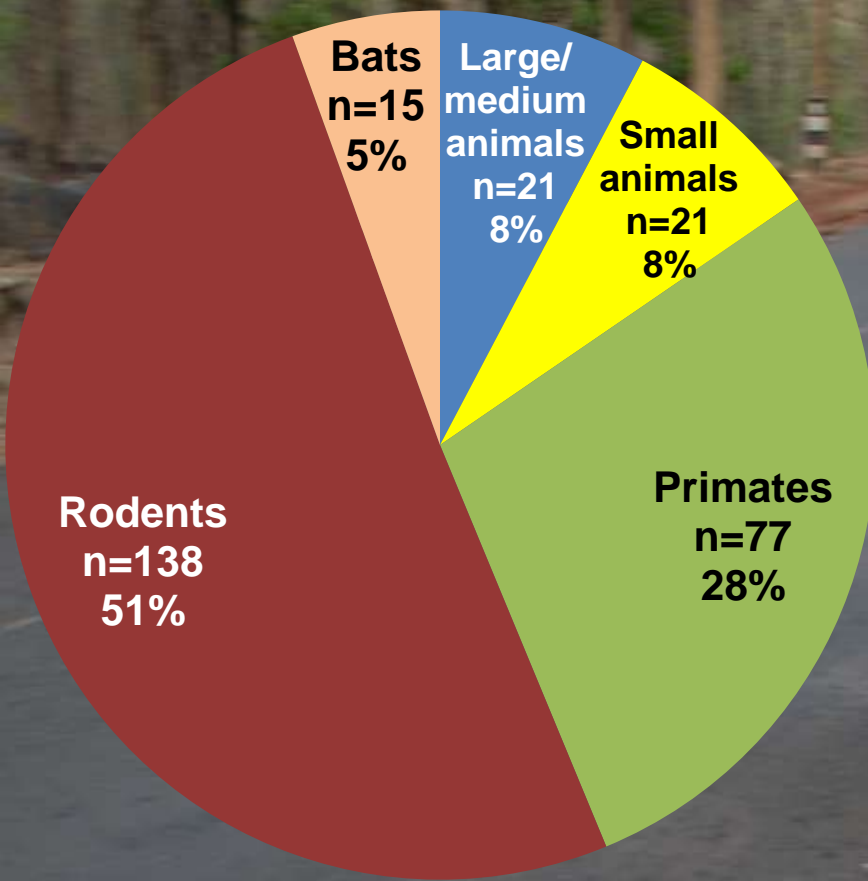


Day time
3 vehicles./ min

Night time
1.3 vehicles./ min



Road related mortality of mammals



Mammalian species are especially vulnerable to road network because they have large spatial requirements, small populations, tend to live at low densities and occupy small geographic range or exhibit migratory behavior (Ball *et al.* 2001; Gittleman *et al.* 2003).



Jackal



Fox



Jungle cat



Chital

272 kills
(15 species)
in 430 days



Sambar



Hare

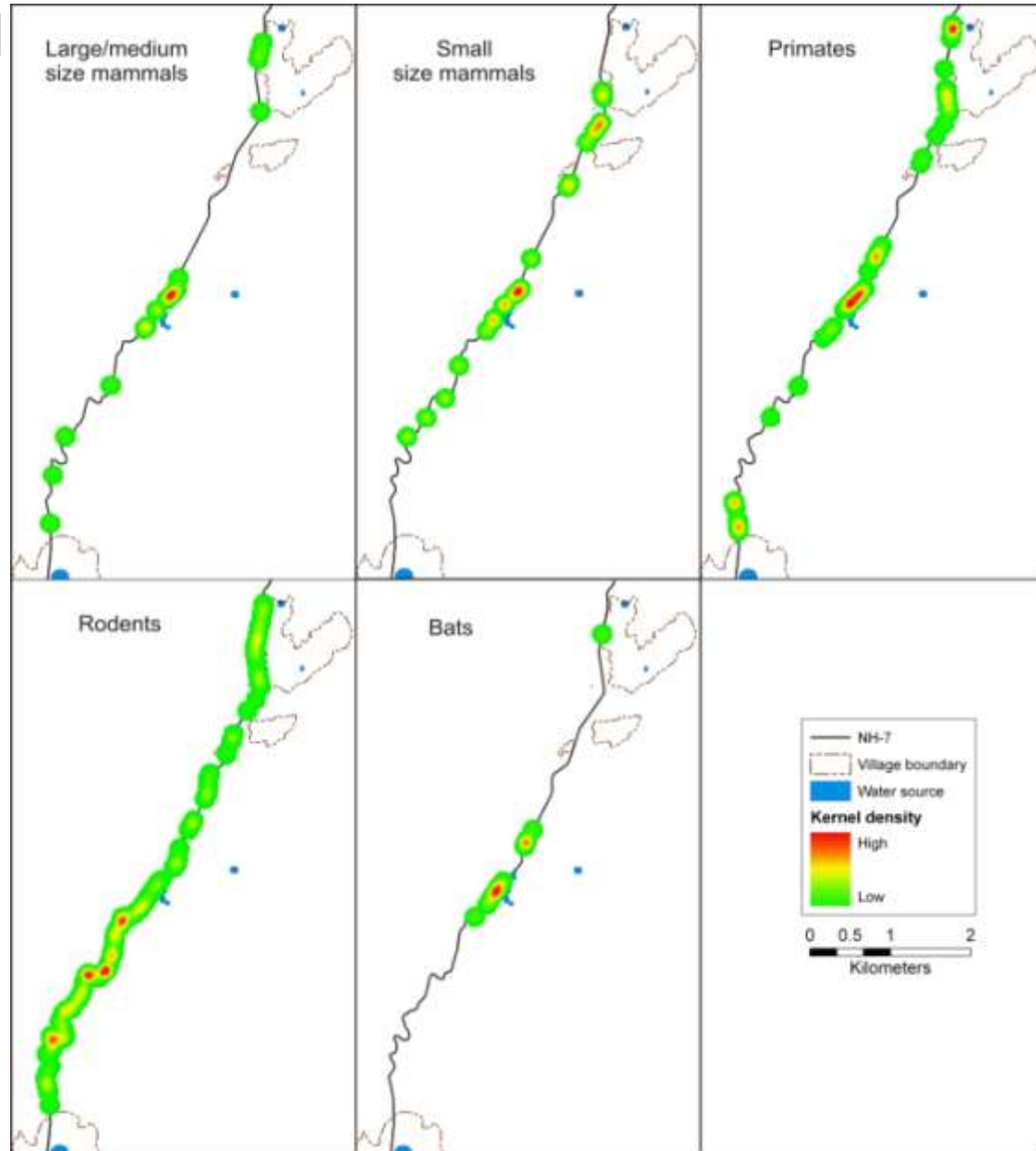


Porcupine

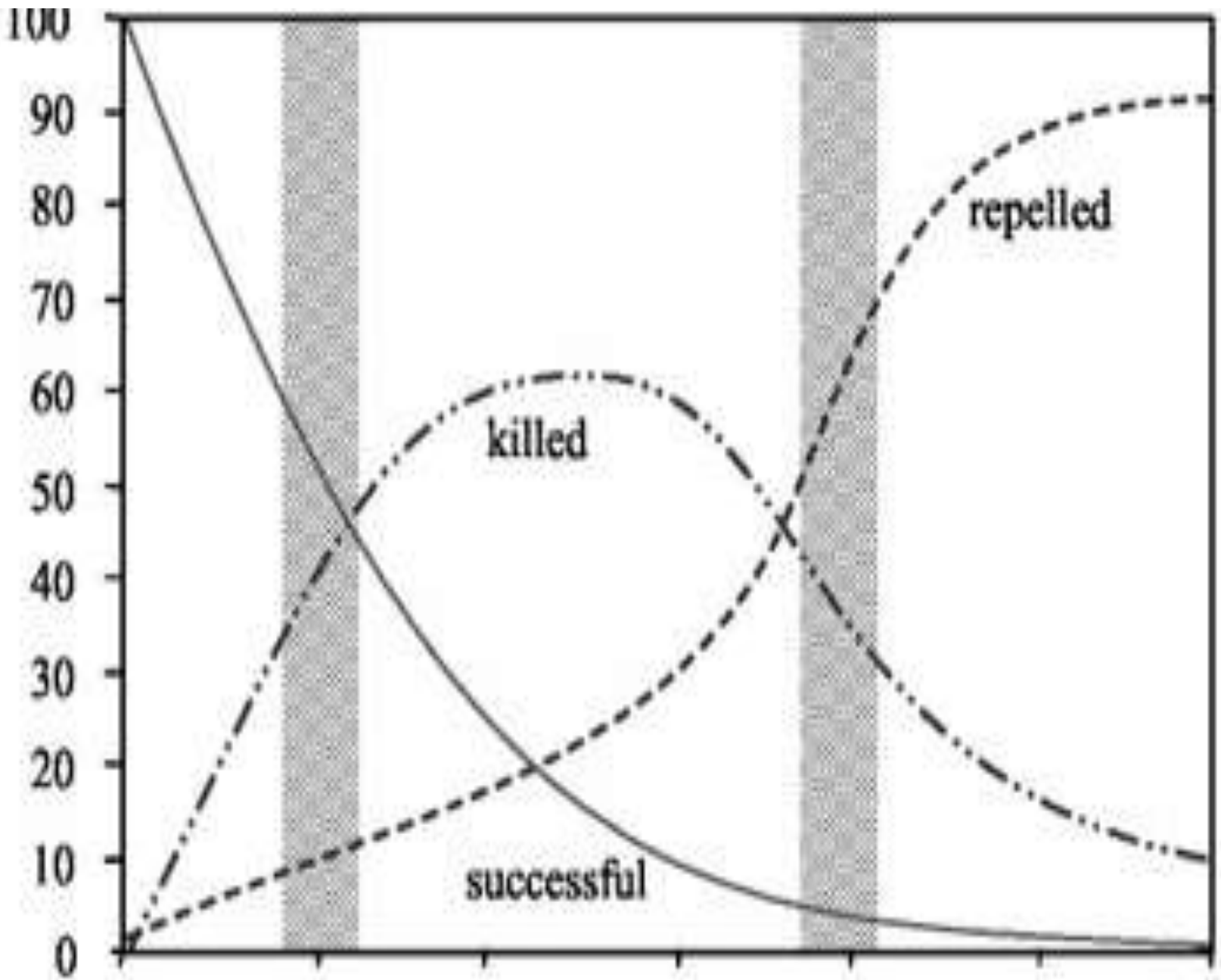


Palm civet

- Large and medium sized mammals killed more near water bodies
- Fatality clusters of small mammals near cropland and water sources
- Primate kills located mostly near crop land and water sources
- Rodent kills located all along the road
- Bat kills mostly near water source



Percent of animals attempting to cross a road barrier



Seiler-2001

Impact of NH-7 on snakes



Snakes represent an ideal target group for studying impacts of roads because of the breadth of ecological niches represented among snake sp. (Ernst & Ernst 2003)



Bamboo pit viper



Barred wolf snake



Beaked worm snake



Checkered keel back

**490 kills
24 species
in 430 days**



Common cat snake



Common krait



Bronzeback tree snake



Trinket snake

Impacts of NH-7 on birds



Bird hits affect greater number of individuals in the population when compared to factors such as predation (Bujoczek et al. 2011) and hunting (Forman & Alexander 1998).



Barred jungle owlet



Indian roller



Jungle crow



Gray night jar

143 bird hits
(16 species)
in 430 days



Jungle babbler



Jungle owlet



Plum-headed parakeet



Rose-ringed parakeet

Permeability of culverts for movement of mammals

- Only 7 species of the 13 species used the culverts.
- Use is very limited (0.36 animal /culvert/day) based on the total 540 days monitoring effort.
- Alternative structures needed to address the connectivity issues for animal movement across the road.

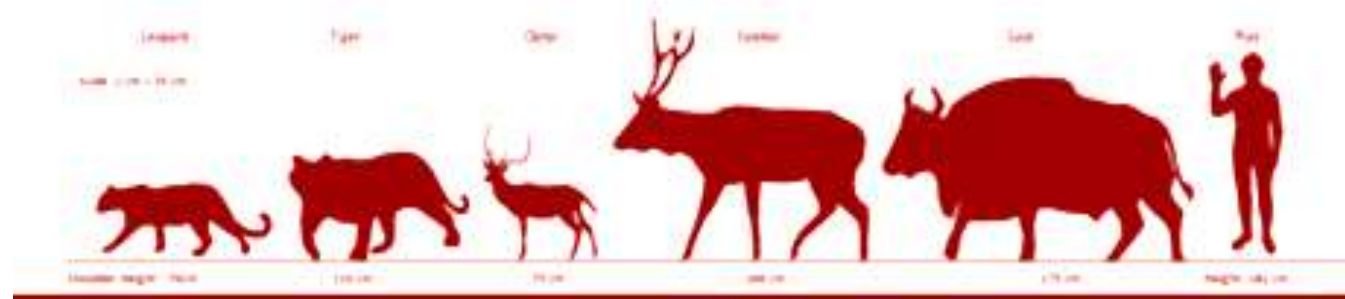


RECOMMENDATIONS



Use of animal passes is strongly influenced by openness ratio and biotic disturbance

Size and design of passages must correspond with ecological requirements of different species



Measures for addressing road induced mortality



Measures to alter human behavior

Regulatory or Prescriptive measures

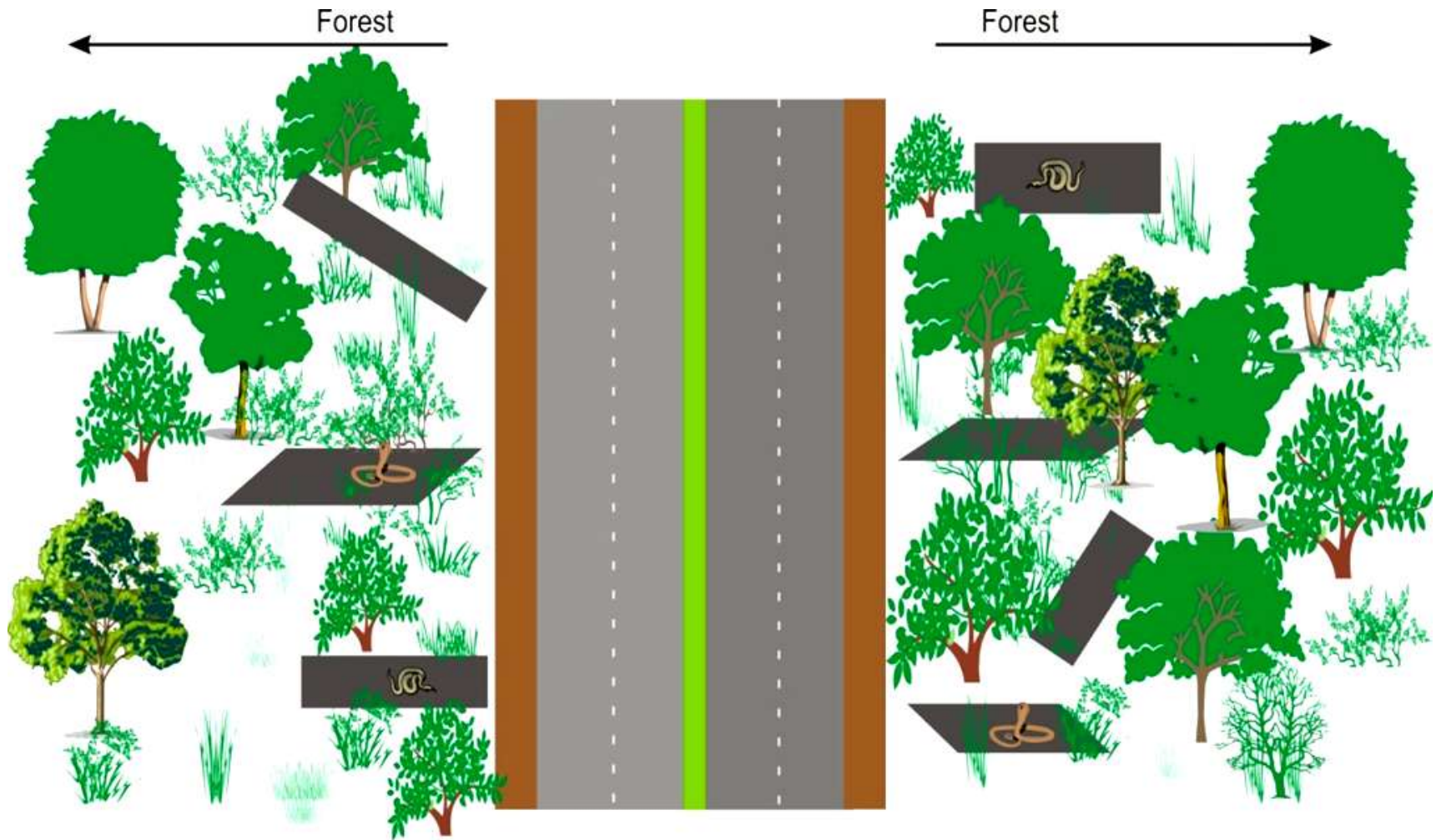
1. Speed control
2. Temporary road closure
3. Regulatory guidelines for laying/upgrading road through sensitive habitats
4. Prescriptions for suitable verge width
5. Restrictions on stopping/ parking of vehicles in vulnerable segments of the highway

Measures to alter animal responses to road

On-site construction and habitat management

1. Clearing vegetation for improving visibility along road
2. Erection of animals proof fence
3. Wildlife detection systems
4. Construction of appropriately designed and positioned culverts
5. Retrofitting existing drainage culverts to facilitate wildlife crossing by animals

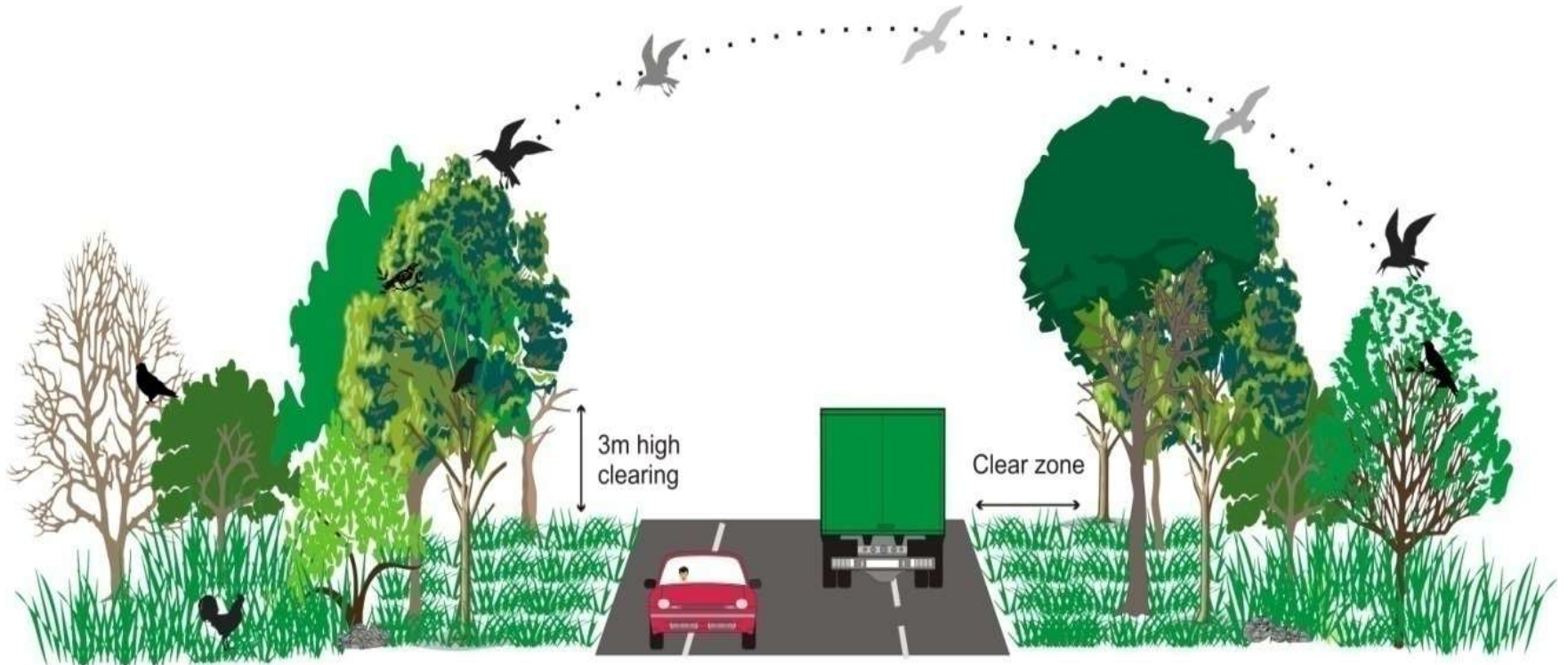
Measures for reducing snake mortality



Creation of alternative sites for thermoregulation

Strategies for reducing mortalities

- (i) Managing roadside habitat to reduce attractiveness for birds
- (ii) Encourage birds to fly higher above the roadway
- (iii) Maintaining a clear zone, devoid of trees and shrubs to prevent reptiles and rodents become prey for birds patrolling for food.



Roadway

Lessons learned for conservation and development

Piecemeal approach in planning : Bigger threat for conservation

Combining conservation science and road building critical for connecting people and conserving wildlife in natural areas

Road in sensitive landscapes to be planned as a single corridor

There is a merit in retaining 'roadless areas' in sensitive habitats where mitigation measures are hard to enforce



Acknowledgements

- Wildlife Institute of India (WII), Dehradun
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- Field Director, Pench Tiger Reserve
- A. Pragatheesh, Senior Research Fellow
- Conservation Community
- Peers, friends and colleagues

A small brown and white weasel is peering out from a hole in a brick wall. The weasel has a dark brown head and back with a white belly. It is looking directly at the camera with large, dark eyes. The background is a blurred brick wall with some green moss. The ground in the foreground is covered with dry, brown leaves.

THANK YOU