Northern Gulf NRM Plan (2016-2021) - Climate change risk assessment- FAUNA

Author: Natalie Waller

Key				
Probability (**P**)	UC- Uncertain	P- Possible	L- Likely	Almost Certain- A.C
Consequences (**C**)	UK- Unknown	L- Low	Mod- Moderate	M- Major
Risk rating (**R**)	L- Low	Mod- Moderate	H- High	Cr-Critical

Climate Hazard	**Birds**	**Amphibians**	**Mammals**	**Reptiles**	**Invertebrates**	**Feral animals**
Increased incidence of destructive wild fires	Vulnerable species include smaller frugivores and granivores (eg: Gouldian finch) that have either very small home ranges or follow seasonal fluctuations in food resources and species that are restricted to small long-unburnt patches (39, 31) **PCR-** LModH Local scale changes in bird species diversity and abundance (31)	Benefit some arboreal frogs (3) **PCR-** PUCL	Vulnerable species include small to medium sized marsupials and rodents that have small home ranges or favour unburnt habitat eg:, common brushtail possum, black-footed tree rat (39, 3, 17, 37, 35) **PCR-** ACMCr Species that may benefit from more frequent fires include northern quoll, pale-field rat (35)	Late-burns benefit some species that prefer sparse ground cover, such as the frill-necked lizard (4,30, 24) **PCR-** ACUCMod Late burns cause decrease in litter utilising species (3, 30) **PCR-** ACModH Declines under late fires in some species eg: spotted tree monitor) (3)	Limited influence as most invertebrate groups highly resilient to fire (2, 3) **PCR-** LUCMod Ground-active groups are sensitive to late fires (3) **PCR-** ACModH **PCR-** ACModH Grass-layer groups influenced by fire occurrence (3) **PCR-** LModH Ant diversity and abundance promoted by fire, with the	Possibly facilitate predation and prey switching by dingoes/wild dogs to target mammal communities (20) and potentially livestock. **PCR-** ACMCr **PCR-** ACMCr Pig damage to wetlands likely increases as pigs seek refuge. Control easier post-wild fire (23) **PCR-** LMCr

	PCR- LModH Beneficial short-term for some species that fire facilitates feeding eg: some granivorous and ground-feeding omnivores and carnivores, however this may be dependent on severity of burn (34) **PCR-** LLM		**PCR-** PUCL Possible increase in predation by dingos (20) and cats. **PCR-** LMCr	**PCR-** LMCr	exception of the green tree ant (3) **PCR-** LUCMod Ant species that will benefit include hot climate specialists (1) **PCR-** LLMod May threaten some butterfly species (19) **PCR-** LPMod	Possible reduction in cane toad numbers in burnt areas (23) **PCR -** PUCL
Increased intensity of high rainfall events (flood and cyclones)	Ground nesting bird species may be impacted eg: magpie geese can only nest in floodplains inundated to a depth of 30-90cm (36) **PCR-**ACModH Reduction in seed resources for some species (36) **PCR-**LModH Southward distribution change of some species eg: Black-necked storks	Heavier rains may help maintain smaller streams and waterholes that may enhance frog recruitment (16) **PCR-**PUCL	Loss of shelter and food resources for some rodent species (36) **PCR-** LModH Potential reduction in Northern Bettong habitat if rainfall increases (14) **PCR-**LMaCr Loss of fruit and flower species may impact on flying fox communities (36)	Ground dwelling species reduction in diversity and abundance along flood plains (27) **PCR-** LModH	Beneficial to some generalist ant species that will recolonise flooded areas (38) **PCR-** LUCM	During and after rainfall events, cane toads will be able to disperse into more areas (6, 23) **PCR-**ACModH A flush of food resources will facilitate pig population growth (10) **PCR-** ACModH Mortality of some pigs (10) **PCR-**LUCM

	moving to south Australia (14) **PCR-**LLM		**PCR-** LModH Some species eg: agile wallabies may cease breeding and/or lose pouched young if flooding occurs early in the wet season (5) **PCR-** PLM			Pig damage exacerbated in non-riparian areas as they move away from watercourses. Evidence of damage already to vine thickets (23) **PCR-** ACModH
Increased storm surge and rising sea levels	Reduced availability of waterbird habitat which will force birds to over utilise remaining habitat, resulting in declines in some species(13) **PCR-** LModH	Inundation of freshwater habitat close to the coast may have some localised impacts **PCR-** LModH	Likely no impact as no truly coastal mammal communities in Northern Gulf **PCR-** UCUCL	Loss of nest sites for some marine turtle species (25) **PCR-** ACModH	Potential impact on mangrove mud-nesting ant species (21, 11) **PCR-** PUCL	Higher mortality of cane toad eggs due to inundation of freshwater breeding sites, however, a likely ecological advantage in comparison to native amphibians due to some salinity tolerance (28, 23) **PCR-** PUCL Pig impact on turtles nests could be greater, as more nest sites are damaged by inundation (23 **PCR-**LMaCr Carrion may be washed up in coastal

						areas which may attract more pigs (23) **PCR-** PUCL
Longer dry seasons	Bird species that utilise wetlands may decline in numbers due to a decrease in water availability (13) **PCR-** ACModH	Negative impacts on frog reproduction (16) **PCR-** LModH	A decline in foliar water will impact folivorous species (33) **PCR-** PLM		Reduced breeding success of some butterfly species (26) **PCR-** LModH	Prey switching during drought period – eg cats known to switch from rabbits to invertebrates, birds, reptiles and mammals during drought (7) **PCR-** LModH Cats will put increasing pressure on prey populations and will consume sick and dying animals, possibly moving over to consuming carrion (18, 22) **PCR-** ACMCr Reduced survival and recruitment of feral pigs (12) **PCR-** LUCM Movement of pigs into wetlands will increase damage (10, 23) **PCR-** LUCM

						Reduced activity, reproduction and distribution of cane toads into refugial areas (33, 39) **PCR-** LModH Reduced reproduction in wild dogs / Dingo (8) **PCR-** LModH
Continued warming of temperature, including more hot days	Changes in arrival and departure of some migratory bird species (14, 9) **PCR-** ACModH Southward movement of nesting grounds of some shorebird species (14) **PCR-** LLM Increase in some marine bird species due to increases in food resources in association with warmer sea temperatures (14) **PCR -** LUCM	Substrate dependent species may fail to adapt as unable to migrate south (15) **PCR-** LModH Earlier spawning in amphibians (32) **PCR-** LLM	A shift in altitudinal maximums for many species (14) **PCR-** LModH Contraction of some species distribution south eg: some flying fox species (14, 29) **PCR-** ACLM Greater numbers of flying foxes roosting at southern roost sites (29) **PCR-** ACLM	May highly influence sex determination in species that temperature determines sex of hatchlings (32) **PCR-** ACMCr	Bioclimates for butterflies are predicted to decrease with temperature increases of between 0.8-1.4 degrees by 2050 (14) **PCR-** LUCM Earlier appearance of migratory butterflies (32) **PCR-** LUCM Range shift of some butterfly species (32) **PCR-** LUCM	Movement of pigs into refugial areas that provide shelter from extreme temperatures (10) **PCR-** ACModH Increased activity of toads and greater resilience than native frogs (23) **PCR-** LModH

5. *Northern Gulf NRM Plan (2016-2021)- Climate change risk assessment- FAUNA*

	Earlier breeding of some species (9) **PCR - LUCM**					

Climate Change Risk Assessment References

1. Andersen, AN 1991, 'Responses of ground-foraging ant communities to three experimental fire regimes in a savanna forest of topical Australia', *Biotropica*, vol. 23, no. 4b, pp. 575-85.
2. Andersen, AN & Müller, M 2000, 'Arthropod responses to experimental fire regimes in an Australian tropical savannah: ordinal-level analysis', *Australian Journal of Ecology*, vol. 25, pp. 199-209.
3. Andersen, AN, Cook, GD, Corbett, LK, Douglas, MM, Eager, RW, Russell-Smith, J, Setterfield, SA, Williams, RJ & Woinarski, JCZ 2005, 'Fire frequency and biodiversity conservation in Australian tropical savannas: implications from the Kapalga fire experiment', *Austral Ecology*, vol. 30, no. 2, pp. 155-67.
4. Andersen, AN, Woinarski, JCZ & Parr, CL 2012, 'Savanna burning for biodiversity: Fire management for faunal conservation in Australian tropical savannas', *Austral Ecology*, vol. 37, no. 6, Sp. Iss. SI, pp. 658-667.
5. Bolton, BL, Newsome, AE & Merchant, JC 1982, 'Reproduction in the agile wallaby Macropus agilis (Gould) in the tropical lowlands of the Northern Territory: opportunism in a seasonal environment', *Australian Journal of Ecology*, vol. 7, pp. 261-77.
6. Brown, GP, Kelehear, C & Shine, R 2011, 'Effects of seasonal aridity on the ecology and behaviour of invasive cane toads in the Australian wet-dry tropics', *Functional Ecology*, vol. 25, pp. 1339-47.
7. Catling, PC 1988, 'Similarities and contrasts in the diets of foxes, *Vulpes vulpes*, and cats, *Felis catus*, relative to fluctuating prey populations and drought', *Wildlife Research*, vol. 15, no. 3, pp. 307-17.
8. Catling, PC, Corbett, LK & Newsome, AE 1992, 'Reproduction in captive and wild dingoes (Canis familiaris dingo) in temperate and arid environments of Australia', *Wildlife Research*, vol. 19, no. 2, pp. 195-209.
9. Chambers, LE & Keatley, MR 2010, 'Australian bird phenology: a search for climate signals', *Austral Ecology*, vol. 35, pp. 969-79.
10. Choquenot, D, McIlroy, J & Korn, T 1996, *Managing Vertebrate Pests: Feral Pigs*, Bureau of Resource Sciences, Australian Government Publishing Service, Canberra.
11. Clay, RE & Andersen, AN 1996, 'Ant fauna of a mangrove community in the Australian seasonal tropics, with particular reference to zonation', *Australian Journal of Zoology*, vol. 44, pp. 521-33.
12. Giles, JR 1980, 'The ecology of the feral pig in western New South Wales', The University of Sydney.
13. Hansen, BD, Menkhorst, P, Moloney, P & Loyn, RH 2015, 'Long-term declines in multiple waterbird species in a tidal embayment, south-east Australia', *Austral Ecology.*
14. Hughes, L 2003, 'Climate change and Australia: trends, projections and impacts', *Austral Ecology*, vol. 28, pp. 423-43.
15. Keith McDonald, personal communication, 27th November 2015.

6. *Northern Gulf NRM Plan (2016-2021)- Climate change risk assessment- FAUNA*

16. Laurance, WF 1996, 'Catastrophic declines of Australian rainforest frogs: is unusual weather responsible?', *Biological Conservation*, vol. 77, pp. 203-12.
17. Legge, S, Murphy, S, Heathcote, J, Flaxman, E, Augusteyn, J & Crossman, M 2008, 'The short-term effects of an extensive and high-intensity fire on vertebrates in the tropical savannas of the Central Kimberley, northern Australia', *Wildlife Research*, vol. 35, pp. 33-43.
18. Molsher, R, Newsome, AE & Dickman, C 1999, 'Feeding ecology and population dynamics of the feral cat (*Felis catus*) in relation to the availability of prey in central-eastern New South Wales', *Wildlife Research*, vol. 26, pp. 593-607.
19. New, TR 1990, 'Conservation of butterflies in Australia', *Journal of Research on the Lepidoptera*, vol. 29, no. 4, pp. 237-53.
20. Newsome, AE & Catling, PC 1983, 'The feeding ecology of the dingo II. Dietary and numerical relationships with fluctuating prey populations in south-eastern Australia', *Australian Journal of Ecology*, vol. 8, pp. 345-66.
21. Nielsen, MG 1997, 'Nesting biology of the mangrove mud-nesting ant *Polyrhachis sokolova* Forel (Hymenoptera, Formicidae) in northern Australia', *Insectes Sociaux*, vol. 44, no. 1, pp. 15-21.
22. Paltridge, R, BGibson, D & Edwards, G 1997, 'Diet of the feral cat (*Felis catus*) in central Australia', *Wildlife Research*, vol. 24, no. 1, pp. 67-76.
23. Panel workshop Sarah Rizvi, Mike Anthony & Natalie Waller.
24. Pianka, ER & H Goodyear, SE 2012, 'Lizard responses to wildfire in arid interior Australia: Long-term experimental data and commonalities with other studies', *Austral Ecology*, vol. 37, pp. 1-11.
25. Pike, DA & Stiner, JC 2007, 'Sea turtle species vary in their susceptibility to tropical cyclones', *Oecologia*, vol. 153, pp. 471-8.
26. Pollard, E, Greatorex-Davies, JN & Thomas, JA 2003, 'Drought reduces breeding success of the buterfly *Aglais urticae*', *Ecological Entomology*, vol. 22, no. 3, pp. 315-8.
27. Preece, N & Franklin, D 2013, *Biodiversity survey Gilbert River 2009 flooded area on Delta Downs Station June 2013*, Biome 5 Pty Ltd, Atherton.
28. Rios-López, N 2008, 'Effects of increased salinity on tadpoles of two anurans from a Carribbean coastal wetland in relation to their natural abundance', *Amphibia-Reptilia*, vol. 29, no. 1, pp. 7-18.
29. Roberts, BJ, Catterall, CP, Eby, P & Kanowski, J 2012, 'Latitudinal range shifts in Australian flying-foxes: A re-evaluation', *Austral Ecology*, vol. 37, pp. 12-22.
30. Trainor, CR & Woinarski, JCZ 1994, 'Responses of lizards to three experimental fires in the savanna forests of Kakadu National Park', *Wildlife Research*, vol. 21, no. 2, pp. 131-47.
31. Valentine, LE, Schwarzkopf, L & Johnson, CN 2012, 'Effects of a short fire-return interval on resources and assemblage structure of birds in a tropical savanna', *Austral Ecology*, vol. 37, pp. 23-34.
32. Walther, G, Post, E, Convey, P, Menzel, A, Parmesan, C, Beebee, TJC, Fromentin, J, Hoegh-Gulberg, O & Bairlein, F 2002, 'Ecological responses to recent climate change', *Nature*, vol. 416, pp. 389-95.
33. Winter, J 2007, *Eucalypt woodland in Cape York Peninsula as habitat for arboreal marsupials: Rresponses of the common brushtail possum*, Tree Kangaroo and Mammal Group, Atherton.
34. Woinarski, JCZ 1990, 'Effects of fire on the bird communities of tropical woodlands and open forests in northern Australia', *Australian Journal of Ecology*, vol. 15, no. 1, pp. 1-22.

7. *Northern Gulf NRM Plan (2016-2021)- Climate change risk assessment- FAUNA*

35. Woinarski, J, Risler, J & Kean, L 2004, 'Response of vegetation and vertebrate fauna to 23 years of fire exclusion in a tropical *Eucalyptus* open forest, Northern Territory, Australia', *Austral Ecology*, vol. 29, pp. 156-76.
36. Woinarski, JCZ, Brendan, M, Nix, H & Traill, B 2007, *The nature of northern Australia: Natural values, ecological processes and future prospects*, ANU E Press, Canberra.
37. Woinarski, JCZ, Armstrong, M, Brennan, K, Fisher, A, Griffiths, AD, Hill, B, Milne, DJ, Palmer, C, Ward, S, Watson, M, Winderlich, S & Young, S 2010, 'Monitoring indicates rapid and severe decline of native small mammals in Kakadu National Park, northern Australia', *Wildlife Research*, vol. 37, no. 2, pp. 116-126.
38. Woodroff, S & Majer, JD 1981, 'Colonisation of ants on the exposed banks of the canning dam reservoir', *Australian Entomology Magazine*, vol. 8, no. 4, pp. 41-6.
39. Yates, CP, Edwards, AC & Russell-Smith, J 2008, 'Big fires and their ecological impacts in Australian savannas: size and frequency matters', *International Journal of Wildland Fire*, vol. 17, pp. 768-781