



## Whither the SEQ Koala?

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**Acknowledgements**

Most of the results I'll be talking about tonight are derived from collaborative studies with colleagues and research students associated with the Koala Study Program at The University of Queensland – I'm indebted to them.

Mistakes or errors of interpretation will be down to me!

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**KSPRP – Need?**

- In December 2008, the Queensland Government introduced a Draft of new State Planning Regulatory Provisions aimed at protecting Koala populations in Southeast Queensland's urban areas
- This is an interim measure as part of the Queensland Government's response to recommendations of the Premier's Koala Taskforce
- Why and why now?

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## Saving the Koalas in South-East Queensland 25 August 2008

(Extract from the Premier's Media Statement)

The koala is Queensland's official faunal emblem.

Despite Queensland having tough planning controls to protect koala habitat, a recent report details a disturbing 45% decline in koala population.

The report, prepared by the state government and three south-east councils, shows that loss of trees, dog attacks and cars are the biggest threats to koalas.

I am really concerned about this - a population decline of this size means we are at real risk of losing the koala population in South-East Queensland within 20 years.

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## Just when Koalas thought it was safe.....

Broadscale clearing of "Remnant" forest and woodland has been markedly reduced by the *Vegetation Management Act 1999* and taken a lot of the habitat alienation pressures off Koala populations outside SEQ

**BUT.....**

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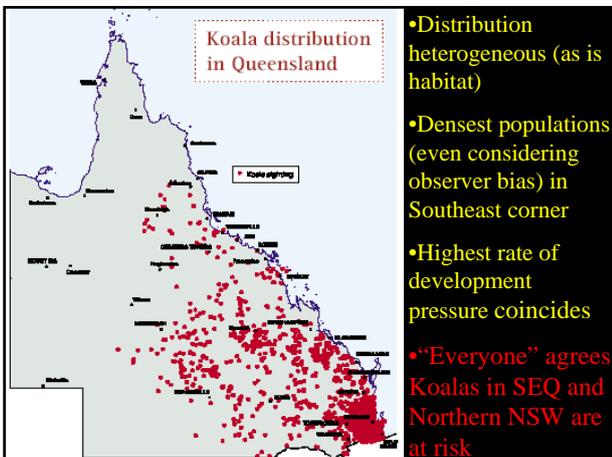
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## Major Threats in Koalas' SEQ stronghold

### Primary

Loss and fragmentation of habitat

### Secondary

Vehicle injury and mortality

Attacks by domestic dogs

Infectious disease

*We'll briefly examine these first*

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## Motor Vehicle Trauma

Mother killed on road at Victoria Point – baby survived, was rescued, hand raised and released back to the wild



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## Domestic Dog Attacks



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## Infectious Disease



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## A Few Words About Disease

Even though it is largely secondary to the other threats, infectious disease can be devastating

Mostly due to bacteria in the Family *Chlamydiaceae*

Affects eyes, urinary tract, reproductive tract, respiratory tract

Treatable – particularly effective for eye disease

Infection often manifests as disease following habitat destruction (e.g. documented following Ney Road residential development, construction of Moreton Bay Road)

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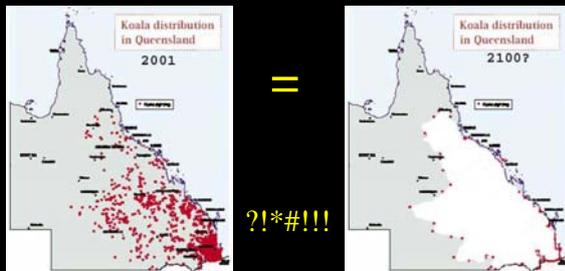
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## No Range Contraction?

Technically true (hypothetical extreme below right would still qualify as the same range) BUT there have been huge effects on distribution within range!



In reality, Koalas have been lost from well over 50% of their distribution in the last 200 years – probably only 8 - 15% of lowland forest in Southeast Queensland remains, for example

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## Context

- This part of the discussion of what's happening in SEQ will concentrate on the Koala Coast
  - We have best information for this area
  - Information we do have from other areas in SEQ shows very similar trends
  - Given the knowledge, community support and State and Local Government will for protecting it, I believe that if we cannot save the Koala Coast population, the prognosis is that Koalas are doomed wherever there is a land use conflict in Queensland

**This has to be the Koalas' "line in the sand"!**

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## Loss of Habitat

From 1997 through to 2005

- The amount of **"bushland" Koala habitat** in the Koala Coast (mostly outside the Urban Footprint) has fluctuated with environmental conditions and management – but overall has stayed much the same
- The amount of **urban Koala habitat** has shown a steady decline
- The amount of **non-habitat** has shown a steady increase
- **Thus most of the Koala habitat loss has been in the urban areas**

(Based on published EPA data)

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## First Find Your Koala!

There is actually a Koala in the photo!



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## There are robust methods for estimating Koala abundance but all are resource intensive

**Koala Coast:** Strip Transects 4695 ha searched: 1792 koalas

**Pine Rivers:** Line Transects 64 km searched: 82 koalas

(Dique *et al.* 2004)

“Indirect” methods (including pellet surveys with rigorous calibration – Sullivan *et al.* 2002) may be more applicable for low density populations

More generally, indirect methods (including detection of faecal pellets) can certainly be used to determine Koala presence (though not absence unless stringent criteria are developed); they may have a role in ground-truthing of predictive mapping and establishing distribution

Without extensive controls – which are heavily site dependent - that’s about all they can validly achieve

Definitely cannot be used to establish dietary preferences

Generally can’t estimate abundance without extensive site specific calibration

(Ellis *et al.* 1998)

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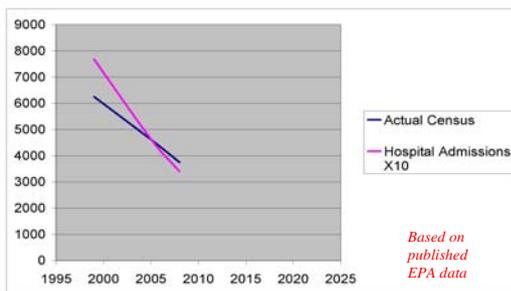
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## Koala Coast Decline 1999 - 2006



In my view, the decline in hospital admissions is NOT due to improved dog or vehicle controls, but rather a decline in the size of the population “sampled” by dogs and cars!

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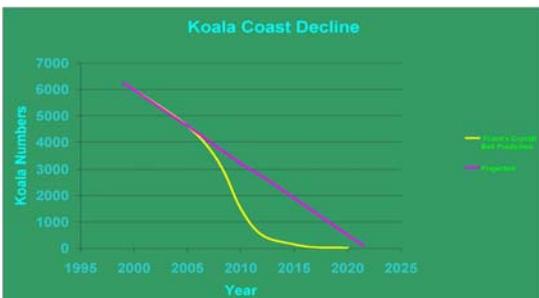
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## Frank's Crystal Ball

Unfortunately, my hunch is that the rate of decline is accelerating and we must be near a “tipping point” where the population will enter an “extinction vortex”



If this happens the population will crash and then linger on at low levels till the final survivors die after about 10 years – reversing the trend becomes much harder once the steep phase is reached (at about 2500 individuals [i.e. THIS YEAR] in this hypothetical curve)

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## Molecular Genetics of SEQ Koalas

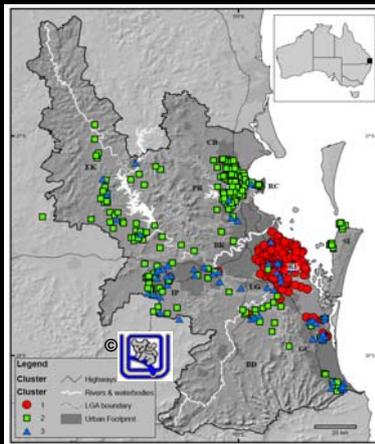
Red Dots – Koala Coast Genotype

Green Squares – Rest of SEQ Genotype

Blue Triangles – “Hybrids”  
Less than 80% of genotype shared with main groups

“Structure” analysis shows Koala Coast animals are reproductively isolated and genetically distinct from Koalas in the rest of SEQ

(From Lee *et al.* 2007)




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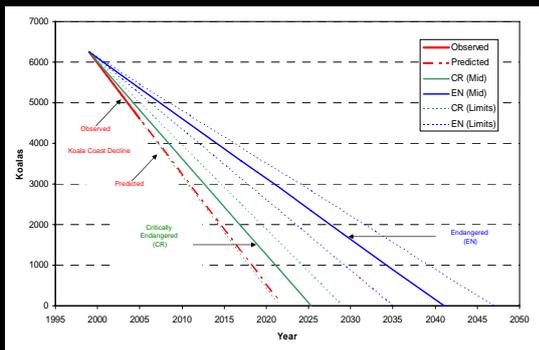
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## Conservation Significance

Projected from published EPA data and criteria from *Nature Conservation Act (1992)* and IUCN




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## What Else Does Molecular Genetics Tell Us?

We have also surveyed Koala mitochondrial DNA (mtDNA) from throughout SEQ – mtDNA changes more slowly than the nuclear (microsatellite) DNA that revealed patterns shown in an earlier slide

The mtDNA analysis detected a long standing separation of inland Koalas from those inhabiting coastal areas of SEQ – the barrier may have been associated with the D’Aguilar Range

Further analysis of the microsatellite data in combination with spatial data indicates that other populations in SEQ are differentiated from each other and probably form separate “Management Units” (see subsequent slide)

All analyses confirm the distinctiveness of the Koala Coast population

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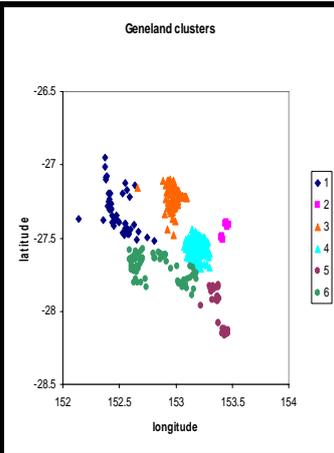
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## Identification of Separate SEQ Koala Populations

At least 6 separate populations have been identified in SEQ – these will probably form distinct management units

The Koala Coast population (the aqua coloured cluster 4) is confirmed as distinct from the rest of SEQ

(From Seddon *et al.* 2008)




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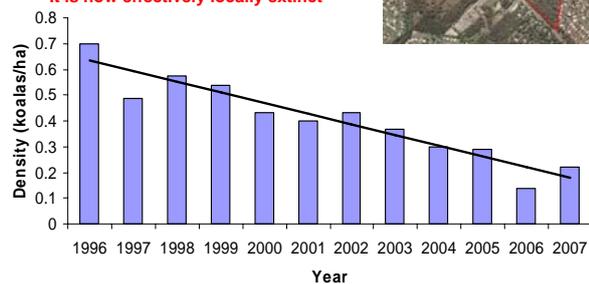
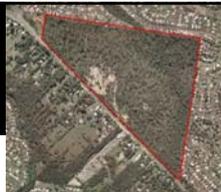
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## Local Extinction in Action

Over a decade, the population of the “Gravel Reserve” crashed from over 45 to 4  
It is now effectively locally extinct



*Dramatic reduction in koala density and abundance*

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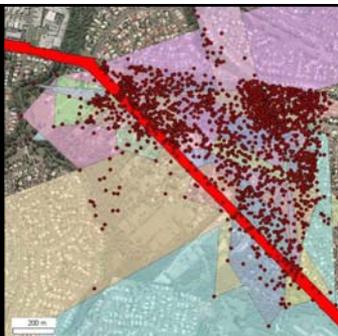
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## Habitat use & roads

- Daily home range use determined by radiotracking
- Not *just* dispersal
- Koalas need to cross the road every 200m or so
- All koalas captured on reserve side of road
- Residents v dispersing animals (need different conditions)
- No sense of road danger
- Population now effectively extinct – arterial road “4-laned” and speed limit increased to 80KPH



*Daily home-range movements result in frequent crossing of roads  
Need for multiple koala crossing points*

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## Conclusions – “Global”

### Koalas occur on mainland & islands in Queensland

- **Mainland**
  - Densest populations in SE corner
    - Home range sizes of 5 to 20 ha typical
    - Carrying capacities of around 0.2 per ha typical (about 2.0 ha<sup>-1</sup> maximum)
  - Extensive low density populations throughout much of rest of State
    - Home range sizes of up to in excess of 200 ha
    - Carrying capacities as low as 0.001 per ha
- **Over-browsing problems not a contemporary issue on islands or mainland**

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## Conclusions - Habitat Dynamism

- Plant communities (Koala habitats) are not static
- Changes in composition & structure are ongoing & often on timeframes not readily recognised by general community & even managers
- Fragmented landscapes vulnerable to loss of carrying capacity
  - process needs to be understood & carefully managed
  - opportunities need to be provided for a metapopulation to “respond”
- Current trends in climate change potentially a major issue for isolated & far Western Koalas via effects on plant communities – makes maintenance of SEQ Koalas even more vital
- Current trends in habitat destruction and fragmentation due to developments for human immigration will lead to the species' extinction in its stronghold in SEQ coastal areas **unless current trends can be halted and reversed**

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## Conclusions - SEQ Koalas

### Urban Koalas

- The “sink” in a Source / Sink system - **Fallacy**
- Vital component of overall Metapopulation - **Fact**
- Population modelling (Thompson 2006) shows in most years, the bushland areas rely on immigration from urban areas to maintain a stable population – **NOT vice versa**
- Actual census data show that the bushland component of the population has also declined despite relatively little loss of bushland habitat – this appears to be driven by the substantial decline in the urban component

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## Management Implications

### HABITAT

- The seemingly reasonable but actually counterproductive approach of “let’s just move the Koalas” is fatally flawed
  - Actually increases mortality
  - Unless “new” habitat is created, it’s a “zero sum game” (i.e. just “shuffling the deckchairs on the *Titanic*”)
  - Contraindicated by genetics in most circumstances – translocating coastal Koalas to sites West of the coastal ranges or *vice versa* is especially unwise
- “Oils ain’t oils” the innately high carrying capacity habitats (mostly in the Urban Footprint) cannot be replaced with equivalent amounts of habitat in the generally more steeply sloping or higher elevation timbered areas outside the Urban Footprint
  - Mostly the reason that the latter areas still have trees is that they are pretty lousy for agricultural purposes
  - Opportunities for re-creating high carrying capacity Koala habitat should be sought in productive agricultural areas no longer viable for traditional primary production; possibly in association with “carbon offset” initiatives – NOT a “quick fix” but a possible part of a medium / long term solution

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## Non-Habitat Measures

- The “inconvenient truth” is that development activities will reduce the SEQ Koala population in the short to medium term at least in proportion to the amount of habitat destroyed
- The Queensland Government has committed to a net increase in Koala habitat by 2020 – but this cannot attain full functionality until about 2040 when the SEQ Koala population might begin a recovery
  - The enormous challenge is to prevent the populations crashing to below recoverable levels in the meantime
  - Possible role for medium term, semi-natural holding areas
- The directly controllable threatening processes are:
  - Motor Vehicles – Main Roads must take the problem seriously
  - Domestic Dogs – Governments must stop the “it’s all too hard” cry
    - There is no necessity to ban all dogs; let’s get a bit more creative about changing community attitudes to what is an acceptable canine family pet

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## Apologies for any messages that might appear mixed!



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