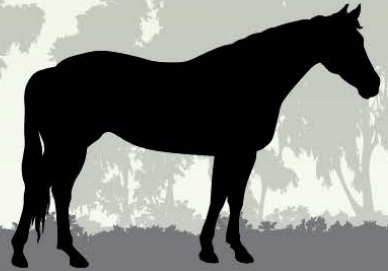
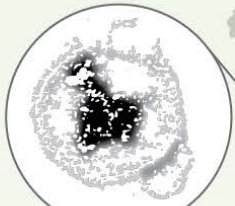


Can protected areas reduce risk of bat-borne zoonotic diseases? Habitat loss, nutritional stress, and spillover of Hendra virus in SE Australia

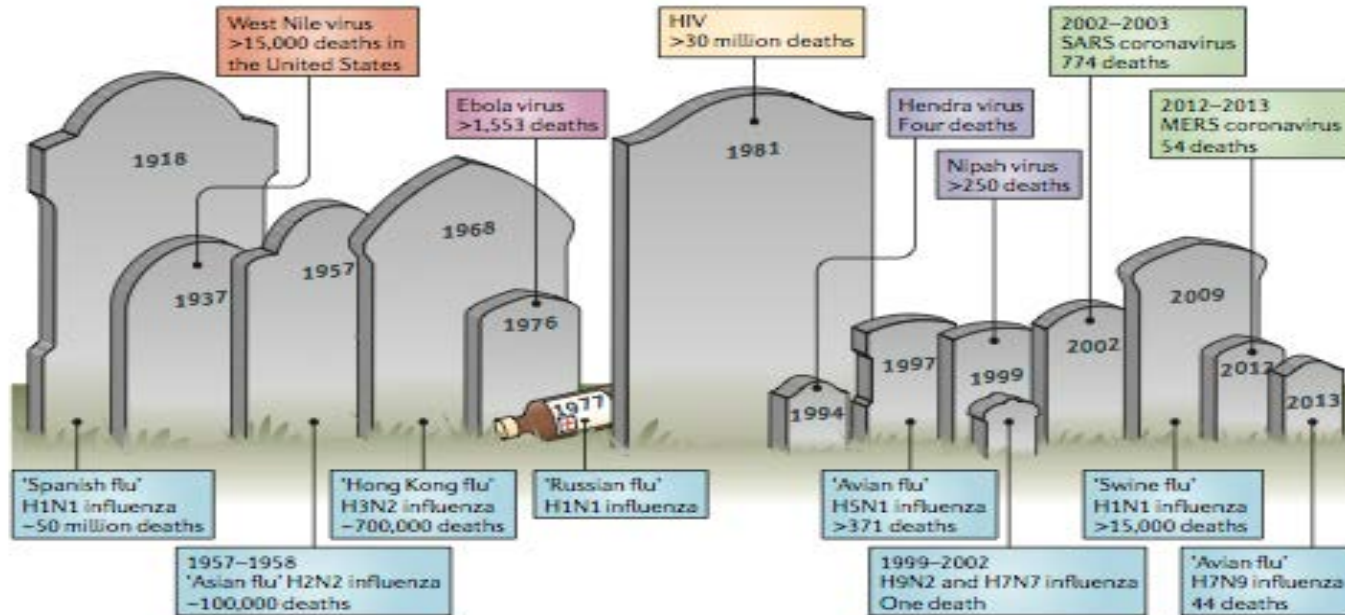
Bat Feeding Site



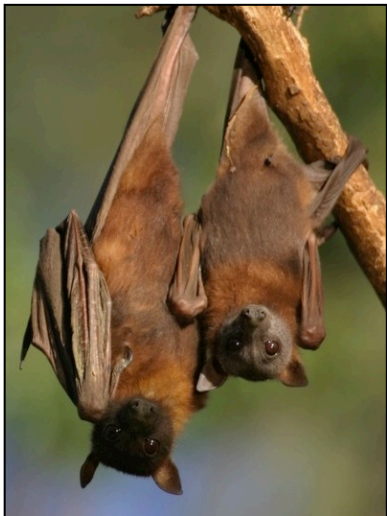
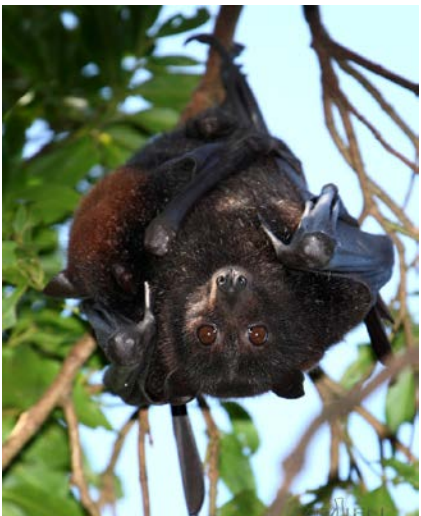
Raina Plowright PhD – Montana State University
Peggy Eby PhD – University of New South Wales



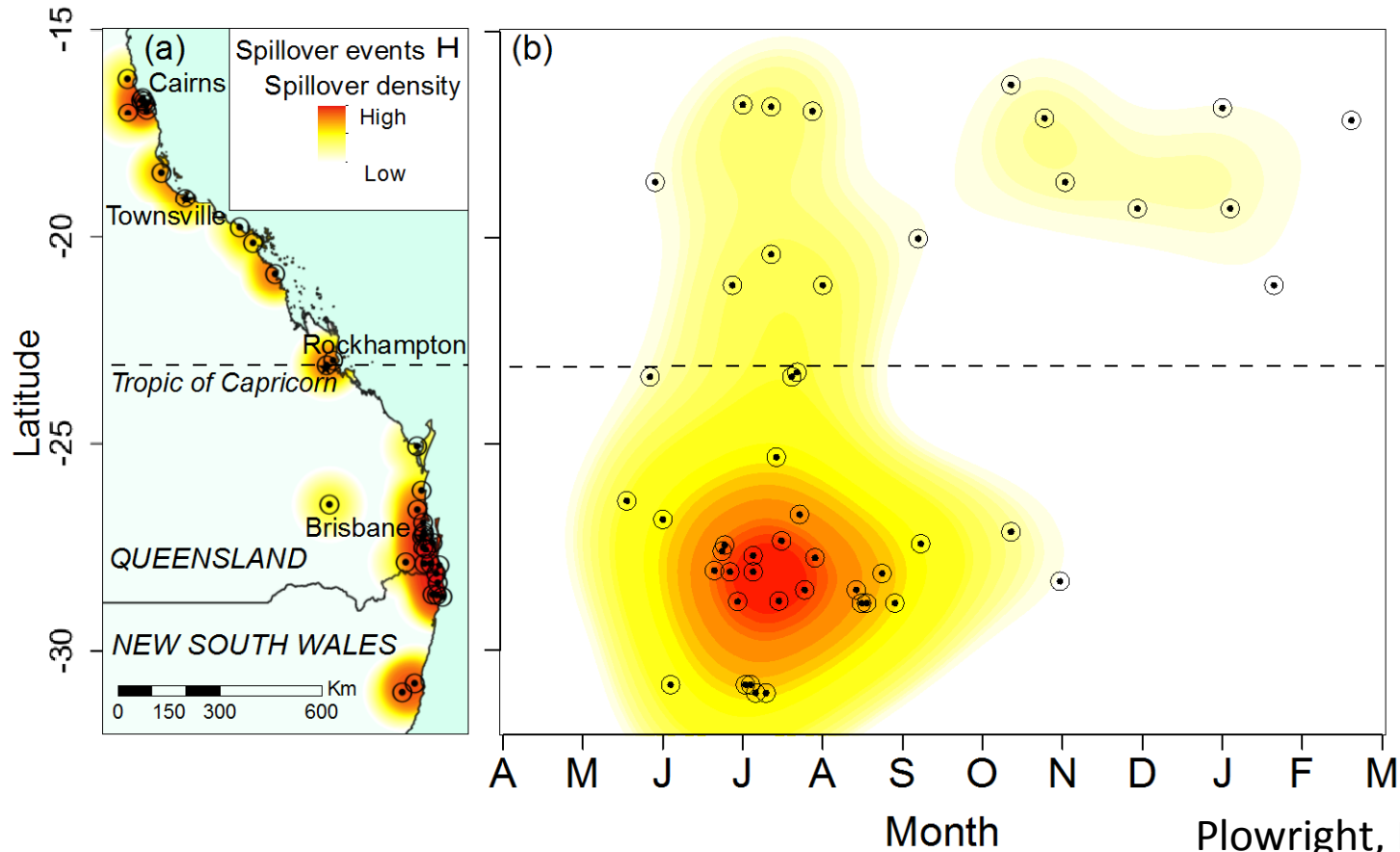
Emerging viruses



From Bean et al. 2013. Nature Reviews Immunology



Spillover events are seasonal



Health and abundance of winter feeding habitat



Health of flying-foxes



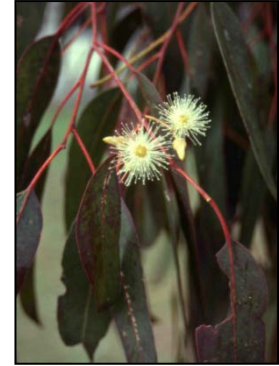
Risk of Hendra spillover

Flying fox ecology

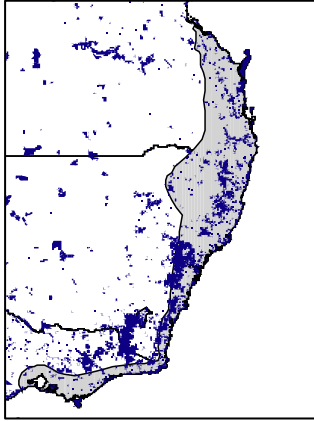
Nectar and pollen diet

Congregate in large colonies

Migrations are largely nomadic



Winter habitat is heavily cleared, under threat, poorly protected

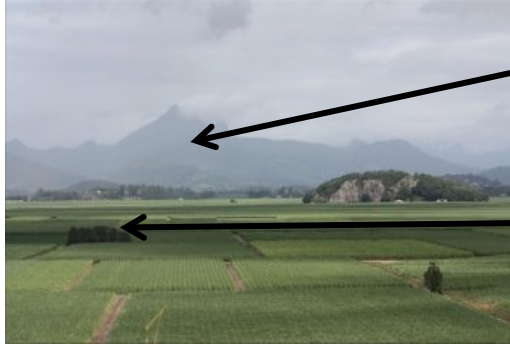


World Database on Protected Areas 2014

Reserve bias

- + altitude
- + slope
- soil fertility
- suitable for agriculture

Joppa and Pfaff 2009



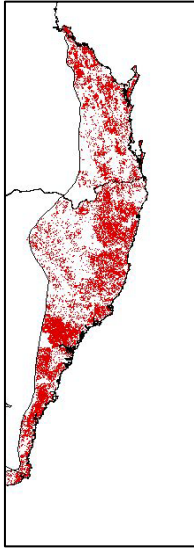
Summer / autumn feeding habitat

winter feeding habitat



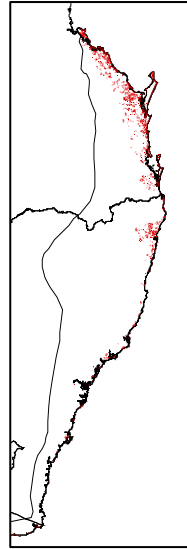
Current land protection doesn't capture ecology

ALL FEEDING
HABITAT



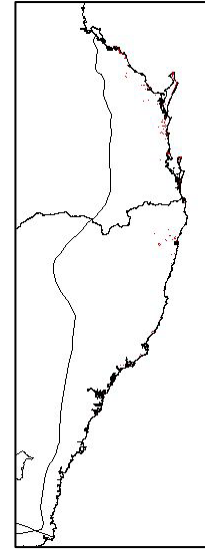
59 diet species
34% of range area

RELIABLE
WINTER HABITAT



4 diet species
1.3% of range area
3.8% of total
feeding habitat

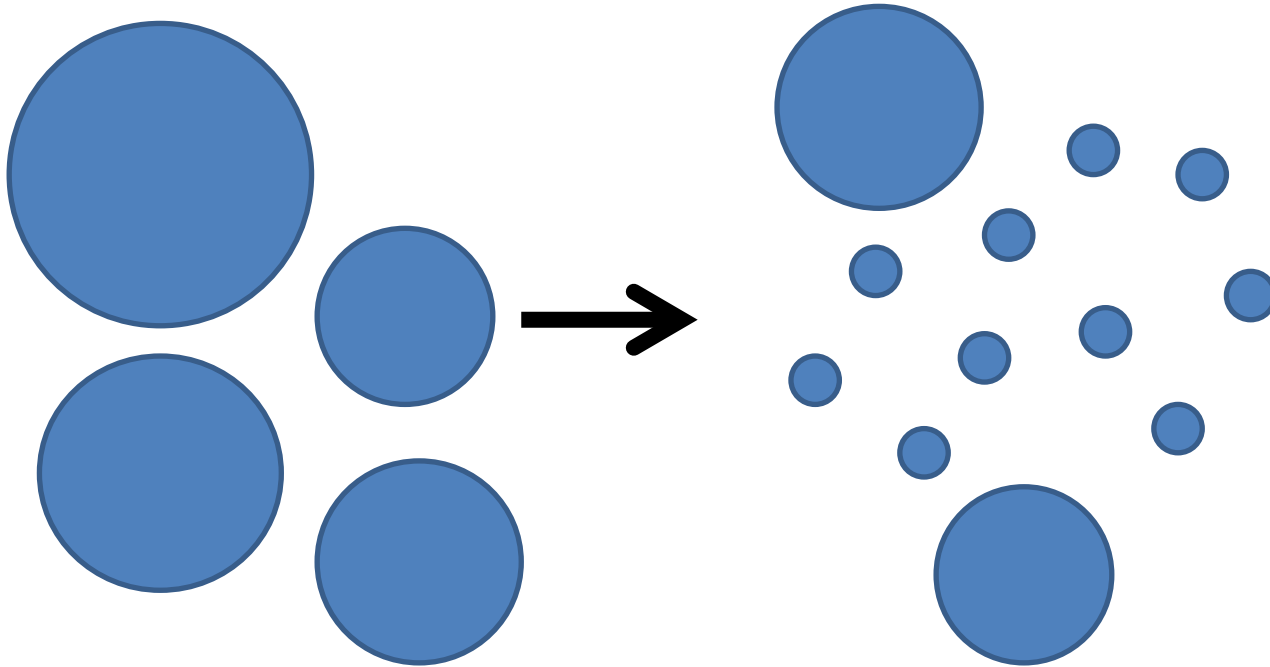
PROTECTED
WINTER HABITAT



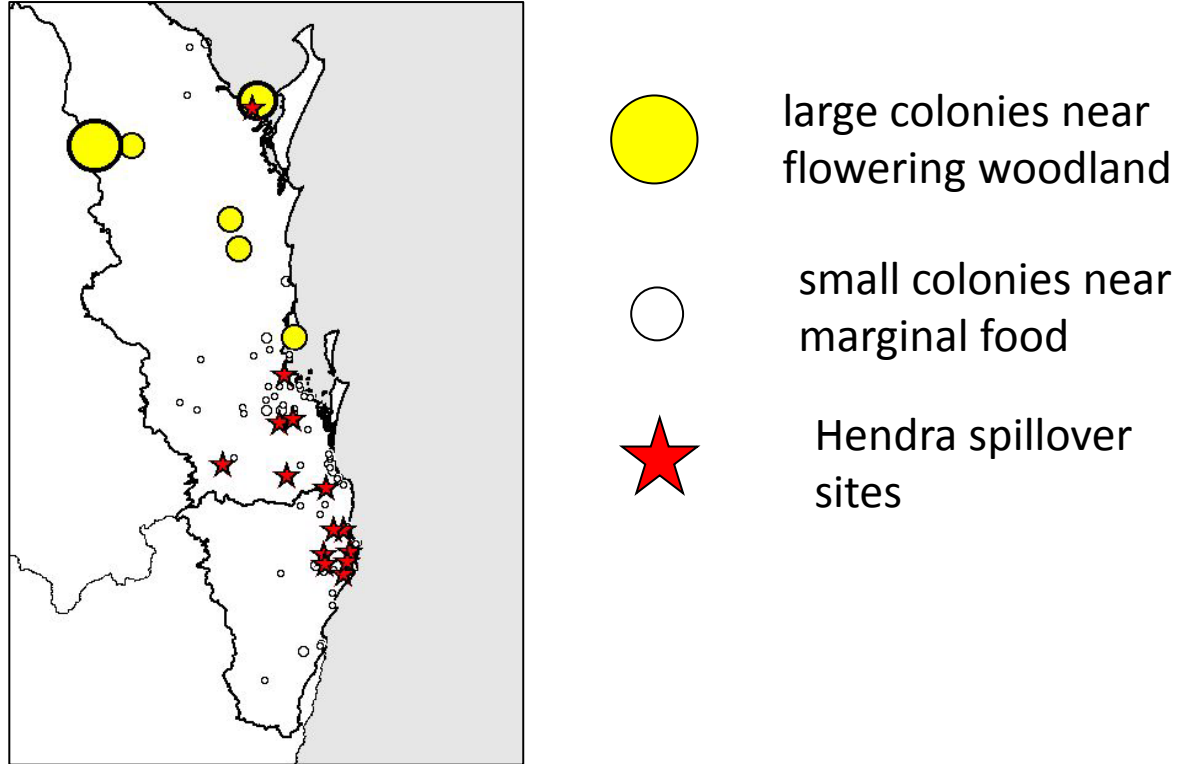
0.4% of range area
1.3% of total
feeding habitat

Responses to winter food bottlenecks:

- fission into small colonies in marginal habitats
- dietary shift to low nutrient foods



2011 Hendra spillover sites were clustered near small flying fox colonies in marginal urban and peri-urban habitats





Most Hendra virus spillover events are associated with urban and peri-urban bat colonies

- Urban and peri-urban areas
- Flying-fox colonies associated with Hendra virus spillover

Food bottleneck
behaviors

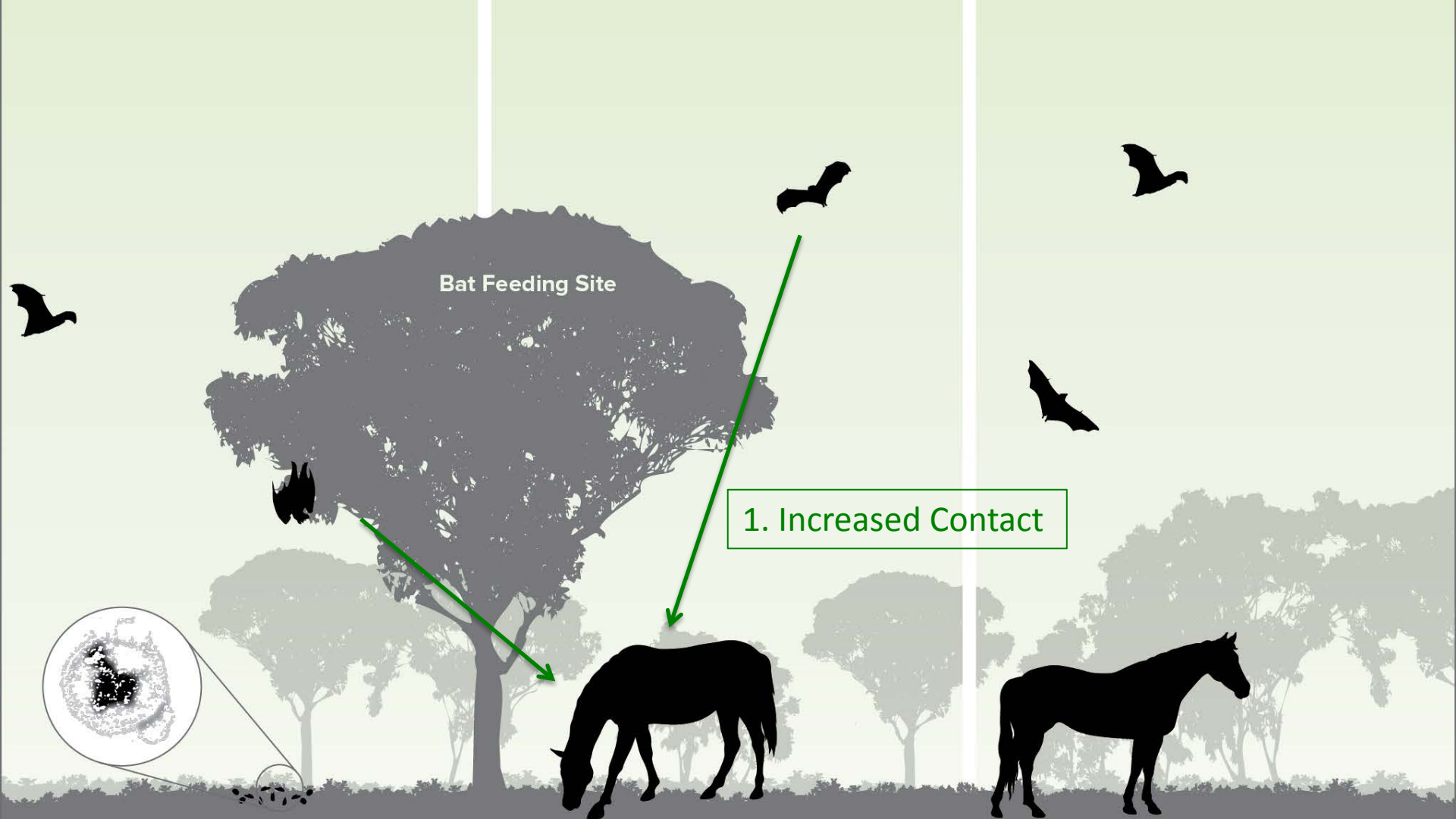
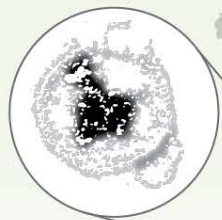


Hendra
virus
spillover



Bat Feeding Site

1. Increased Contact





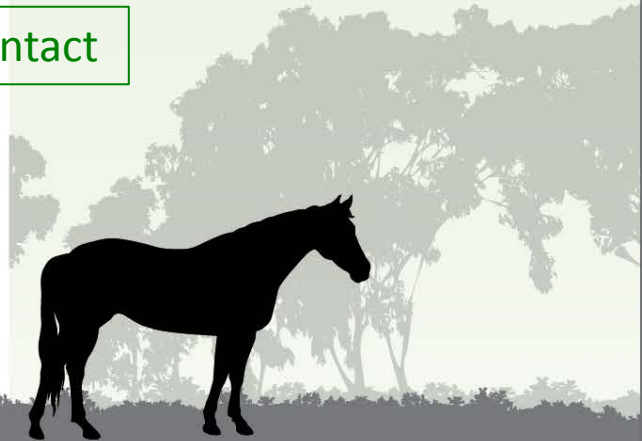
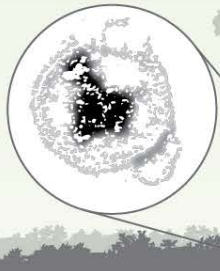
Urban bats –
introduced food
sources
(in horse paddocks)

Migratory bats –
nectar in native
forests



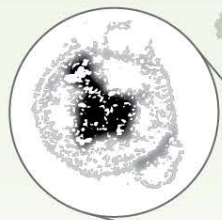
Bat Feeding Site

1. Increased Contact



Bat Feeding Site

2. Nutritional
stress triggering
viral shedding



Poor quality food sources
(junk food) during the
winter resource bottleneck

2. Nutritional
stress triggering
viral shedding

Virus shed in pulses of
linked to pulses of
spillover

PROCEEDINGS
— OF —
THE ROYAL
SOCIETY

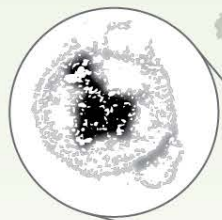


Proc. R. Soc. B (2008) 275, 861–869
doi:10.1098/rspb.2007.1260
Published online 15 January 2008

Reproduction and nutritional stress are risk factors for Hendra virus infection in little red flying foxes (*Pteropus scapulatus*)

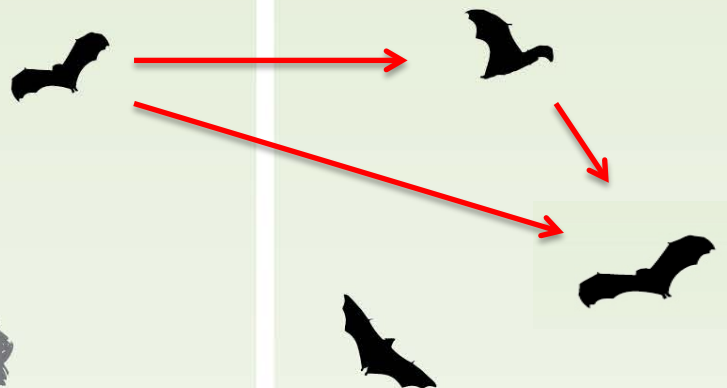
Raina K. Plowright^{1,*}, Hume E. Field², Craig Smith², Anja Divljan³,
Carol Palmer⁴, Gary Tabor⁵, Peter Daszak⁶ and Janet E. Foley¹

Bat Feeding Site



3. Changing viral dynamics

Bat Feeding Site



PROCEEDINGS
OF
THE ROYAL
SOCIETY

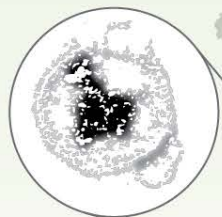
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Proc. R. Soc. B
doi:10.1098/rspb.2011.0522
Published online

Urban habituation, ecological connectivity and epidemic dampening: the emergence of Hendra virus from flying foxes (*Pteropus* spp.)

Raina K. Plowright^{1,2,3,*}, Patrick Foley⁴, Hume E. Field⁵, Andy
P. Dobson⁶, Janet E. Foley², Peggy Eby⁷ and Peter Daszak^{3,*}



Solution Agenda

- Enlarge the under-represented conservation estate
- Protect what we have: remaining critical winter feeding habitat (i.e. intact lowland coastal forests)
- Regenerate what can be restored
- Strategic conservation of winter feeding habitat in private lands
- Killing or shifting bats in colonies will not reduce the risk of spillover

Thank You

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