

Going with the Flow: Cane Toad Dispersal via River Systems and Implications for Management

Dr Bec Lipscombe

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Cane Toads in Northern NSW

Cane toads (*Rhinella marina*) continue to expand their range southward and westward across northern NSW

Terrestrial movement is well documented

River systems can be major drivers of range expansion, especially during flooding events

Understanding how toads use rivers and tributaries is key for predicting and managing future spread



Image: Feralscan

Movement mechanisms in river systems

Movement is driven by intrinsic traits and environmental factors

Rivers provide connectivity across landscapes and play a central role in dispersal dynamics

Active movement: swimming

Passive transport: rafting on vegetation, transported during flooding



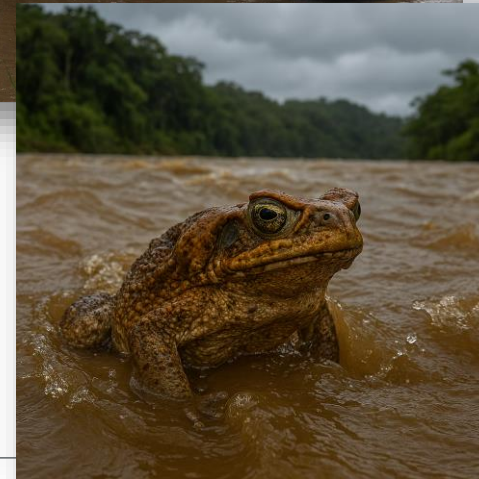
Images: Clarence Valley Council; Doody et al., 2014

Hydrological drivers: Flooding facilitates movement

Connectivity of habitats - linking rivers to floodplains

Transport- Floods can displace animals and aid dispersal downstream or laterally

Flood characteristics- Magnitude, duration and flow direction can impact dispersal patterns



Images: The Guardian; abc News; AI generated

Evidence from Northern Australia

Daly and Fitzroy River (NT & WA): rapid downstream expansion after wet season flooding. Populations established downstream ahead of expected invasion front (Doody et al., 2018)

Ord River (WA): Rafting toads after major flooding (Doody et al., 2018)

Lake Argyle (WA): toads recorded on 21 of the 27 islands in Lake Argyle, 90–1140 m from mainland (Somaweera et al., 2012)

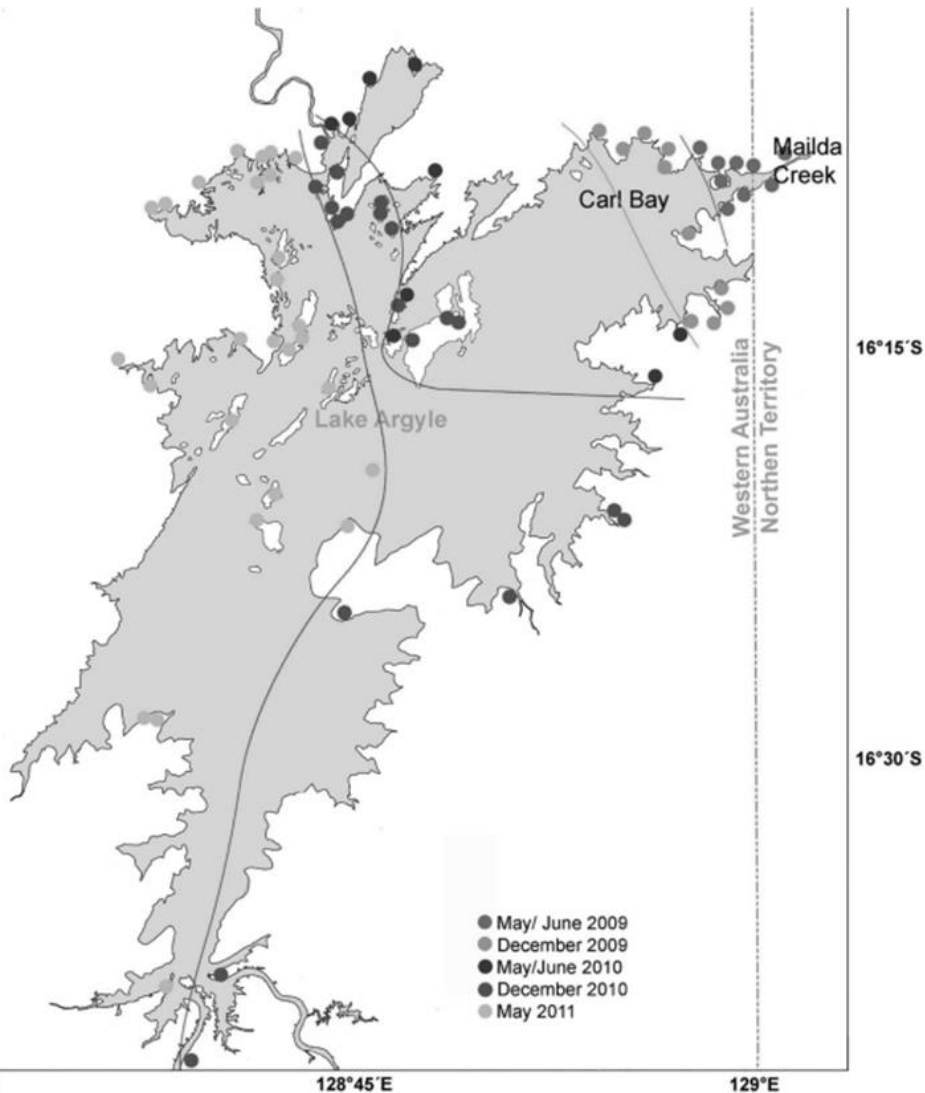


Figure 1 Spread of cane toads along the shoreline of Lake Argyle. Toads were first seen in Matilda Creek flowing to Carl Bay in March 2009.

Cane Toads Behaviours in River Systems

Readily enter water to escape predators

Capable of crossing rivers, observed swimming for > 400 m in the Elizabeth River near Darwin (Doody et al., 2018)

Rafting behaviour documented during flood events in NT and WA (Doody et al., 2018)

Rafts in Lake Argyle transported cane toads an average of 3.2 km in 8 days, east to west across the lake (Somaweera et al., 2012)



Images: abc News; dreamtime

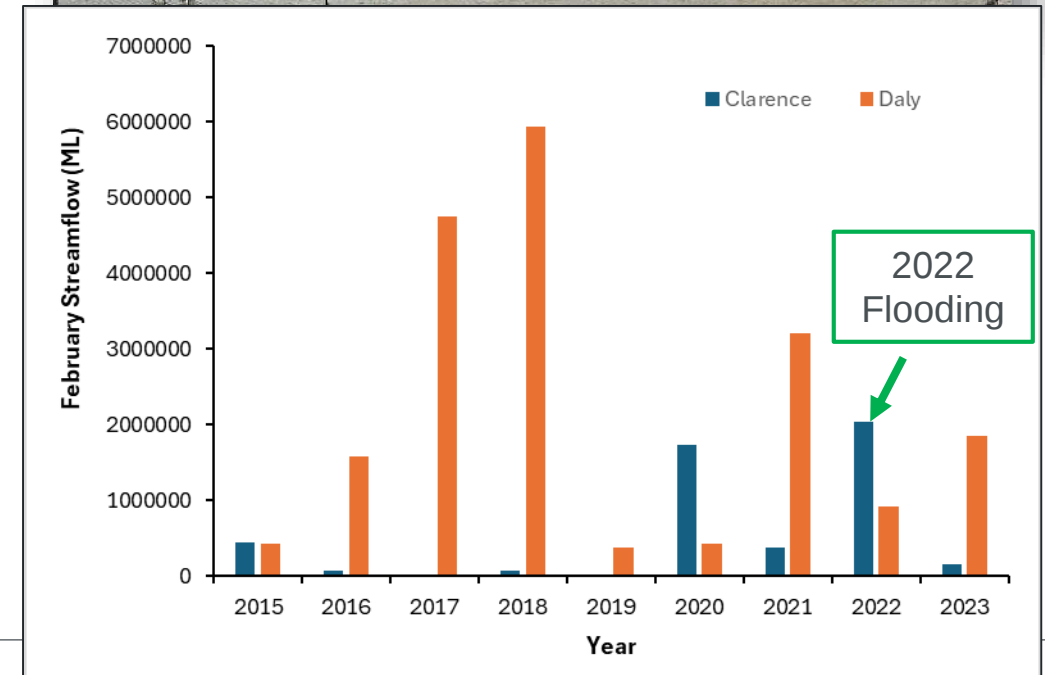
Can the Clarence River Facilitate Cane Toad Movement?

Clarence catchment ~22,700 km² with an extensive floodplain

Flow heavily driven by rainfall

Topography, hydrology and land use in Northern NSW vastly different to NT and WA

Fewer months of high rainfall with episodic flooding



Data source: Bureau of Meteorology

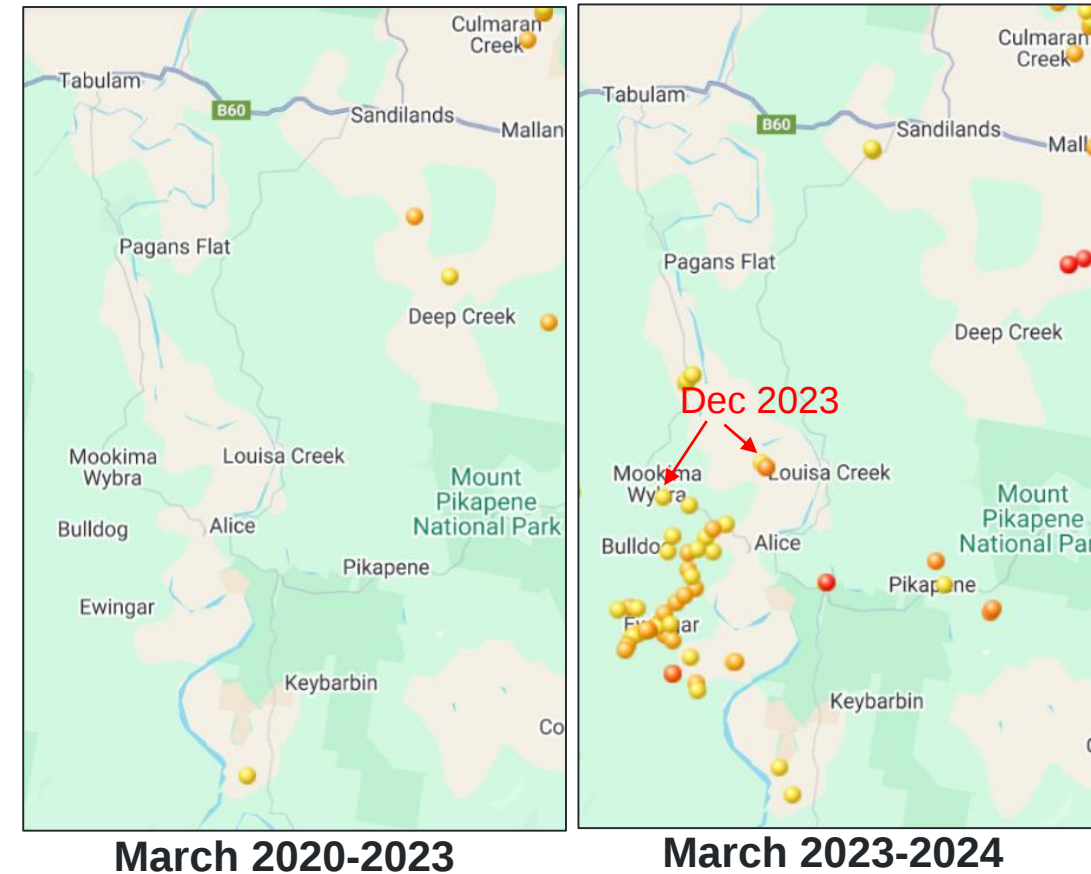
Incursions on the Western side of the Clarence River - Ewingar

Potential for dispersal via downstream flow or across floodplains during major flood events

Reports of cane toads on the western side of the Clarence River at Ewingar one year after flooding

Prior to this, closest report was 10 km east, on the eastern side of the Clarence River

By March 2024 over 30 reports in Ewingar/Bulldog

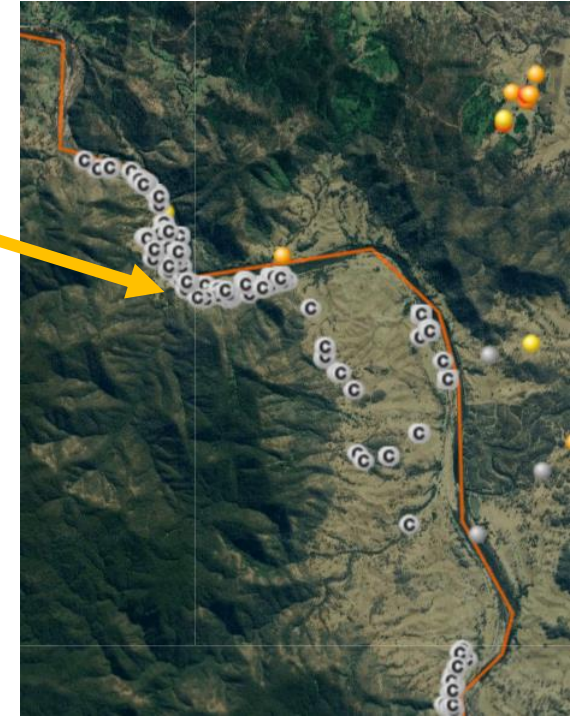
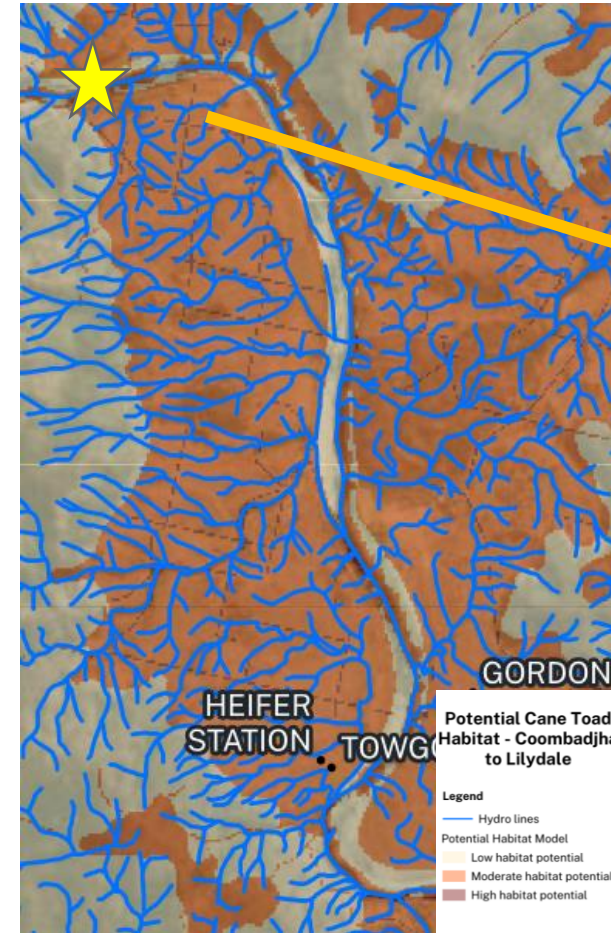


Incursions on the Western side of the Clarence River – The Gorge

Low streamflow + narrow river section allows for cane toad movement across the Clarence

Recent incursion at The Gorge where river narrows to ~ 50 m ★

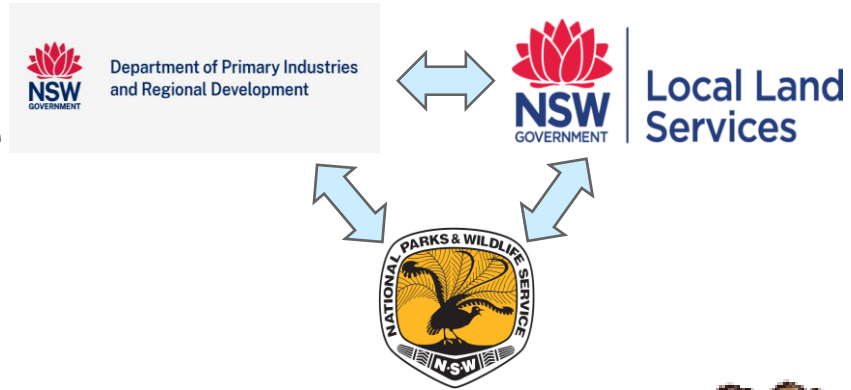
Areas of still water and suitable cane toad habitat



Images: North Coast LLS;
ToadScan

Management Strategies – Collaboration + Reporting + Engagement

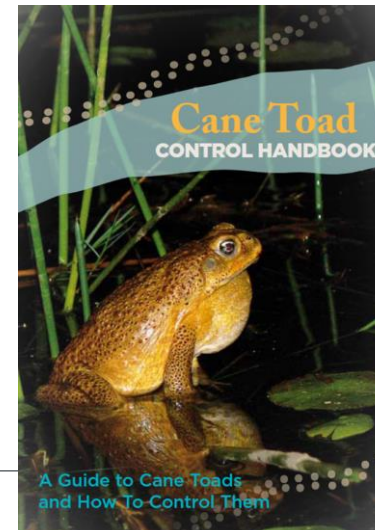
Interagency collaboration - coordinating control and surveillance along the invasion frontline



Reporting - encourage community reporting of cane toads through Toad Scan



Community Engagement – build capacity of landholders to control cane toads

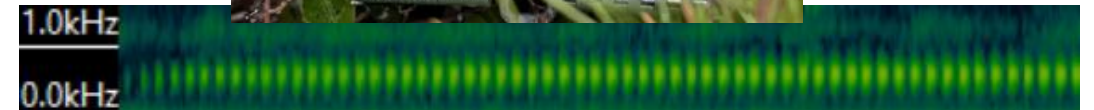


Management Strategies - Early Detection

Detection is difficult if cane toads are moving into areas where reporting is limited (i.e., lack of mobile and internet)

Strategic surveillance ahead of the frontline using acoustic songmeters

eDNA may be useful as a long-term monitoring tool



Biol Invasions (2019) 21:1–6
<https://doi.org/10.1007/s10530-018-1810-4>



INVASION NOTE

Environmental DNA sampling as a surveillance tool for cane toad *Rhinella marina* introductions on offshore islands

R. Tingley  · M. Greenlees · S. Oertel · A. R. van Rooyen · A. R. Weeks

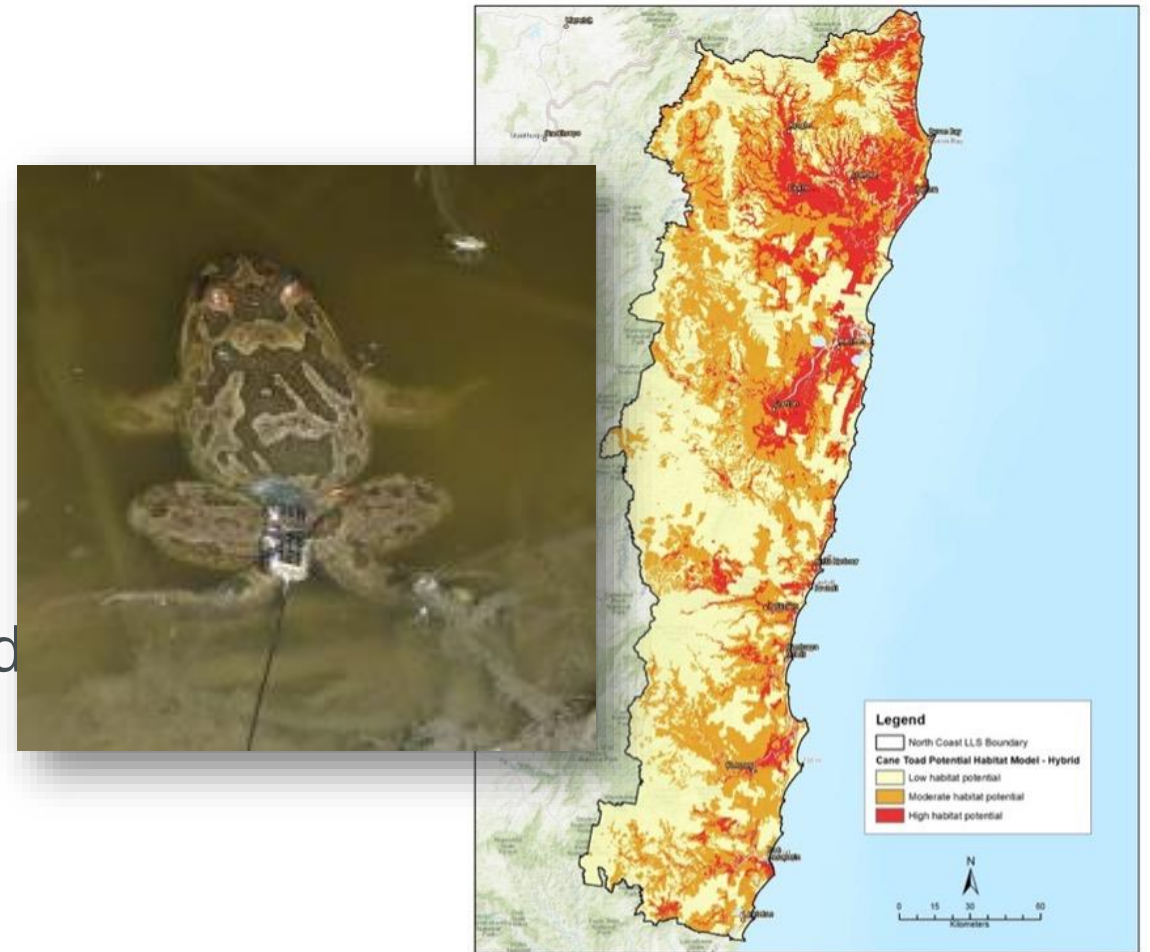
Images: Wildlife Acoustics; North Coast LLS

Knowledge Gaps and Future Needs

Lack of data on cane toad dispersal in NSW river systems

Telemetry studies could elucidate new information on movement pathways

Need for ongoing predictive modelling, especially as habitat changes through fire and floods



Images: Australian Museum; 2rog

Summary

River systems can act as drivers of range expansion, especially during flooding events

Cane toads are capable of actively swimming across rivers or rafting during floods

Characteristics of the Clarence River are conducive to active and passive cane toad movement



Image: AI generated