

Assessing the impacts of major roads on Barn Owls in Ireland to identify requirements for mitigation

John Lusby & Michael O'Clery
BirdWatch Ireland



Where there are Barn Owls & major roads.....there are
Barn Owl road mortalities!



Current knowledge

Extent of Barn Owl road mortalities

- Mortality rate increasing (Newton et al. 1997)
- Most common raptor recorded as road casualty e.g. France & UK (Baudvin 1997, Massesmin & Zorn 1998, Shawyer & Dixon 1998)
- Most common bird species recorded as road casualty in Idaho, US (Boves & Belthoff 2012)
- Scale of casualty rate per 100km of motorway per year varies significantly
 - 7 casualties/100km/year in Switzerland (Bourquin 1993)
 - 25 casualties/100km/year in France (Baudvin 1997)
 - 49 casualties/100/yr. in Portugal (Gomes et al. 2009)
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Impacts on Barn Owl populations

- Major roads contribute to 10 – 15% of adult Barn Owl deaths in Germany resulting in significant impact (Illner 1992)
- Population declines in parts of Netherlands linked to increases in major road networks (De Bruin 1994)
- Major roads have caused loss of Barn Owl sites over 40% of rural England (Ramsden 2003)
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Current knowledge

Impacts on Barn Owl populations

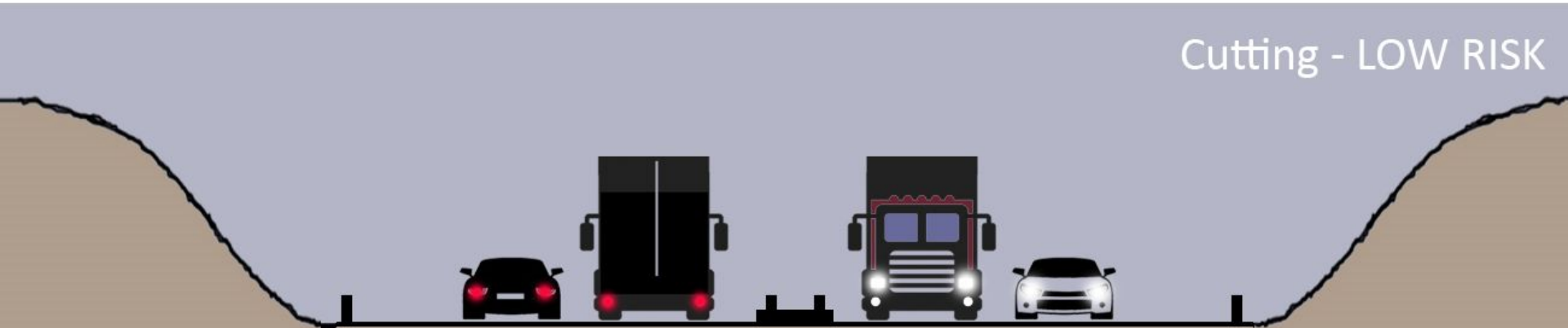
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Current knowledge

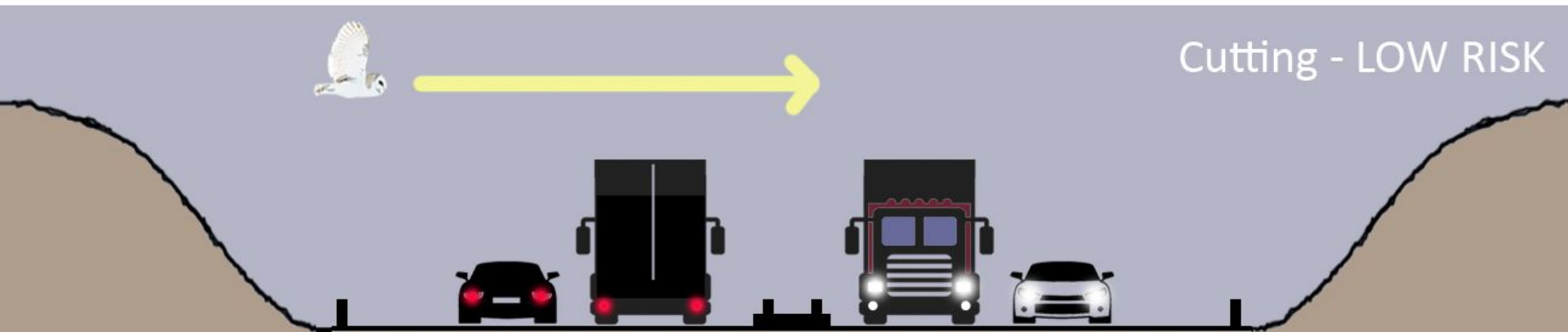
Factors which may influence collision risk

Cutting - LOW RISK



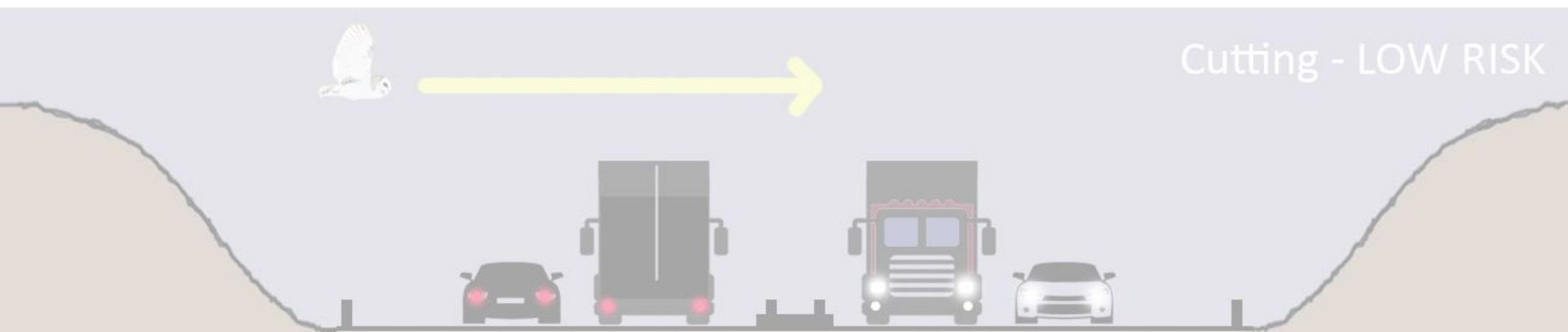
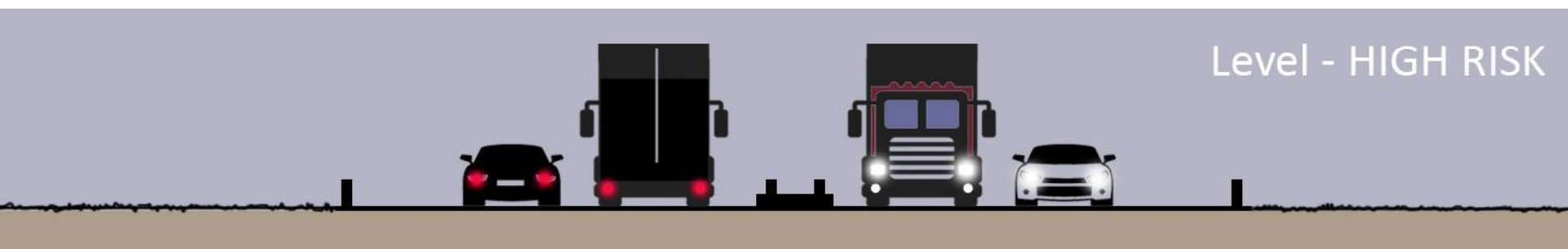
Current knowledge

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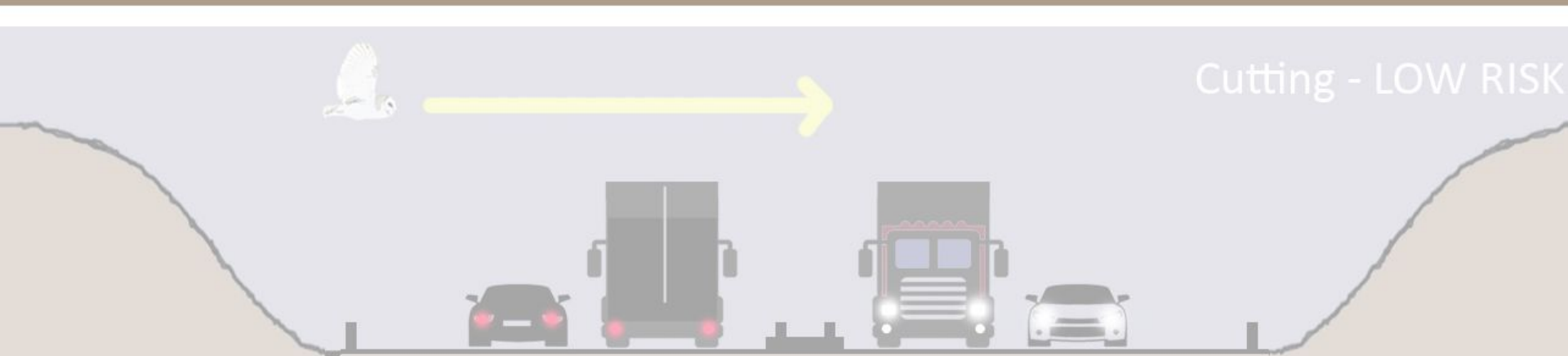
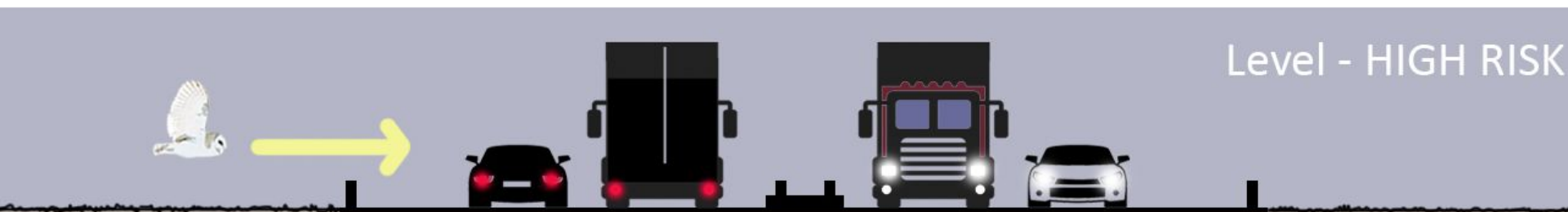
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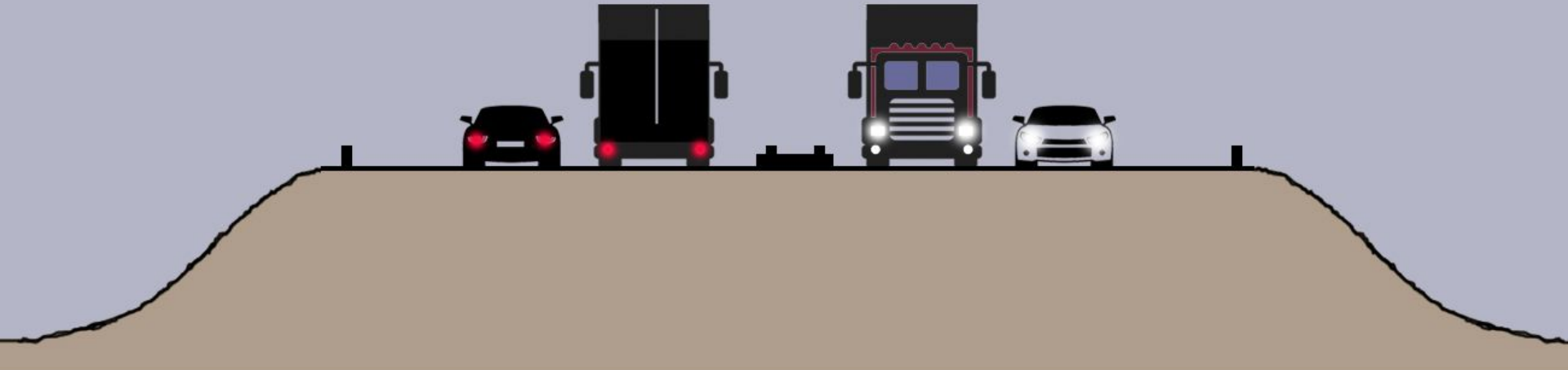
Factors which may influence collision risk



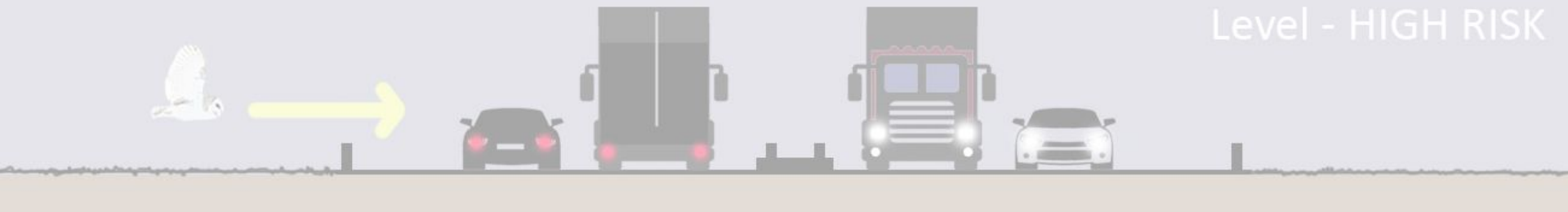
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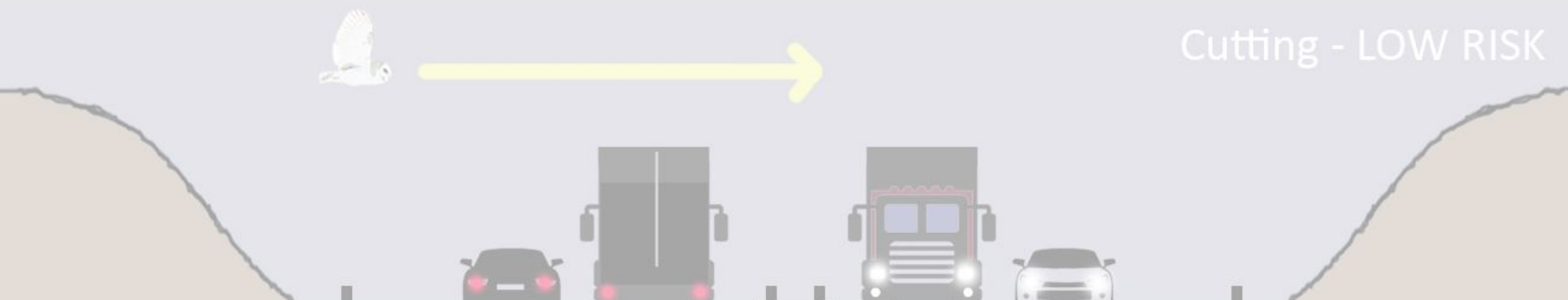
Embankment - HIGH RISK



Level - HIGH RISK



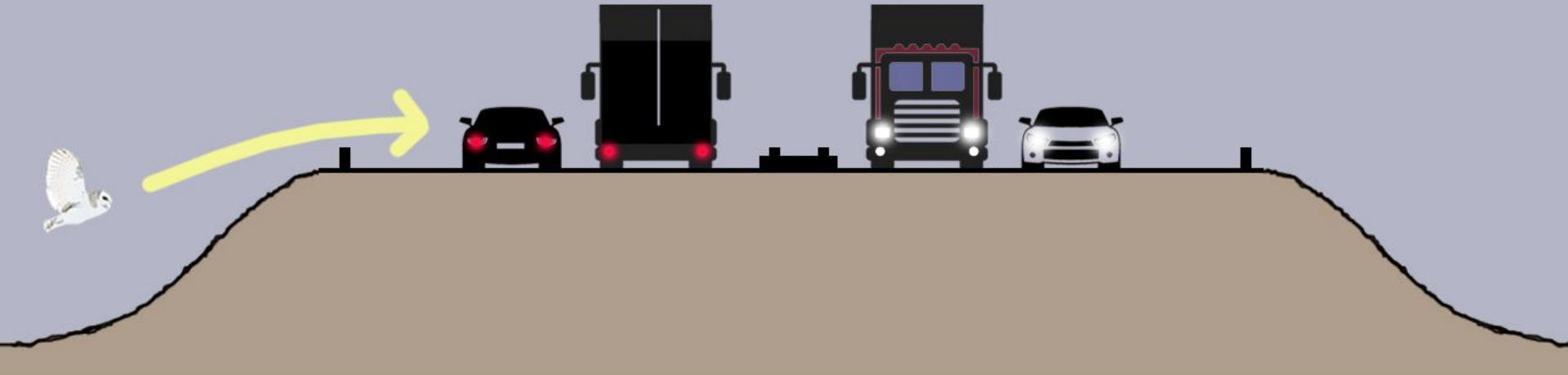
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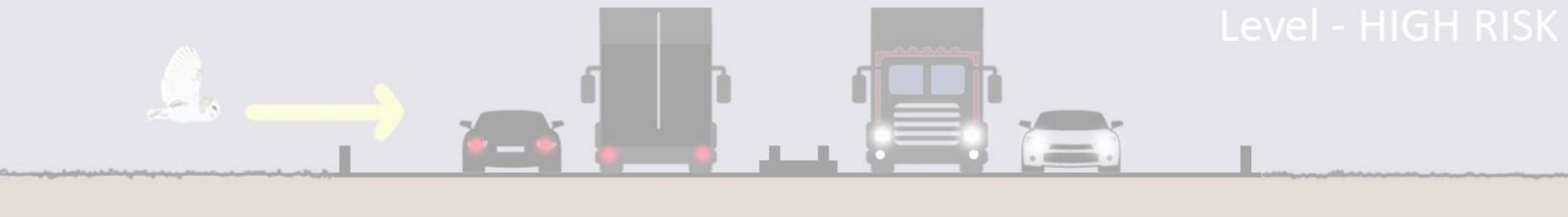
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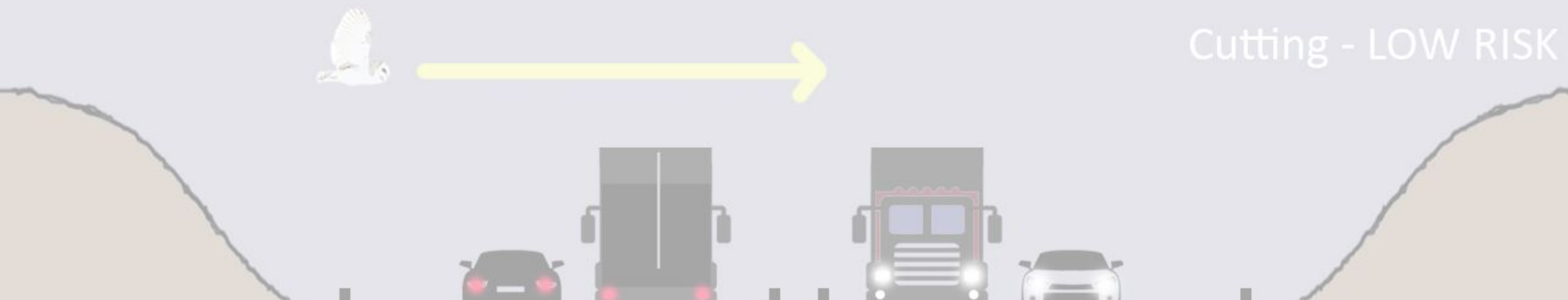
Embankment - HIGH RISK



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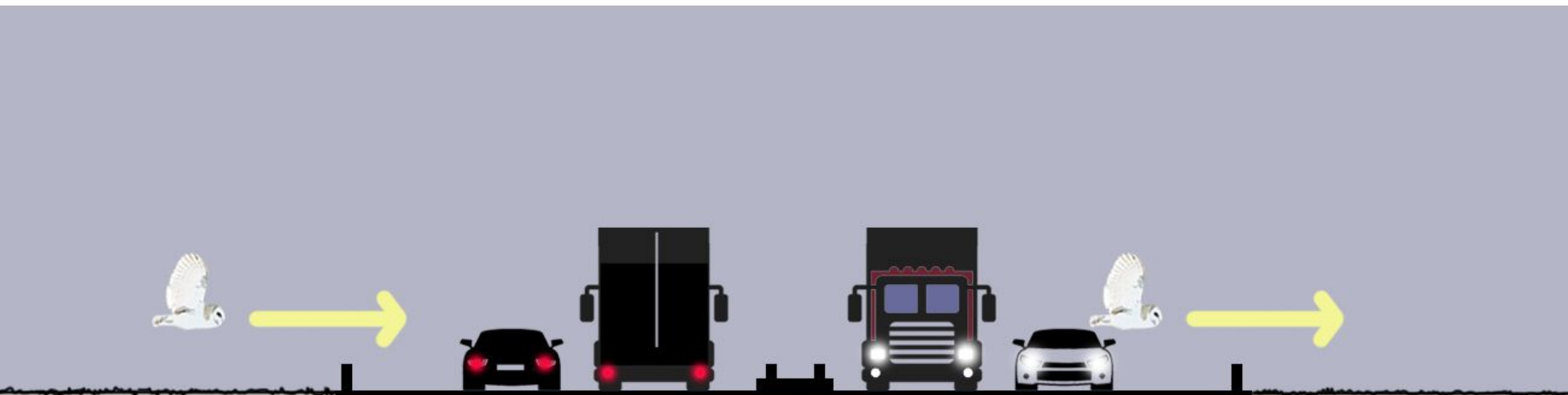
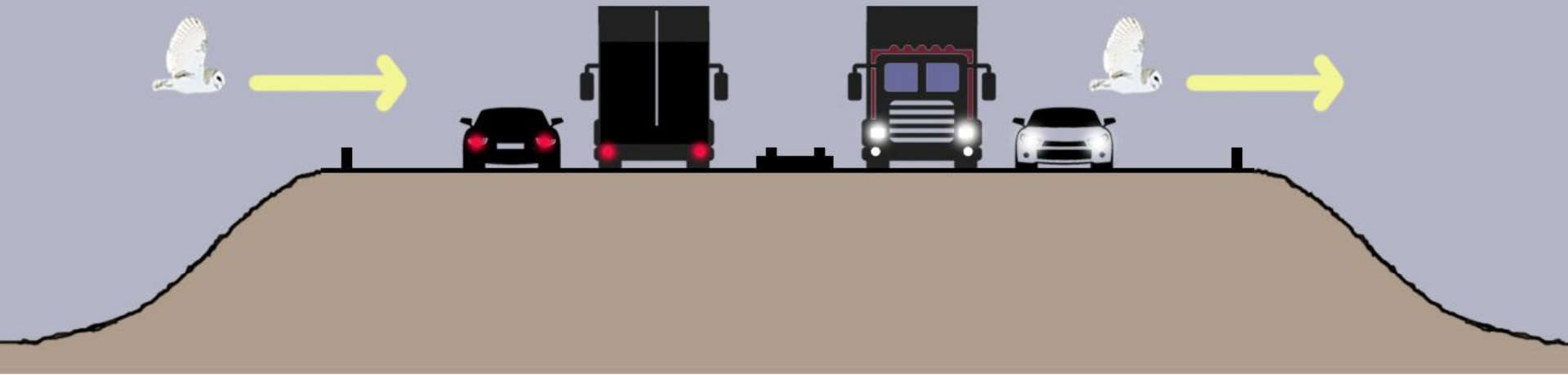


Cutting - LOW RISK



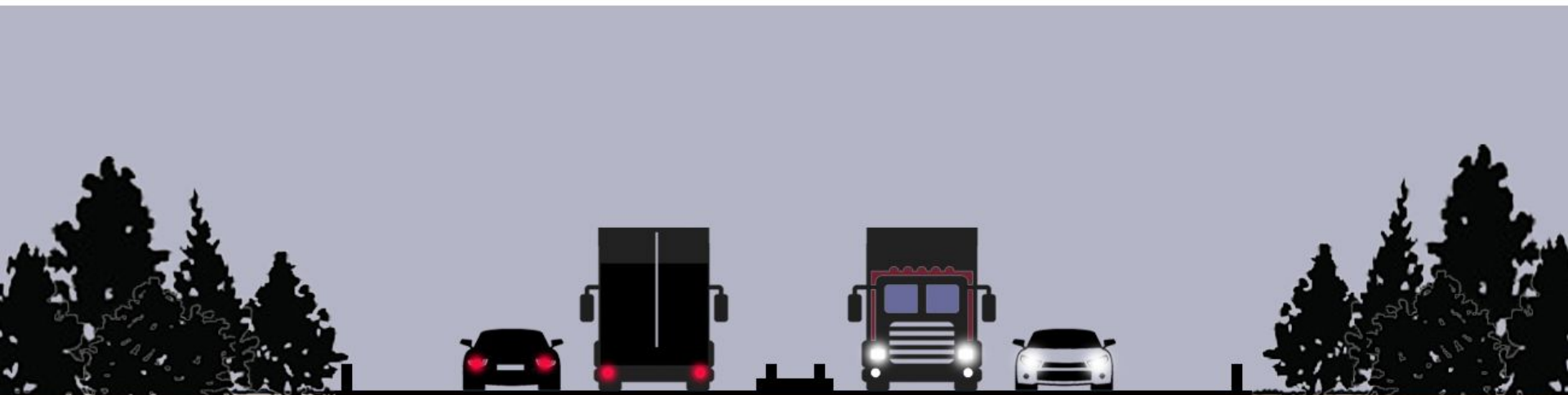
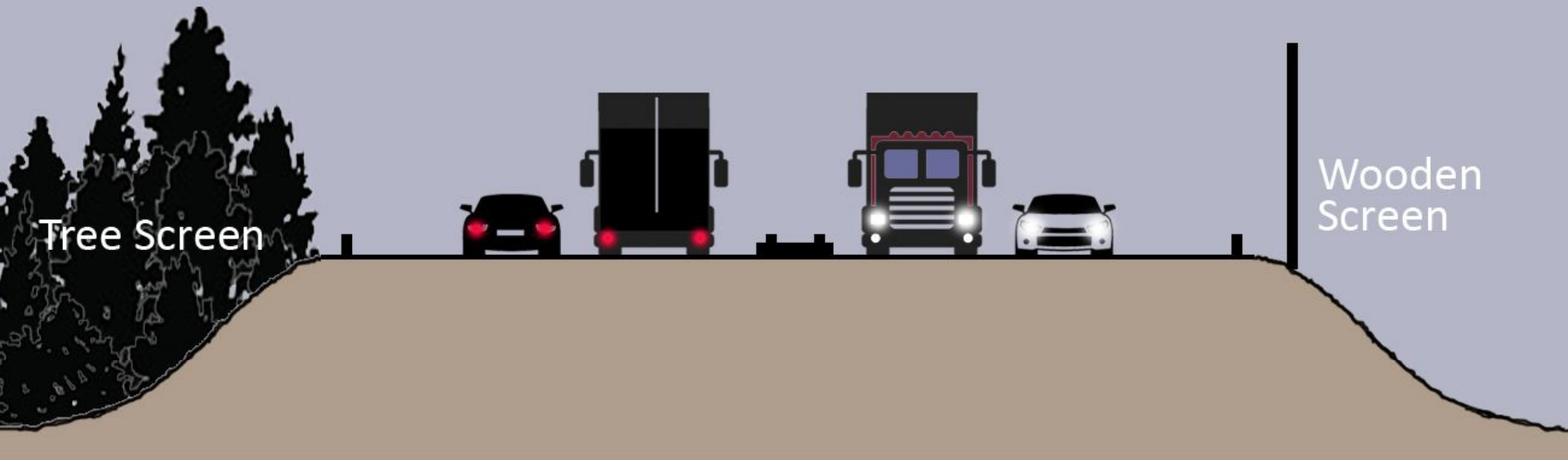
Current knowledge

Proposed mitigation



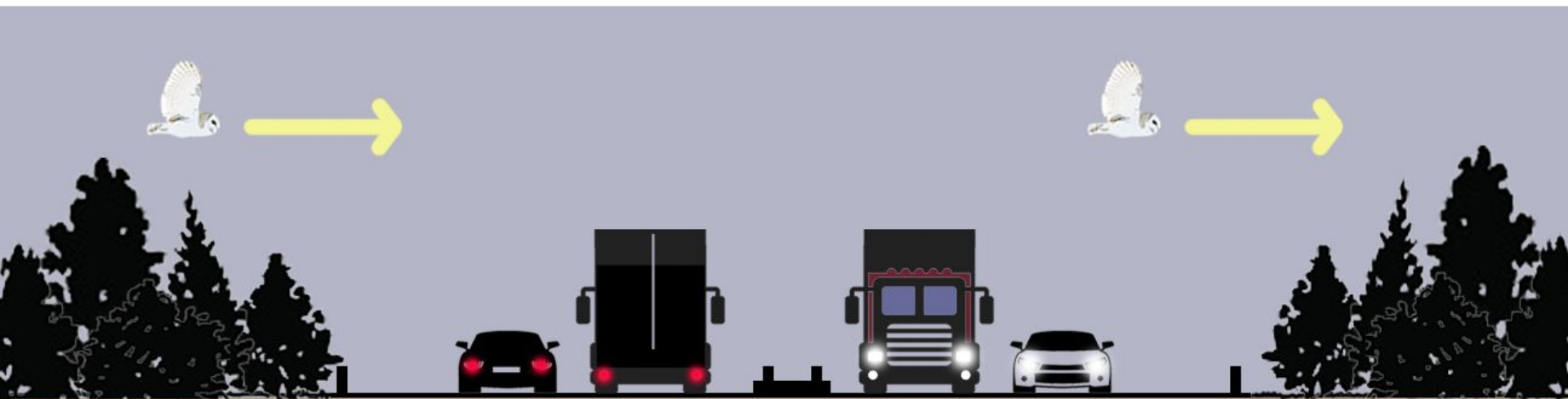
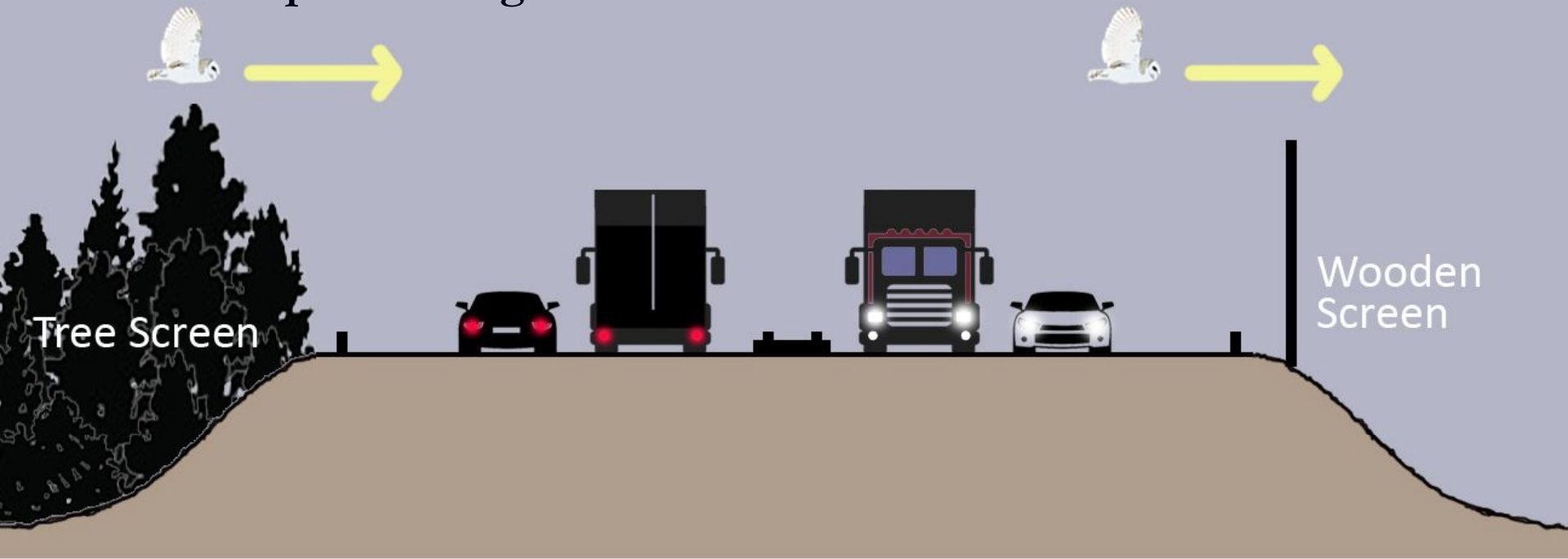
Current knowledge

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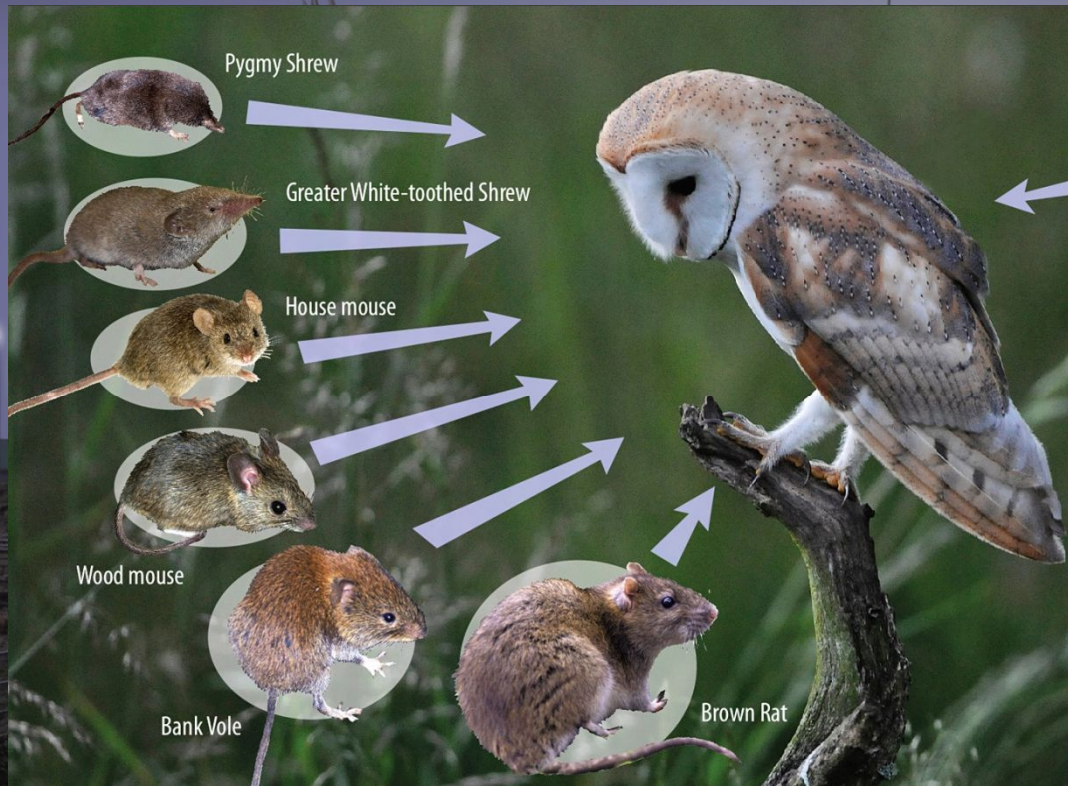
Current knowledge

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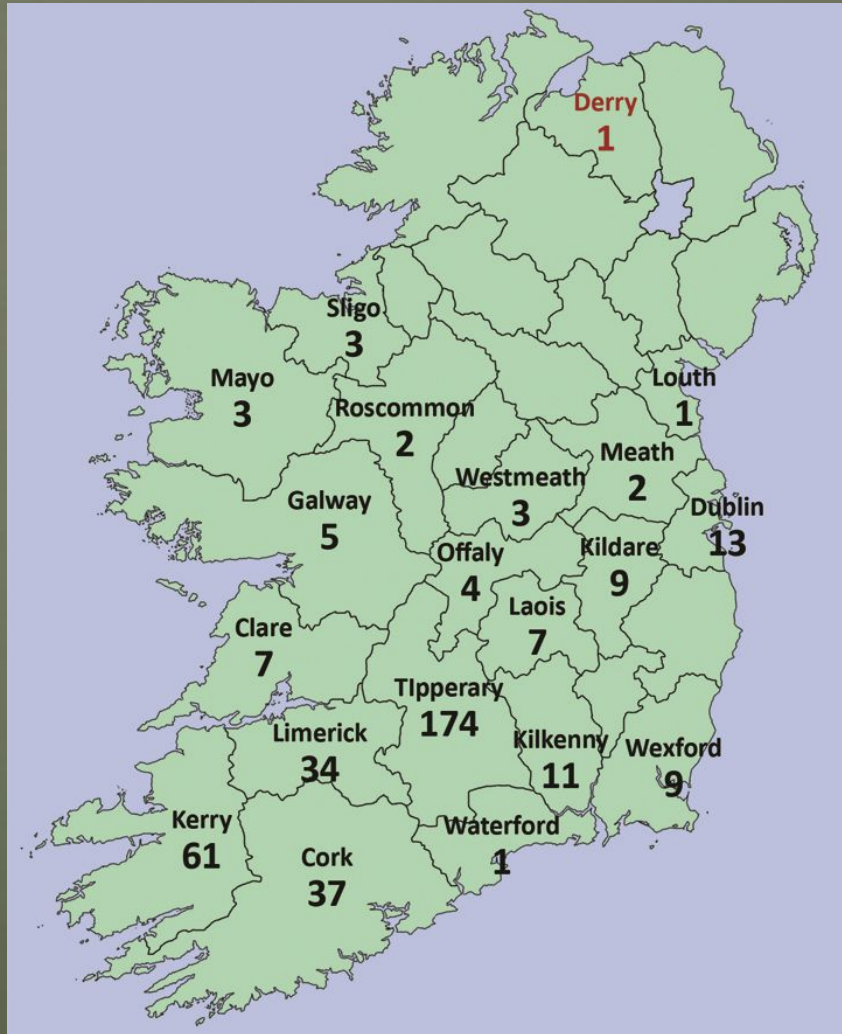


Current knowledge

Factors which may influence collision risk



Current knowledge

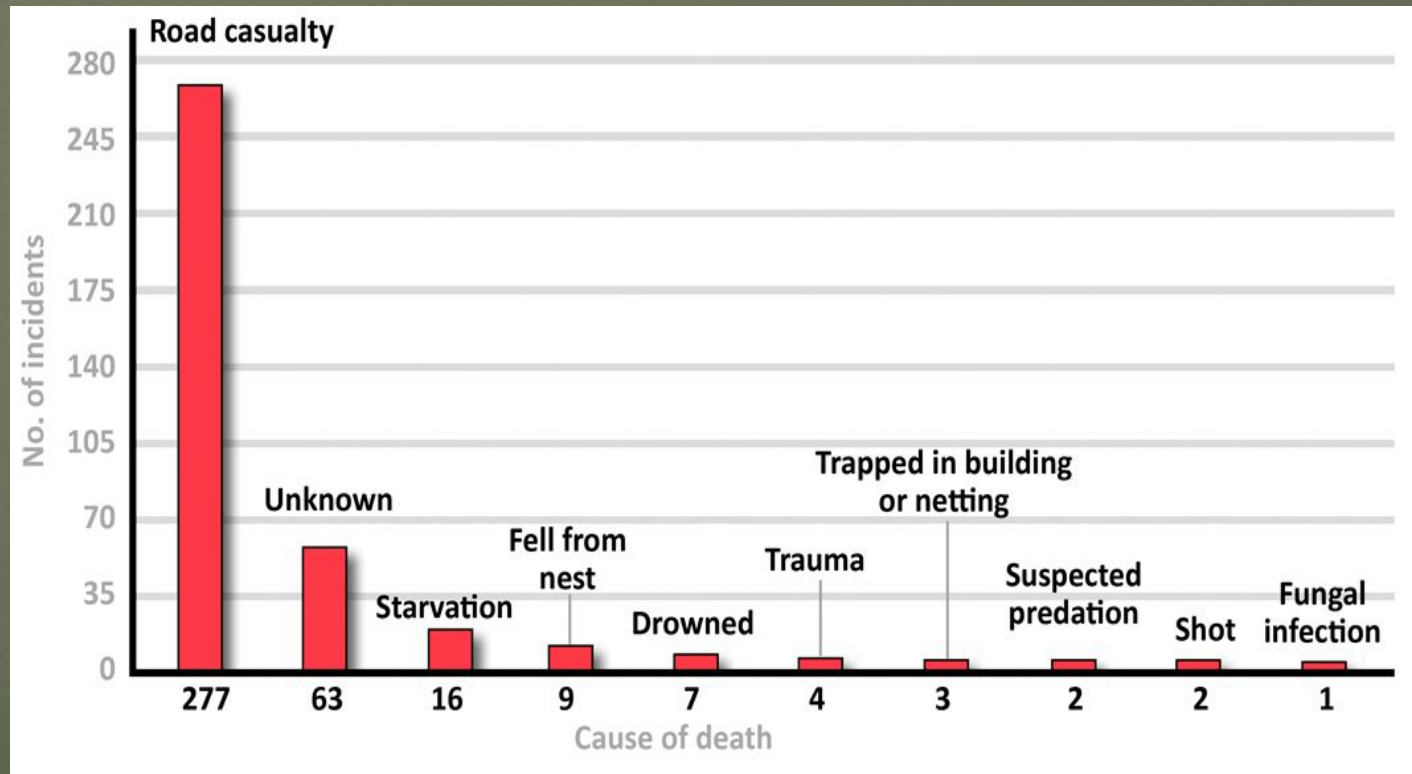


The distribution of all recorded Barn Owl mortality incidents ($n = 387$) in the Republic of Ireland (2008 - 2017).

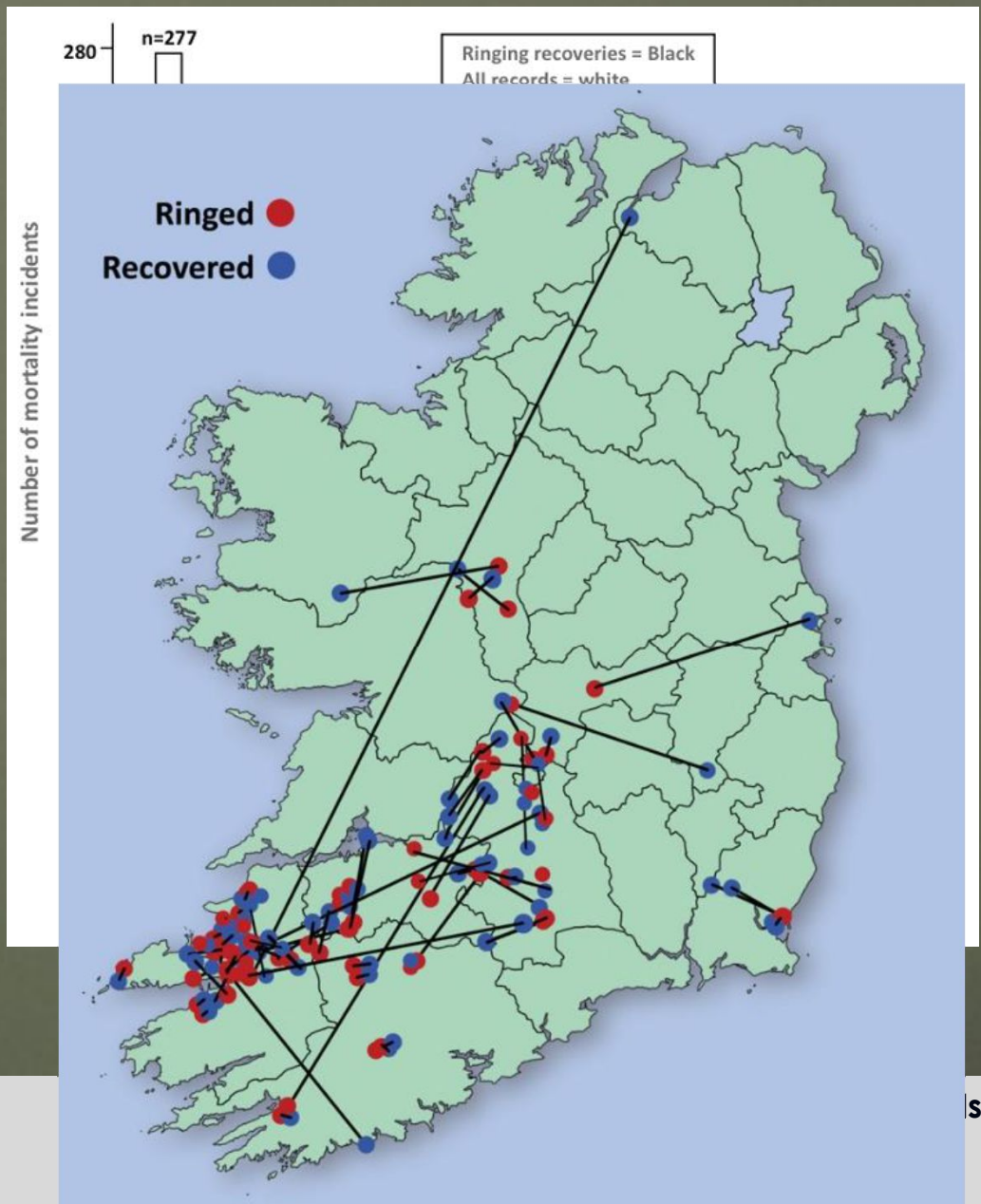


Current knowledge

Road mortality in Ireland



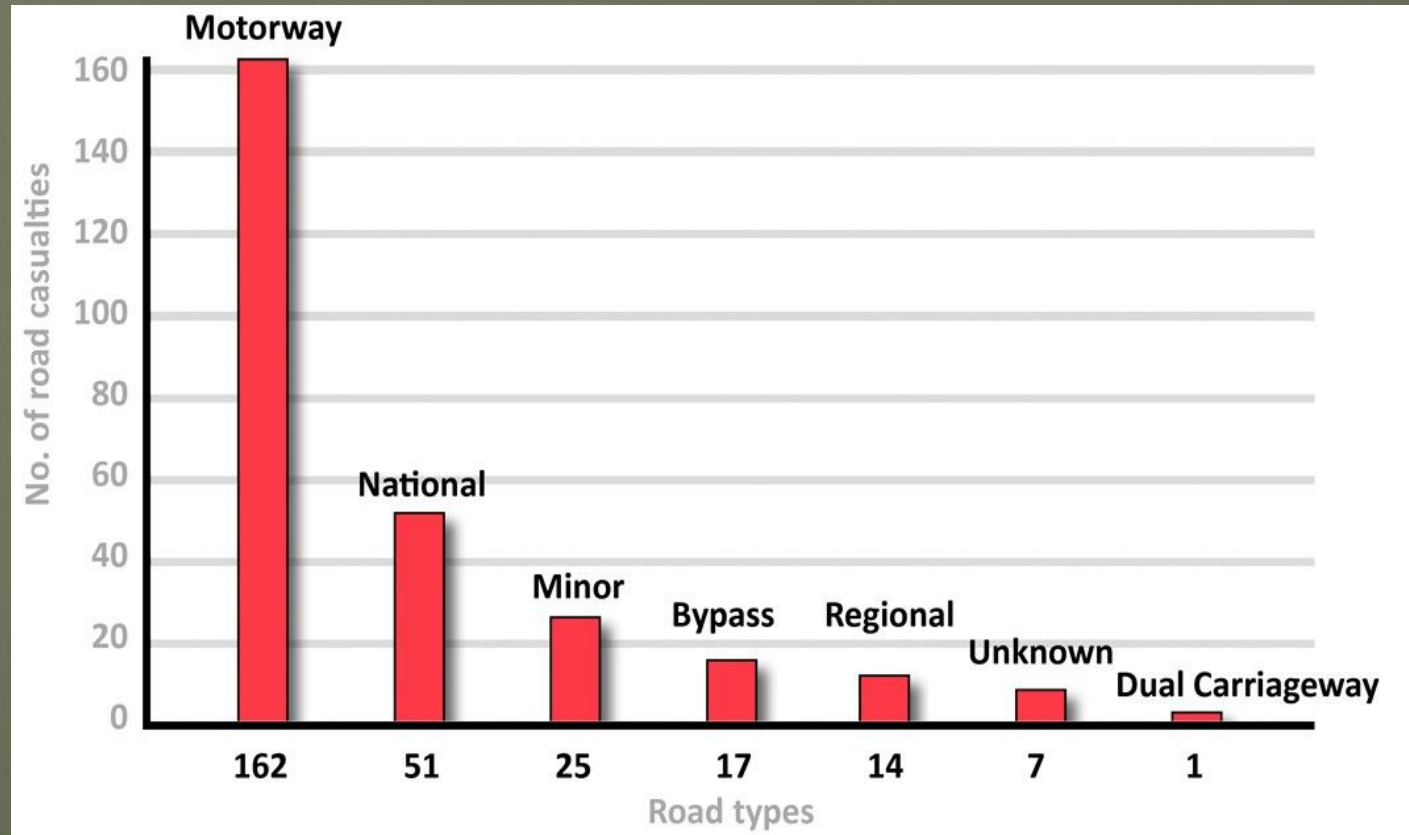
The cause of death for all recorded Barn Owl mortality incidents (n = 387) in the Republic of Ireland (2008 to May 2017).



Road casualties account for 3% of deaths of all birds ringed.

Current knowledge

Road mortality in Ireland

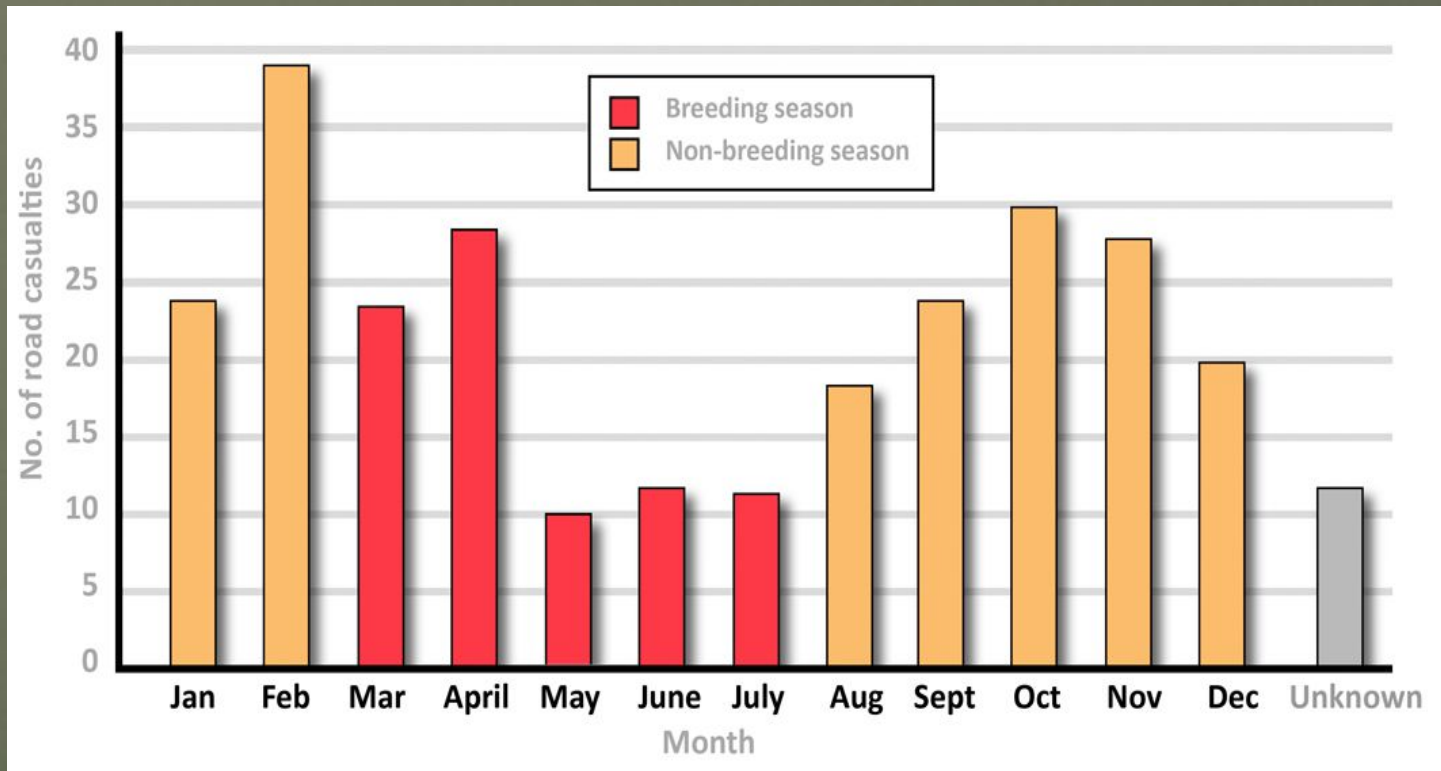


The road type on which all Barn Owl road mortalities were recovered (n = 277) in the Republic of Ireland (2008 - 2017).



Current knowledge

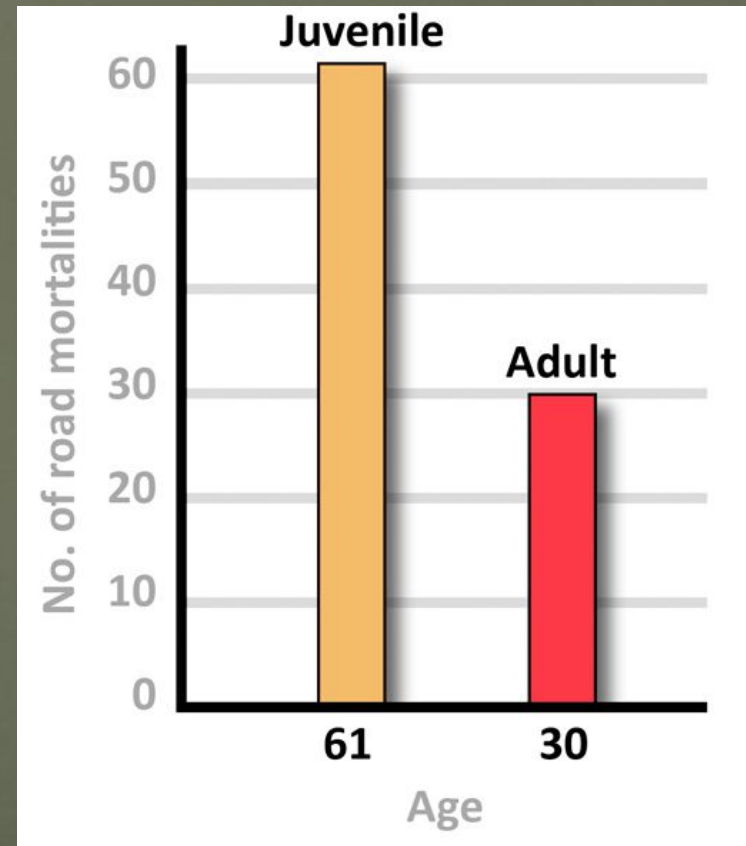
Road mortality in Ireland



The month in which Barn Owl road mortalities were recorded (n = 277) in the Republic of Ireland (2008 - 2017).

Current knowledge

Road mortality in Ireland



The age profile of Barn Owl road casualties (n = 91) in the Republic of Ireland (2008 - 2017).

Knowledge gaps

The extent of Barn Owl road mortalities on a local and national scale in Ireland?

- The factors which influence risk of collision?

- The population level impact of road mortalities on Barn Owl populations in Ireland?

- Whether it is possible to mitigate risk of collision?

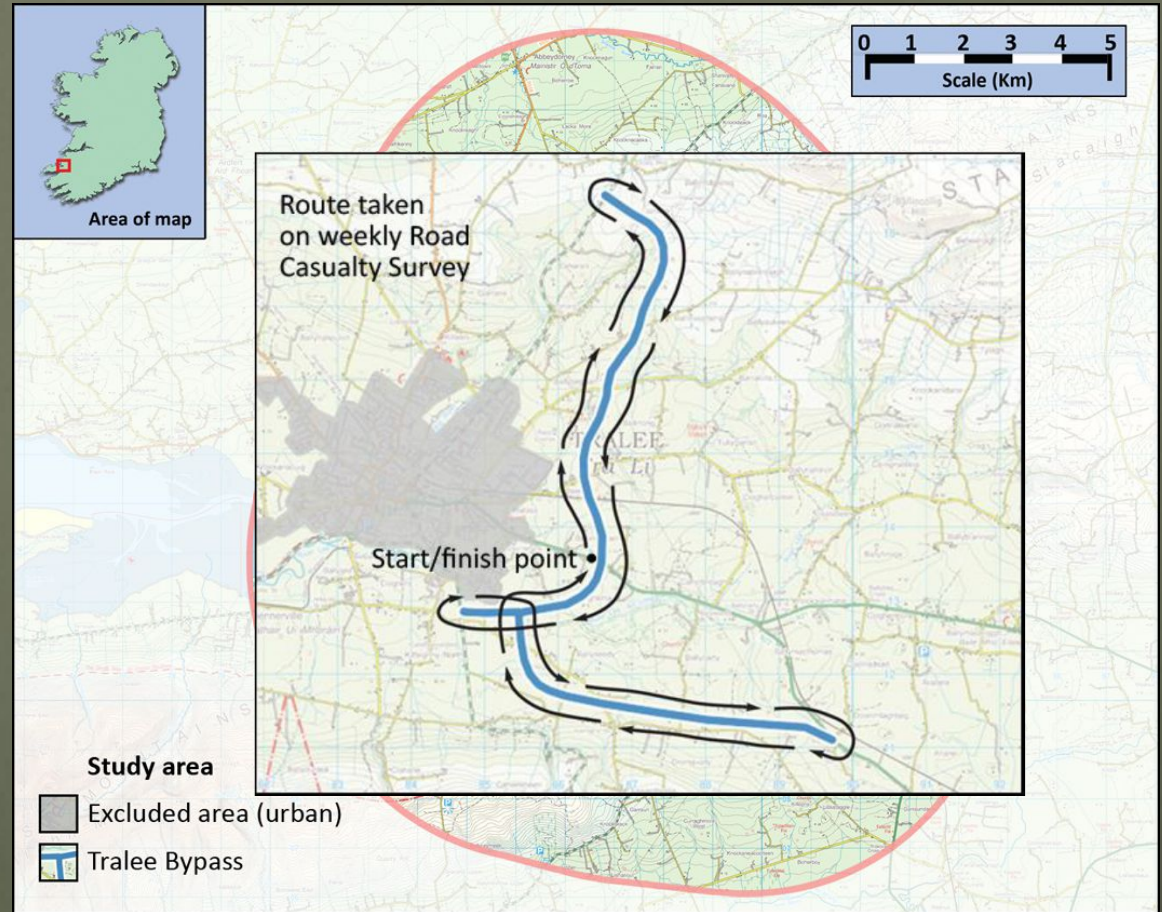
- Identification of mitigation which is practical and effective?





The Tralee Bypass and M8 motorway - the main study sites for the Barn Owl road casualty survey.

Extent of road casualties – Tralee Bypass

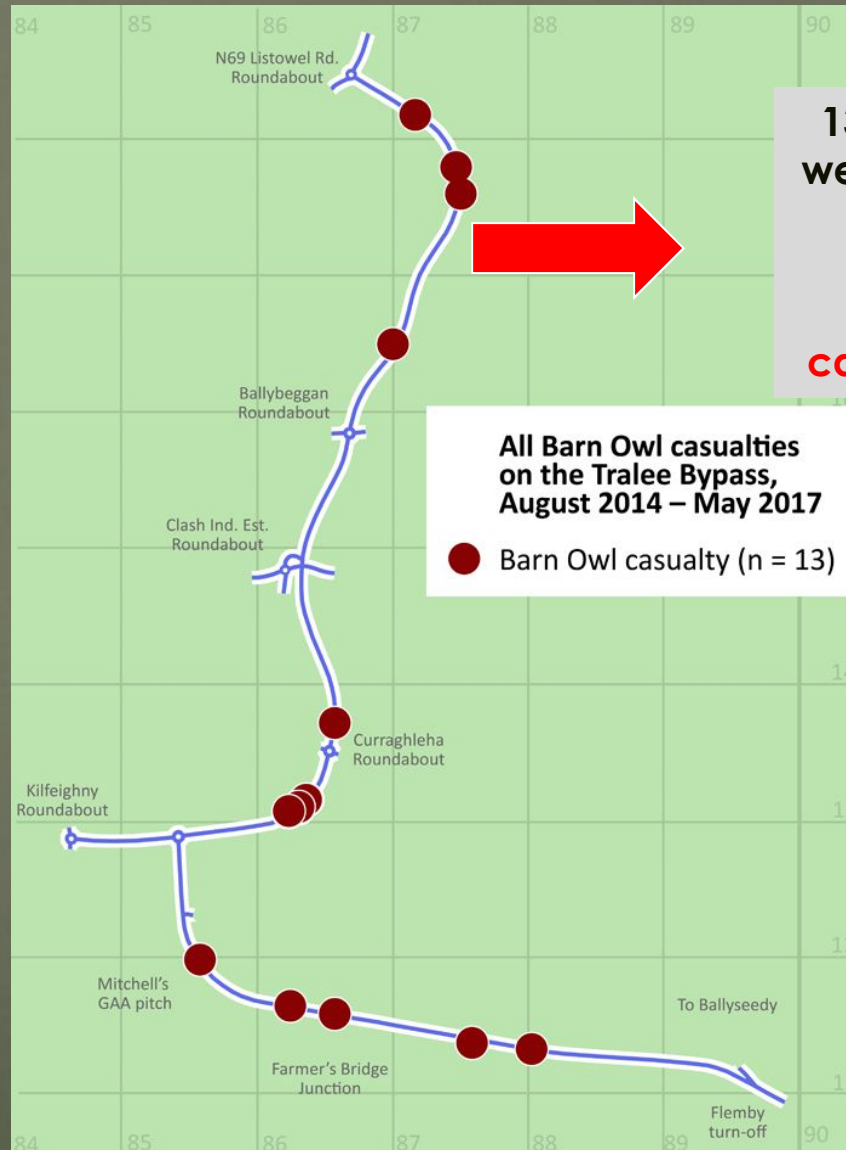


The Tralee Bypass (13.5km) study site for the strategic Barn Owl survey.

METHODS:

- One survey / week for 144 weeks (Aug 2014 – May 2017)
- All avian & mammalian road mortalities recorded

Extent of road casualties – Tralee Bypass



13 Barn Owls over 144 weeks on Tralee Bypass (13.5km)

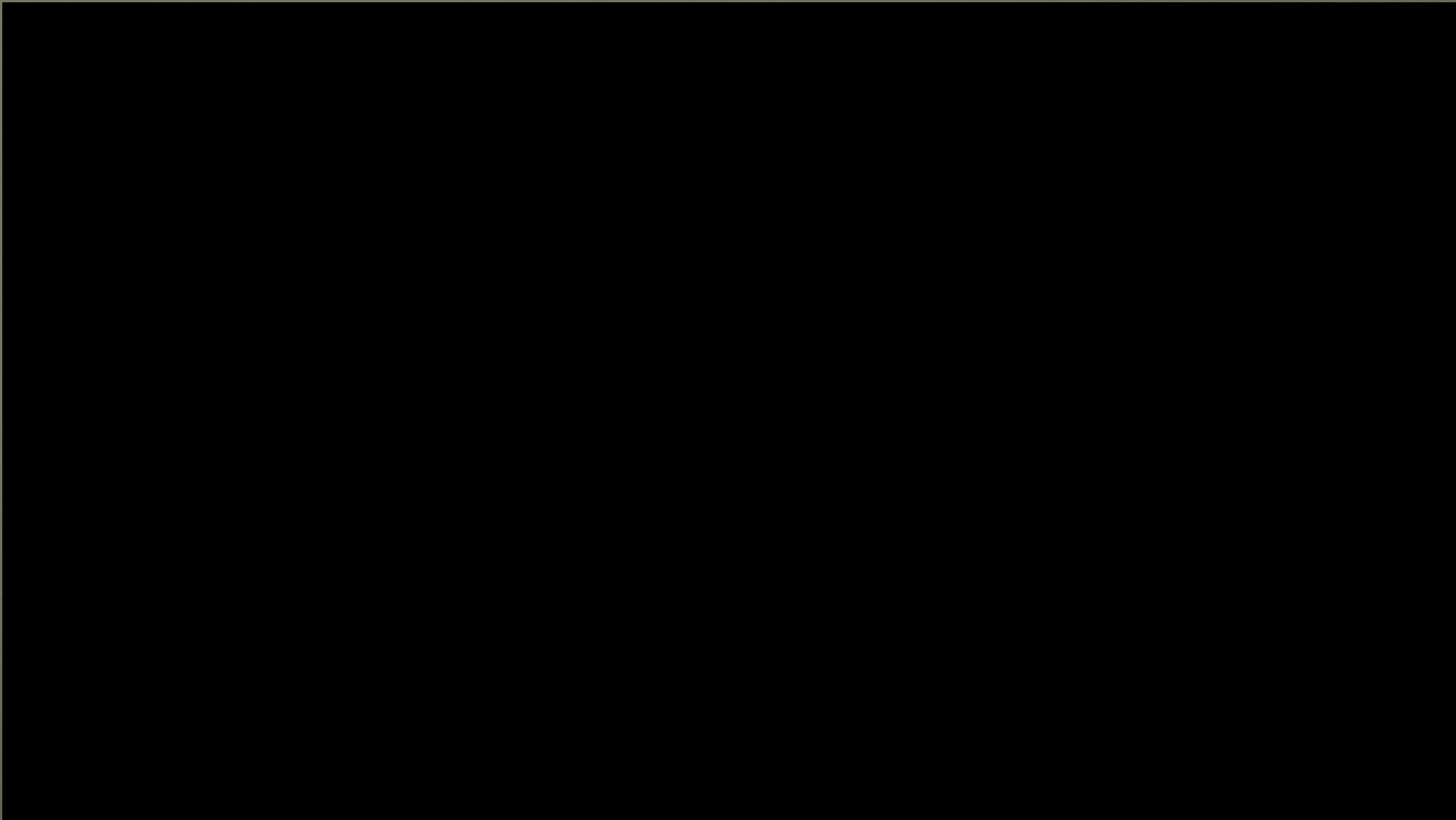
=

35 Barn Owl casualties/100km/year

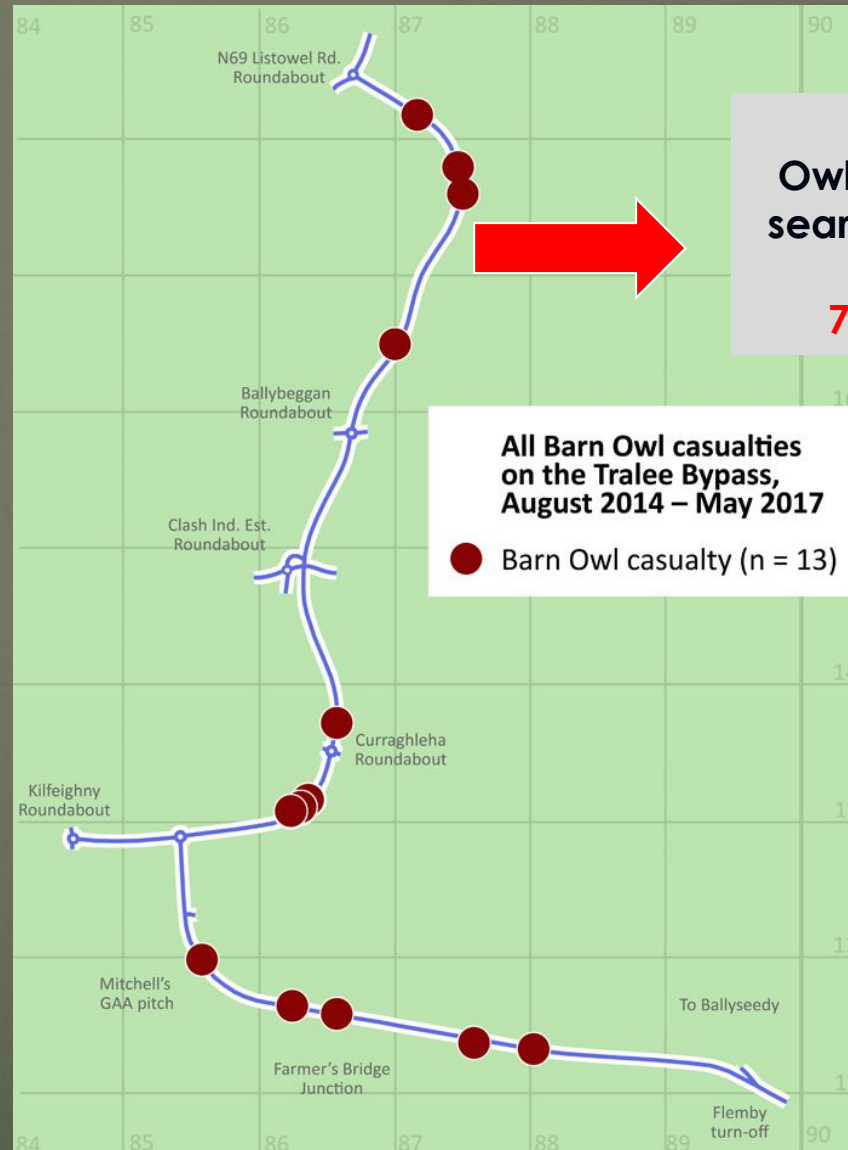
Distribution of Barn Owl road casualties on the Tralee Bypass Aug 2014 – May 2016 (n = 11)

Extent of road casualties – Tralee Bypass

Effect of search & removal bias



Extent of road casualties – Tralee Bypass



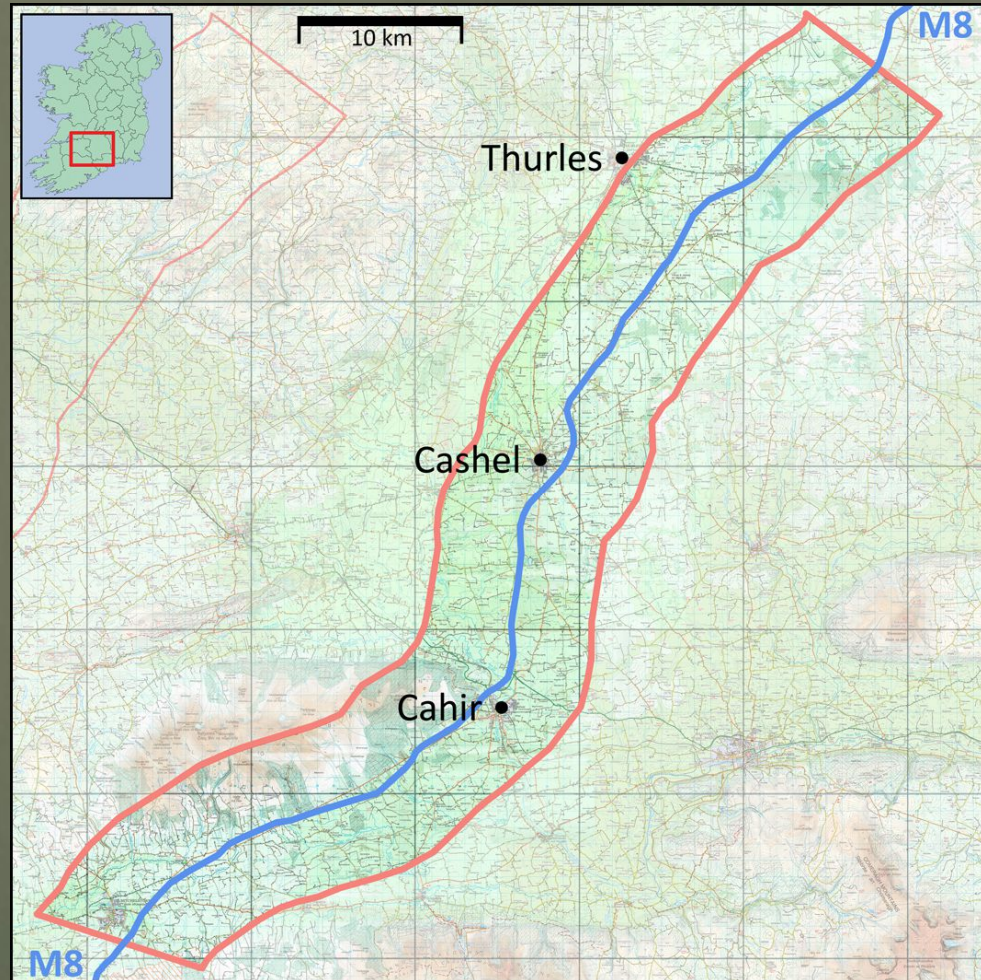
When figures (35 Barn Owls/100km/yr.) adjusted for search and removal, estimate

=

78 Barn Owls/100km/yr.

Distribution of Barn Owl road casualties on the Tralee Bypass Aug 2014 – May 2016 (n = 11)

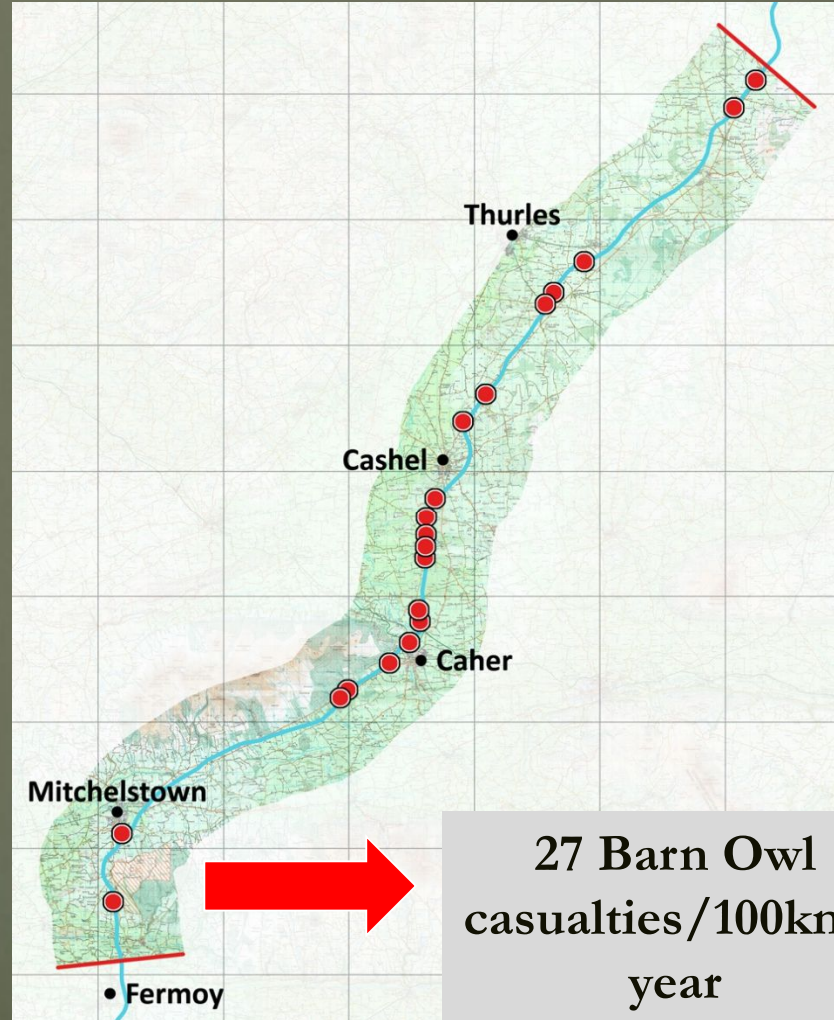
Extent of road casualties – M8



METHODS:

- Daily survey (96km) for 81 weeks (Nov 2015 – May 2017)
- All Barn Owl road mortalities recorded and collected

Road Casualty Survey – M8

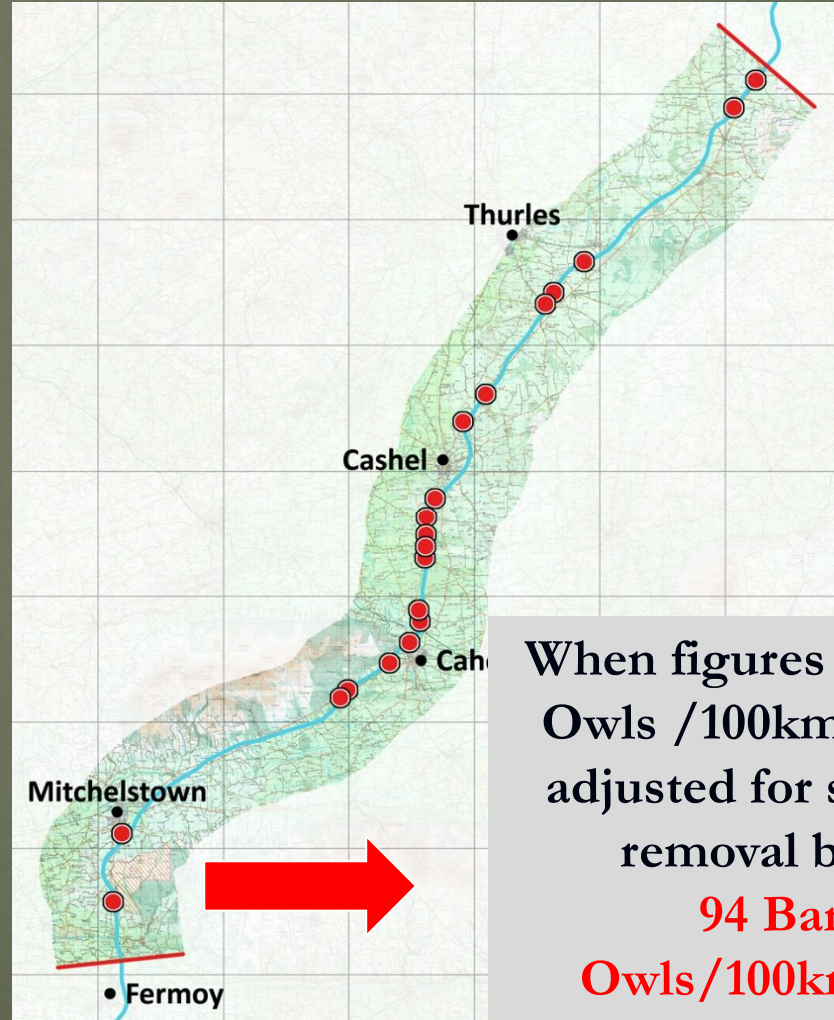


The location of Barn Owl road mortalities on the M8 recorded by EgisLagan survey (Nov 2015 – May 2017).

Search & removal bias – M8



Trials to determine efficiency of survey/detection rates

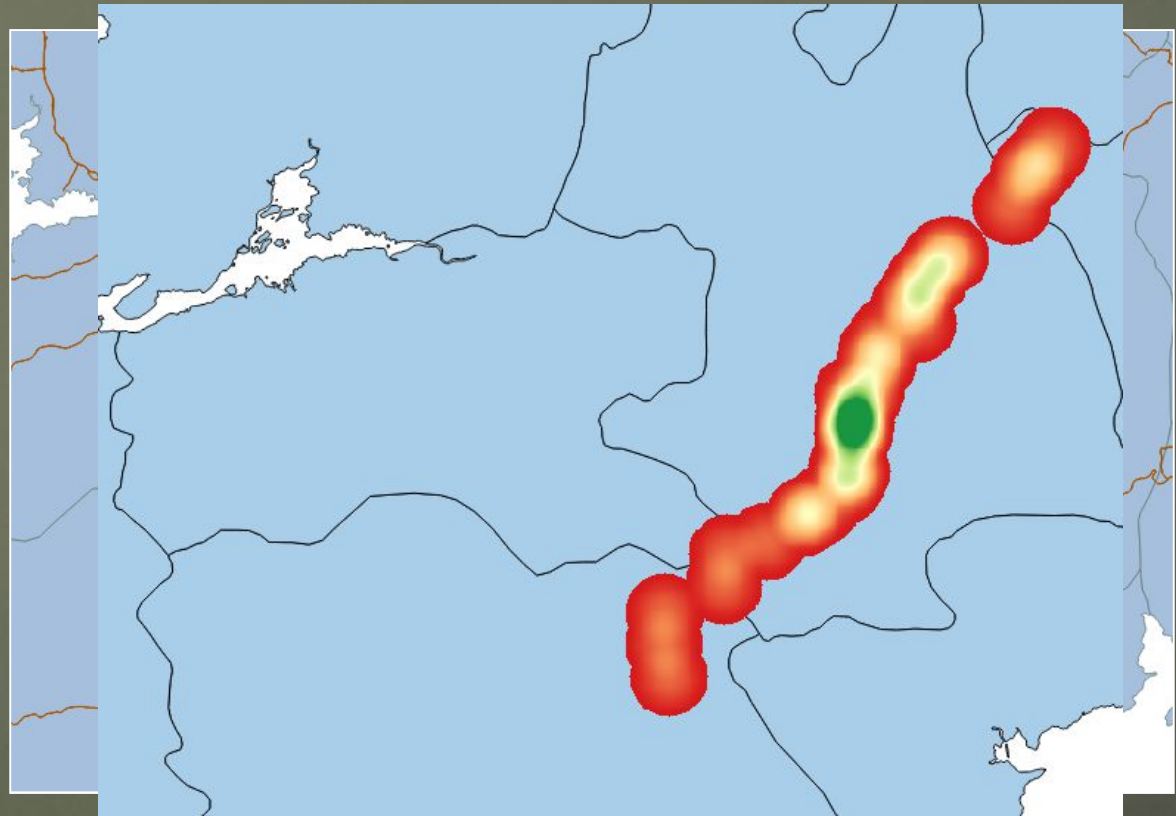


When figures (27/Barn
Owls /100km/yr.) are
adjusted for search &
removal bias =

**94 Barn
Owls/100km/year**

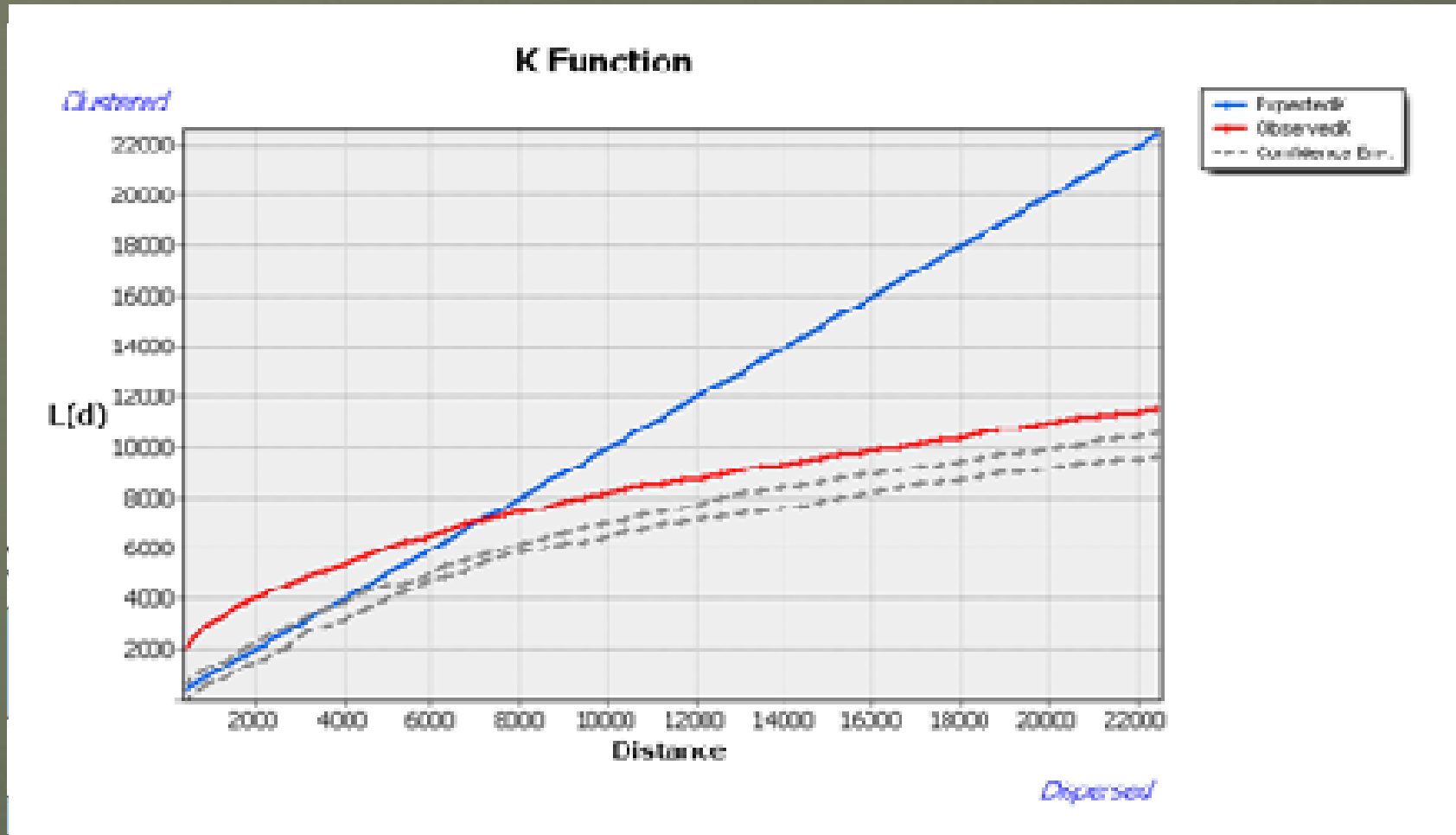
The location of Barn Owl road mortalities (n = 22) on the M8 (Nov 2015 – Oct 2016).

Factors which influence risk of collision – M8



Barn Owl collision points on the M8 (n = 50; 2009 – 2017)

Factors which influence risk of collision – M8



Ripley's K function multi-distance spatial clustering analysis of M8 data collision points (n = 50)

Factors which influence risk of collision – M8

Data attributed to each collision point
(n = 50) & random point (n = 50)

- Adjacent habitat type
 - Verge width
 - Distance to junction
 - Distance to flyover
- Distance to linear feature
 - Verge habitat
- Embankment / verge height



Sources: 1m contour maps, CORRINE Land
Cover, Satellite – Bing Maps & Google
Streetview



Factors which influence risk of collision – M8

Verge width

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	Variable 2
Mean	20.28	17.42
Variance	126.0016327	120.629899
Observations	50	100
Hypothesized Mean Difference	0	
df	96	
t Stat		1.481580594
P(T<=t) one-tail		0.070863456
t Critical one-tail		1.66088144
P(T<=t) two-tail		0.141726911
t Critical two-tail		1.984984312

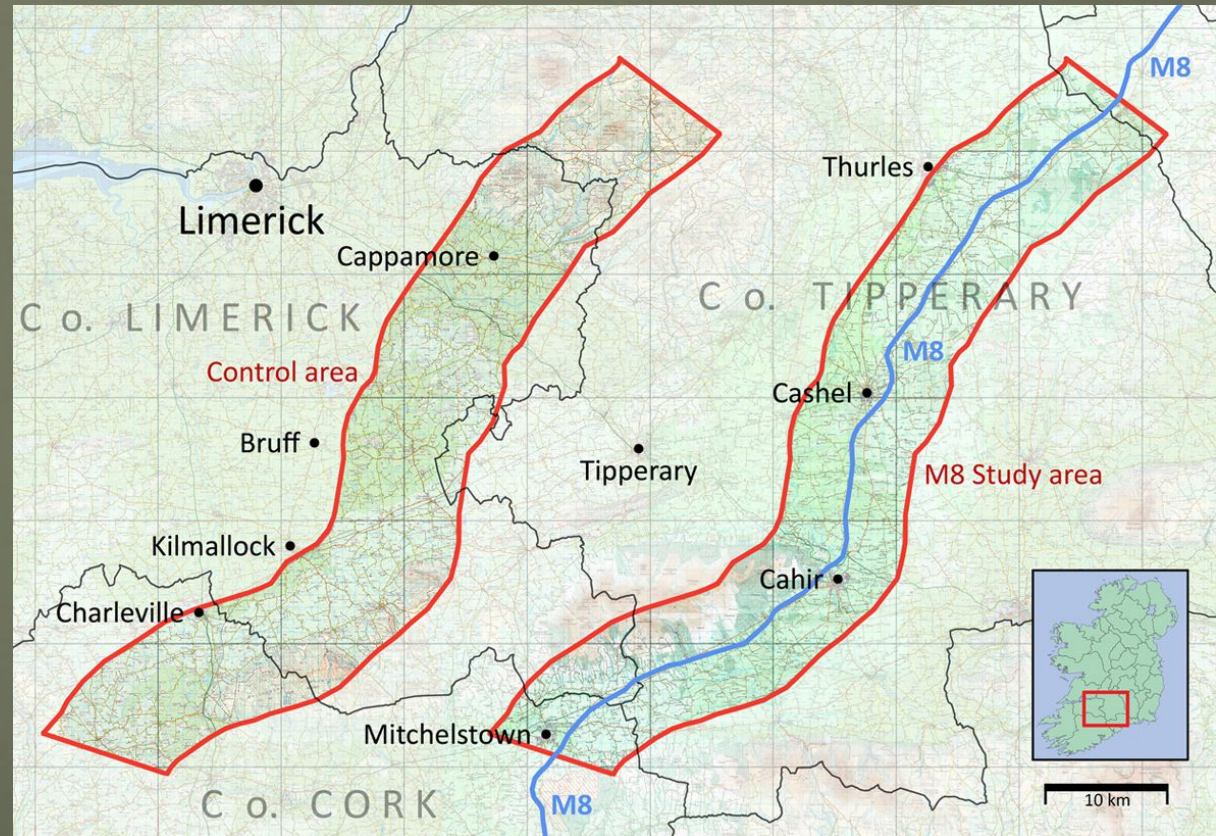
* Verge width IS significant at $P < 0.1$

* Verge is significantly wider at collision points



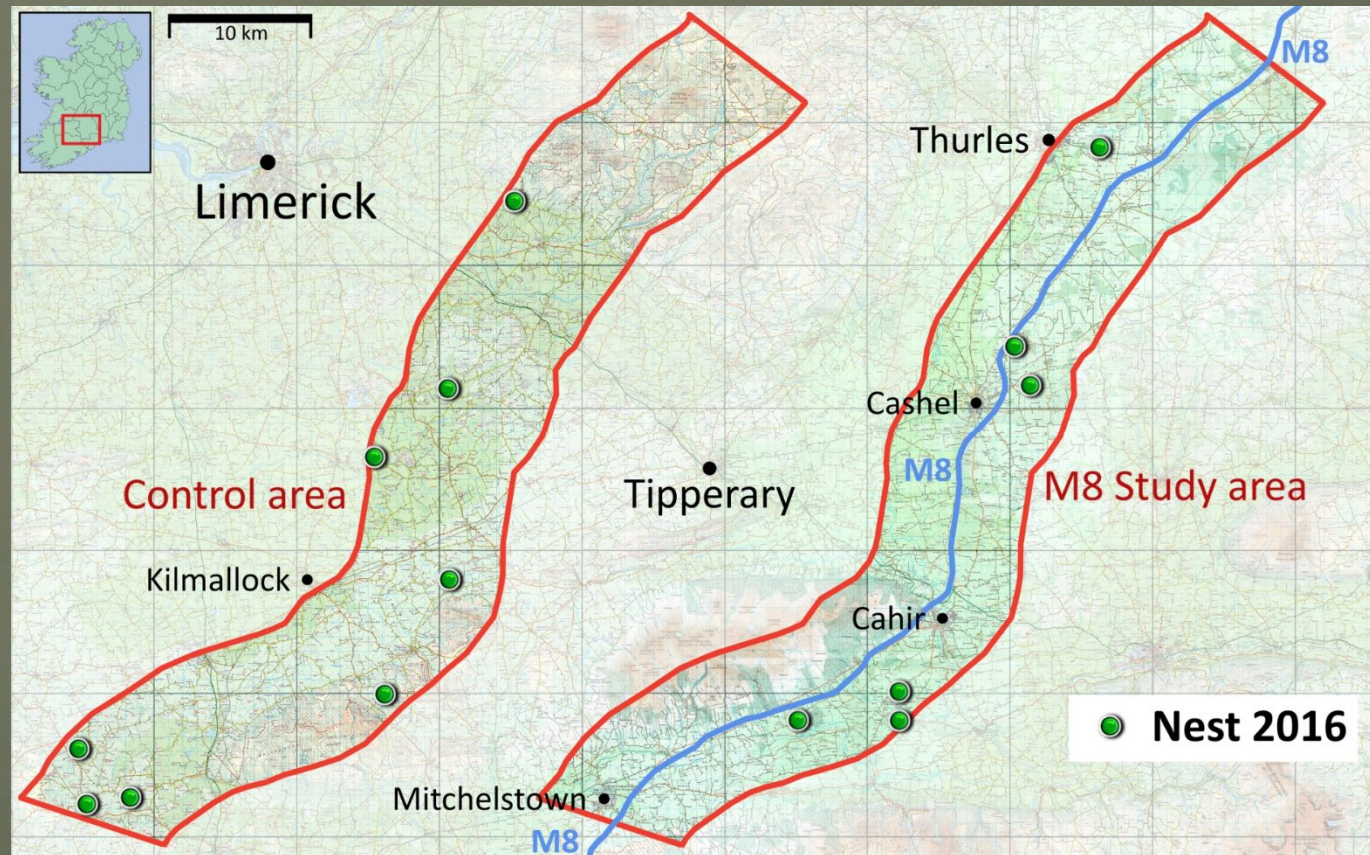
Impacts on local populations – M8

Breeding density survey



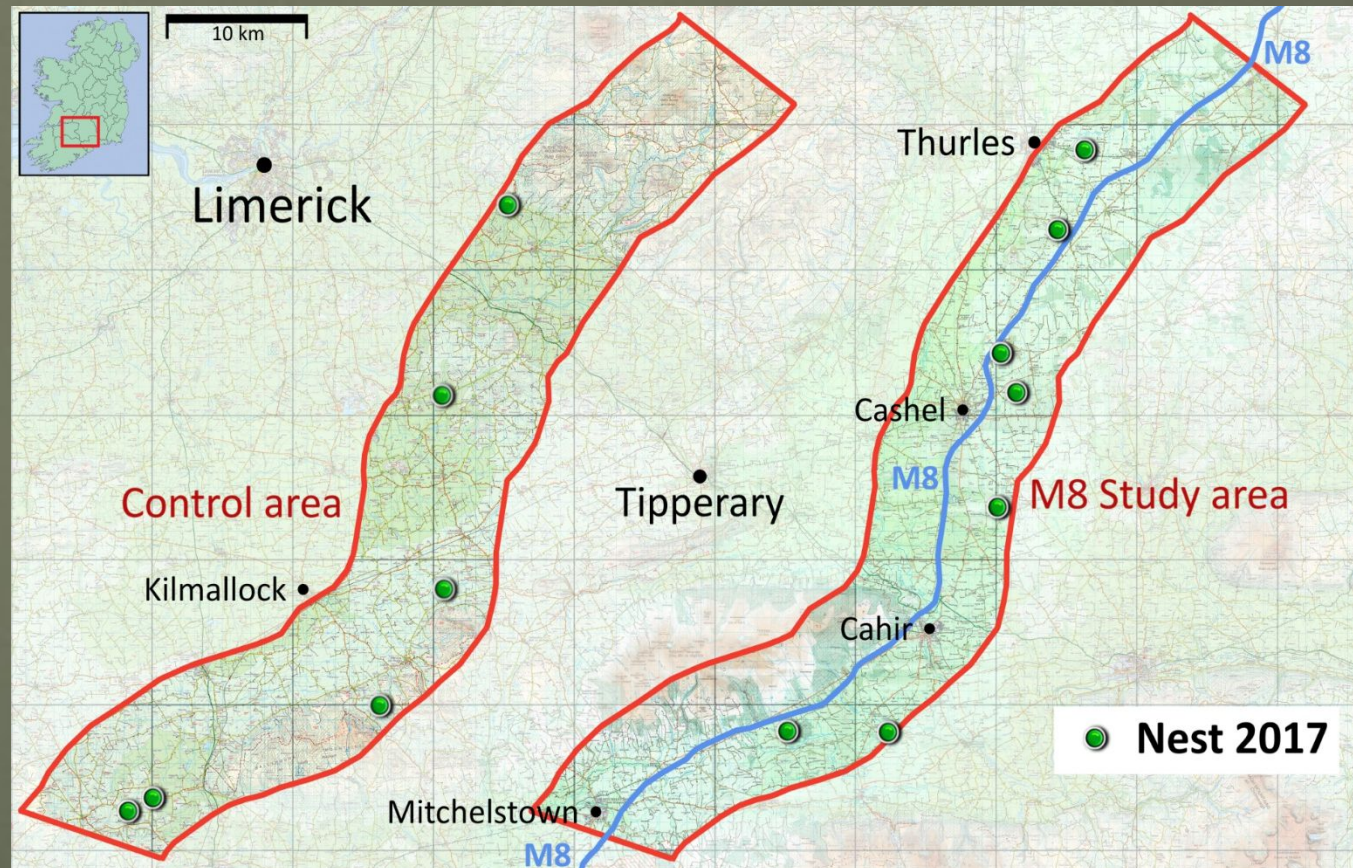
The M8 study site (right) and the control study site for the Barn Owl density survey and monitoring.

Impacts on local populations – M8 Breeding density survey



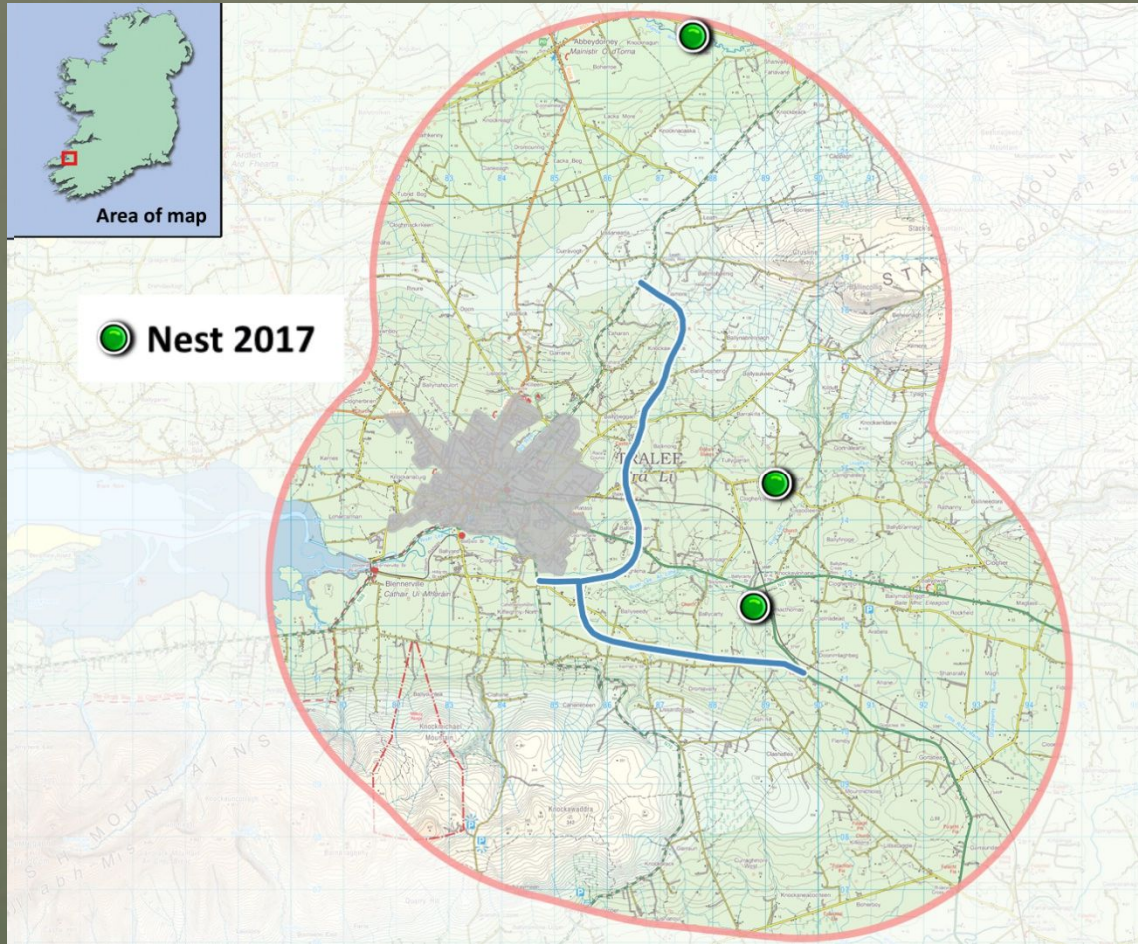
The distribution and activity status of Barn Owl sites within the M8 study area and control area in 2016.

Impacts on local populations – M8 Breeding density survey



The distribution and activity status of Barn Owl sites within the M8 study area and control area in 2017.

Impacts on local populations – M8

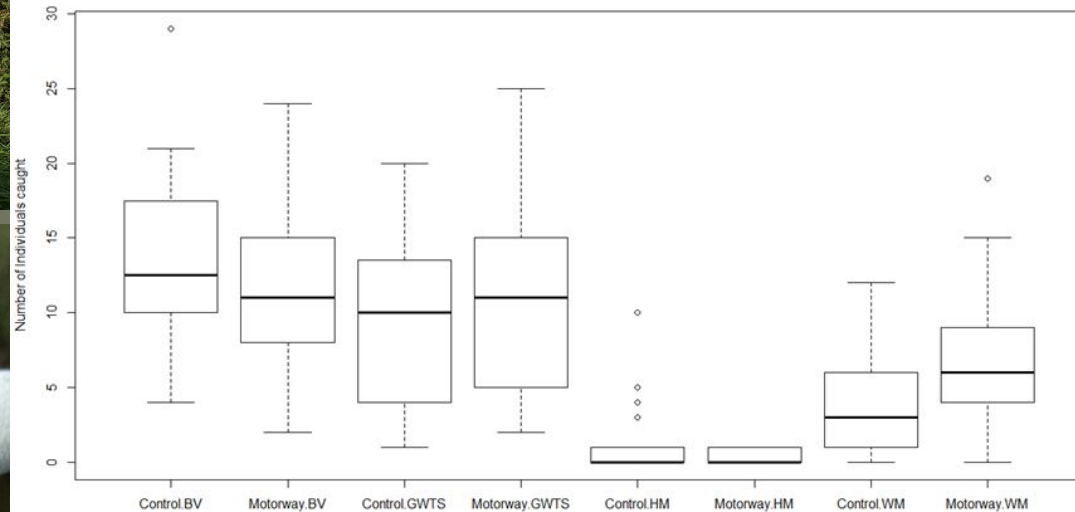


Barn Owl distribution and breeding status within the Tralee Bypass study area (195km²)
2014 - 2017

Barn Owl breeding success

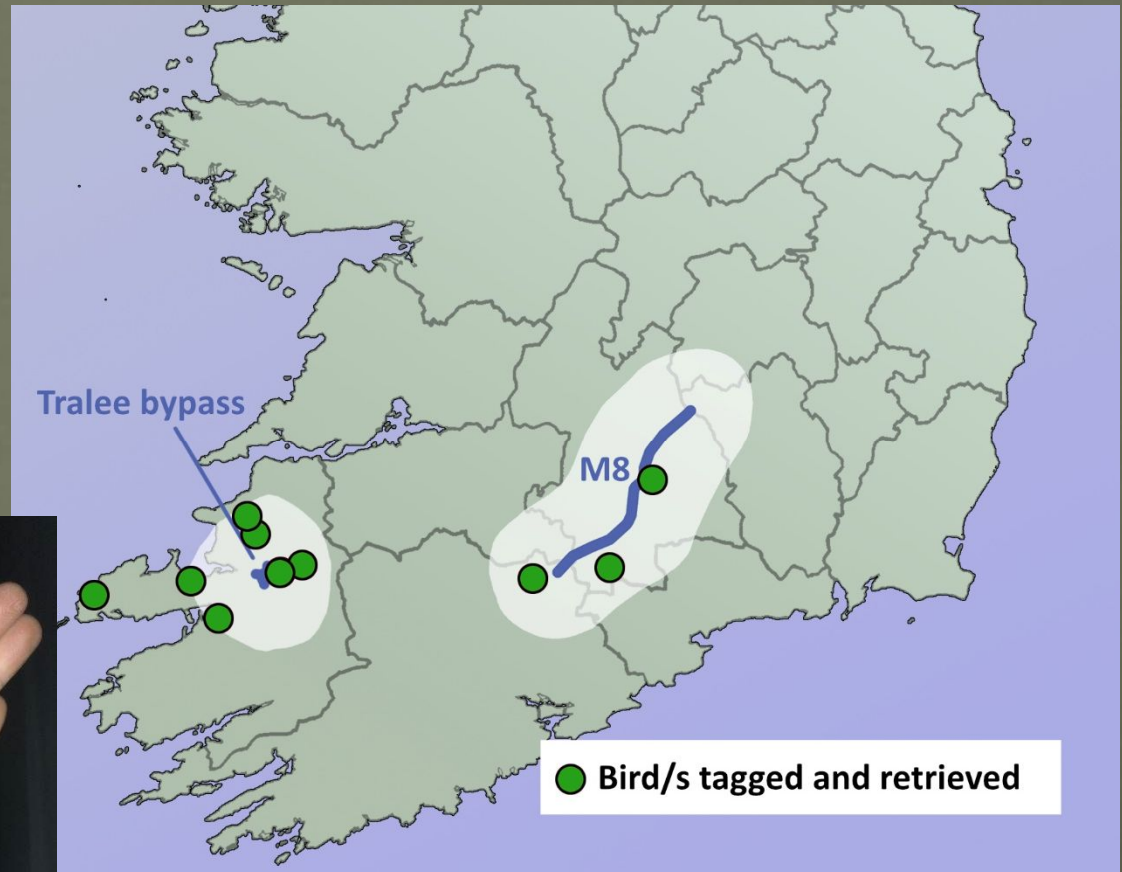


Individual responses – M8



Comparison of number of individual small mammals ($n = 1,399$) caught on motorway verge ($n = 735$) versus road verges (664)

Individual responses – M8 & Tralee Bypass

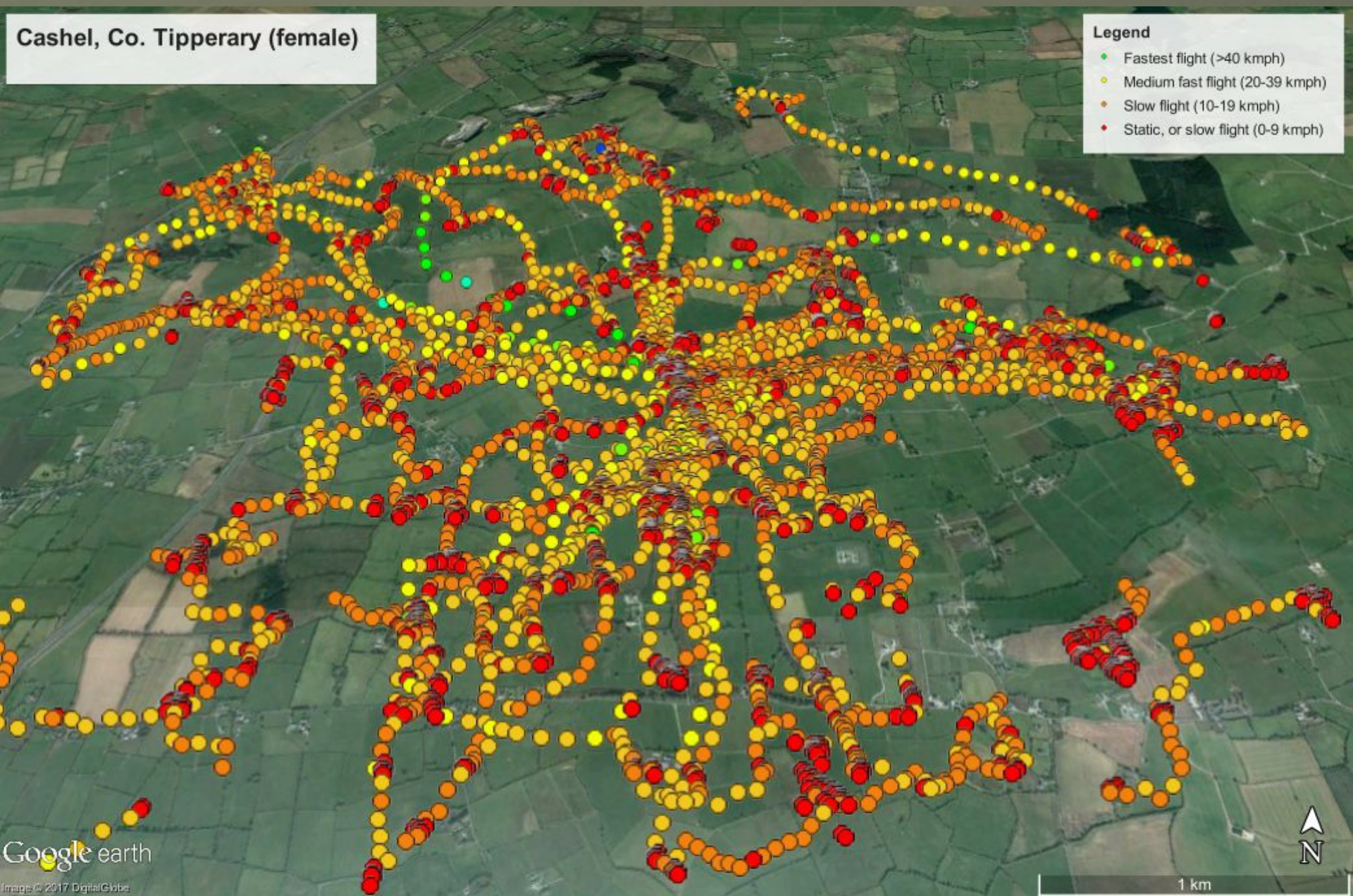


The location of Barn Owl breeding sites ($n = 10$) where adult breeding birds ($n = 13$) were fitted with GPS tags (2016 – 2017)

Cashel, Co. Tipperary (female)

Legend

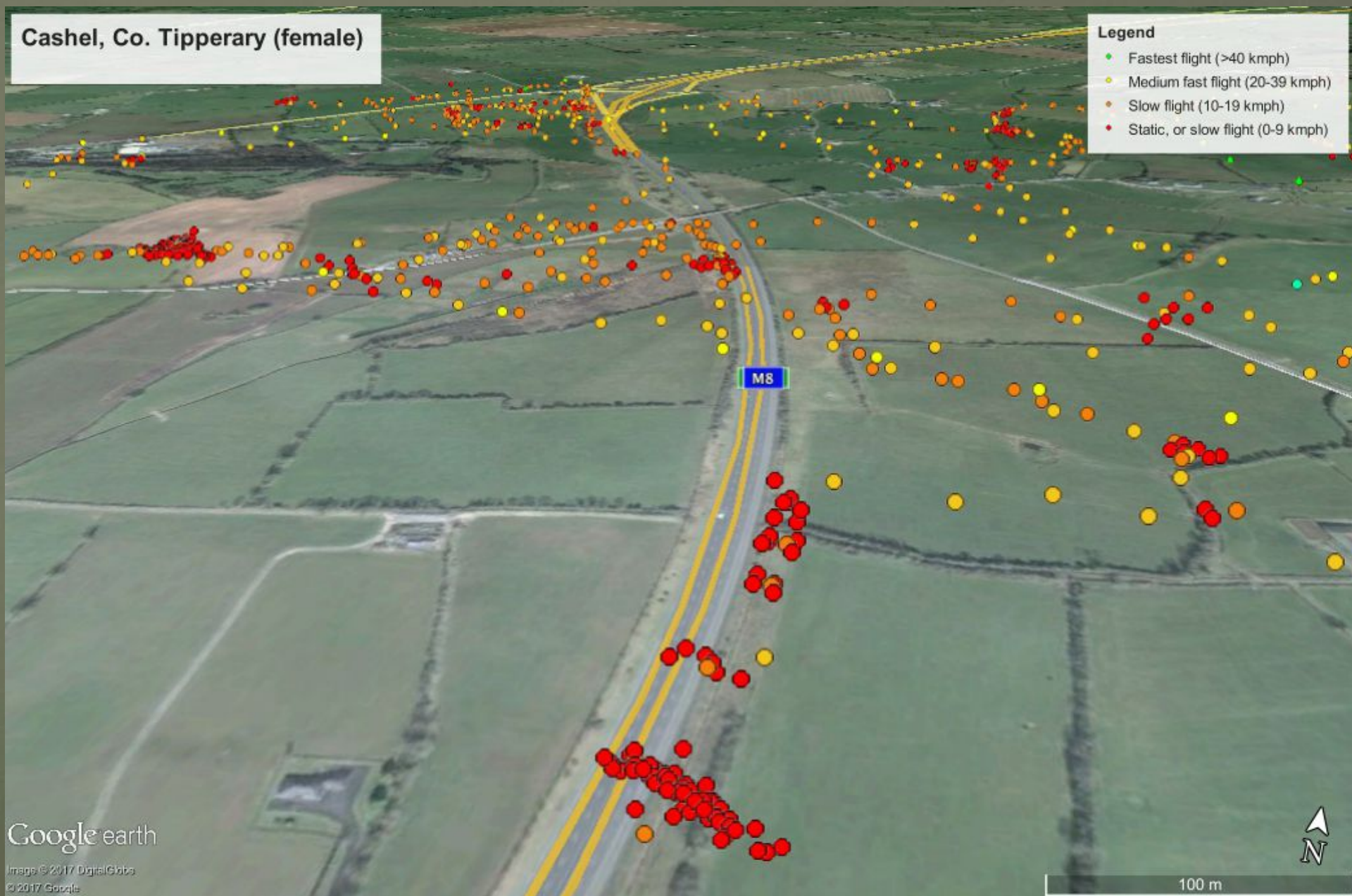
- Fastest flight (>40 kmph)
- Medium fast flight (20-39 kmph)
- Slow flight (10-19 kmph)
- Static, or slow flight (0-9 kmph)



Cashel, Co. Tipperary (female)

Legend

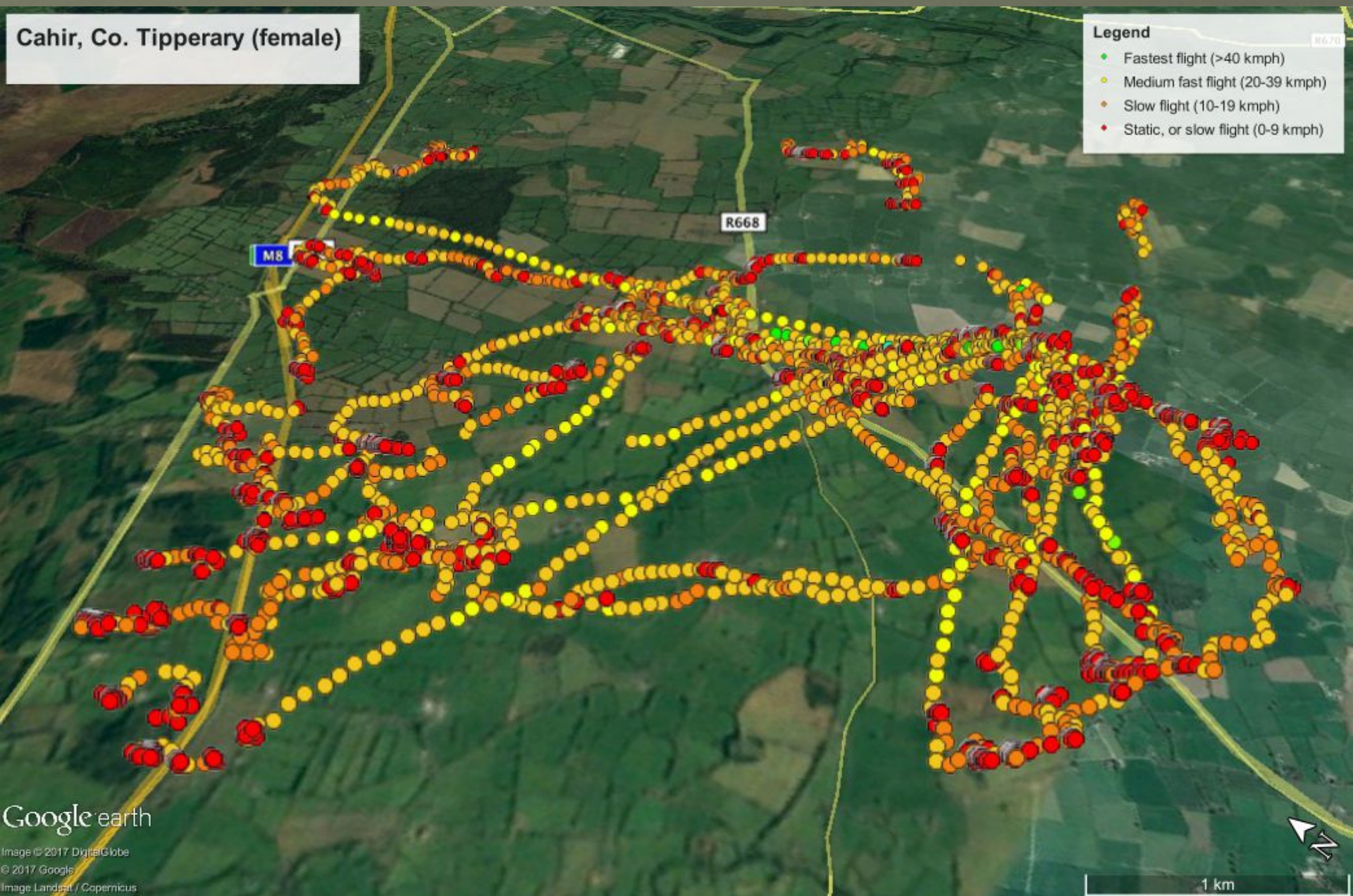
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Cahir, Co. Tipperary (female)

Legend

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Cahir, Co. Tipperary (female)

Legend

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- Static, or slow flight (0-9 kmph)



North Kerry (female)

Legend

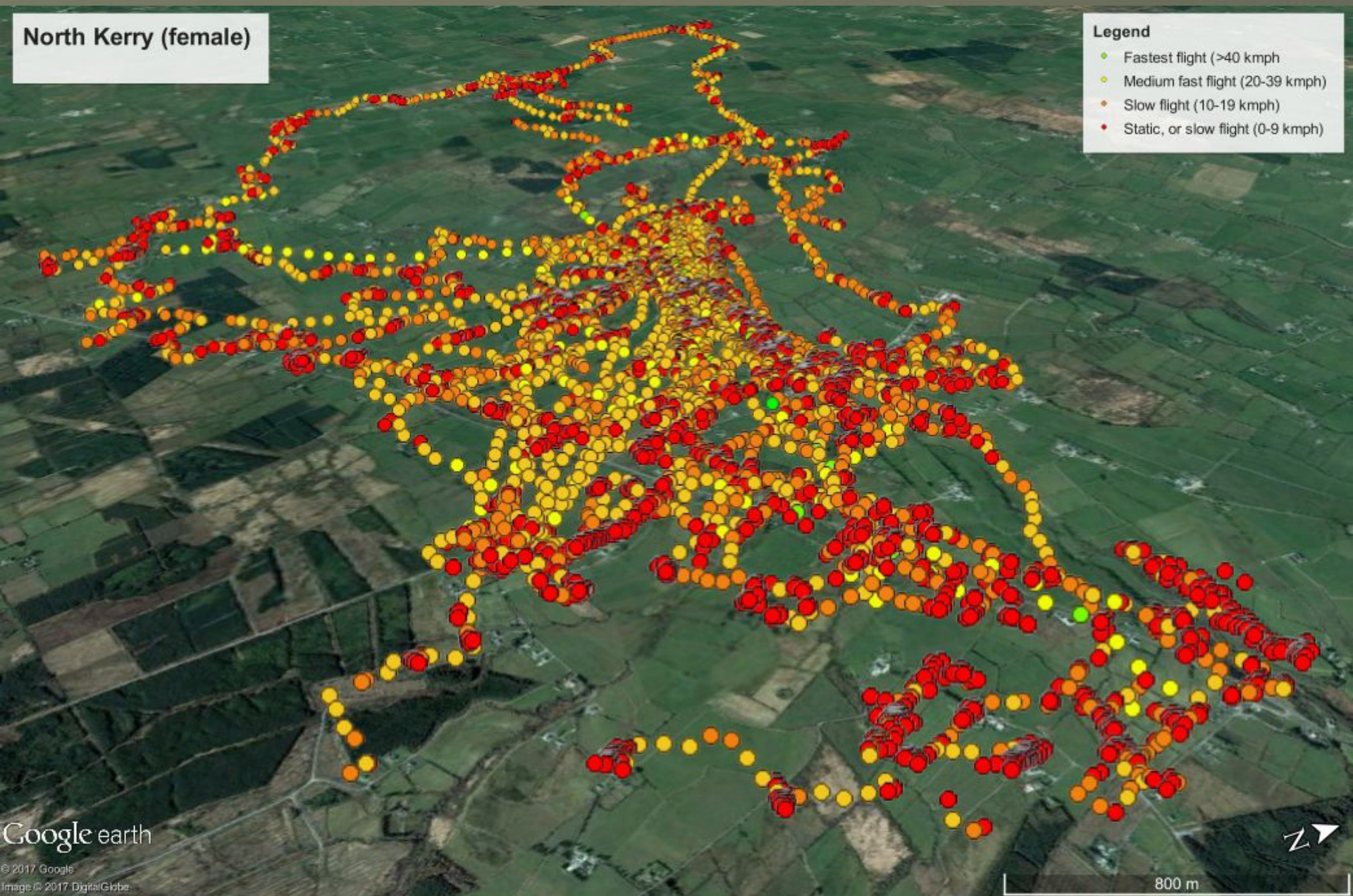
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Google earth

© 2017 Google
Image © 2017 DigitalGlobe



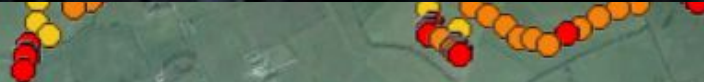
800 m



Cashel, Co. Tipperary (female)

Legend

• Fastest flight (>40 kmph)





ACKNOWLEDGEMENTS

Vincent O'Malley & Sarah-Jane Phelan (TII)

Albert Daly (TII)

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Egis Lagan (Cahir Depot)

Aine Lynch (NPWS)

Steering Group

David Tosh (Ulster Museum)

Thomas Reed (UCC)

David Tierney & Jervis Good (NPWS)

Olivia Crowe & Shane McGuinness (BWI)