High Pathology Avian Influenza

H5N1- clade 2.3.4.4b

Preparedness Planning

Colonial Waterbirds

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Northern Territory Government- DLPE

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Acronyms	Full form
NT	Northern Territory
DLPE	Department of Lands, Planning and Environment
DAF	Department of Agriculture and Fisheries

Contents

Purpose and Audience

In the Northern Territory (NT), the Northern Territory Department of Agriculture and Fisheries (NT DAF) is the lead agency for biosecurity emergencies and leads all phases of emergency management for a H5 bird flu incursion in the NT. The aim in response to the H5 Bird flu will be to minimise impacts on NT wildlife populations, domestic animals, people and the environment. Eradication of H5 bird flu in wildlife is not considered feasible and will not be attempted. Management will eventually transition following H5 bird flu becoming endemic within wildlife populations.

Objectives for a response in wildlife will vary, but may include:

- Ensuring public safety and Work Health and Safety (WHS),
- Identifying the source, extent and spread of diseases,
- Minimising the conservation impact of disease where possible,
- Enhance the surveillance of wild bird populations to identify at risk populations and monitor impacts,
- Managing animal welfare,
- Enhancing biosecurity for captive wildlife.

Within this context, this document is designed to assist wildlife managers to:

- Enable early detection of H5 avian influenza and infection in other susceptible species at priority sites.
- Implement biosecurity measures to reduce the risk of H5 avian influenza establishment and spread.
- Minimise risks to human, animal, and environmental health posed by H5 avian influenza.
- Ensure land/wildlife managers and biosecurity representatives working within the site, or deployed during an incident, are prepared for outbreak response and recovery.
- Establish communication, surveillance, and reporting protocols consistent with relevant legislation, emergency management arrangements, animal welfare requirements, and workplace health and safety obligations.

This document identifies sites of significance, including areas where key species are likely found. Some sites relate to species-specific risks - for example, wetlands important for populations of magpie geese or major shorebird aggregation areas, while others are recognised as matters of national significance, such as islands. Collectively, this information outlines which actions are eligible or ineligible for cost-sharing and highlights any further work required to refine each action. This supports more targeted planning and helps clarify the appropriate cost-sharing arrangements.

Broadly, preparedness and response actions aim to:

- protect people by reducing contact with infected birds and contaminated environments,
- prevent virus spread, including via footwear, clothing, or equipment,
- minimise stress and build resilience in wildlife populations.

This document outlines actions to support conservation and management of a potential an H5 avian influenza outbreak in wildlife populations. It aligns with Commonwealth priorities and obligations and informs future management and investment decisions to mitigate impacts on wildlife.

Introduction

This is a Preparedness document for colonial waterbirds and their associated habitats of the Northern Territory (NT) that focuses on landscape scale planning in response to a potential incursion of High Pathology Avian Influenza, H5N1, clade 2.3.4.4b (herein referred to as HPAI). Specifically, the document focuses on site and landscape scale considerations, and addresses selected avian species across 18 key sites in the Northern Territory (NT), Australia: Arafura Swamp, Joseph Bonaparte Gulf, Moyle Floodplains, Daly River, Finniss River, Adelaide River, Mary River, North Peron Island, Kakadu, Rose River, Blyth River, Goyder River, Buckingham Bay, Blue Mud Bay, Tiwi Islands, Keep River, Victoria River and McArthur River (Chatto 2006).

The selected sites were prioritised due to their ecological importance and relevance to avian populations susceptible to HPAI. They regularly support large aggregations of feeding, roosting and breeding colonial waterbirds, functioning as critical refugia and predictable congregation points. Colonial breeding creates conditions conducive to disease amplification due to high densities and close contact, this same predictability makes these sites strategic focal points for surveillance, preparedness and rapid response. As key metapopulation and connectivity nodes, these colonies may influence regional transmission pathways and provide important sentinel value for surrounding ecosystems. The sites are particularly significant for taxa including ibises, pelicans and spoonbills, which are predicted to be among the most susceptible groups to HPAI H5N1 in Australia based on family-level phylogenetic signals and susceptibility modelling for the current clade 2.3.4.4b lineage.

Additional Northern Territory locations and species of concern for HPAI are addressed in complementary preparedness documents (Table 1). Together, these materials identify species and locations at greatest risk from HPAI introduction due to ecological sensitivity, proximity to vulnerable environments, or association with MNES. Supporting documents, including the Wildlife Actions Register and a risk assessment and resource guide, inform response planning and operational decision-making.

An Emergency Response to the arrival of HPAI will be activated via the National Management Agreement (NMA) at the scale deemed appropriate by a potential outbreak. The agreement functions in parallel with the Emergency Animal Disease Response Agreement (EADRA), providing interoperability of governance and decision-making.

Vaccination or translocation are not considered to be viable options for management of wild bird populations in the NT. Instead, actions will focus on HPAI preparedness (e.g., surveillance and population monitoring, mitigating existing threats via feral animal and weed control), response (e.g., carcass removal from some locations, management of public access to infected areas) and recovery (e.g., population monitoring).

Species at Risk

Avian fauna in the NT may play a dual role in HPAI epidemiology, functioning both as vectors that enable virus dispersal along dispersal/ migratory routes and as susceptible hosts that can experience substantial mortality. Several avian species associated with the 18 target sites in the NT are therefore considered vulnerable to HPAI. For HPAI preparedness planning, vulnerable species were grouped into assemblages based on ecological characteristics and habitat use, these include:

- Islands - offshore islands and associated avian assemblages, including colonial breeding seabirds and shorebirds that regularly use islands for roosting (Ray Chatto surveys, 1990-2001).
- Shorebirds - species occurring along mainland beaches and coastal mudflats, estuaries, and wetlands, including EPBC-listed migratory and resident species (Garnett, 2008, 1987).
- Colonial Waterbirds - freshwater and estuarine colonial breeders in wetlands and rivers.
- Barkly Tablelands- inland, episodic wetland-dependent species (Jaensch, 2003).
- Magpie goose- a culturally and ecologically significant species that forms large aggregations in floodplain wetlands and is of particular relevance due to its abundance, mobility, and susceptibility to HPAI disease impacts (Clancy, 2020).

The current document includes species with documented, repeated use of selected sites, for breeding or roosting. Ecological traits that heighten HPAI vulnerability in colonial waterbird species include:

- Colonial breeding and high contact rates and potential for rapid transmission.
- Use of habitats overlapping with other susceptible species.
- Documented susceptibility or exposure to clade 2.3.4.4 HPAI viruses (Wildlife Health Australia, 2024).

Target Species

Background

The following detail may assist in the scenario of developing a NMA Response Plan. Additionally, the catchment profile information included in this plan can help define the 'vicinity' as per the AUSVETPLAN Avian influenza response strategy template. The intention is to provide habitat information, as well as estimates, not precise numbers, of susceptible species in the vicinity. This information requires updating on a case-by-case basis. The target species are listed in Table 2, and include species identified in Chatto (2005), with the addition of several listed marine species, listed migratory species (e.g., Oriental Pratincole).

Of these species, Chatto (2001) documented and confirmed colony sizes ranging from the low tens to over 15,000 adults at similar locations. Most colonies exhibited mixed-species composition, with colonial breeding assemblage including herons, egrets, ibises, spoonbills, cormorants, and darters.

Regarding target species are those specifically selected for focused monitoring and management within preparedness HPAI planning. These species are prioritised due to factors such as their ecological significance, conservation status, sensitivity to disturbance, or likelihood of being impacted, and therefore are likely to form the primary focus of response and recovery strategies.

In contrast, associated species are those identified in previous research, such as studies by Chatto on Northern Territory waterbirds, where they are documented as part of broader wetland and colonial bird assemblages. These species provide additional ecological context for HPAI preparedness efforts.

Target and Associated Species Table

Table 1: Target and Associated Colonial Waterbird species in HPAI Preparedness in the NT (taxonomy and sequencing follow AviList: *(Rheindt et al., 2025)*..

Scientific Name	Common Name	Order	Family Scientific Name	Risk Group/ Family Name	Risk sub-group	Estimated HPAI Susceptibility Index
Anseranas semipalmata	Magpie Goose	Anseriformes	Anseranatidae	Ducks, Geese and Swans	Anatids	0.71
Dendrocygna eytoni	Plumed Whistling-Duck	Anseriformes	Anatidae	Ducks, Geese and Swans	Anatids	0.86
Dendrocygna arcuata	Wandering Whistling-Duck	Anseriformes	Anatidae	Ducks, Geese and Swans	Anatids	0.86
Nettapus pulchellus	Green Pygmy-goose	Anseriformes	Anatidae	Ducks, Geese and Swans	Anatids	0.86
Anas gracilis	Grey Teal	Anseriformes	Anatidae	Ducks, Geese and Swans	Anatids	0.86
Poliocephalus poliocephalus	Hoary-headed Grebe	Podicipediformes	Podicipedidae	Grebes	Grebes	0.3
Podiceps cristatus	Great Crested Grebe	Podicipediformes	Podicipedidae	Grebes	Grebes	0.3
Gallirallus castaneoventris	Chestnut Rail	Gruiformes	Rallidae	Crakes, Rails and Swamphens	Other bird	0.26
Antigone rubicunda	Brolga	Gruiformes	Gruidae	Cranes	Crane group	0.73
Ephippiorhynchus asiaticus	Black-necked Stork	Ciconiiformes	Ciconiidae	Storks	Other bird	0.61
Platalea flavipes	Yellow-billed Spoonbill	Pelecaniformes	Threskiornithidae	Ibis and Spoonbills	Ibis group	0.26
Platalea regia	Royal Spoonbill	Pelecaniformes	Threskiornithidae	Ibis and Spoonbills	Ibis group	0.26
Threskiornis molucca	Australian White Ibis	Pelecaniformes	Threskiornithidae	Ibis and Spoonbills	Ibis group	0.26
Threskiornis spinicollis	Straw-necked Ibis	Pelecaniformes	Threskiornithidae	Ibis and Spoonbills	Ibis group	0.26
Plegadis falcinellus	Glossy Ibis	Pelecaniformes	Threskiornithidae	Ibis and Spoonbills	Ibis group	0.26
Nycticorax caledonicus	Nankeen Night-Heron	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56

Bubulcus coromanda	Eastern Cattle Egret	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Ardea pacifica	White-necked Heron	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Ardea sumatrana	Great-billed Heron	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Ardea alba	Great Egret	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Ardea plumifera	Plumed Egret	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Egretta picata	Pied Heron	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Egretta novaehollandiae	White-faced Heron	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Egretta garzetta	Little Egret	Pelecaniformes	Ardeidae	Herons, Egrets and Bitterns	Herons, Egrets and Bitterns	0.56
Pelecanus conspicillatus	Australian Pelican	Pelecaniformes	Pelecanidae	Pelican	Pelican	0.89
Microcarbo melanoleucos	Little Pied Cormorant	Pelecaniformes	Phalacrocoracidae	Cormorants and Shags	Cormorants and Shags	0.48
Phalacrocorax carbo	Great Cormorant	Pelecaniformes	Phalacrocoracidae	Cormorants and Shags	Cormorants and Shags	0.48
Phalacrocorax sulcirostris	Little Black Cormorant	Pelecaniformes	Phalacrocoracidae	Cormorants and Shags	Cormorants and Shags	0.48
Phalacrocorax varius	Great Pied Cormorant	Pelecaniformes	Phalacrocoracidae	Cormorants and Shags	Cormorants and Shags	0.48
Anhinga novaehollandiae	Australasian Darter	Pelecaniformes	Anhingidae	Darter	Darter	0.89
Haematopus longirostris	Australian Pied Oystercatcher	Charadriiformes	Haematopodidae	Oystercatchers	Oystercatchers	0.2
Haematopus fuliginosus	Sooty Oystercatcher	Charadriiformes	Haematopodidae	Oystercatchers	Oystercatchers	0.2
Recurvirostra novaehollandiae	Red-necked Avocet	Charadriiformes	Recurvirostridae	Stilts and Avocets	Stilts and Avocets	0.14
Himantopus leucocephalus	Pied Stilt	Charadriiformes	Recurvirostridae	Stilts and Avocets	Stilts and Avocets	0.14
Pluvialis squatarola	Grey Plover	Charadriiformes	Charadriidae	Plovers, Dotterel and Lapwings	Plovers, Dotterel and Lapwings	0.04
Vanellus miles	Masked Lapwing	Charadriiformes	Charadriidae	Plovers, Dotterel and Lapwings	Plovers, Dotterel and Lapwings	0.04

Irediparra gallinacea	Comb-crested Jacana	Charadriiformes	Jacanidae	Jacanas	Other bird	0.65
Numenius phaeopus	Eurasian Whimbrel	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Limosa lapponica	Bar-tailed Godwit	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Arenaria interpres	Ruddy Turnstone	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Calidris acuminata	Sharp-tailed Sandpiper	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Calidris ferruginea	Curlew Sandpiper	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Calidris ruficollis	Red-necked Stint	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Xenus cinereus	Terek Sandpiper	Charadriiformes	Scolopacidae	Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes	Waders, gulls	0.21
Stiltia isabella	Australian Pratincole	Charadriiformes	Glareolidae	Pratincoles	Other bird	0.65
Glareola maldivarum	Oriental Pratincole	Charadriiformes	Glareolidae	Pratincoles	Other bird	0.65
Sternula albifrons	Little Tern	Charadriiformes	Laridae	Gulls, Terns and Noddies	Waders, gulls	0.88
Sternula nereis	Fairy Tern	Charadriiformes	Laridae	Gulls, Terns and Noddies	Waders, gulls	0.88
Chlidonias hybrida	Whiskered Tern	Charadriiformes	Laridae	Gulls, Terns and Noddies	Waders, gulls	0.88
Thalasseus bengalensis	Lesser Crested Tern	Charadriiformes	Laridae	Gulls, Terns and Noddies	Waders, gulls	0.88
Thalasseus bergii	Greater Crested Tern	Charadriiformes	Laridae	Gulls, Terns and Noddies	Waders, gulls	0.88
Pandion haliaetus	Osprey	Accipitriformes	Pandionidae	Osprey	Raptors	0.11
Icthyophaga leucogaster	White-bellied Sea-Eagle	Accipitriformes	Accipitridae	Eagles, Kites and Goshawks	Raptors	0.68
Haliastur indus	Brahminy Kite	Accipitriformes	Accipitridae	Eagles, Kites and Goshawks	Raptors	0.68

Distribution and Movement

The distribution of colonial waterbirds across the NT reflects the diversity of wetland habitats, including extensive coastal mudflats, tidal creeks, mangrove forests, freshwater floodplains, and seasonal swamps. The selection of colony sites is likely influenced by proximity to foraging habitat, protection from terrestrial predators, and the structural characteristics of nesting trees (Chatto, 2001). Colonial waterbirds in the NT show strong preferences for inundated nesting substrates, with stands of mangrove (*Avicennia* spp., *Rhisophora* spp., *Bruguiera* spp.) and paperbark (*Melaleuca* spp.) being the most used nesting trees (Chatto, 2001).

Understanding shared habitat types may play an important role in HPAI transmission mitigation among waterbirds. Avian influenza viruses can persist in water and wetland environments, creating opportunities for indirect exposure, but environmental persistence and transmission risks vary.

Chatto (2005) documented waterbirds on all parts of the NT coast. Several points of concentration where waterbird numbers were consistently highest across his survey period include:

1. Keep River/Legune Station (far south-west NT) recorded the highest waterbird numbers of any location surveyed.
2. Moyle-Finniss Corridor/ the wetlands between the Moyle and Finniss Rivers consistently supported high waterbird densities including numerous colonial waterbird species.
3. Adelaide River-Murgenella Creek Corridor/ wetland complex was identified as a regional concentration area with high conservation significance.
4. Arafura Swamps Complex (Liverpool/Tomkinson and Glyde/Goyder Rivers).
5. Southern Arnhem Bay and its coastal and estuarine habitats recorded consistently high waterbird numbers.
6. East Coast Sites such as Northern Blue Mud Bay, the Roper River area, and the Port McArthur area were identified as a primary concentration area.

Population Connectivity and Resource-Driven Movement

Australian colonial waterbirds are generally highly mobility and opportunistic, responding to spatially and temporally variable wetland resource availability, rather than following fixed migratory routes (Kingsford et al., 2010; Roshier et al., 2002, 2012). This nomadic behaviour allows species to exploit pulses of productivity across broad landscapes, moving rapidly between wetland habitats as conditions change, which allows birds to exploit ephemeral resources across time and space (Nye et al., 2007).

In the NT, colonial waterbirds undertake a mix of short-range movements within the Top End and longer-range dispersals to other wetland regions of northern and inland Australia. Although detailed telemetry studies specific to the NT are few, continental research on species such as ibis and other nomadic waterbirds shows that these birds can move hundreds to thousands of kilometres in response to dynamic wetland conditions (CSIRO, 2025; East et al., 2008).

The NT's wetlands are part of a broader Australo-Papuan biogeographic system, and many waterbirds exhibit connectivity across northern Australian landscapes, particularly in response to widespread rainfall and flooding. While specific regular movements between northern Australia and PNG/Indonesia are less well quantified for most waterbirds than for migratory shorebirds, the potential for broad-scale dispersal and cross-regional connectivity remains ecologically plausible

given the nomadic nature of many species and their ability to cross substantial geographic distances in search of suitable habitat.

Many colonial waterbirds occur in the NT throughout the year, but seasonal movements are common in response to the monsoonal climate. During the wet-season (Nov-April), widespread flooding and increased wetland productivity attract large concentrations of waterbirds, while in the dry season (May- October) individuals may disperse to other regionally favourable habitats (Whitehead et al., 1992; Whitehead & Saalfeld, 2000). These patterns closely track variability in rainfall and flooding, with birds concentrating in reliable habitats during dry periods and dispersing broadly in wet years (Whitehead, Bowman and Tideman, 1992; Roshier, Robertson and Kingsford, 2002).

Herons and egrets in the region tend to show more resident behaviour, but -many individuals still undertake local seasonal movements between nesting colonies and foraging areas, and may disperse to exploit resources elsewhere (McKilligan, 2005).

Piscivorous colonial waterbirds, including cormorants and darters, also exhibit seasonal and opportunistic movements related to water availability and prey abundance. For instance, Dorfman, Kingsford and Porter (2002) documented that these species utilise both natural wetlands and artificial waterbodies e.g., farm dams, sewage ponds, aquaculture facilities. Their mobility enhances persistence in variable environments but also complicates management considerations related to disease dynamics (Kingsford et al., 2010; Roshier et al., 2002).

Breeding Phenology

Breeding phenology of colonial waterbirds in the NT is generally linked to the wet season, when wetland resources are abundant (Chatto, 2005; Whitehead & Saalfeld, 2000). However, the timing and duration of breeding varies among species. Some colonies exhibit prolonged activity, with documented periods extending from November to August, encompassing overlapping and staggered breeding cycles of multiple species (Chatto, 2001).

Most colonial sites are active annually, indicating that target HPAI Preparedness locations consistently provide suitable conditions for nesting (Chatto, 2001). However, the types and abundance of breeding species and the timing of peak activity vary between colonies and years (Chatto, 2001). Some colonies maintain relatively stable assemblages of species, with predictable annual breeders, but the species composition of others is more variable, reflecting opportunistic breeding by nomadic species that track favourable environmental conditions (Chatto, 2001).

Threats

Colonial waterbirds in the NT face multiple threats operating across different spatial and temporal scales. Although much of the region remains relatively remote compared to some parts of Australia, a key vulnerability for NT colonial waterbirds is that most breeding colonies occur outside formal conservation reserves. Surveys indicate that a high proportion of colonies are located on Aboriginal land or pastoral leasehold. This spatial pattern means that the long-term security of most colonies depends on land management decisions by Aboriginal landholders and pastoralists rather than being guaranteed through reserve protection (Chatto, 2001).

Colonial waterbirds are particularly sensitive to disturbance during the breeding season, with repeated disturbance capable of causing nest abandonment and breeding failure (McKilligan, 2005). Colonies located in proximity to expanding human activity are therefore at elevated risk of disruption during critical nesting periods (McKilligan, 2005). Disturbance of habitat by feral animals and weeds leads to a reduction in habitat condition.

Harvest of waterbirds, particularly Magpie Geese, is a documented component of NT waterbird population dynamics in the NT, and sustainable use is an important management consideration (Delaney et al., 2009; Traill et al., 2010). For most other colonial waterbird species, direct harvest pressure is generally low or absent, although localised disturbance during hunting activities or collection of eggs may affect some colonies (Chatto, 2001). The cultural and subsistence importance of waterbird harvest to Indigenous communities underpins the need for collaborative approaches that also consider biosecurity and disease management objectives (Delaney et al., 2009).

Threats rarely operate in isolation, and cumulative or synergistic effects may pose greater risks than single stressors alone (Traill et al., 2010). For example, when habitat loss or degradation interacts with other pressures such as harvest or climate change, the combined impacts may be more pronounced.

Current Management Actions

The conservation of colonial waterbirds in the NT depends on the protection and maintenance of sufficient wetland and breeding habitat to support viable populations. Management efforts for colonial waterbirds involve a range of approaches, including targeted research and monitoring, integration of waterbird habitat objectives into protected area management, and collaborative engagement with stakeholders.

Despite the comprehensive baseline data provided by Chatto's surveys, significant gaps remain in understanding the full distribution and status of colonial waterbirds across the NT, owing to remoteness, limited access, and logistical constraints. Targeted survey work in under-documented regions remains a priority to improve knowledge and inform management and HPAI disease surveillance.

Kakadu National Park provides formal conservation protection for extensive wetland systems and waterbird populations, with World Heritage status reflecting both natural and cultural values (Finlayson et al., 2006). Kakadu is managed under distinct frameworks and is not considered further in this document.

Public Interest

Institutional engagement with waterbird conservation in the NT is often reflected through academic or government-supported surveys and monitoring programs, collaborative landholder engagement, and integration of waterbird values into regional land management planning. The survey program conducted by Chatto and colleagues represents a significant governmental investment in waterbird research and monitoring. However, since these early baseline efforts, comparable systematic surveys of waterbird distribution, abundance and colonial sites across the NT have not been

repeated, underscoring the need for ongoing, sustained funding and institutional support to maintain and build on these data (Delaney et al., 2009).

Susceptibility to HPAI

Highly Pathogenic Avian Influenza, H5N1 clade 2.3.4.4b, poses a global threat to colonial waterbird populations, with outbreaks causing severe mortality and rapid declines in breeding colonies elsewhere (Knief et al., 2025; Lane et al., 2023). Currently Australia remains HPAI free, but predictive models and risk assessments highlight potential vulnerability in northern regions, including the NT (Curran, 2012; Ryding et al., 2025; Wille et al., 2024).

Waterbirds exhibit variable susceptibility to HPAI. Globally, Anseriformes (ducks, geese, swans) can act as reservoir hosts, carrying virus with minimal clinical signs, while Ciconiiformes and other colonial species- including herons, egrets, terns, and gulls- may experience higher mortality if exposed (Couty et al., 2026; Feare, 2010; Knief et al., 2025).

In Australia, seabirds, shorebirds, and waterbirds consistently emerge as the highest-risk groups, with some gull and tern species already targeted in experimental studies due to their coastal and opportunistic foraging behaviour, and colony-based breeding increases transmission risk by bringing large numbers of individuals into close contact (Curran, 2012; Ryding et al., 2025).

Northern Australia, including NT, is a potential entry point for HPAI due to its connectivity within the Australo-Papuan flyway. Nomadic waterfowl movements link the NT with Papua New Guinea and Indonesia, creating pathways for virus introduction if HPAI becomes established in those regions (East et al., 2008; Kingsford & Porter, 2009). The high mobility of Australian waterbirds, combined with long-distance dispersal and opportunistic habitat use, means pathogens could spread rapidly across vast areas once introduced (East, Hamilton and Garner, 2008).

Several ecological and behavioural factors amplify HPAI transmission risk in colonial waterbirds:

- Colony structure and nesting density: High breeding densities and close proximity of nests facilitate rapid pathogen spread (Knief et al., 2025; Lane et al., 2023).
- Shared aquatic habitats: Virus may persist in water and wetlands, creating opportunities for exposure (Furness et al., 2023).
- Local persistence and spillover: Interactions between resident and migratory birds may sustain local circulation and connect to long-range dispersal or spill over into other species (Yoo et al., 2022).
- Stress periods and environmental vulnerability: Outbreaks often occur during environmental or physiological stress e.g., moulting and adverse weather (Feare, 2010).
- Carcass persistence and management: The presence and handling of infected carcasses influence environmental contamination and local transmission risk (Furness et al., 2023; Knief et al., 2025).

Documented impacts of HPAI outbreaks in waterbirds demonstrate rapid and severe consequences for colonial waterbird populations, including large-scale local declines in occupied sites, reductions in breeding success, and increased adult mortality (Lane et al., 2023). Mass mortality events may remove substantial portions of impacted populations. There is some evidence via serological survey suggesting that surviving individuals may achieve post-outbreak immunity (Ross et al., 2024).

Given these factors, colonial waterbirds in the NT are a priority group for targeted surveillance and biosecurity planning, particularly high-density breeding colonies, shared aquatic habitats, and highly mobile or nomadic species, to support early detection and rapid response if HPAI is introduced into northern Australia (Couty et al., 2026; Curran, 2012; Ryding et al., 2025).

Recommended Biosecurity Controls

Biosecurity preparedness for HPAI at target colonial waterbird sites should be designed to operate at a landscape scale that could remain adaptable to changing conditions, associated wildlife movements and a potential HPAI incursion.

NT HPAI Wildlife Actions Register

The Wildlife Actions Register accompanies this document and summarises the actions considered in HPAI preparedness planning for the NT. It outlines key management activities, their alignment with the National Management Agreement (NMA), cost-sharing eligibility, and the likely lead agency for implementation.

The register is a living document and will continue to be updated as Australia's HPAI situation evolves. It identifies which actions are eligible or ineligible for NMA cost sharing and notes any further work required to develop each activity.
Overall, these actions aim to:

- protect people by reducing contact with infected birds and contaminated environments
- prevent the virus spreading via footwear, clothing, or equipment
- minimise additional stress on wildlife populations

Activities that may be subject to restriction may include, but are not limited to:

- tourism
- access to public spaces e.g., beaches, lakes.
- bird banding
- population monitoring or management activities
- research and environmental studies (with or without interaction with wildlife)
- pest animal control activities
- wildlife translocations
- recreational hunting.

There may be regular activities undertaken at the site that are essential to the health and welfare of the wildlife population, such as monitoring or maintenance activities. Permits or restriction exemptions may be required for certain activities if deemed appropriate by government authorities.

A summary of the activities is provided in Tables 3 to 6.

All Activities

Table 2: Activities during all phases

#	Management Category	Management Activity	Relative Priority - e.g., high/medium/low	Expected conservation benefit (to support implementation in emergency settings)	Biodiversity Outcome if No Action is Taken	Biodiversity Outcome if Action is Implemented
1	Control measure	**Long-term Population Monitoring - Magpie goose**	High	Supports conservation management of an iconic species, informs sustainable cultural harvest, and provides baseline data for detecting HPAI-related population impacts.	Mass mortality events may remain undetected until severe population decline occurs, potentially leading to collapse of harvestable populations and loss of ecological function.	Early detection of population impacts enables targeted management interventions, adaptive harvest controls and maintenance of sustainable, resilient populations.
2	Control measure	**Long-term monitoring- Wildlife Populations**	Medium	Supports ecosystem health assessment, early detection of population declines, and evaluation of HPAI impacts and recovery outcomes.	Population declines and local extinctions may occur without detection	Early warning of disease impacts supports evidence-based recovery planning, prioritisation of interventions and improved conservation outcomes.

Preparedness Activities

Table 4: Preparedness - Including resilience building and management activities

#	Management Category	Management Activity	Relative Priority - e.g., high/medium/low	Expected conservation benefit (to support implementation in emergency settings)	Biodiversity Outcome if No Action is Taken	Biodiversity Outcome if Action is Implemented
3	Surveillance	**Risk-Based Wildlife Surveillance (early detection)**	High	Critical for early detection of HPAI incursions, enabling timely response activation, reduced disease spread, and coordinated community engagement in emergency procedures.	Delayed detection may allow uncontrolled spread of HPAI across wildlife populations and into poultry systems, increasing biodiversity loss and economic impacts.	Rapid detection supports early containment, targeted response measures and maintenance of market and tourism confidence through proof-of-freedom evidence.
4	Surveillance	**Develop culturally appropriate wildlife biosecurity protocols**	High	Strengthens culturally informed preparedness and response capacity, integrates traditional ecological knowledge, and supports effective collaborative management.	Reduced compliance, mistrust and delayed reporting in remote and culturally sensitive areas may hinder response effectiveness.	Strong community participation improves surveillance coverage, reporting rates, cultural legitimacy and on-ground biosecurity outcomes.

5	Control measure	**Develop Carcass Management / Disposal Guidelines**	High	May reduce environmental viral loading, minimises secondary transmission risk, and improves responder safety and operational consistency.	Infected carcasses may increase scavenger exposure, environmental contamination and ongoing viral persistence in wetlands and waterways.	Effective carcass management reduces environmental viral load, breaks transmission pathways and protects sensitive wetland ecosystems.
6	Risk Assessment	**Data, Mapping and Modelling**	Medium	Improves risk assessment, resource prioritisation, epidemiological modelling, and evidence-based decision-making during preparedness and response activities.	Responses may be poorly targeted, inefficient and unable to prioritise high-value biodiversity assets.	Data-driven decision-making enables precise targeting of surveillance and protection measures for threatened species and MNES sites.
7	Risk Assessment	**Identify HPAI activities relevant to Threatened Species/ MNES**	High	Supports protection of threatened species and MNES, reduces risk of local population decline or extirpation, and enables rapid implementation of targeted response measures.	Highly vulnerable species or genetically distinct populations may suffer irreversible decline or extinction before interventions are mobilised.	Early prioritisation enables rapid activation of targeted protections and improves survival prospects for vulnerable species
8	Risk Assessment	**Develop Integrated Wildlife Response Plan**	High	Improves preparedness, coordination and operational efficiency while reducing the likelihood of fragmented response actions and ineffective resource allocation.	Fragmented governance and unclear responsibilities may delay response actions and reduce effectiveness.	Coordinated multi-agency mobilisation enables rapid, consistent and effective wildlife response operations across jurisdictions.
9	Risk Assessment	**Establish Decision Triggers & Wildlife Biosecurity Controls**	High	Supports timely and evidence-based decision-making, reduces disease spread risk, and strengthens implementation of proportionate control measures.	Delayed or inconsistent decisions may increase transmission and ecological damage.	Objective and defensible trigger mechanisms support timely implementation of effective biosecurity and containment measures.
10	Communications	**Communications Strategy**	High	Reduces misinformation and public concern, improves stakeholder coordination, and supports effective implementation of response measures.	Public confusion, misinformation and poor compliance may increase wildlife disturbance, illegal access and disease spread.	Clear and coordinated communication improves public confidence, stakeholder cooperation and adherence to biosecurity measures.
11	Control measure	**Feral Pest Control/Culling - Pigs and Buffalo**	Medium	Improves habitat condition and native species resilience while reducing scavenger-mediated spread	Habitat degradation and scavenger-mediated spread may increase wildlife vulnerability to HPAI and reduce recovery capacity.	Improved habitat condition and reduced scavenger pressure strengthen ecosystem resilience and native species survival.
12	Control measure	**Weed Reduction Activities**	Low	Enhances habitat resilience and supports healthier wildlife populations	Habitat degradation may concentrate birds into small refugia, increasing transmission risk and ecological stress.	Improved habitat distribution supports dispersed populations, reducing disease transmission and enhancing resilience.

Response Activities

Table 5: HPAI Incident Response Activities. Where indicated activities may be eligible under NMA cost-sharing arrangements, noting approval is at the discretion of the National Management Group. Eligible costs are those that are above and beyond the resource costs of a party that exists for / or are required to carry out its Normal Biosecurity and normal conservation commitments. NMA- Schedule 3

#	Management Category	Management Activity	Relative Priority - e.g., high/medium/low	Expected conservation benefit (to support implementation in emergency settings)	Biodiversity Outcome if No Action is Taken	Biodiversity Outcome if Action is Implemented
13	Control measure	**Humane Euthanasia**	Medium	Primarily supports animal welfare outcomes while reducing unnecessary suffering and maintaining public confidence in response activities.	Infected wildlife may experience prolonged suffering and continue shedding virus into the environment.	Reduced animal suffering and lower viral shedding contribute to improved welfare and biosecurity outcomes.
14	Surveillance	**Establish Surveillance in Outbreak Areas**	High	Defines extent of infection, improves situational awareness, and reduces risk of undetected spread to wildlife, livestock and humans.	Disease spread beyond the initial outbreak zone may remain undetected, increasing risk to wildlife and poultry sectors.	Enhanced surveillance enables targeted containment and protection of uninfected populations and ecosystems.
15	Surveillance	**Establish Surveillance for Surrounding Outbreak Areas**	High	Improves early detection at surrounding high-risk sites and reduces broader ecological and agricultural impacts.	Secondary outbreaks in isolated or high-value ecological areas may remain undetected until severe impacts occur.	Early detection in surrounding areas supports rapid protective actions and reduces risk to sensitive ecosystems.
16	Control measure	**Strategic and Targeted Feral Animal Control (Buffalo/Pig)**	Medium	Reduces potential for scavenger-mediated disease spread and lowers risk of HPAI transmission into unaffected areas and spillover species.	Feral animals may amplify environmental contamination and contribute to ongoing disease spread.	Reduced scavenger activity lowers environmental viral loads and supports outbreak containment.
17	Control measure	**Consider immediate hunting suspension- Magpie Goose Harvesting**	High	Reduces human-mediated spread risk, limits disturbance to infected wildlife populations, and protects community and cultural values.	Human-assisted spread through contaminated equipment, vehicles and movement between sites may accelerate disease transmission.	Reduced movement-related transmission supports containment and enables earlier recovery of hunting activities.
18	Control measure	**Limit Non-essential Access**	High	Reduces disturbance-driven dispersal and minimises mechanical spread through fomites, vehicles and human movement.	Increased human disturbance may disperse infected birds and spread virus between colonies and wetlands.	Reduced disturbance and human-mediated spread help localise outbreaks and support wildlife recovery.

19	Environmental Management	**Implement Carcass Disposal**	High	Reduces environmental contamination and wildlife exposure risk while supporting effective outbreak containment.	Persistent carcasses may contaminate wetlands and maintain long-term environmental reservoirs of virus.	Removal and safe disposal reduce environmental contamination and improve conditions for ecosystem recovery.
20	Environmental Management	**Decontamination Procedures**	High	Maintains operational biosecurity and reduces risk of cross-site contamination and spillover transmission.	Personnel, vehicles and equipment may become vectors for disease spread between sites.	Strong biosecurity protocols maintain operational integrity and minimise human-assisted transmission.
21	Communications	**Distribute Communications Products**	High	Supports compliance with response measures, improves public understanding, and maintains stakeholder confidence.	Poor awareness and misunderstanding may result in non-compliance, unauthorised access and increased spread risk.	Consistent messaging improves compliance, supports containment measures and enhances public trust.

Post Incursion Activities

Table 6: Post-incursion activities to build population resilience and ensure population management is appropriate.

#	Management Category	Management Activity	Relative Priority - e.g., high/medium/low	Expected conservation benefit (to support implementation in emergency settings)	Biodiversity Outcome if No Action is Taken	Biodiversity Outcome if Action is Implemented
22	Environmental Management	**Weed Reduction/ Land Management**	Medium	Restores habitat quality, supports ecosystem resilience, and reduces conditions that may facilitate disease spread.	Degraded habitats may limit recovery of surviving populations and reduce long-term ecosystem resilience.	Restored habitats improve ecosystem functionality and support recolonisation and population recovery.
23	Environmental Management	**Feral Pig and Buffalo control**	High	Supports wildlife recovery, improves habitat resilience, and maximises post-outbreak survivor recruitment and population stability.	Feral pests may suppress recovery of vulnerable native species through predation, habitat destruction and disturbance.	Reduced pest pressure supports rapid recovery and stabilisation of native wildlife populations following HPAI impacts.

Disease Surveillance

Active Surveillance

- Targeted sampling: Regular collection of faecal samples or swabs at key sites
- Sentinel species monitoring: Focused surveillance of species known to be highly susceptible to HPAI (e.g., waterfowl, gulls) that may serve as early indicators of virus presence.

Passive Surveillance

- Mortality monitoring: Systematic reporting and investigation of shorebird mortality events.
- Behavioural monitoring: Observation for signs of illness in shorebird populations, including lethargy, neurological signs, or unusual behaviour.

Surveillance Priorities

- High-priority sites: sites supporting large shorebird concentrations or threatened species.
- High-risk periods: Peak migration periods (September-November, March-May) when birds are arriving from or departing to regions where HPAI may be present.
- Trigger events: Increased rainfall within region and increased surveillance following HPAI detections in nearby regions or along the flyway.

Wildlife Population Monitoring

Avian population data in the NT are primarily derived from species-specific counts at defined locations and times, which can be aggregated to identify important sites and relatively abundant species (Chatto, 2005). The aerial and ground surveys initiated by Chatto and colleagues from 1990 onwards provide the foundation for understanding colonial waterbird distribution, abundance, and colony locations, and remain critical for conservation planning and management (Chatto, 2001, 2005). Ground surveys complement aerial counts by providing detailed information on species composition, colony size, and breeding phenology, while aerial surveys offer broad spatial coverage across remote wetlands and islands (Chatto, 2001; Kingsford & Porter, 2009). Despite these efforts, major limitations remain:

- Absence of long-term population trends for most species.
- Limited information on breeding success, demography, and responses to environmental variability.
- Unquantified impacts of threats, including habitat disturbance, harvest, climate change, and disease.
- Insufficient survey coverage in priority or remote regions (Chatto, 2001, 2005; Roshier et al., 2012, 2012; Whitehead et al., 1992; Whitehead & Saalfeld, 2000).
- Seasonal and spatial variability: Species presence and abundance fluctuate across islands and wetlands; aggregated classifications such as "*common in the NT coastal/island environment*" do not imply uniform occurrence. Limited records may reflect survey gaps rather than true absence.

Monitoring for HPAI on key sites is therefore critical. Monitoring prioritises regular surveillance while minimising disturbance at breeding and roosting sites, with a focus on species identified as high-risk, including common species (Knief et al., 2025; Ryding et al., 2025).

Sustained long-term monitoring using standardised methodologies, adaptive frameworks, and coordinated data sharing across agencies will improve trend detection and support management

(Chatto, 2005; Roshier et al., 2012; Traill et al., 2010; Whitehead & Saalfeld, 2000). In addition, an expanded focus on breeding success, disease surveillance, and environmental data integration to allow adaptive management of emerging threats such as HPAI (Kingsford & Porter, 2009; Kingsford, Roshier & Porter, 2010).

By addressing these limitations and maintaining rigorous, coordinated monitoring, population data for NT colonial waterbirds can better support conservation planning, detect population changes, and inform rapid response strategies for threats including HPAI.

Restricted Access

In the event of HPAI detection on NT Colonial Waterbird sites, temporary access restrictions may be an appropriate measure to reduce indirect disease spread and minimise additional stress on affected birds. While rapid virus spread is likely via natural movements of highly mobile species, limiting human access to key habitats can reduce the risk of human-mediated transmission through contaminated footwear, vessels, vehicles or equipment. Additionally, disturbance alters spatial use, increasing contact rates among birds, therefore reduced disturbance also lowers the likelihood of disease transmission risk.

Access restrictions would operate as a supporting risk-management measure rather than a standalone response. Consistent with AUSVETPLAN, restricted areas, enhanced surveillance and biosecurity measures are appropriate where HPAI poses a risk to wildlife, while avoiding ecologically damaging interventions such as culling.

In the NT Colonial Waterbird context, temporary closures would support targeted surveillance and if necessary, carcass management or feral pest eradication, recognising that outbreak outcomes depend on integrated surveillance, biosecurity and adaptive management rather than access controls alone.

Feral Pest Species Culling

Under AUSVETPLAN, routine culling or population reduction of wild animals (including feral species) is not recommended as a primary HPAI emergency response measure to eradicate disease in wild birds, as there is little evidence it effectively reduces virus transmission and it may increase disease spread by causing animals to disperse, mix more widely, or experience stress. However, AUSVETPLAN does recommend targeted feral pest control as a supporting, risk-based action where there is a clear and defensible link to biosecurity or outbreak management objectives, rather than disease eradication in wild birds. For example, controlling feral scavengers may be considered where they are spreading contaminated material (e.g., moving carcasses between sites), interfering with surveillance or carcass management, or increasing the risk of transmission to domestic species such as poultry, or sensitive wildlife areas.

Any such action must be considered site-specific, proportionate, coordinated with surveillance and access restrictions, and designed to minimise disturbance to infected or susceptible bird populations. In practice, AUSVETPLAN places much greater emphasis on restricted access, biosecurity, surveillance, and carcass management, with feral animal control used only where it clearly supports those measures and does not exacerbate disease spread or ecological harm.

Carcass Management

Due to the remote and vast landscape in the NT, in most situations, it is considered appropriate to leave wild bird carcases in situ, carcass removal may be justified in some situations e.g., public places, in close proximity to poultry operations and densely populated public spaces to reduce

potential disease transmission and improve social amenity. Carcass management will typically be carried out by specially trained personnel, however, a public guidance document is available via the DAF website, should this be necessary. The use of appropriate PPE is essential to ensure carcasses are removed safely.

Key Sites/ Locations at Risk

The sites listed are confirmed breeding colonies documented by Chatto, (2001) and represent critical habitat for colonial waterbirds. Some colonies support up to 15,000 adults, ranking among the largest in Australia for certain species (Chatto, 2001). Many colonies host multiple species in mixed aggregations, so protecting a single site benefits several taxa simultaneously. Most colonies remain active annually, highlighting their consistent suitability for breeding and their priority for HPAI surveillance and preparedness (Chatto, 2001, 2005).

For each site, factors affecting HPAI risk were considered including public access, tourism, research activities (e.g., banding, ecological surveys), pest control, and recreational hunting, which may influence bird movement and pathogen exposure. Sites are defined according to National Catchment Boundaries (Geoscience Australia - Product catalogue, 2025) (Figure 3). They are:

- Arafura Swamp
- Joseph Bonaparte Gulf
- Moyle Floodplains
- Daly River
- Finniss River
- Adelaide River
- Mary River
- North Peron Island
- Kakadu National Park*
- Rose River
- Blyth River
- Goyder River
- Northeast Arnhem Coast/ Buckingham River
- Blue Mud Bay
- Tiwi Islands
- Keep River
- Victoria River
- McArthur River

*Kakadu National Park, managed as a distinct area by DECEEW and encompassing key Colonial waterbird habitats, is subject to separate HPAI preparedness and response plans.

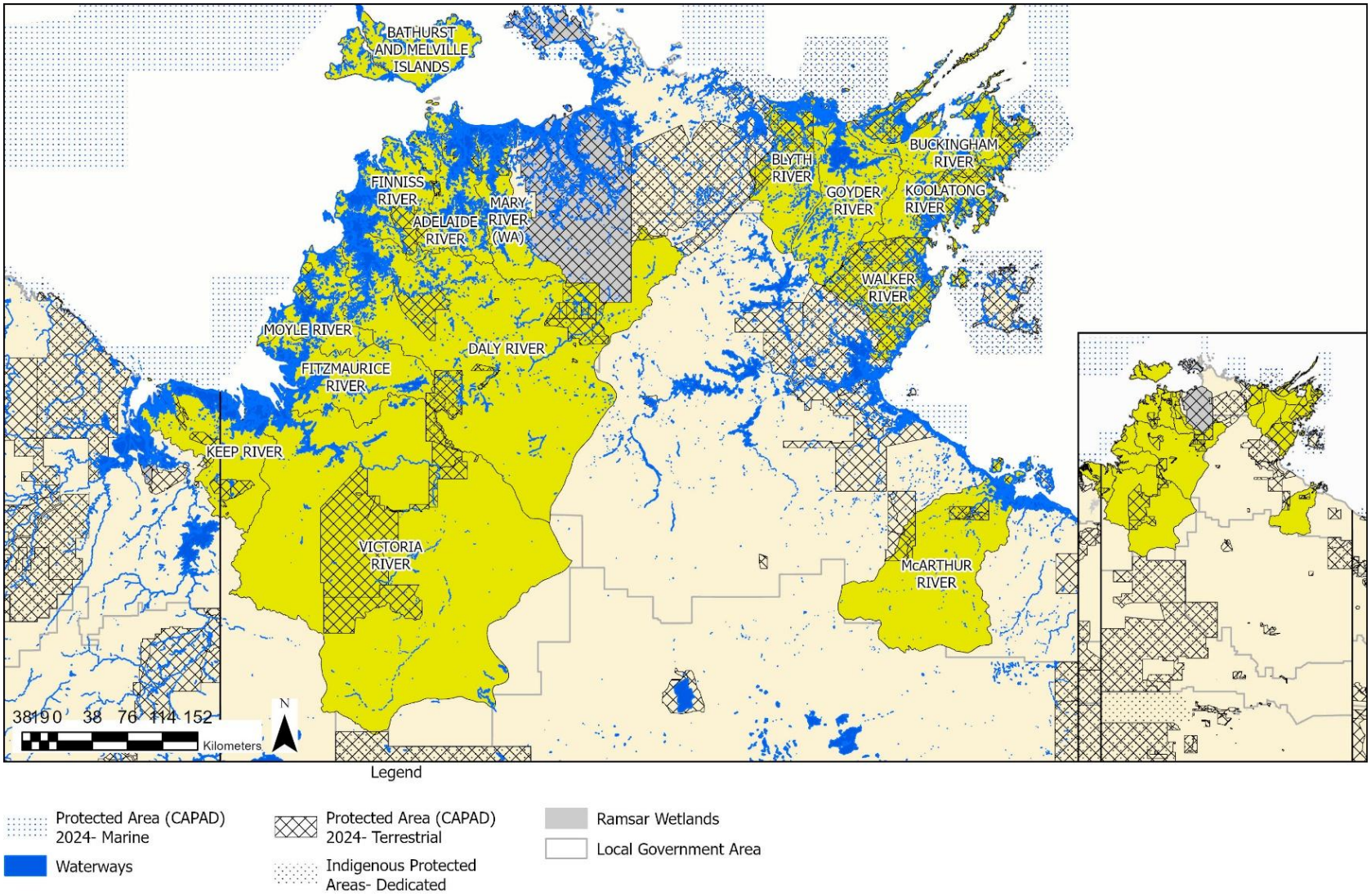


Figure 1: Key sites/ geographic locations in the Northern Territory relevant to this report are shaded yellow, represented by National Catchment Boundaries (Geoscience Australia - Product catalogue, 2025). CAPAD, Indigenous Protected Areas, Hatched areas constitute separate management areas/ units and are not considered in this particular report.

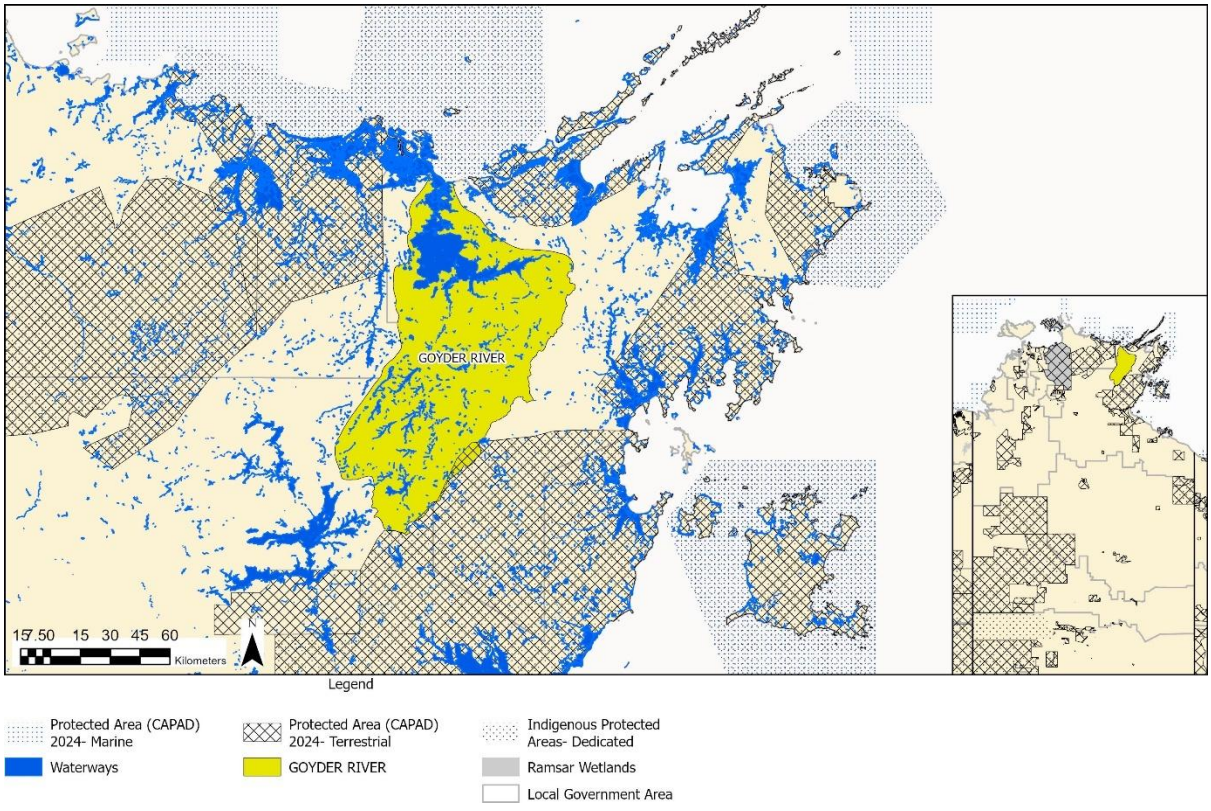
Colonial Waterbirds Profile

The following detail can assist in forming the information required in the scenario of a potential NMA Response Plan. This includes a description and estimated number of and types of species of interest/ relevant to HPAI preparedness actions. Additionally, the catchment profile information can help define the 'vicinity' as per the AUSVETPLAN Avian influenza Response strategy template. The intention is to provide habitat information, as well as estimates, not precise numbers, of susceptible species in the vicinity.

This information requires updating on a case-by-case basis. There is significant variation in the distribution, density, and habitats of wildlife between and within colonial waterbird habitats of the Northern Territory, which may change seasonally, and the information presented here is relevant at a catchment scale. Limited access to the Top End - especially during the wet season- restricts data detail. As such, the information provides regional context rather than precise site-level estimates.

Arafura Swamp/ Goyder River Catchment

Map



Key Detail:

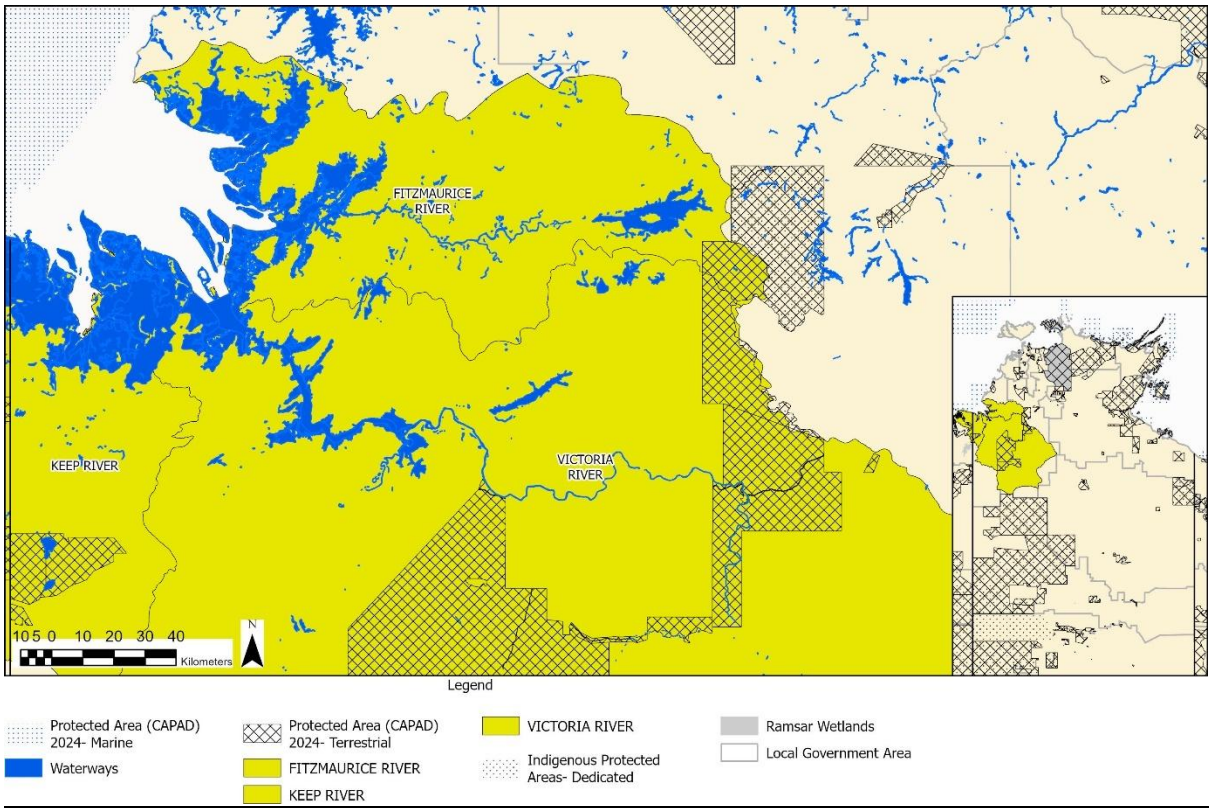
Location	**Arafura Swamp**
Site Overview	
Coordinates (approx.):	~ 12.25°-12.60° S, ~ 134.90°-135.25° E (NE Arnhem Land)
Catchment Area	~10,391 km² (Goyder River basin)
River Length	Goyder River: ~171 km from its source in the Mitchell Ranges to its confluence with the Glyde River, flowing through the swamp.
Proximity to urban areas	Extremely remote from urban centres – dry season only unpaved road access Closest community: Ramingining.

Ecological and Land Context	
Access and Tenure Description	Aboriginal freehold land, the area is designated as an Indigenous Protected Area (IPA) known as the Arafura Swamp IPA (Gurruwiling), involving Traditional Owners and conservation partners.
Ecosystem Description	Permanent freshwater marsh, paperbark forests, seasonal wetlands, moderate agricultural interface. The Arafura Swamp is located in Arnhem Land, about 450- 500 km east of Darwin. The swamp occupies the floodplain of the Goyder and Gulbuwangay Rivers and lies adjacent to the tidal coastal plain of Castlereagh Bay. The Arafura Swamp spans parts of the Arnhem Coast and Central Arnhem bioregions. The subregions include low plateau surrounds, escarpments, and the floodplain basin of the swamp. Key Features include: • Extensive paperbark swamp and perennial springs feeding the floodplain. • Seasonally flooded plains and billabongs with large water depth variation (wet vs dry season) up to ~2 metres change. • Surrounding sandstone hills, woodlands, sinkholes, floating mats and rainforest patches. Minimal road access, some outstations, seasonal tracks. Small scale, ranger outstations and visitor amenities
Key biological features	The Arafura Swamp is one of the largest seasonally inundated freshwater ecosystems in northern Australia. It spans up to 1,300 km² during the wet season and retains substantial areas of open water and swamp throughout the dry season due to permanent spring-fed inputs. Vegetation communities are highly diverse, with more than 100 recorded plant species and approximately 25 distinct plant assemblages. These include large paperbark (Melaleuca spp.) forests, floodplain sedgelands, floating aquatic mats, and open water lagoons. Transitional zones link the swamp to surrounding tropical savannas and sandstone escarpments.
Fauna and Ecological Significance	Identified as a Key Biodiversity Area by BirdLife International and a Site of Conservation Significance. The Arafura Swamp supports breeding populations of many waterbird species, including the Magpie goose, and provides habitat for four bird species listed under the EPBC Act and 15 listed marine and migratory species. The area regularly supports very high aggregations of waterbirds.
Wildlife Density & Diversity	Extremely high - Major aggregations and species diversity.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population (≥1000 pairs).
Cultural and Social Context	
Cultural and Social features	The Arafura Swamp holds cultural significance for the Yolŋu people, including Traditional Owners from the Ramingining community. The swamp and its surrounding Country continue to be used for customary practices such as hunting, fishing, and gathering. Indigenous land management remains active across the region, including fire management, species monitoring, and seasonal access decisions.
Key Stakeholders	Key stakeholders include Yolŋu Traditional Owners, the Ramingining community, and the Arafura Swamp Rangers. Conservation partners such as Bush Heritage Australia play a role in supporting land management and planning initiatives.
Local Government Authority	Unincorporated / Native Title
Conservation Management organisations	Arafura Swamp Rangers

Land Use and Human Activity	
Key Land Use Types	Seasonal wetland, Indigenous land management
Human Use and Activity frequency	activity- Research, traditional land use, restricted seasonal access, permits required, Indigenous ranger access only. Commercial crocodile egg harvest via helicopter during wet season Relatively low, constrained by distance, seasonality, traditional use for hunting, fishing, gathering.
Risk and Management	
Site biosecurity implications	• Land use across the Arafura Swamp catchment remains predominantly natural, with large areas of intact wetland and tropical savanna. • There are no known intensive poultry or agricultural operations within close proximity to the swamp system. • Ongoing collaboration with Yolŋu Traditional Owners and Indigenous Ranger groups is critical for managing site access
Management Implications	• Feral buffalo and cattle, along with invasive weed species, continue to impact wetland structure, water quality, and habitat availability. • Protection of key breeding and foraging areas is essential to maintain ecological function and biodiversity values.
Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in habitat condition. Ongoing surveillance for HPAI (Highly Pathogenic Avian Influenza) risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Joseph Bonaparte Gulf

Map:



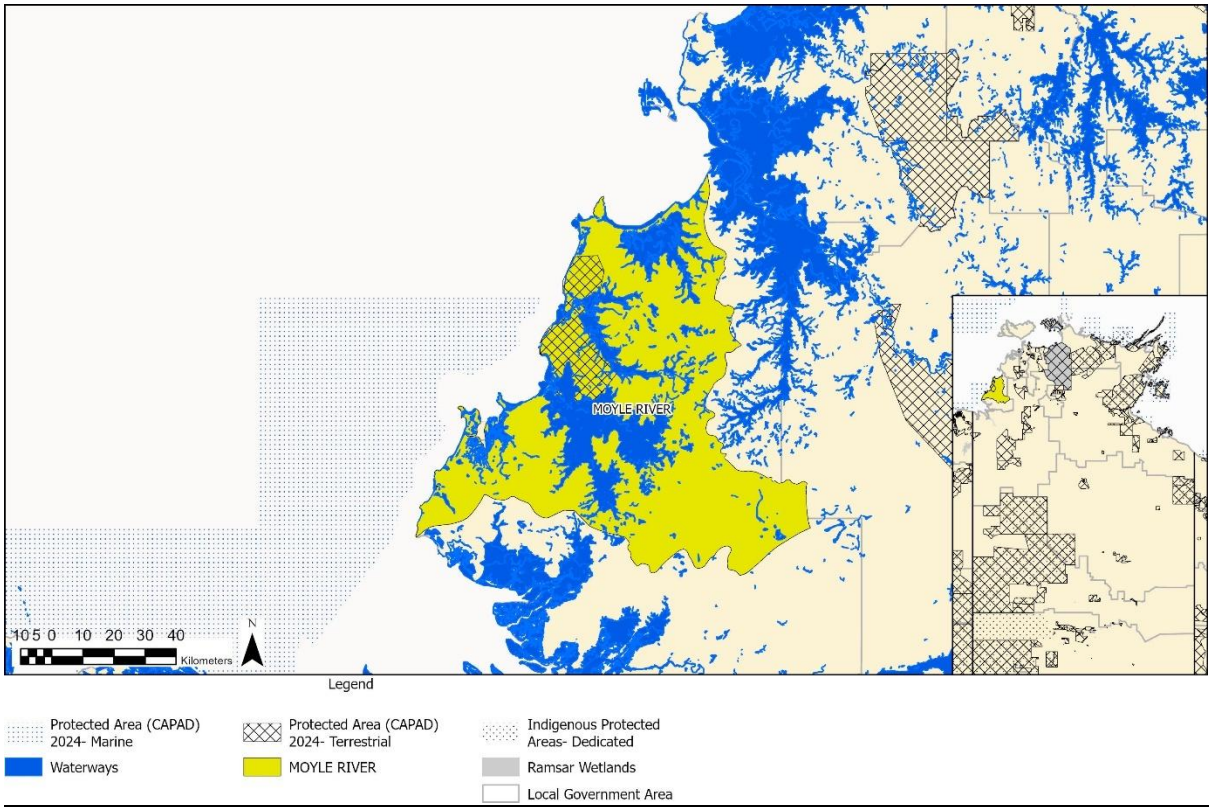
Key Detail:

Location	Joseph Bonaparte Gulf
Site Overview	
Coordinates (approx.):	~14.5°–16.0° S, ~128.0°–130.5° E
Catchment Area	Drained via by the Victoria River and Keep River catchments, along with smaller seasonal coastal drainages and floodplains (e.g., Legune coastal plain).
River Length	Victoria River: ~560 km (major NT river flowing into the gulf). Keep River: flows north into the gulf
Proximity to urban areas	Extremely remote; no major urban centres on the Gulf. Closest community is Wadeye
Ecological and Land Context	
Access and Tenure Description	Part of the Northwest Shelf Transition marine bioregion. Commonwealth waters managed under the EPBC Act as the Joseph Bonaparte Gulf Marine Park (IUCN Category VI). Adjacent coastal floodplains and wetlands include Indigenous land and pastoral leases (see cultural / social context). Boat and aircraft access; coastal road infrastructure; inland communities and airstrips (e.g., Wadeye) provide access points.
Ecosystem Description	Shallow marine system with extreme tidal ranges (up to ~7 m), high turbidity, carbonate banks, channels and mudflats. Adjacent ecosystems include mangroves, estuaries, freshwater swamps and seasonally inundated floodplains.
Key biological features	Extensive intertidal mudflats, estuarine mixing zones, and productive benthic habitats supporting filter-feeding organisms.
Fauna and Ecological Significance	Important habitat for threatened marine species including Australian snubfin dolphins. Coastal floodplains and wetlands support internationally significant waterbird populations.
Wildlife Density & Diversity	High - particularly seasonally. Large aggregations of waterbirds (>40,000 recorded in the Legune / Joseph Bonaparte Bay Important Bird Area). Diverse marine fish and invertebrate communities.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)

Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High presence of wild waterbirds (e.g., magpie geese, whistling-ducks, herons, egrets, shorebirds). No known intensive domestic poultry operations near the gulf.
Cultural and Social Context	
Cultural and Social features	Sea Country of multiple Indigenous groups including Miriuwung, Gajerrong, Doolboong, Wardenybeng, Gija and Balangarra peoples. Ongoing cultural, subsistence and custodial connections.
Key Stakeholders	Traditional Owners and Indigenous ranger groups; Parks Australia; Northern Land Council; Kimberley Land Council; NT and Commonwealth environmental agencies.
Local Government Authority	Remote NT regions including West Daly Regional Council (terrestrial areas); Commonwealth jurisdiction applies to marine park waters.
Conservation Management organisations	Parks Australia (marine park management); Indigenous ranger groups (e.g., Thamarrurr Rangers); NT and Commonwealth environment departments.
Land Use and Human Activity	
Key Land Use Types	Marine conservation, commercial and recreational fishing, adjacent pastoral grazing on floodplains, resource exploration in the broader region.
Human Use and Activity frequency	Low to moderate; highly seasonal and constrained by remoteness, tides and wet-season access limitations. Low-intensity recreational and charter fishing use; commercial fisheries operating under permit; traditional Indigenous use (hunting, fishing, cultural activities).
Risk and Management	
Site biosecurity implications	Large seasonal aggregations of wild waterbirds create a potential ecological interface for HPAI. Remoteness and absence of intensive poultry operations reduce spillover risk.
Management Implications	Ongoing coordination between government agencies and Indigenous ranger groups is essential. Management focuses on maintaining ecological integrity, managing fishing pressure, and monitoring impacts from adjacent pastoral land use.
Surveillance and Monitoring	Marine and coastal biodiversity monitoring through Parks Australia and Indigenous ranger programs. Waterbird surveys in Important Bird Areas contribute to national wild bird surveillance relevant to HPAI risk assessment.

Moyle Floodplains

Map:



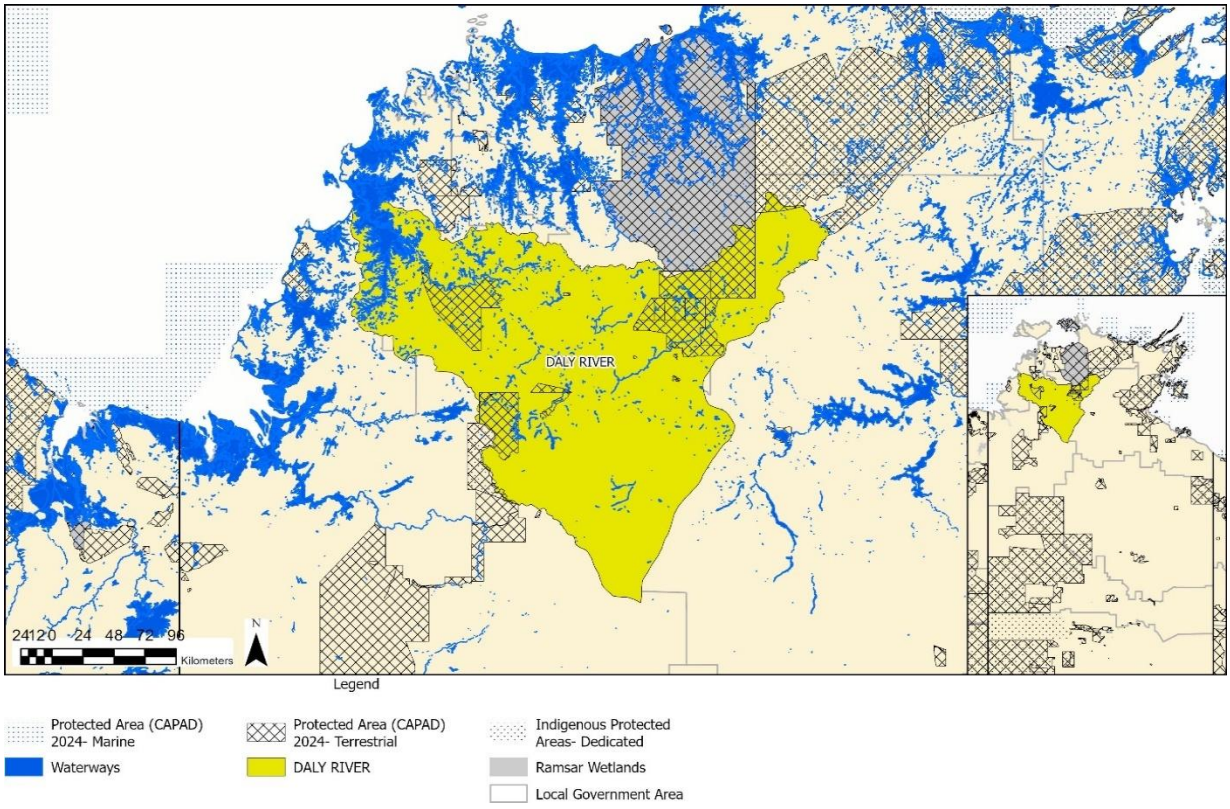
Key Detail:

Location	**Moyle River**
Site Overview	
Coordinates (approx.):	13°58′ S, 129°44′ E
Catchment Area	~7,085 km²
River Length	~133 km
Proximity to urban areas	Very remote from major urban centres. Closest community: Wadeye (~30 km from river mouth), one of the NT's largest remote Indigenous communities.
Ecological and Land Context	
Tenure and Access Description	The Moyle River, located in northwestern Northern Territory, flows through Aboriginal freehold land and discharges into the Timor Sea near Wadeye. Accessibility varies seasonally and is often restricted during the wet season. Access via 4WD access during dry season
Ecosystem Description	Forms part of the Darwin Coastal IBRA subregion and supports ecologically complex floodplain, wetland, and estuarine habitats critical for biodiversity. The floodplain supports 801 km² of grasslands, sedgelands, and swamps providing key habitat for waterbirds. Its estuarine and wetland systems also serve as vital nursery and refuge areas for aquatic species year-round.

Fauna and Ecological Significance	Provides critical habitat e.g., Important Bird Area (IBA). Seasonal aggregations and breeding colonies are characteristic, with many species relying on dry season refuges and nesting sites in swamps and woodlands.
Wildlife Density & Diversity	High - Seasonal congregations
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population
Cultural and Social Context	
Cultural and Social features	Part of the Marri-Jabin Indigenous Protected Area (71,200 ha), managed by Thamarrurr Rangers.
Key Stakeholders	Traditional Owner groups, Northern Land Council, ranger teams, freehold landowners, pastoralists, tourism operators, and NT Government agencies.
Local Government Authority	Victoria Daly Regional Council
Conservation Management organisations	Thamarrurr Rangers, Marri-Jabin, based in Wadeye.
Land Use and Human Activity	
Key Land Use Types	Marri-Jabin Indigenous Protected Area (IPA), Stage 1, Natural wetlands, low-intensity grazing
Human Use	Road (restricted) and boat access, traditional land use, ecological research. Minimal development within the catchment, no major infrastructure or commercial agriculture. Traditional land use (e.g.,, fishing, hunting, cultural practices). Remoteness and access constraints. Accessibility varies seasonally and is often restricted during the wet season.
Human Activity frequency	Seasonal or intermittent - Cultural visits, egg collection, commercial crocodile egg harvest via helicopter during wet season, recreational fishing (estuarine section), fieldwork.
Risk and Management	
Site biosecurity implications	Land use in the surrounding area is predominantly natural or marshland environments. No intensive agricultural or poultry operations within close proximity. Collaboration with community and Traditional Rangers in the area is essential.
Management Implications	Floodplain and wetland systems are vulnerable to climate change impacts, feral pest species, habitat loss and degradation.
Surveillance and Monitoring	Continued community-led monitoring, informed by local and traditional knowledge, is essential for early detection of disease risks and ecological changes. Ongoing surveillance for HPAI risk is warranted due to: Large seasonal waterbird aggregations. Potential flyway connections for migratory birds.

Daly River

Map:



Key Detail:

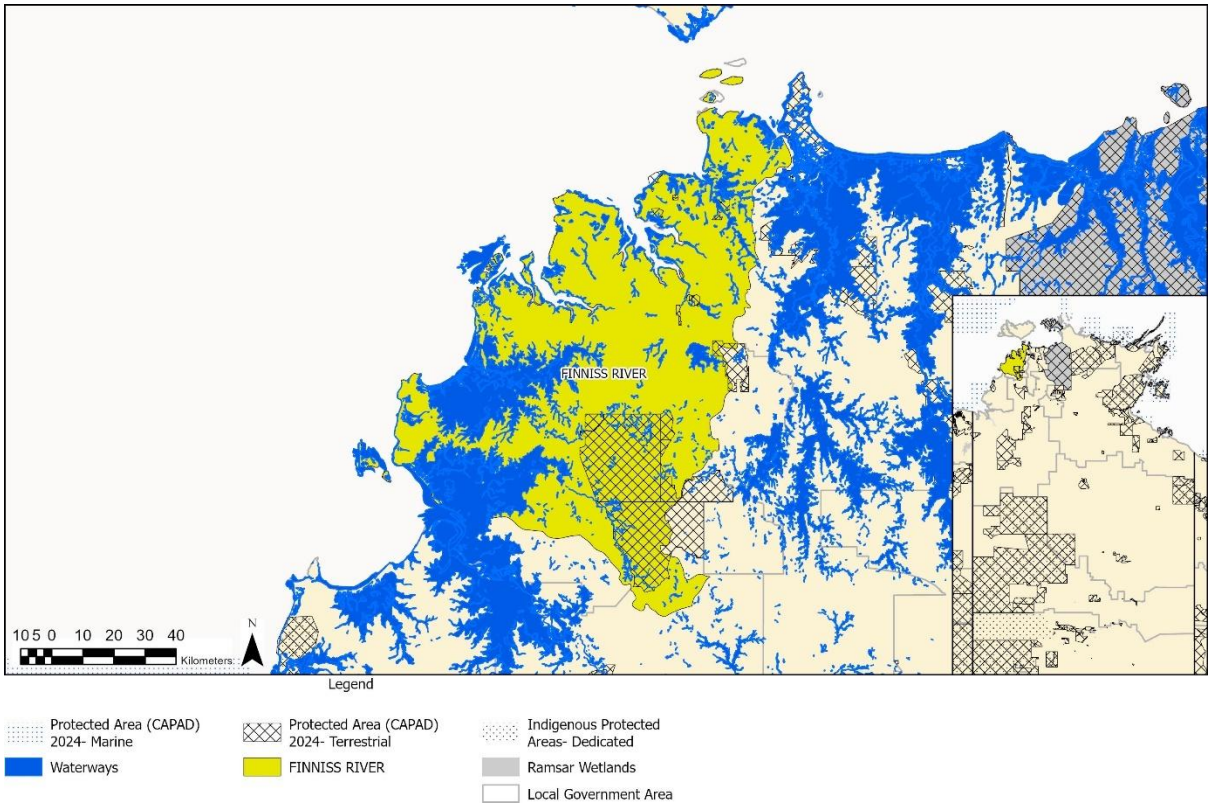
Location	Daly River
Site Overview	
Coordinates (approx.):	14.2°S, 129.6°E
Catchment Area	~ 52,600 km²
River Length	~150 km
Proximity to urban areas	Remote from major urban centres but high and frequent visitation to the Daly River and transit to Moyle region- eco-tourism, frequent ranger access, production and conservation lands Closest community: Nauiyu community and nearby Woolianna agriculture/tourism precinct
Ecological and Land Context	
Access and Tenure Description	Tenure across the catchment includes Aboriginal land, pastoral leases, freehold (small area) and conservation areas, with co-management arrangements in place in some locations. Infrastructure includes public roads, crossings, and river-based facilities- boat ramps, campgrounds, and tourist lodges. While land use remains largely natural or lightly modified in many areas, expanding agriculture and water extraction in region. Some communities and homesteads exist along the river.
Ecosystem Description	Remote-Seasonal Road access, active use by locals/tourists. Riverine, floodplain and estuarine wetland, perennial river. The Daly River forms part of the Daly River catchment, located in the Western Top End of the Northern Territory, the river drains a large area and flows northwest into the Timor Sea.

	The Daly River runs approximately 320 km from the confluence of the Katherine and Flora Rivers to the mouth catchment, covering parts of the Daly Basin and Sturt Plateau bioregions. It flows year-round, supported by strong baseflow from regional aquifers.
Key biological features	The Daly's floodplain is distinct from the Hyland Bay & Moyle system but also includes extensive seasonal inundation zones. Mangroves located in the lower estuary, provide key fish nursery habitats and shoreline protection. The lower Daly includes broad estuarine zones with seasonal variation in salinity and flow, supports high aquatic productivity. Within the IBRA framework, the river spans the Daly Basin and extends into the Victoria Bonaparte and Arnhem Plateau bioregions. Key features defining the subregion include lateritic soils, tropical savanna landscapes, and highly seasonal rainfall driving wet-season flooding. The catchment supports a mosaic of vegetation types, including open eucalypt woodland dominated by *Eucalyptus miniata* and *E. tetrodonta*, riparian forests, and seasonally inundated wetlands and sedgelands.
Fauna and Ecological Significance	Ecologically, the Daly supports diverse aquatic and terrestrial fauna. The region also supports notable populations of freshwater turtles, fish, and crocodiles. Many of these species hold cultural and subsistence value for Traditional Owners.
Wildlife Density & Diversity	High - Seasonal congregations
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population (≥1000 pairs).
Cultural and Social Context	
Cultural and Social features	Moderate - Supports wildlife and occasional cultural use.
Key Stakeholders	Daly River Key stakeholders include Traditional Owner groups, ranger teams, freehold landowners, pastoralists, tourism operators, and NT Government agencies.
Local Government Authority	Victoria Daly Regional Council
Conservation Management organisations	Malak Malak Rangers
Land Use and Human Activity	
Key Land Use Types	Agriculture, wetlands, tourism
Human Use and Activity frequency	Fishing, tourism, traditional land use, mining, boat-based recreation, public road access. Accessibility varies seasonally, with public roads and river crossings often impassable during the wet. Commercial crocodile egg harvest via helicopter during wet season increased activity during the dry season linked to tourism, research, and recreational fishing.
Risk and Management	
Site biosecurity implications	Land use surrounding the river remains a mix of natural vegetation, grazing land, and small-scale agriculture. There are no known large poultry or intensive livestock operations nearby. Community and ranger collaboration is critical for managing ecological and biosecurity risks, particularly given the area's ecological sensitivity
Management Implications	The Daly's wetlands and river systems are highly sensitive to changes. Invasive species such as feral pigs and weeds pose a threat to habitat integrity and bird breeding sites.

	Climate change impacts-especially increased rainfall variability-could affect ecological function.
Surveillance and Monitoring	Community-led monitoring supported by ranger groups and informed by Traditional Ecological Knowledge is vital. Continued surveillance for ecological change and emerging disease risks should focus on the post-wet season period, when bird concentrations peak. Collaborative efforts strengthen early detection and response capability. Ongoing surveillance for avian disease risks such as HPAI is warranted due to: - Significant seasonal aggregations of waterbirds and the potential for migratory connections. - Wetlands and floodplains are at risk from invasive species and altered water regimes driven by climate change and water extraction.

Finniss River

Map:



Key Detail:

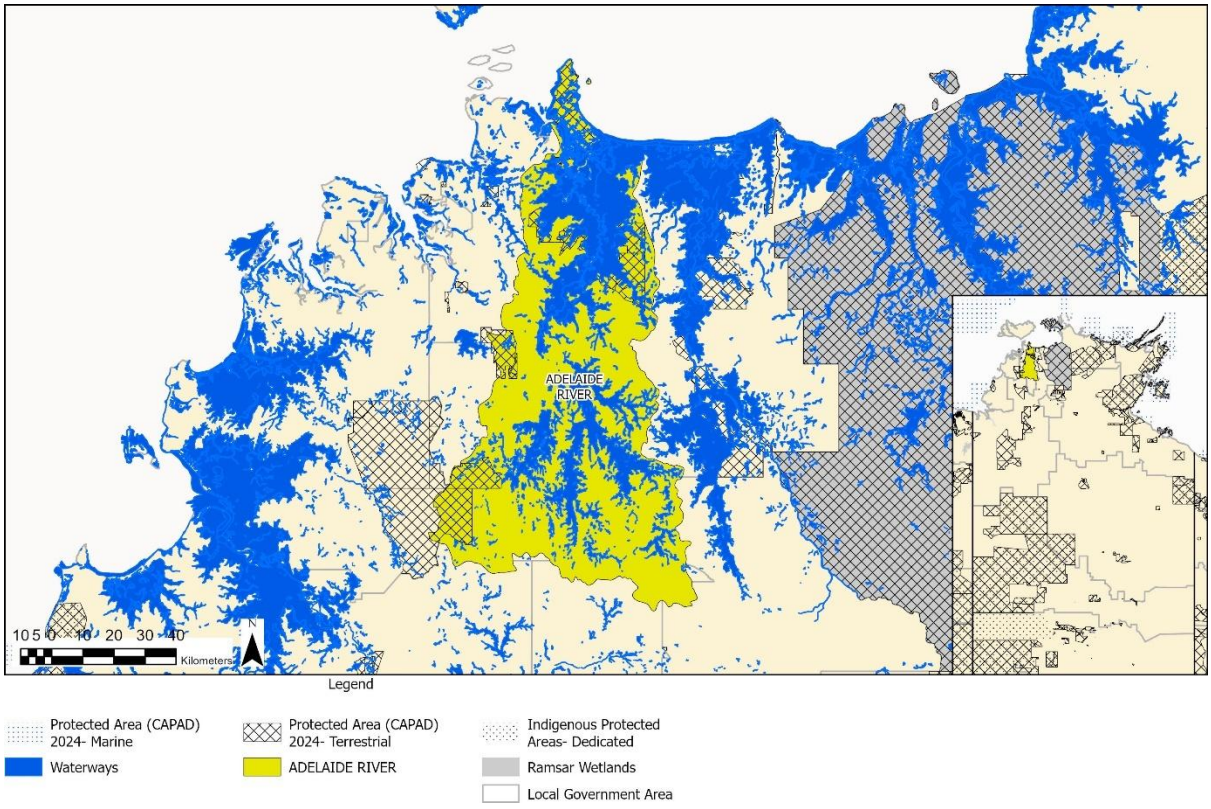
Location	**Finniss River**
Site Overview	
Coordinates (approx.):	12°52’S, 130°59’E
Catchment Area	The Finniss River catchment covers approximately 8,000 km², draining from the Darwin Coastal bioregion into the Timor Sea. The catchment includes Darwin and includes Litchfield NP.
River Length	Approximately 150 km from its headwaters near Litchfield National Park to the river mouth near Fog Bay.
Proximity to urban areas	Relatively close to Darwin but much of the catchment is remote with seasonal road access, active use by locals/tourists. Closest community: Dundee Beach (rural) and Bachelor
Ecological and Land Context	
Access and Tenure Description	The river corridor includes freehold, pastoral lease, and public land, with sections managed under Indigenous Land Use Agreements (ILUAs) and conservation tenure. Road access is seasonal and primarily unsealed, with several informal tracks leading to key wetland areas. Public access points are often not signposted, and road conditions vary significantly with rainfall. There are no formal visitor facilities in the floodplain, although camping infrastructure is occasionally established. Access is or controlled in areas with cultural sensitivity or conservation significance. Pastoral tracks, fences, bores, and some remote monitoring stations. There is no intensive development within the floodplain itself.
Ecosystem Description	Estuarine-freshwater wetlands, mangroves, seasonal floodplains.

	The Finniss River flows through a mixed landscape of Eucalyptus open forest, seasonal floodplains, and estuarine-freshwater interfaces. It lies within the Darwin Coastal IBRA subregion.
Key biological features	The Finniss River system hosts a diverse range of ecological habitats, shaped by seasonal monsoonal flooding and prolonged dry periods. The floodplain wetlands, ephemeral billabongs, and estuarine margins are central to the site's ecological function. These flood-dependent ecosystems are dominated by aquatic macrophytes such as Nymphaea, Eleocharis, and Oryza species, which proliferate during the wet season, providing important food and cover for waterbirds and aquatic fauna. The surrounding woodland and grassland habitats are characterised by Eucalyptus open forests with an understory of native grasses and sedges, contributing to habitat heterogeneity. The ecological productivity of the site increases significantly during the wet season (December to April), when extensive flooding recharges surface water systems and drives nutrient exchange. These seasonal dynamics are essential for sustaining large aggregations of waterbirds, fish spawning cycles, and amphibian activity. Shallow floodplain wetlands function as breeding and feeding grounds for key species, and their extent and duration are critical in determining reproductive success and survival rates, particularly for iconic species such as the Magpie Goose (*Anseranas semipalmata*), whose population dynamics are closely tied to wetland availability.
Fauna and Ecological Significance	The Finniss River wetlands are recognised as important habitat for a broad assemblage of waterbirds, many of which are considered high-risk species for avian influenza transmission due to their migratory behaviour and gregarious roosting patterns. These birds rely on shallow, nutrient-rich wetlands for feeding, nesting, and moulting, and often congregate in high densities during and immediately after the wet season. The estuarine and freshwater interface also provides foraging grounds for migratory shorebirds, such as the common greenshank, sharp-tailed sandpiper and Latham's snipe. All of which are protected under international migratory bird agreements (e.g., JAMBA, CAMBA, ROKAMBA). In addition to avifauna, the floodplain supports native fish (e.g., Leiopotherapon unicolor), amphibians, and reptiles, as well as feral species such as pigs and water buffalo that may disturb nesting habitat and contribute to pathogen spread through wetland degradation.
Wildlife Density & Diversity	High - Seasonal congregations
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population (≥1000 pairs).
Cultural and Social Context	
Cultural and Social features	The Finniss River Traditional Owners, include the Wadjigan, Warai, and Kungarakan peoples. Magpie Geese are not only ecologically and culturally significant, traditionally harvested for food during specific seasons in accordance with traditional knowledge and local management practices. Customary use of the floodplains includes hunting, fishing, and the gathering of plant materials for food and medicine. Seasonal movement across Country continues today, supported by Indigenous Ranger programs and community access rights. Sacred sites are present throughout the river corridor, and appropriate cultural protocols must be observed in any research, surveillance, or management activities. Recognition and inclusion of Indigenous land management perspectives, particularly Traditional Ecological Knowledge (TEK), are vital for developing effective and culturally respectful biosecurity responses.
Key Stakeholders	Key partners include Traditional Owner groups and Indigenous Ranger programs (e.g., Wadjigan Rangers), NT Parks and Wildlife, the Northern Land Council, local pastoral leaseholders, recreational hunting groups, and conservation NGOs. Community awareness campaigns focused on early signs of avian disease, biosecurity best practices, and reporting pathways will be essential, particularly during the wet season when access and activity peak. Training for Indigenous Rangers in wildlife health monitoring, sample collection, and field hygiene should be supported through partnerships with NT

	Government biosecurity units and research institutions. Existing networks (e.g., Landcare, birdwatching groups) can also be leveraged for citizen science-based surveillance and risk communication.
Local Government Authority	Litchfield Municipality
Conservation Management organisations	Bulgul Rangers
Land Use and Human Activity	
Key Land Use Types	Natural vegetation, mixed farming
Human Use and Activity frequency	Moderate and regular - Use by rangers, locals, and researchers. Recreation, hunting, traditional land use, birdwatching, accessible roads and public areas. Moderate use- recreational hunting, fishing, and camping. Customary access by Traditional Owners. In the dry season, parts of the river are accessible via 4WD tracks and bush roads. Boat access is possible near the estuary and Fog Bay. Commercial crocodile egg harvest via helicopter during wet season
Risk and Management	
Site biosecurity implications	The site presents a biosecurity risk due to the seasonal density of waterbirds, habitat complexity, and human activity. Precautionary biosecurity should be implemented, including: • Decontamination protocols for boots, boats, and field equipment • Suspend the waterfowl recreational hunting season • Restriction of access to known breeding sites during high-risk periods • Signage at access points about disease reporting and hygiene • Monitoring of feral animal activity and possible control programs • Community engagement to report unusual bird deaths or illness An emphasis should be placed on empowering local landholders and Traditional Owners with the tools and knowledge to implement practical, context-sensitive biosecurity measures in the field.
Management Implications	Management must balance conservation priorities, cultural rights, and disease risk mitigation. There is a need to strengthen coordination between biosecurity agencies, Indigenous ranger groups, and conservation bodies to ensure early detection and a rapid, locally appropriate response to any HPAI outbreak. Access planning, seasonal closures, and adaptive land-use strategies should be considered. Investment in remote surveillance, training, and infrastructure support (such as mobile field kits and communications
Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in habitat condition. Ongoing surveillance for HPAI (Highly Pathogenic Avian Influenza) risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Adelaide River

Map:



Key Detail:

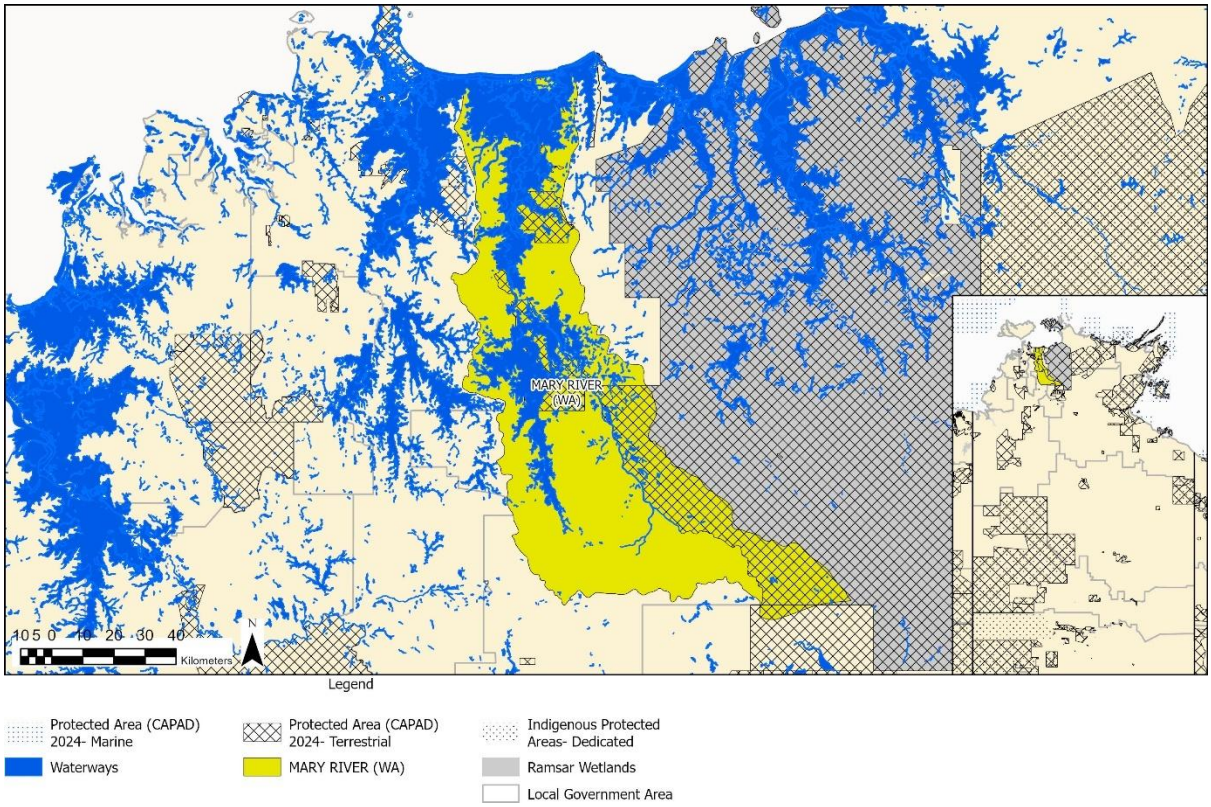
Location	Adelaide River
Site Overview	
Coordinates (approx.):	~ 13°10'S, 131°10'E
Catchment Area	Approx. 7,640 km², encompassing all creeks and tributaries feeding into the Adelaide River including Margaret River, Burrell Creek, Howley Creek, and others.
River Length	~ 238 km from headwaters in Litchfield National Park to the river mouth at Adam Bay
Proximity to urban areas	Relatively close to Darwin - Near highways or peri-urban areas. Closest community: Marrakai, Humpty Doo (rural areas)
Ecological and Land Context	
Access and Tenure Description	Tenure across the Adelaide River floodplain is mixed. Conservation reserves such as Fogg Dam and Harrison Dam protect key wetlands and bird habitats. Surrounding lands are held under a combination of pastoral leases, Aboriginal freehold title, and rural residential or agricultural allotments. Traditional Owners retain strong connections to the area, with Indigenous Ranger groups involved in land management and species monitoring. Unsealed roads and tracks that become seasonally inundated, informal boat ramps and river launch points. The town of Adelaide River provides road crossing infrastructure (Stuart Highway) which connects to other major roads. Conservation reserves (including Fogg Dam, Harrison Dam) have visitor facilities, observation platforms, and signage in some areas, but many wetlands lack formal entry points, interpretative signage, or biosecurity infrastructure. Road and track access and infrastructure associated with dams (Fogg and Harrison Dam), conservation reserves, tourism enterprises, and some pastoral infrastructure.
Ecosystem Description	Freshwater river, floodplain, estuarine wetland, monsoon rainforest, Eucalyptus woodland.

	The Adelaide River, located within the Pine Creek IBRA subregion of the Northern Territory, flows through a landscape shaped by the Pine Creek Orogen- the river supports seasonally inundated floodplains, freshwater wetlands, and riparian forest corridors. The region's monsoonal climate drives ecological productivity, with annual rainfall ranging from 1000 mm inland to 1600 mm near the coast, sustaining Eucalyptus woodlands, tall open forests, and patches of monsoon rainforest along river margins.
Key biological features	The Adelaide River floodplain is a highly dynamic wetland system shaped by annual monsoonal flooding, which drives ecological productivity and habitat diversity. The river and its associated wetlands support a mosaic of habitats including seasonally inundated grasslands, Melaleuca swamps, permanent lagoons, and riparian forests. These features provide critical breeding, foraging, and refuge areas for a wide range of species. Flood pulses sustain aquatic vegetation, support nutrient cycling, and maintain the hydrological connectivity essential for fish migration, bird movements, and invertebrate life cycles. Seasonal inundation patterns shape species distribution and behavior, making the Adelaide River system particularly important for waterbirds and wetland-dependent fauna in both wet and dry seasons
Fauna and Ecological Significance	The Adelaide River floodplains are globally and nationally significant for waterbirds. They regularly support large populations of Magpie geese and other species. In addition to avifauna, the river supports important aquatic fauna including native fish and reptiles. Saltwater crocodiles are abundant in lower reaches, while freshwater crocodiles are also present. The location is key in ecological connectivity, providing nursery habitats, the presence of large congregations of waterbirds, their nesting colonies (notably for Magpie geese), and significant predator-prey biomass (e.g., high densities of rats and pythons in some wetlands) contribute to the ecological distinctiveness and potential disease risk of the Adelaide.
Wildlife Density & Diversity	High - Seasonal congregations
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa, olive hymenache)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population (≥1000 pairs).
Cultural and Social Context	
Cultural and Social features	Traditional Owners include the Warray and Kungarakan peoples. Many waterbird species, especially Magpie geese, are embedded in customary practices both for subsistence and ceremonial purposes. Beyond traditional custodians pastoralists, tourism operators, anglers, birdwatchers, local communities (townships such as Adelaide River), and conservation researchers are significant stakeholders. Tourism is common in the lower river and around conservation reserves and Fogg Dam/Harrison Dam, which also serve as sites of education and research. Access for recreation, hunting, fishing is seasonally important
Key Stakeholders	Key stakeholders in the Adelaide River catchment include Traditional Owner groups (Warray, Kungarakan, and others), Indigenous Ranger Programs, Northern Land Council, Department of Lands, Planning and Environment (NT), Parks and Wildlife, conservation NGOs, local pastoralists and landholders, tourism operators, and supporting scientific institutions such as Charles Darwin University and CSIRO. Users dependent on the river for livelihood and culture span sectors from fishing, tourism, customary harvest, agriculture, and water supply
Local Government Authority	Coomalie Shire Council
Conservation Management organisations	Parks and Wildlife Commission
Land Use and Human Activity	
Key Land Use Types	Mixed agriculture, peri-urban, floodplain
Human Use and Activity frequency	High activity- public access via roads and cruises, boat ramps, traditional land use, highway access.

	Commercial crocodile egg harvest via helicopter during wet season. Diverse and seasonal recreational activities. During the dry season access is via roads and tracks, during the wet season many roads become impassable. Customary harvest by Indigenous communities. Tourism operators common particularly around estuarine zones and reserves.
Risk and Management	
Site biosecurity implications	Key biosecurity measures may be considered for this site e.g: • disinfection for boats, footwear, equipment used near wetlands, • restricting access to critical nesting or roosting sites during high-risk periods, • strong community engagement for reporting bird mortality • signage at all access points, • regular monitoring of feral animal activity, • ensuring domestic poultry or birds kept in adjacent lands are biosecure.
Management Implications	Integrating Traditional Ecological Knowledge alongside scientific monitoring will be essential for identifying changes in bird behaviour or mortality.
Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in habitat condition. Ongoing surveillance for HPAI (Highly Pathogenic Avian Influenza) risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Mary River

Map:



Key Detail:

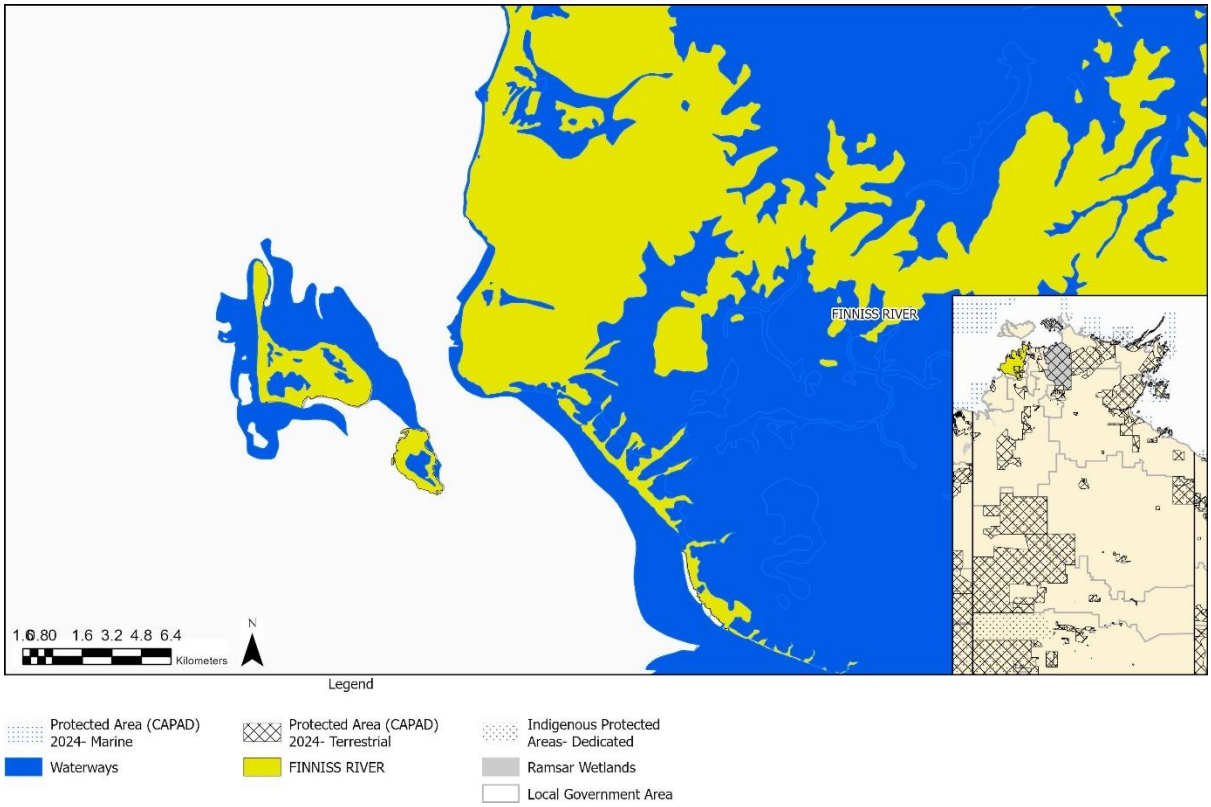
Location	**Mary River**
Site Overview	
Coordinates (approx.):	12.7°S, 131.6°E
Catchment Area	8,000 KM^2
River Length	Approximately 225 km from the Arnhem Plateau to Chambers Bay
Proximity to urban areas	Relatively close to Darwin - Near highways or peri-urban areas. Closest community: Marrakai (rural area)
Ecological and Land Context	
Access and Tenure Description	The majority of the land is Aboriginal freehold, pastoral leasehold, or conservation estate, including Mary River National Park. Infrastructure includes sealed and unsealed roads, floodplain crossings, boat ramps, and tourism facilities within national parks. Permanent infrastructure is minimal outside of homesteads and park-managed areas.
Ecosystem Description	Extensive freshwater river and floodplain, Eucalyptus and Melaleuca woodlands. The river lies within the Darwin Coastal IBRA bioregion, specifically the Mary River- Alligator Rivers subregion. Key landscape features include seasonally flooded blacksoil plains, coastal mangroves, and upland woodlands on lateritic and alluvial soils. The climate is tropical monsoonal, with rainfall concentrated between November and April.

	The Mary River is one of the largest floodplain systems in northern Australia, Mary River flows northward from the Arnhem Plateau into Chambers Bay on the Van Diemen Gulf. The floodplain expands dramatically during the wet season, supporting extensive wetlands, billabongs, and seasonal waterbird habitats. It is ecologically significant for both resident and migratory species and is partly protected within the Mary River National Park and surrounding conservation areas.
Key biological features	The Mary River region supports a diverse and ecologically rich landscape shaped by extreme wet-dry seasonal cycles. Key biological features include: • Floodplain wetlands, including permanent and seasonal billabongs, sedgelands, and open water lagoons. • Significant waterbird breeding and feeding areas, supporting large aggregations of Magpie geese, brolgas, egrets, ibis, and ducks during and after the wet season. • Important habitat for migratory shorebirds, including species listed under international agreements (e.g., JAMBA, CAMBA, ROKAMBA). • Aquatic biodiversity, including native fish, freshwater turtles, and estuarine crocodiles. • High productivity during the wet season, which drives nutrient cycling and supports food webs.
Fauna and Ecological Significance	The Mary River floodplain is of high conservation value, supporting habitat for 12 bird species listed under the EPBC Act and 77 marine and migratory species. It is also considered one of the Northern Territory's most important breeding sites for the Magpie goose. The area is directly adjacent to the World Heritage-listed Kakadu National Park, Ramsar-listed wetlands, and the Mary River Coastal Floodplain Site of Conservation Significance. Ecologically it supports diverse aquatic habitats including floodplain wetlands, paperbark swamps, and permanent billabongs. These habitats provide critical feeding and nesting areas for a wide range of species.
Wildlife Density & Diversity	Extremely high - Major aggregations and species diversity.
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High - Large wild Anseriformes population (≥1000 pairs).
Cultural and Social Context	
Cultural and Social features	Culturally, the river holds strong significance for Traditional Owners, who maintain customary rights and practices across the floodplain. Songlines, sacred sites, and traditional knowledge are deeply tied to the river's seasonal dynamics. Community ranger programs are active in conservation, fire, and feral animal management.
Key Stakeholders	Key stakeholders include Traditional Owners and ranger groups, NT Parks and Wildlife, pastoral leaseholders, tourism operators, and conservation NGOs. Land management is often collaborative.
Local Government Authority	Victoria Daly & Coomalie SC
Conservation Management organisations	Parks and Wildlife Commission
Land Use and Human Activity	
Key Land Use Types	Wetlands, grazing, ecotourism
Human Use/ Activity frequency	High activity- Tourism, pastoral properties, traditional land use, wildlife control, pest monitoring, fishing, 4WD and helicopter access. Varies seasonally, roads are generally passable during the dry season, but access is low during the wet.

	High and frequent - eco-tourism, frequent ranger access Commercial crocodile egg harvest via helicopter during wet season
Risk and Management	
Site biosecurity implications	• Surrounding land use is predominantly natural or managed for low-intensity grazing, • No known large-scale poultry or intensive livestock operations in proximity. • Collaboration with Traditional Owners and ranger programs is key to managing biosecurity risks.
Management Implications	The Mary River floodplain is highly vulnerable to altered hydrology, particularly due to sea-level rise and saltwater intrusion, which have already caused "wetland dieback" in some areas. Invasive species, such as feral pigs and para grass, threaten habitat structure and waterbird breeding. Ongoing pressures from grazing and unsuitable fire regimes also pose risks.
Surveillance and Monitoring	Community-led ecological monitoring is essential, particularly during and after the wet season when bird activity peaks. Integrating Traditional Ecological Knowledge enhances understanding of ecosystem trends and supports early detection of disease outbreaks and ecological shifts. Surveillance efforts should prioritise wetlands with high bird densities and migratory species presence. Ongoing surveillance is recommended due to the presence of large seasonal bird aggregations and potential connections to international migratory flyways.

North Peron Island

Map:



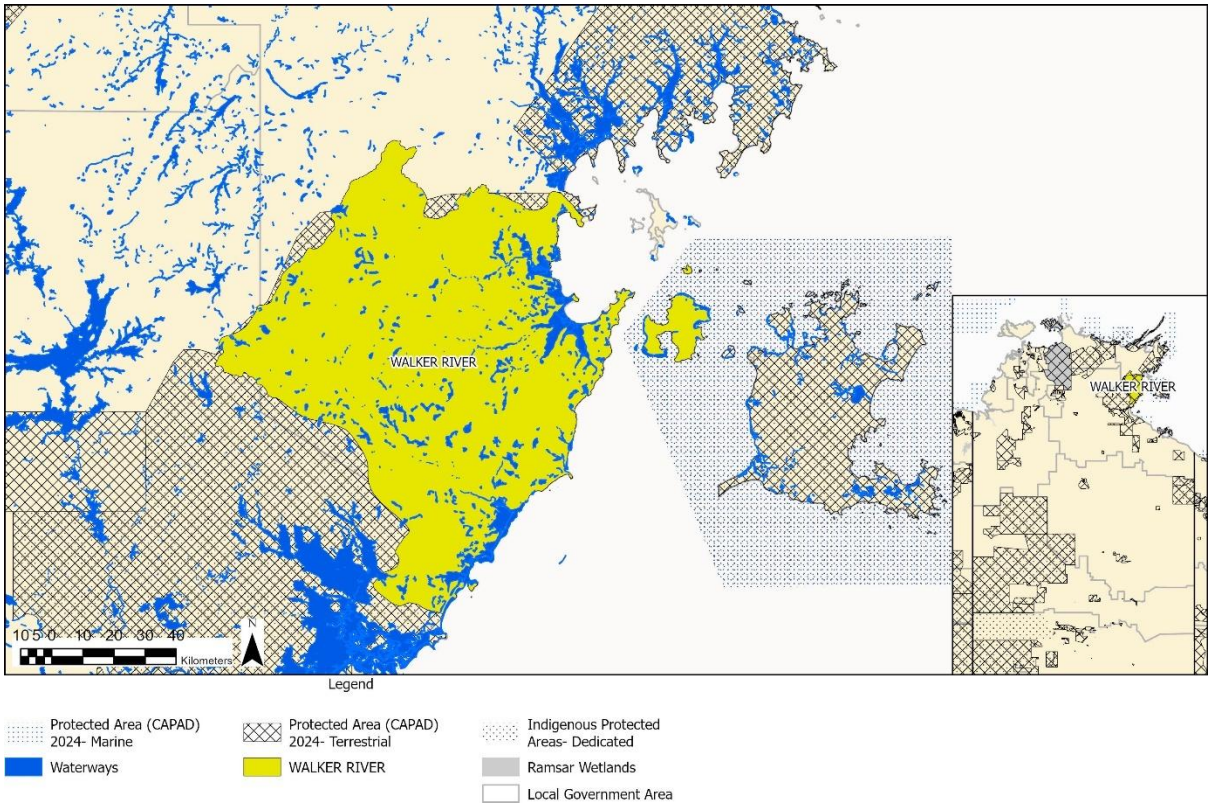
Key Detail:

Location	North Peron Island
Site Overview	
Coordinates (approx.):	~ -13.1926° S, 130.0511° E (North Peron Island centre).
Catchment Area	Coastal wetland and intertidal floodplain connected to the Finniss River catchment, flowing into Fog Bay and Anson Bay. The Finniss River floodplain has been identified as a wetland of high conservation significance.
Proximity to urban areas	Remote region, nearest larger urban centre is Darwin (~65+ km northeast). Access is generally by boat via Channel Point Coastal Reserve or from Dundee Beach.
Ecological and Land Context	
Access and Tenure Description	North Peron Island is uninhabited, forming part of Delissaville/Wagait/Larrakia Aboriginal land trust and located adjacent to Important Bird Area (IBA) coastal wetlands of Fog Bay and the Finniss River floodplain. Access is controlled via permits under the Aboriginal Land Rights Act. Access by boat from Channel Point Coastal Reserve (permit required) or from Dundee Beach. No infrastructure on the island itself.
Ecosystem Description	Low-lying sand and mangrove-influenced island within tidal marine and coastal wetland systems. Nearby Finniss River floodplain consists of seasonally inundated paperbark and sedge swamps, extensive intertidal mudflats, and mangrove channels.
Key biological features	Supports seabird rookeries (notably Australian pelican) and lies adjacent to internationally significant waterbird habitats in Fog Bay and Finniss River wetlands. Intertidal zones have high productivity for shorebirds and waders.
Fauna and Ecological Significance	Peron Islands serve as important waterbird and seabird habitat. Pelican colony on North Peron Island is possibly of national importance, and the floodplain supports large seasonal aggregations of waterbirds (magpie geese, egrets, shorebirds). Finniss River- Fog Bay Wetlands: Identified as a

	nationally and internationally significant bird habitat - supporting >1% of global populations of species such as magpie geese, pied herons and several migratory shorebirds (e.g., great knots, grey-tailed tattlers) - extending into adjacent intertidal mudflats and islands. Bird Diversity: The broader region regularly supports tens of thousands of waterbirds and shorebirds, indicating high biodiversity and ecological productivity, making it a priority for environmental and avian disease surveillance.
Wildlife Density & Diversity	High waterbird and shorebird density in adjacent wetlands; studies have recorded thousands of waterbirds in this region (e.g., counts up to ~22,000 in wetland surveys). The IBA supports broad waterbird diversity.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Large wild waterbird populations including terns, pelicans, ibis, plumed and wandering whistling-ducks, grey teals and other Anseriformes and shorebirds. Domestic poultry operations are not documented in immediate vicinity.
Cultural and Social Context	
Cultural and Social features	Islands and surrounding coastal areas are Aboriginal land (Delissaville/Wagait/Larrakia Trust) with traditional cultural values. Access is by permit and cultural custodianship is central.
Key Stakeholders	Delissaville/Wagait/Larrakia traditional owners, Northern Land Council, Aboriginal ranger and community groups, NT Parks and Wildlife (via access management systems).
Local Government Authority	The island group is within Rakula locality under NT jurisdiction; adjacent lands are managed through Aboriginal Land Trust arrangements and permit systems.
Conservation Management organisations	Traditional owner groups, NT environmental agencies, and national bird conservation groups engage in site stewardship and monitoring.
Land Use and Human Activity	
Key Land Use Types	Conservation and wildlife habitat (coastal intertidal and island ecosystem), low-impact recreational fishing, controlled access tourism.
Human Use and Activity frequency	Low to moderate, highly seasonal (dry season boating and fishing) and controlled via access permits. Permitted access for fishing, boating, birdwatching with permit from Aboriginal land managers. No permanent settlement.
Risk and Management	
Site biosecurity implications	High abundance of wild waterbirds and seabirds may create interfaces relevant to avian influenza surveillance, especially during migratory and breeding seasons, absence of local intensive poultry reduces domestic spillover risk.
Management Implications	Traditional owner land tenure and permit systems guide access and use, conservation considerations emphasise protection of bird colonies and wetland habitats.
Surveillance and Monitoring	Waterbird monitoring occurs in portions of Fog Bay and Finniss River floodplain as part of Important Bird Area tracking, broader national wild bird surveillance programs include such high-value habitats.

Rose River (Walker River Catchment)

***Map*:**



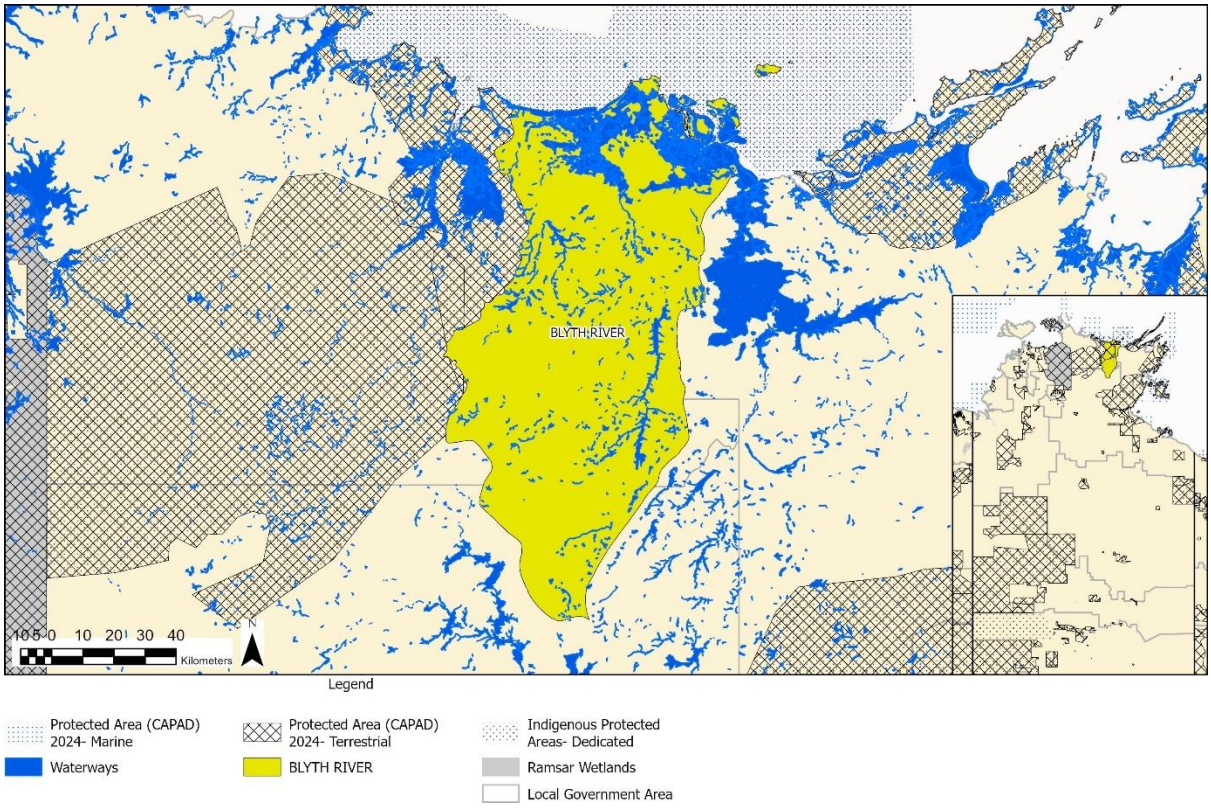
Key Detail/ Summary:

Location	Rose River (Walker River Catchment)
Site Overview	
Coordinates (approx.):	~14.25° S, 135.75° E
Catchment Area	Part of the broader Gulf of Carpentaria drainage division; associated with the Walker River catchment and surrounding coastal floodplains.
Proximity to urban areas	Remote; the Aboriginal community of Numbulwar is located at the river mouth.
Ecological and Land Context	
Access and Tenure Description	Located on Aboriginal land within Arnhem Land, under native title and community governance. The river and adjacent coastal plains are largely undeveloped and culturally managed. Road access to Numbulwar, community airstrip, boat access to the river and coastal areas.
Ecosystem Description	Tropical coastal riverine and estuarine ecosystem including mangroves, tidal channels, salt flats, mudflats and adjacent freshwater and brackish wetlands. Strong wet-dry seasonal dynamics.
Key biological features	Estuarine habitats supporting fish nurseries, mangrove communities, tidal wetlands and seasonally inundated floodplains.
Fauna and Ecological Significance	Provides habitat for waterbirds, shorebirds and estuarine fauna typical of the Gulf of Carpentaria region. Likely used by migratory species along coastal flyways.
Wildlife Density & Diversity	Moderate to high, particularly for waterbirds and shorebirds during wet season and migration periods.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High presence of wild waterbirds including ducks, herons, egrets and shorebirds. No known intensive domestic poultry operations in close proximity.
Cultural and Social Context	
Cultural and Social features	The Rose River area is culturally significant to Traditional Owners and the Numbulwar community. The river and surrounding lands are used for customary fishing, hunting and cultural practices.

Key Stakeholders	Traditional Owners, Numbulwar community organisations, local Aboriginal ranger groups, regional councils and Northern Land Council.
Local Government Authority	Roper Gulf Regional Council
Conservation Management organisations	Community land managers, Indigenous ranger programs, and Northern Territory environmental agencies.
Land Use and Human Activity	
Key Land Use Types	Indigenous land management, coastal wetlands, small-scale grazing in surrounding regions, subsistence and recreational fishing.
Human Use and Activity frequency	Moderate within the local community; low external visitation; seasonal variation influenced by wet-season access constraints. Largely Community-based use.
Risk and Management	
Site biosecurity implications	Coastal wetlands with regular waterbird use present potential interfaces for avian influenza circulation in wild birds.
Management Implications	Land and water management guided by Traditional Owners and community governance. Protection of wetland and estuarine health is central to maintaining biodiversity and cultural values.
Surveillance and Monitoring	Opportunistic waterbird observations possible. Ideal location for HPAI surveillance.

Blyth River

***Map*:**



Key Detail:

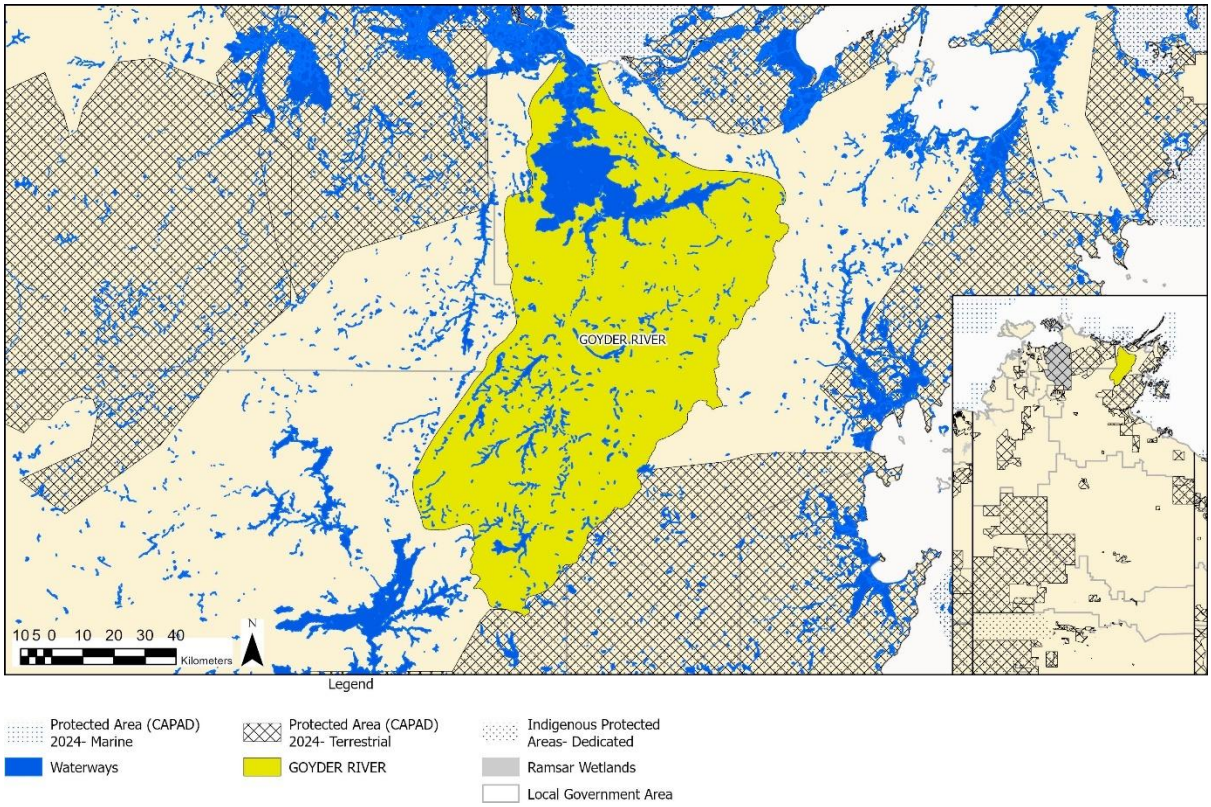
Location	**Blyth River**
Site Overview	
Coordinates (approx.):	-12° 03′ S, ~ 134° 35′ E
Catchment Area	Approximately 9,219 km²
River Length	~ 175 km from headwaters to the Timor Sea
Proximity to urban areas	Extremely remote from urban centres – dry season only unpaved road access Closest community: Maningrida
Ecological and Land Context	
Access and Tenure Description	Land tenure in the Blyth catchment is predominantly Aboriginal freehold and traditional ownership. The floodplains of Blyth and Cadell lie on traditionally owned lands, managed under Indigenous governance. Compared to more developed rivers, the Blyth retains relatively low infrastructure and human alteration, enhancing its ecological integrity. Indigenous land management is central to ecological stewardship. Road and track infrastructure is sparse. Few formal roads penetrate the floodplain. Access may exist via river launches, small craft, or walking/bush tracks. There is minimal signage, visitor infrastructure, or formal amenities. There is negligible infrastructure in the core wetland zones. Any infrastructure is likely to ranger outposts, occasional airstrips, small shelters, or remote monitoring stations.
Ecosystem Description	Estuarine wetlands, mangroves and floodplain interface. The Blyth River lies within the Arnhem Coast IBRA subregion of northern Australia. The catchment traverses low-lying coastal plains (< 50 m elevation), underlain by sandy soils derived from the Arafura and Pine Creek basins, with extensive floodplains and a complex estuarine-coastal interface. Upstream reaches may interface with sandstone escarpments

	or higher ground characteristic of the Arnhem Plateau, ecological interest is in the floodplain-estuary continuum and wetland connectivity.
Key biological features	The Blyth River's seasonal flooding regime underpins a dynamic wetland network of billabongs, shallow inundated grasslands, swamps, channels, and riparian corridors. In wet seasons, vast expanses of floodplain become inundated, promoting the growth of aquatic macrophytes, sedges, and emergent vegetation that provide food and cover for aquatic fauna and waterbirds. The river's hydrological connectivity between main channel, lagoons, floodplain depressions, and estuarine zones is critical for fish migration, dispersal of invertebrates, nutrient transport, and maintenance of wetland productivity. Transition zones between fresh and brackish waters form rich ecological zones. the Blyth system supports strong habitat continuity across spatial scales, making it resilient to seasonal extremes and sustaining species that depend on wet-dry cycles.
Fauna and Ecological Significance	The Blyth and Cadell floodplains have been recognised as an Important Bird Area (IBA) with populations of species such as pied herons, brolgas, great knots, and pied oystercatchers. The floodplain and adjacent mudflats also host large numbers of Magpie geese, whistling ducks, egrets, shorebirds, and migratory waterfowl. Fish diversity is high in the Blyth system, including species adapted to both freshwater and estuarine conditions. Riparian and floodplain habitats additionally support reptiles, amphibians, and mammals adapted to inundation cycling, such as water monitors, snake species, and small marsupials. The relatively undisturbed nature of the Blyth system enhances its value as a biodiversity stronghold in Arnhem Land.
Wildlife Density & Diversity	Moderate - Year-round presence but no large groups
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Moderate - wild Anseriformes population
Cultural and Social Context	
Cultural and Social features	The Blyth River floodplain is integral to the lives of Traditional Owners in Arnhem Land. Because the area is remote and less developed, social pressure is lower than in more accessible river systems. Nonetheless, the river plays a role in local livelihoods, cultural tourism, and as a reference landscape for Indigenous management. Maintaining cultural protocols, respect for sacred areas, and community engagement are essential for preparedness planning.
Key Stakeholders	Traditional Owner groups and Indigenous Ranger programs managing the Blyth-Cadell lands. Supporting actors include Northern Land Council, Territory Government (e.g., Department of Environment), NGOs focused on wetlands and bird conservation, researchers/universities, and local communities (though small) that may occasionally engage in fishing or traverse the floodplain for access or customary use.
Local Government Authority	Unincorporated / Native Title
Conservation Management organisations	Djelk IPA Rangers
Land Use and Human Activity	
Key Land Use Types	Remote, traditional lands, natural wetland systems
Human Use and Activity frequency	Traditional land use, tourism, remote access only via boat, charter, helicopter, Indigenous ranger programs. Seasonal or intermittent - Cultural visits, egg collection, fieldwork. Fishing, cultural visitation, and Indigenous seasonal use dominate. The river is remote, with low human population density, minimal tourism, and recreational infrastructure. Access is via bush tracks, rivers, or seasonal pathways, during the dry season, certain floodplain areas may be accessible by 4WD, but wet season flooding restricts movement widely. Commercial crocodile egg harvest via helicopter during wet season

Risk and Management	
Site biosecurity implications	Given the ecological connectivity, bird aggregations, and human-wildlife interface access control during high-risk periods (e.g., breeding season, large bird congregations) should be considered. Mortality reporting systems and community-based surveillance (through ranger networks) should be established. Monitoring of feral animal presence and movement is warranted. Any movement of equipment between wetlands must incorporate biosecurity hygiene. Remote locations may require self-contained kits and emergency protocols for sample preservation and transport.
Management Implications	Engagement of Indigenous land managers is crucial. Proactive preparation for disease events is a priority. Integrating surveillance and ecological monitoring with cultural management aims can strengthen resilience. Buffer zones, seasonal restrictions, and adaptive strategies may be needed if disease risk intensifies.
Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in habitat condition. Ongoing surveillance for HPAI (Highly Pathogenic Avian Influenza) risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Goyder River

Map:



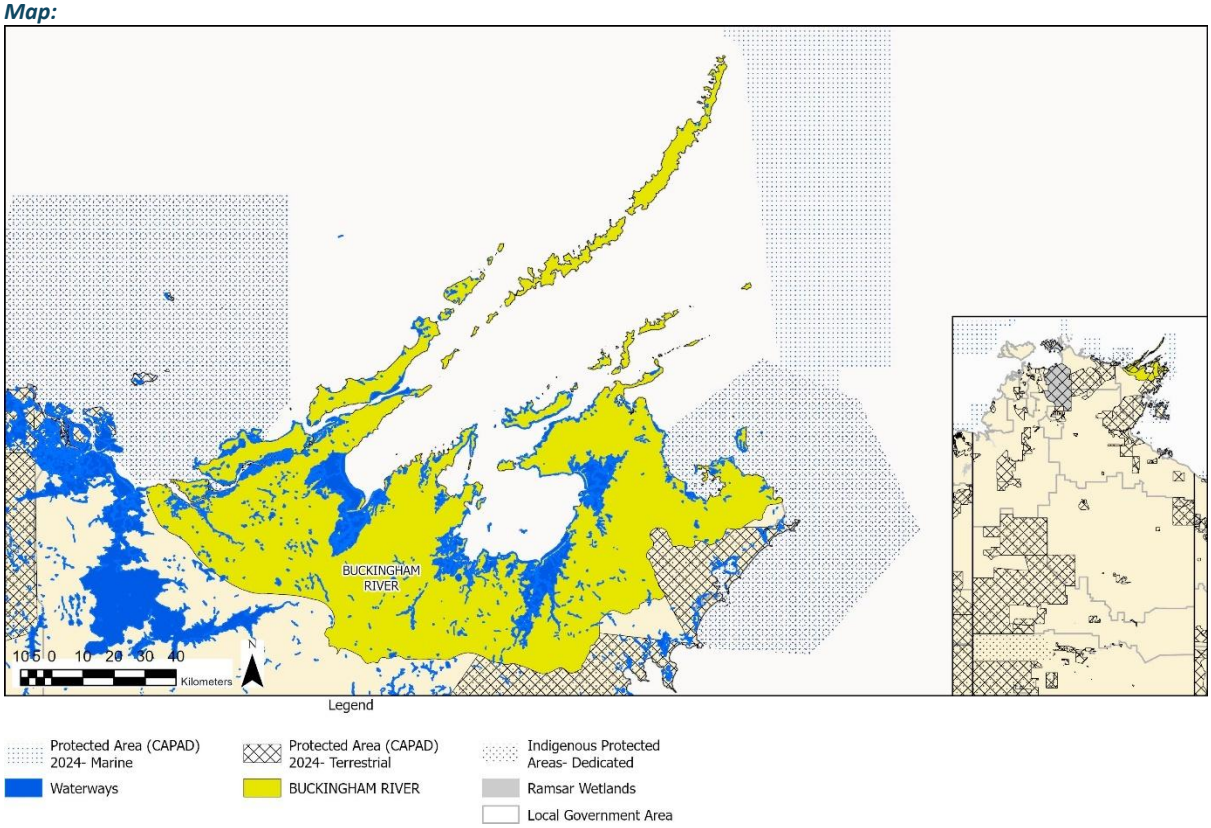
Key Detail:

Location	Goyder River
Site Overview	
Coordinates (approx.):	~12.2°-12.6° S, 134.9°-135.3° E
Catchment Area	Approximately 10,000-10,400 km² (Goyder River basin).
River Length	Approximately 170 km from its source in the Mitchell Ranges to its confluence with floodplain wetlands of the Arafura Swamp.
Proximity to urban areas	Extremely remote; no urban centres. Closest community is Ramingining.
Ecological and Land Context	
Access and Tenure Description	Located entirely within Arnhem Land Aboriginal freehold. The river and floodplain are part of the Arafura Swamp region, proposed/managed as an Indigenous Protected Area with strong Traditional Owner governance. Access is highly seasonal. Minimal infrastructure, seasonal tracks, small outstations, air access. Wet-season access is extremely restricted.
Ecosystem Description	Tropical freshwater river system feeding a vast seasonal floodplain. Includes permanent springs, paperbark swamps, freshwater marshes, billabongs, sedgelands, and seasonally inundated grasslands.
Key biological features	Large spring-fed wetland complex that retains water year-round, extensive floodplain inundation during the wet season, diverse vegetation assemblages including paperbark forests and aquatic plant communities.
Fauna and Ecological Significance	One of the most significant freshwater wetland ecosystems in northern Australia. Provides breeding and foraging habitat for large populations of waterbirds, freshwater fish, reptiles, and amphibians.
Wildlife Density & Diversity	Extremely high - particularly during wet-season flooding and dry-season concentration. Supports large multispecies aggregations of waterbirds.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)

Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Very high abundance of wild Anseriformes.
Cultural and Social Context	
Cultural and Social features	The Goyder River and Arafura Swamp are central to Yolŋu peoples. The river and wetlands are actively used for cultural activities.
Key Stakeholders	Yolŋu Traditional Owners, Ramingining community, Indigenous ranger groups, Aboriginal land management organisations.
Local Government Authority	Unincorporated Aboriginal land, community governance through local Aboriginal organisations and councils.
Conservation Management organisations	Indigenous ranger programs (Arafura Swamp Rangers), Traditional Owner organisations, conservation partners supporting IPA management.
Land Use and Human Activity	
Key Land Use Types	Indigenous land management, freshwater wetland ecosystem, seasonal traditional harvesting, conservation and research.
Human Use and Activity frequency	Low overall; activity concentrated among Traditional Owners and ranger groups and strongly seasonal. Traditional subsistence use, cultural activities, research access, ranger operations. No commercial agriculture.
Risk and Management	
Site biosecurity implications	Very large seasonal aggregations of waterbirds create conditions relevant to avian influenza ecology. The absence of poultry production reduces domestic spillover risk, but the site is ecologically important for wild-bird surveillance.
Management Implications	Protection of floodplain hydrology and wetland integrity is critical. Management relies on Traditional Owner leadership, ranger programs, and integration of cultural and ecological knowledge.
Surveillance and Monitoring	Community-led ecological monitoring, waterbird counts, wetland condition assessments, and participation in broader wildlife disease surveillance frameworks during peak aggregation periods.

Northeast Arnhem Coast/ Buckingham River

Map:



Key Detail:

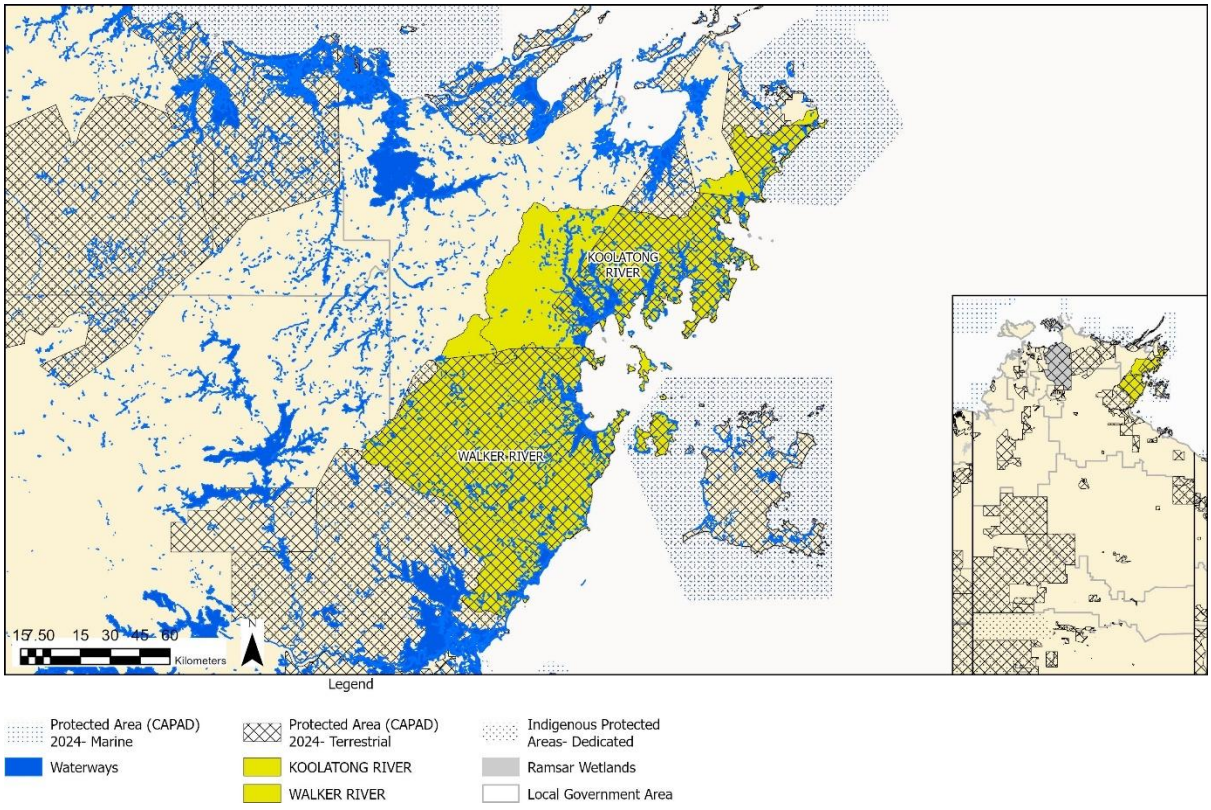
Location	**Northeast Arnhem Coast/ Buckingham River**
Site Overview	
Coordinates (approx.):	~ 12°06', ~ 135°49'
Catchment Area	Approximately 7,510 km²
River Length	~ 59 km from headwaters to its mouth at North East Arnhem Coast/ Buckingham River
Proximity to urban areas	Extremely remote from urban centres – dry season only unpaved road access Closest community: Gapuwiyak, Yirrkala, Nhulunbuy
Ecological and Land Context	
Access and Tenure Description	Tenure is Aboriginal freehold land, under the Arnhem Land Aboriginal Land Trust. Sparse formal infrastructure, likely boat access sites near river mouth and landing points. Few roads/tracks, much travel by boat or along coast. Minimal built infrastructure in wetland zones. Some fisheries infrastructure where commercial fishing occurs. Possible ranger outstations, cultural resource sites.
Ecosystem Description	Intertidal estuarine wetland, floodplain-mangrove complex, remote. Northeast Arnhem Coast/ Buckingham River lies on the northern coast of Arnhem Land, in northeast Top End, approximately 120 km west of Nhulunbuy. The coastal and floodplain habitat is dominated by intertidal mudflats, salt flats, and seasonally inundated floodplains backed by these saline flats. Mangroves are confined to lower river reaches, inland areas include floodplain grasslands and scattered patches of dry coastal vine thicket. The bay is part of a remote, relatively undisturbed landscape characterised by strong tidal influence and periodic wet-season inundation.
Key biological features	Northeast Arnhem Coast/ Buckingham River is recognized for its vast intertidal mudflats, saline flats, seasonally flooded coastal plains, and the coastal floodplain-bay continuum that supports extremely large congregations of shorebirds and waterbirds. The mud and

	salt flats provide rich benthic invertebrate food resources, particularly during low tides, which support migratory shorebirds of global significance. Mangrove patches near the river mouth act as breeding and roosting sites for colonial waterbirds. The seasonal floodplains inland from the saline zones provide feeding and resting habitat, especially in wet season when freshwater supply inundates the plains. Hydrological dynamics (tidal pulses, seasonal inundation, freshwater input during wet season) underpin habitat turnover: when floodplains are inundated, they create ephemeral wetlands, refugia, and foraging areas, in dry times, the habitat contracts, concentrating bird populations. This natural fluctuation is key to maintaining ecological function, species diversity, productivity, and supports both resident and migratory species.
Fauna and Ecological Significance	North East Arnhem Coast/ Buckingham River is an Important Bird Area (IBA). The site supports globally significant populations of migratory shorebirds. Notably, Black-tailed Godwits, Great Knots, and Eastern Curlews are recorded on the bay's flats. Waterbird breeding colonies are present in the mangrove fringes e.g.,: Pied Herons, Intermediate Egrets, Little Egrets, Great Egrets and Rufous Night-Herons. Other species of conservation concern include Magpie geese and brolgas which use adjoining floodplains.
Wildlife Density & Diversity	Extremely high - Major aggregations and species diversity.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Low - colony nesting species
Cultural and Social Context	
Cultural and Social features	North East Arnhem Coast/ Buckingham River is part of Arnhem Land's traditional country and is controlled by Indigenous groups (Yolngu), with deep cultural connections to land, coastal resources, and birdlife. Traditional ecological knowledge, customary harvest, and cultural practices are important in shaping land and seascape use. Socially, the bay is relatively remote. Closest communities are Galiwin'ku (on Elcho Island, ~ 15 km NW) and Gapuwiyak (~ 25 km south) which access the bay/floodplain for food, resources, and fishing.
Key Stakeholders	Traditional Owners / Yolngu groups / Arnhem Land Aboriginal Land Trust, Northern Land Council (NT), NT Fisheries & Marine Resource Agencies, Bird conservation organisations (BirdLife, local NGOs), Local Indigenous Ranger programs, Commercial and recreational fisheries operators and nearby communities (Gapuwiyak, Galiwin'ku)
Local Government Authority	East Arnhem Shire Council
Conservation Management organisations	Gong Dal Aboriginal Rangers Gumurr Marthakal Rangers Yirralka Rangers
Land Use and Human Activity	
Key Land Use Types	Coastal, remote, Indigenous land management, some hunting/fishing
Human Use and Activity frequency	Predominantly Indigenous traditional use, small scale / recreational fishers, maybe tourists. Access is constrained by remoteness: road access, water/boat access. Seasonal accessibility fluctuates with tides and floods. Traditional Land Use, minimal access by helicopter or sea only
Risk and Management	
Site biosecurity implications	Given ecological importance and human use a biosecurity risk exists. Engagement with Traditional Owners is important for early detection and preparedness activities such as control of feral animals.
Management Implications	Maintaining minimal disturbance during key seasons (bird breeding, migrations) may reduce disease risk.

Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in habitat condition. Ongoing surveillance for HPAI risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Blue Mud Bay/ Koolatong and Walker Rivers

Map:



Key Detail:

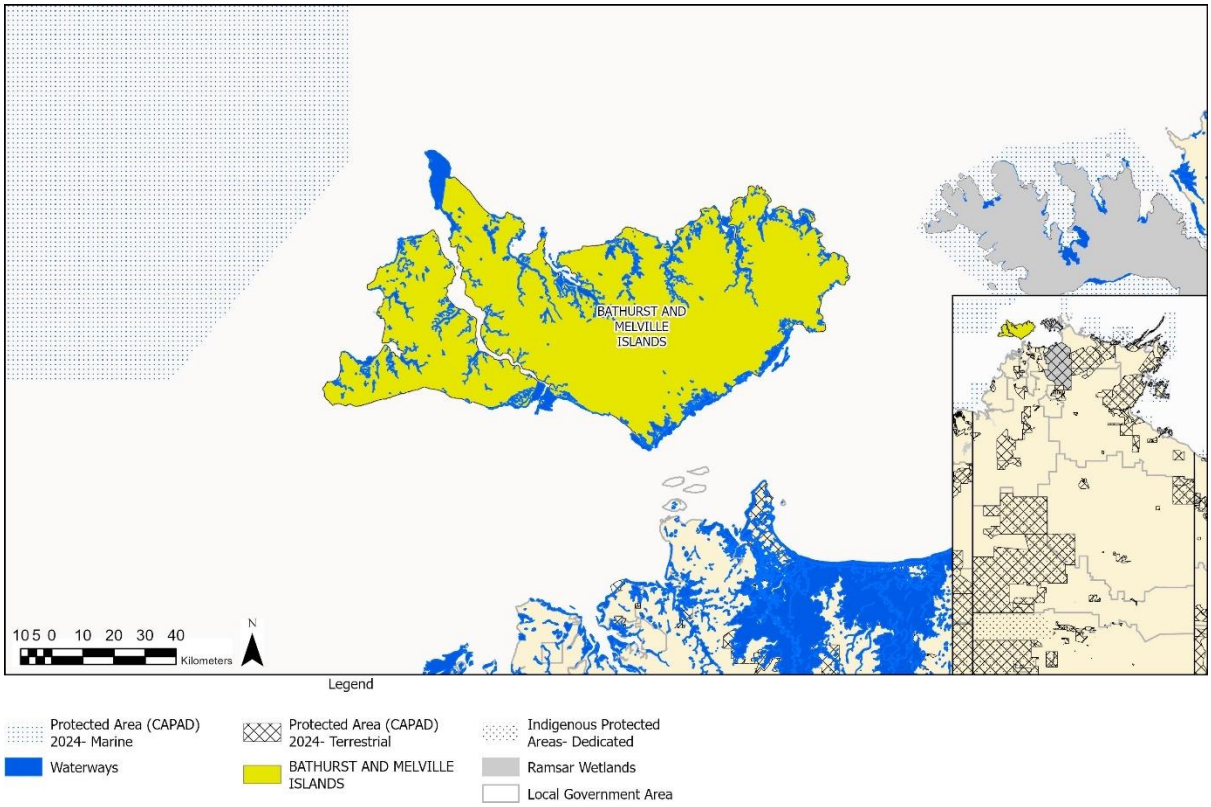
Location	**Blue Mud Bay / Koolatong and Walker Rivers**
Site Overview	
Coordinates (approx.):	~12°27'S, 136°39'E
Catchment Area	Approximately 14,000- 18,000 km², depending on inclusion of the Koolatong, Cato, and Rose River systems.
River Length	Major rivers entering the bay include the Rose (~100 km), Cato (~80 km), and Koolatong (~140 km), all flowing from Arnhem Land uplands to the coast.
Proximity to urban areas	Extremely remote from urban centres – dry season only unpaved road access Closest community: Yirrkala, Nhulunbuy
Ecological and Land Context	
Access and Tenure Description	The area is Aboriginal freehold land, managed under the Arnhem Land Aboriginal Land Trust. Minimal formal infrastructure, access via boat, seasonal 4WD tracks, and air, ranger bases support ecological monitoring. signage or public infrastructure. Ranger bases, community infrastructure in nearby homelands. No major roads or facilities within wetland zones. Possibly temporary field camps.
Ecosystem Description	Coastal intertidal wetlands, estuarine basins, mangrove flats. Blue Mud Bay lies within the Arnhem Coast bioregion and represents one of the most ecologically intact estuarine-coastal systems in northern Australia. The region represents an interface between freshwater inflows and marine tidal processes creates a biologically rich and spatially dynamic wetland mosaic.
Key biological features	The bay's ecological complexity is driven by seasonal flooding and tidal exchange, which sustain diverse estuarine, freshwater, and saline habitats. Mangrove forests fringe tidal creeks and mudflats, supporting fish nurseries and bird nesting colonies. Vast intertidal

	mudflats, saltpans, and seasonally flooded grasslands provide feeding and roosting habitat for thousands of migratory and resident shorebirds and waterbirds. Key habitat types include open saline flats, mangrove forests, riparian corridors along the rivers, and ephemeral floodplain wetlands. Flood recession enhances food availability and drives productivity pulses critical for fish, invertebrates, and water-dependent species.
Fauna and Ecological Significance	Blue Mud Bay is internationally recognised for its birdlife. The site regularly supports Grey-tailed Tattler, Eastern Curlew, and Great Knot. Mangrove and floodplain zones support breeding colonies of egrets, herons, and Magpie geese, with brolgas and whistling ducks common across inland wetlands. The bay is also ecologically significant for marine fauna: dugongs, saltwater crocodiles, turtles, and commercially important fish rely on the estuarine productivity. Floodplain areas support semi-aquatic mammals, reptiles, and amphibians, as well as feral species (buffalo, pigs) that alter ecological function and increase biosecurity risks.
Wildlife Density & Diversity	High - Seasonal congregation, migratory habitat
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Low - but colony nesting species
Cultural and Social Context	
Cultural and Social features	The region is deeply embedded in Yolŋu culture. Cultural knowledge systems guide land use, species understanding, and seasonal access. Fishing, hunting, and gathering continue to be key activities, with strong links to waterbirds and wetlands.
Key Stakeholders	• Yolŋu Traditional Owners (multiple clans) • Northern Land Council • Local Indigenous Ranger groups
Local Government Authority	Unincorporated / Native Title
Conservation Management organisations	Yirralka Rangers
Land Use and Human Activity	
Key Land Use Types	Coastal wetlands, Indigenous land management Indigenous tenure
Human Use and Activity frequency	Low tourism. activity- Cultural fishing, traditional land use, ecological research, remote access only. Subsistence fishing, hunting, and gathering by Yolŋu people, some fishing (subject to agreements), Research and ranger patrols. Commercial crocodile egg harvest via helicopter during wet season
Risk and Management	
Site biosecurity implications	Important activities may include: • Mortality reporting system via ranger groups and land councils. • Education materials for local residents and fishing licensees. • Regular monitoring during peak bird congregation and breeding seasons.
Management Implications	• Protect key bird habitats (mudflats, nesting colonies, floodplain wetlands). • Limit disturbance during breeding and migration periods. • Support Indigenous-led monitoring and biosecurity programs. • Regulate external access and promote hygiene standards for field staff and researchers. • Assess long-term risks from climate change (e.g., sea-level rise, altered wet-dry cycles).
Surveillance and Monitoring	Continued, community-led ecological monitoring is essential, particularly during peak waterbird breeding and migration periods. Monitoring should integrate scientific and Traditional Ecological Knowledge to detect emerging disease risks and respond to changes in

	habitat condition. Ongoing surveillance for HPAI risk is warranted due to: • Large seasonal aggregations of waterbirds, including Magpie geese and migratory shorebirds. • Possible connectivity with international flyways, particularly for migratory species during the wet season.

Tiwi Islands / Bathurst and Melville Islands

Map:



Key Detail:

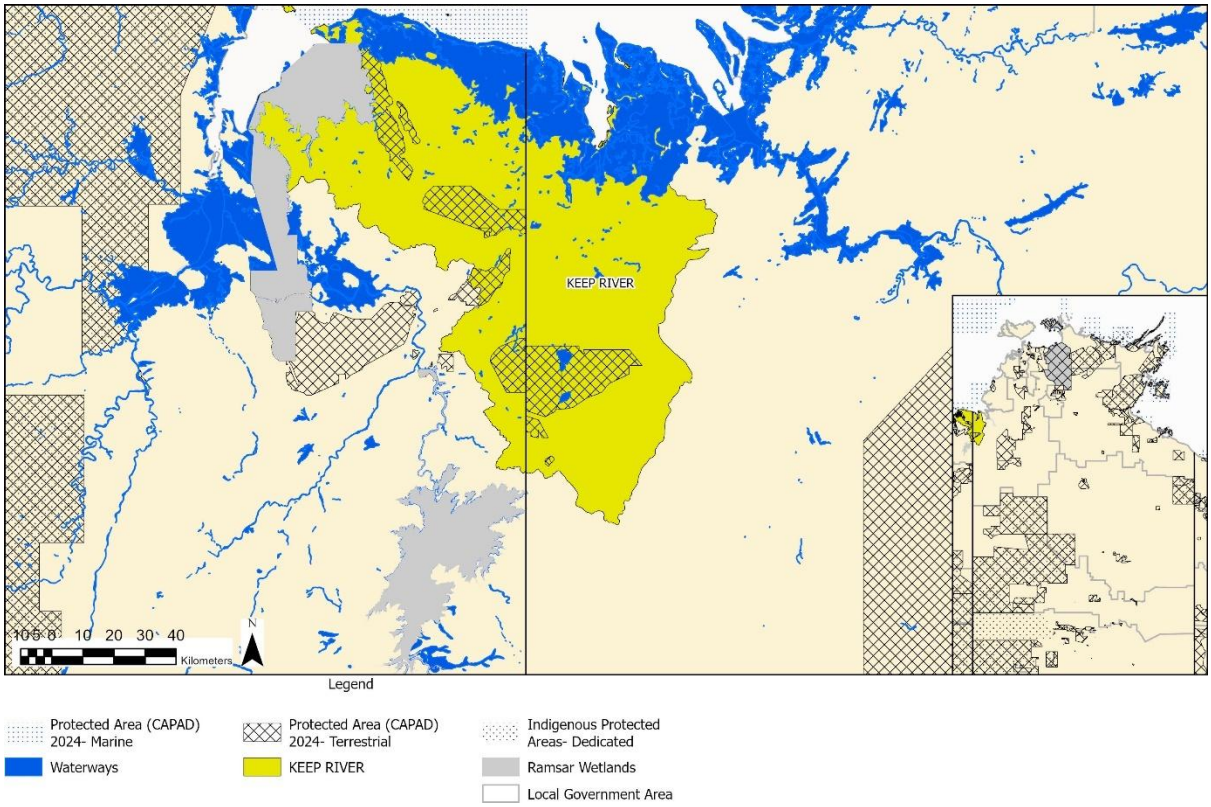
Location	**Tiwi Islands**
Site Overview	
Coordinates (approx.):	11°20’ to 11°45’ S, 130°30’ to 131°30’ E
Catchment Area	~ 8,000 km² (Tiwi Land Trust area) covering Melville, Bathurst and many smaller islands
River Length	No large mainland “rivers” as such, drainage is via many creeks, wetlands, springs, and minor watercourses.
Proximity to urban areas	Extremely remote from urban centres and separated by water - Accessible only by air or boat, no direct public roads. Closest community: Wurrumiyanga, Milikapiti, Pirlangimpi
Ecological and Land Context	
Access and Tenure Description	The Tiwi Islands are Aboriginal freehold land, vested in the Tiwi Aboriginal Land Trust. Traditional Owners maintain strong customary management regimes, with increasing formal governance under an Indigenous Protected Area (IPA) framework. Forestry plantations (on Melville), tourism, some mining, and commercial fisheries are among supplementary land uses, but most lands are managed for traditional uses, conservation, and community livelihood. Basic infrastructure: roads, harbours / boat ramps. Remote tracks, ferry or boat access for coastal / marine surveillance. Ranger outposts and marine rangers operate in many locations. Plantation forestry infrastructure (roads, plantation plots) on Melville. Community infrastructure in major settlements. Fisheries along coasts.
Ecosystem Description	Island wetlands, Eucalyptus and monsoon forests, intertidal systems.

	The Tiwi Islands lie off the northern coast of the Northern Territory. The landscapes are composed of sandy and lateritic soils, rises, plains, coastal cliffs, rocky headlands, interspersed with perennial springs and rainforest patches, eucalypt woodlands, and extensive mangrove and wetland systems.
Key biological features	The Tiwi Islands represent a biodiversity hotspot, with exceptionally high species richness, many endemic and threatened taxa, and relatively intact ecosystems due to their isolation. There are eleven plant taxa entirely endemic to the Islands, and many more plant and animal species that are threatened, rare or have restricted distributions. Vegetation includes well-developed eucalypt forests, rainforest patches around springs, melaleuca and acacia woodlands, mangroves, and coastal beach and rocky headlands. Wetland ecosystems, including intertidal mudflats, coastal creeks, seasonal inundated flats, and estuarine zones, support large populations of waterbirds, migratory shorebirds, seabirds, and marine fauna (e.g., turtles, dugongs, dolphins). The hydrological connectivity between coastal, estuarine, and terrestrial zones (especially via creeks and mangrove fringe) underpins seasonal breeding, foraging, and migrations. Because many wetlands dry in the dry season and refill in the wet, the islands' ecological dynamics are strongly tied to rainfall and tidal cycles
Fauna and Ecological Significance	The Tiwi Islands support numerous threatened and migratory species. There are ~ 31 threatened animal species and 19 threatened plant species recorded within the IPA boundary. Birdlife includes both resident waterbirds and internationally migratory species, many using coastal estuaries, seagrass beds, mangroves, and intertidal mudflats as feeding or breeding grounds. Sea turtles, marine mammals (dugongs, dolphins), saltwater crocodiles are also present. Fauna endemism is strong.
Wildlife Density & Diversity	High - Seasonal congregations, Seabird colonies.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	High- colony nesting and presence of poultry or domestic ducks/geese.
Cultural and Social Context	
Cultural and Social features	The Tiwi people maintain strong cultural, spiritual, and social ties to the Islands' land, sea, wildlife, and cultural sites. The population is relatively low (~2,600) in communities such as Wurrumiyanga, Milikapiti, Pirlangimpi. Social infrastructure is concentrated in these towns. Activities include customary hunting, fishing, gathering, arts, cultural tourism. Tourism is but growing, commercial fisheries and plantations are present.
Key Stakeholders	• Tiwi Traditional Owners, clan groups, Tiwi Land Council • Tiwi Indigenous Rangers and Sea Country Rangers • NGOs, researchers, universities involved in ecology and conservation science • Tourism operators, plantation forestry entities, fishing community
Local Government Authority	Tiwi Islands Regional Council
Conservation Management organisations	Tiwi Aboriginal Rangers
Land Use and Human Activity	
Key Land Use Types	Forestry, traditional land use.
Human Use and Activity frequency	Tiwi communities fishing, gathering, arts, and some tourism. Access to remote parts of islands is by transport, seasonal conditions. Visitors typically require permits or coordination through Land Council. Some commercial activity (plantation forestry, fishing) operates, especially near transport hubs or accessible coastlines. Commercial crocodile egg harvest via helicopter during wet season. Moderate activity- ranger programs, traditional land use, research, air and road access.

Risk and Management	
Site biosecurity implications	Needed measures include: • hygiene and disinfection protocols for boats, equipment, footwear, mortality event reporting systems via Ranger network, • public awareness in communities, • regulation of domestic bird keeping, • monitoring of feral animal populations, • controlling introductions of invasive species, • where feasible restrict access during bird breeding / gathering seasons, • ensure monitoring of waterbird health.
Management Implications	The IPA Plan of Management (2023-2033) provides a governance framework that must embed biosecurity and disease risk assessments. Land use changes should be evaluated for disease risk and ecological impact. Ensuring Traditional Owners have decision making authority, and that resources (ranger capacity, funding, partner agencies) are sufficient to carry out needed surveillance and response is critical in forming an effecting response to HPAI.
Surveillance and Monitoring	Recommended activities: • Regular monitoring of waterbird populations especially in coastal estuaries, mangrove fringes, mudflats, wetland patches. • Detection and investigation of bird mortality or disease symptoms through Ranger network and community reports. • Monitoring of threatened/endemic species populations and their habitat condition. • Marine surveillance (marine mammals) in coastal waters.

Keep River

Map:



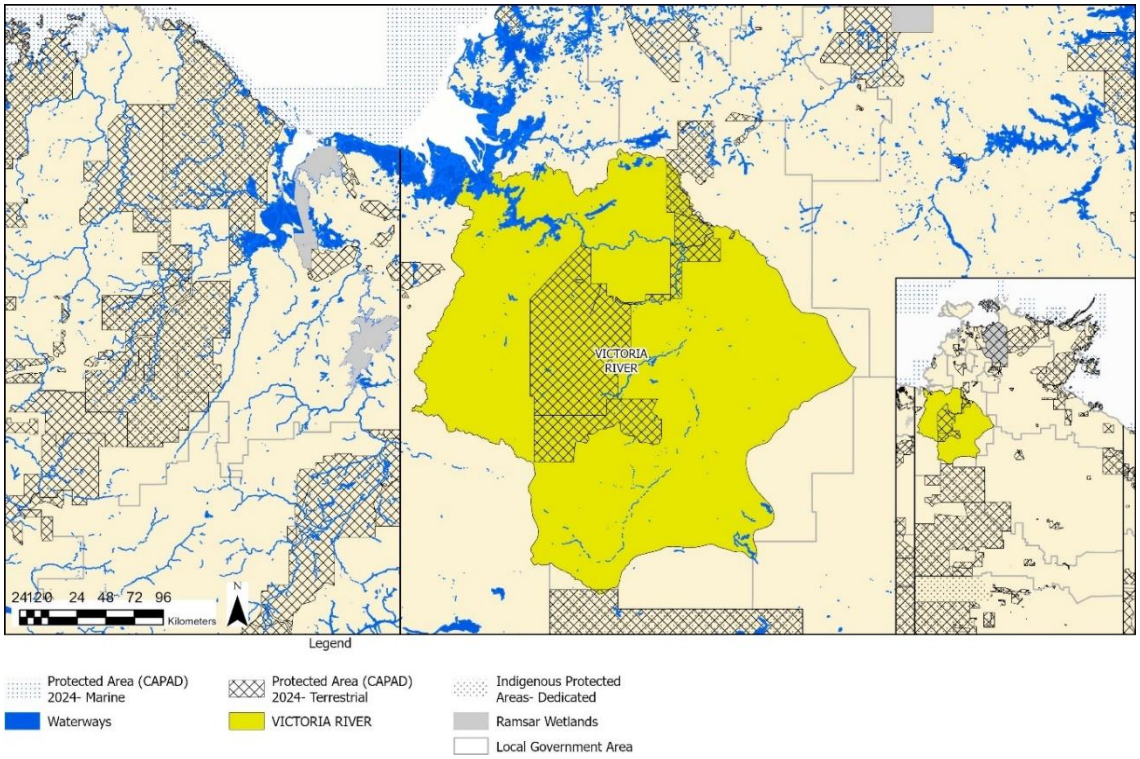
Key Detail:

Location	Keep River
Site Overview	
Coordinates (approx.):	~14.7°–15.7° S, 129.0°–129.7° E
Catchment Area	Approximately 6,000 km² (Keep River catchment).
River Length	~220 km
Proximity to urban areas	Remote; nearest town is Kununurra (WA) to the southwest. No urban centres within the catchment.
Ecological and Land Context	
Access and Tenure Description	Upper catchment includes Keep River National Park and Aboriginal freehold land. Lower catchment and estuary occur on Aboriginal land and pastoral leases, with coastal waters managed under Commonwealth marine jurisdictions. Access is seasonal. Road access including unsealed roads to Keep River National Park; seasonal river crossings; minimal infrastructure outside park facilities.
Ecosystem Description	Tropical riverine ecosystem including sandstone gorges, savanna woodlands, freshwater pools, seasonal floodplains, mangroves and estuarine wetlands near the mouth. Strong wet-dry seasonal flow regime.
Key biological features	Permanent freshwater pools, sandstone gorge systems, seasonal floodplain inundation, mangrove-lined estuary, and high connectivity between freshwater and marine habitats.
Fauna and Ecological Significance	Supports freshwater and estuarine fauna, migratory waterbirds, shorebirds and coastal species often associated with adjacent Joseph Bonaparte Gulf wetlands.
Wildlife Density & Diversity	Moderate to high; waterbird density increases seasonally on floodplains and estuarine mudflats, with diverse fish and reptile assemblages throughout the system.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Regular presence of wild waterbirds (ducks, herons, egrets, shorebirds).
Cultural and Social Context	

Cultural and Social features	The Keep River flows through Country of multiple Traditional Owner groups. The river and its gorges have strong cultural significance.
Key Stakeholders	Traditional Owners, Indigenous ranger groups, Northern Land Council, Parks and Wildlife NT, and pastoral leaseholders in surrounding areas.
Local Government Authority	Victoria Daly Regional Council (NT side); adjacent WA areas fall under local government in the East Kimberley.
Conservation Management organisations	Parks and Wildlife NT (Keep River National Park), Indigenous ranger programs, NT environmental agencies.
Land Use and Human Activity	
Key Land Use Types	National Park conservation, Aboriginal land management, pastoral grazing in surrounding areas, low-impact tourism.
Human Use and Activity frequency	Low to moderate; concentrated in the dry season, minimal activity during wet season flooding. Recreational visitation (dry season), fishing, sightseeing in national park areas, traditional land use.
Risk and Management	
Site biosecurity implications	Seasonal floodplains and estuarine wetlands attract waterbirds, creating ecological interfaces relevant to avian influenza circulation in wild birds. Remoteness and absence of poultry production reduce domestic spillover risk.
Management Implications	Maintenance of river connectivity, floodplain health and estuarine condition is critical. Management requires coordination between park managers, Traditional Owners and pastoral leaseholders.
Surveillance and Monitoring	Ecological monitoring in national park areas, ranger-led surveillance, and inclusion of regional wetlands in broader NT and national wildlife monitoring programs during periods of high bird abundance.

Victoria River

Map:



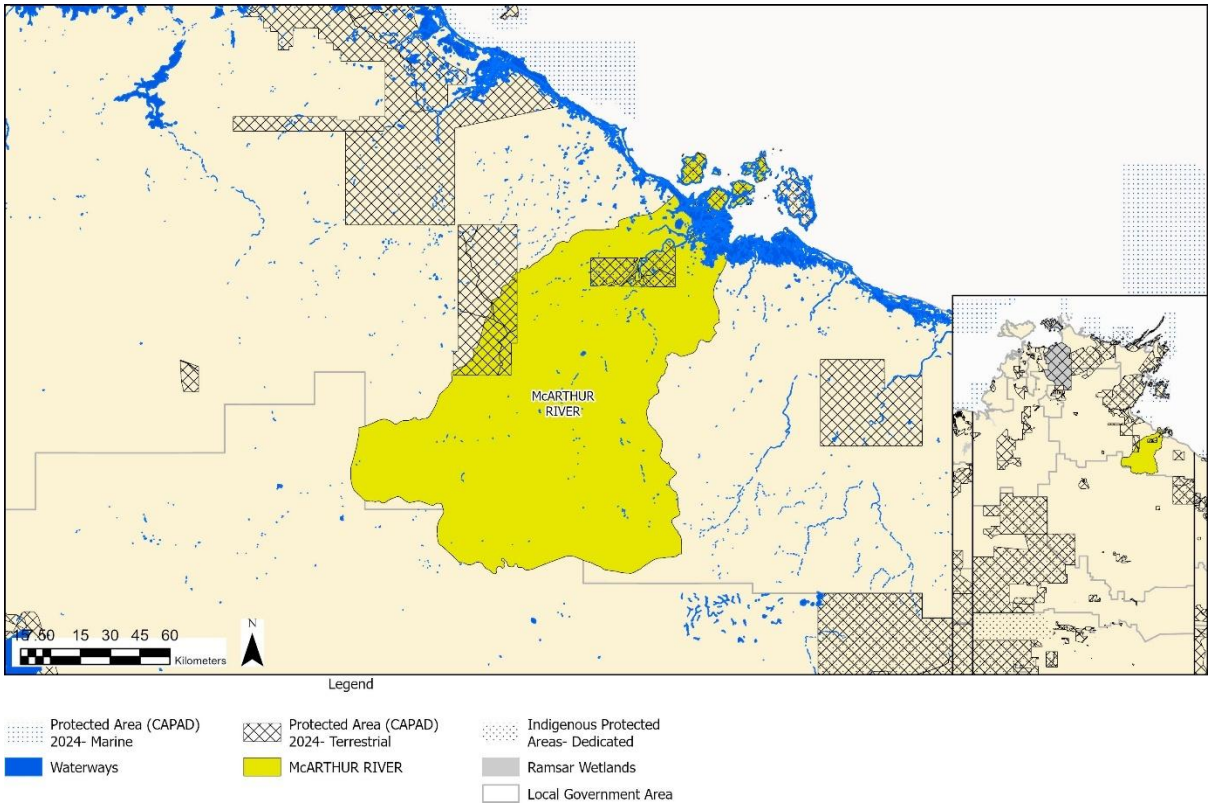
Key Detail:

Location	Victoria River
Site Overview	
Coordinates (approx.):	~16.5°-15.0° S, 129.0°-130.5° E
Catchment Area	Approximately 49,000 km², covering the Victoria River District and parts of the Barkly Tablelands.
Proximity to urban areas	Remote; nearest settlements are small communities and cattle stations, including Timber Creek and Victoria River Downs.
Ecological and Land Context	
Access and Tenure Description	Victoria River catchment includes national parks (Gregory National Park), Aboriginal land, and pastoral leases. Unsealed roads to communities and parks, river crossings, small airstrips, basic visitor infrastructure in national parks.
Ecosystem Description	Tropical riverine system with freshwater pools, sandstone gorges, seasonal floodplains, riparian woodlands, and mangrove-lined estuarine wetlands. Flooded during wet season; pools and billabongs persist in dry season. The river passes through sandstone escarpments, floodplains, and savanna woodlands before reaching estuarine areas.
Key biological features	Permanent freshwater pools, diverse floodplain habitats, sandstone gorges with unique flora, mangrove and estuarine communities at the river mouth.
Fauna and Ecological Significance	Habitat for freshwater fauna, migratory waterbirds, shorebirds, and estuarine-dependent species.
Wildlife Density & Diversity	Moderate to high; especially high waterbird concentrations on floodplains during wet season; diverse assemblages of freshwater fish and riparian fauna.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Abundant wild waterbirds, including ducks, herons, egrets, pelicans, and shorebirds. Minimal domestic poultry in the catchment.
Cultural and Social Context	
Cultural and Social features	Victoria River region is culturally significant for multiple Aboriginal groups. Traditional uses include fishing, hunting, and ceremonial activities.

Key Stakeholders	Traditional Owners, Aboriginal ranger groups, pastoral leaseholders, Northern Land Council, Parks and Wildlife NT.
Local Government Authority	Victoria Daly Regional Council and unincorporated areas managed under Aboriginal governance.
Conservation Management organisations	Parks and Wildlife NT, Indigenous ranger programs, Aboriginal land management authorities.
Land Use and Human Activity	
Key Land Use Types	Pastoral grazing, conservation (national parks), Indigenous land management, eco-tourism and recreation.
Human Use and Activity frequency	Moderate in pastoral and park areas; low in remote gorges and estuarine zones. Seasonal variation due to wet season inaccessibility. Cattle grazing, recreation, cultural activities, eco-tourism, fishing.
Risk and Management	
Site biosecurity implications	Wetlands and floodplains attract large numbers of wild waterbirds, presenting potential interfaces for avian influenza. Domestic poultry increases local spillover risk.
Management Implications	Management priorities include maintaining floodplain connectivity, wetland health, and protection of riparian and estuarine habitats. Coordination required between Traditional Owners, ranger programs, and pastoralists.
Surveillance and Monitoring	Ecological monitoring, waterbird counts, and integration into broader Northern Territory and national wildlife disease surveillance programs. Peak wet season periods are critical for monitoring.

McArthur River

Map:



Key Detail:

Location	McArthur River
Site Overview	
Coordinates (approx.):	~16.0°-16.5° S, 136.0°-136.5° E
Catchment Area	Approximately 30,000 km² (McArthur River catchment).
Proximity to urban areas	Remote; nearest community is Borroloola.
Ecological and Land Context	
Access and Tenure Description	River flows through Aboriginal land and pastoral leases. infrastructure, unsealed roads to Borroloola and nearby stations, boat access to river and wetlands, minor community and ranger infrastructure.
Ecosystem Description	Tropical freshwater riverine system with seasonal floodplains, permanent pools, mangroves, tidal flats, and estuarine wetlands. Strong wet–dry seasonal variation. The lower reaches include estuarine wetlands, mangroves, and tidal mudflats. Upper catchment includes savanna woodlands and semi-permanent freshwater wetlands.
Key biological features	Extensive floodplains and billabongs, freshwater pools, mangrove-lined estuary, and diverse fish and bird habitats. Supports wetland connectivity with the Gulf of Carpentaria.
Fauna and Ecological Significance	Habitat for freshwater and estuarine fish, crocodiles, migratory waterbirds, shorebirds, and wetland-dependent mammals. Important for regional biodiversity.
Wildlife Density & Diversity	Moderate to high; waterbird populations concentrate seasonally on floodplains and wetlands. Fish, reptiles, and amphibians are abundant in permanent pools.
Existing Ecological Threats	Feral animals (pigs, buffalo and horses) and weeds (Mimosa)
Reservoir Hosts (e.g., Nearby Domestic Bird Presence)	Large populations of wild waterbirds including ducks, herons, egrets, and shorebirds.
Cultural and Social Context	
Cultural and Social features	The McArthur River is significant to local Aboriginal groups, including the Yanyuwa people. Used for fishing, hunting, ceremonial activities, and cultural practices.

Key Stakeholders	Traditional Owners, Indigenous ranger groups, Northern Land Council, Borroloola community, pastoral leaseholders.
Local Government Authority	Unincorporated Aboriginal land and Gulf of Carpentaria Regional Council jurisdiction in surrounding areas.
Conservation Management organisations	Indigenous ranger programs, NT Parks and Wildlife, environmental NGOs supporting wetland and coastal management.
Land Use and Human Activity	
Key Land Use Types	Pastoral grazing, Indigenous land management, freshwater and estuarine wetland conservation, subsistence and recreational fishing.
Human Use and Activity frequency	Low overall; concentrated around communities and accessible river sections, seasonal variation due to wet season. Cultural practices, subsistence fishing, recreation, and tourism in remote areas.
Risk and Management	
Site biosecurity implications	Seasonal aggregation of waterbirds presents potential interfaces for avian influenza in wild populations. Low domestic poultry presence reduces spillover risk.
Management Implications	Protection of floodplains, estuarine wetlands, and river connectivity is critical. Management coordinated between Traditional Owners, ranger programs, and pastoral operations.
Surveillance and Monitoring	Ecological and waterbird monitoring, community-led surveys, and integration into broader Northern Territory and national wildlife disease surveillance frameworks, especially during wet season bird aggregation.

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