

# TEMPORARY WATER FROGS



Green-thighed frog



Green-striped frog



Southern laughing treefrog



Salmon-striped frog



Great brown broodfrog



Spotted grass frog



Eastern gungan



Chubby gungan



## CONSERVATION ACTION STATEMENT

September 2010

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to conserve our wildlife.



Dedicated to a better Brisbane

# TEMPORARY WATER FROGS

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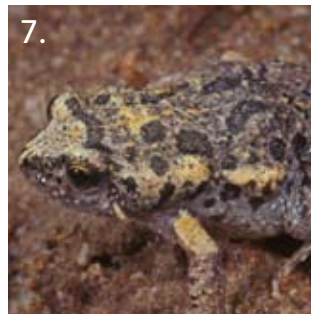
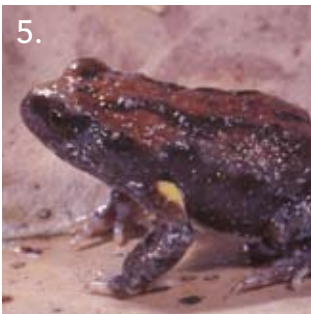
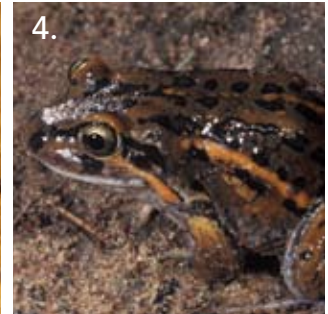
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# TEMPORARY WATER FROGS

## 1 Introduction<sup>1</sup>

This Conservation Action Statement addresses the following frog species, collectively referred to as temporary water frogs, some of which are identified as significant species within Brisbane, as per Council's Natural Assets Planning Scheme Policy (Brisbane City Council 2000):



1. Green-thighed frog (*Litoria brevipalmata*)<sup>2</sup>.
2. Green-striped frog (*Cyclorana alboguttata*) (referred to as '*Litoria alboguttata*' within Council's Natural Assets Planning Scheme Policy).
3. Southern laughing treefrog (*Litoria taylori*) (referred to as 'laughing treefrog' within Council's Natural Assets Planning Scheme Policy).
4. Salmon-striped frog (*Limnodynastes salmini*).
5. Great brown broodfrog (*Pseudophryne major*).
6. Spotted grass frog (*Limnodynastes tasmaniensis*) (not listed in Council's Natural Assets Planning Scheme Policy).
7. Eastern gungan (*Uperoleia laevigata*).
8. Chubby gungan (*Uperoleia rugosa*) (referred to as '*Uperoleia rogosa*' within Council's Natural Assets Planning Scheme Policy).

Temporary water frogs are classified as such because they do not depend on permanent water bodies to complete their life-cycle. Unlike some frog species that depend on water all year round for survival, temporary water frogs only need water for reproduction and can subsist by burrowing underground or hiding in cracks or holes in the soil or in tree holes. Some temporary water frogs are able to breed all year round, enabling the frogs to breed whenever a heavy rainfall occurs. The green-thighed frog and the green-striped frog will only breed after heavy rains in late spring to early autumn.

<sup>1</sup>Unless otherwise stated the information in this section is compiled from BAAM (2005).

<sup>2</sup>This document follows the nomenclature provided by the Commonwealth Department of Water, Heritage and the Arts' online 'Australian Faunal Directory' (DEWHA 2010), which is kept up to date with taxonomic revisions and provides a single, categorical point of reference for both common names and scientific names for all Australian taxa.

## 1 Introduction continued...

This Conservation Action Statement will be updated as new information becomes available and to report progress on conservation actions. For more information about this or any other Conservation Action Statement, visit Council's website at [www.brisbane.qld.gov.au](http://www.brisbane.qld.gov.au) or phone Council on (07) 3403 8888.

### Aims

This Conservation Action Statement details Council's management intent for the long-term protection and conservation of significant temporary water frogs within Brisbane through the following actions.

- Collating **existing information** on the distribution, ecology and management requirements of these species within Brisbane and surrounds
- Identifying **key threats** that significantly impact upon these species within Brisbane
- Identifying **gaps in existing knowledge** of the habitat and management requirements of these species, allowing research priorities to be defined.
- Detailing **practical and affordable strategies and actions** that support the long-term protection and conservation of these species within Brisbane.

## 2 Conservation status

The conservation status of a species will influence how it is managed. 'Threatened' species are typically accorded a more stringent management regime than 'common' species. Various conservation registers identify the status of fauna species at local, state and national levels. The current conservation status of the temporary water frogs is provided in Table 1.

**Table 1:** Official conservation status of Brisbane's temporary water frogs.

Species	Brisbane City <sup>1</sup>	South East Queensland <sup>2</sup>	Queensland <sup>3</sup>	National <sup>4</sup>
Green-thighed frog	Significant	Not listed	Near threatened	Not listed
Green-striped frog	Significant	Not listed	Least concern	Not listed
Southern laughing treefrog	Significant	Regionally-significant priority taxa	Least concern	Not listed
Salmon-striped frog	Significant	Regionally-significant priority taxa	Least concern	Not listed
Great brown broodfrog	Not listed	Regionally-significant priority taxa	Least concern	Not listed
Spotted grass frog	Not listed	Not listed	Least concern	Not listed
Eastern gungan	Significant	Regionally-significant priority taxa	Least concern	Not listed
Chubby gungan	Significant	Not listed	Least concern	Not listed

<sup>1</sup> Brisbane City Council 2000, *Brisbane City Plan 2000*, Natural Assets Planning Scheme Policy, vol. 2 (2006 amendments) <sup>2</sup> Significant for South East Queensland Bioregion under the Biodiversity Assessment and Mapping Methodology (Environmental Protection Agency 2002) <sup>3</sup> *Nature Conservation (Wildlife) Regulations 2006* under the Nature Conservation Act 1992 <sup>4</sup> *Environment Protection and Biodiversity Conservation Act 1999*.

## 3 Distribution<sup>3</sup>

### National/state

#### Green-thighed frog

- Occurs in isolated localities in sclerophyll forests from Cordalba State Forest, South East Queensland south to Ourimbah, central New South Wales.
- In Queensland recorded from sea level to about 600 metres above sea level.
- The extent of occurrence of the species is approximately 72,500km<sup>2</sup>, but it occurs in only a small part of this area, thought to be less than 500km<sup>2</sup> (Hines *et al.* 2004).

#### Green-striped frog

- Occurs west of the Great Dividing Range, northern New South Wales, coastal and inland Queensland and a small part of the Northern Territory.

#### Southern laughing treefrog

- Occurs in coastal areas to 100 kilometres inland, from South East Queensland (Fraser Island) to the south coast of New South Wales (Wollongong).

#### Salmon-striped frog

- Occurs in central inland New South Wales reaching the coast only in the far north and near-coastal areas of southern Queensland.
- Mostly found in drier areas (e.g. west of the Great Dividing Range).

#### Great brown broodfrog

- Occurs in coastal areas to 200 kilometres inland from Cape York Peninsula to just south of the Queensland/New South Wales Border.
- The true range for this species is imperfectly known due to confusion with other *Pseudophryne* species (Frost and Morgan 1999).

#### Spotted grass frog

- Extremely adaptable and occurs in most of Queensland including South East Queensland and extends into South Australia.

#### Eastern gungan

- Occurs in coastal areas to 350 kilometres inland, from eastern Victoria to Blackdown Tableland, west of Rockhampton, Queensland.

#### Chubby gungan

- Occurs in coastal and inland southern Queensland (north to Rockhampton), central western New South Wales and into northern Victoria.

### Local

#### Green-thighed frog

- Should be considered rare in Brisbane (Frost and Morgan 1999).
- Recorded from Berrinba, Karawatha Forest, Anstead and McDowell.

#### Green-striped frog

- Usually found in lowland alluvial flats in South East Queensland.
- Recorded from Rocklea, Birkdale, Tennyson, Bulimba, Nudgee. Historical records show this species once inhabited Karawatha Forest.

## 3 Distribution<sup>2</sup> continued...

### Local continued...

#### **Southern laughing treefrog**

- Historically records from Brisbane, but is now considered rare in this region (Queensland Museum 2007).
- Recorded from Karawatha Forest and the Carbrook-Mt Cotton area. Historically recorded as abundant in suitable habitat within D'Aguilar National Park.

#### **Salmon-striped frog**

- Historically this species has been recorded in Brisbane, but it now appears to be rare.
- Previous records were from Boondall, Nudgee, Fitzgibbon, Pullenvale, Bellbowrie, Bald Hills and Bulimba.

#### **Great brown broodfrog**

- Abundant where suitable forested areas remain (Frost and Morgan 1999).
- Recorded from Sandgate, Boondall, Chermside, Bald Hills, Toowong, Anstead, Kholo, Chandler, Durack, Nathan, Karawatha Forest, Manly West and Capalaba West.

#### **Spotted grass frog**

- Extremely abundant in areas that contain suitable habitat west of Brisbane.
- Recorded from Boondall, Fitzgibbon, Anstead, Kholo, Ransome, Lota, Manly and Tarragindi.

#### **Eastern gungan**

- Distribution uncertain because of the problem with identification.
- Recorded from Nudgee, Kholo, Ransome and Karawatha Forest.

#### **Chubby gungan**

- Distribution uncertain because of the problem with identification but should be considered uncommon in Brisbane (Frost and Morgan 1999).
- Recorded from Boondall and one record in Berrinba.

Verified temporary water frog records for Brisbane are shown on Map 1.

### Temporary water frogs

- Green-thighed frog
- Green-striped frog
- Southern laughing treefrog
- Salmon striped frog
- Great brown broodfrog
- Spotted grassfrog
- Eastern gungan
- Chubby gungan

#### DATA INFORMATION

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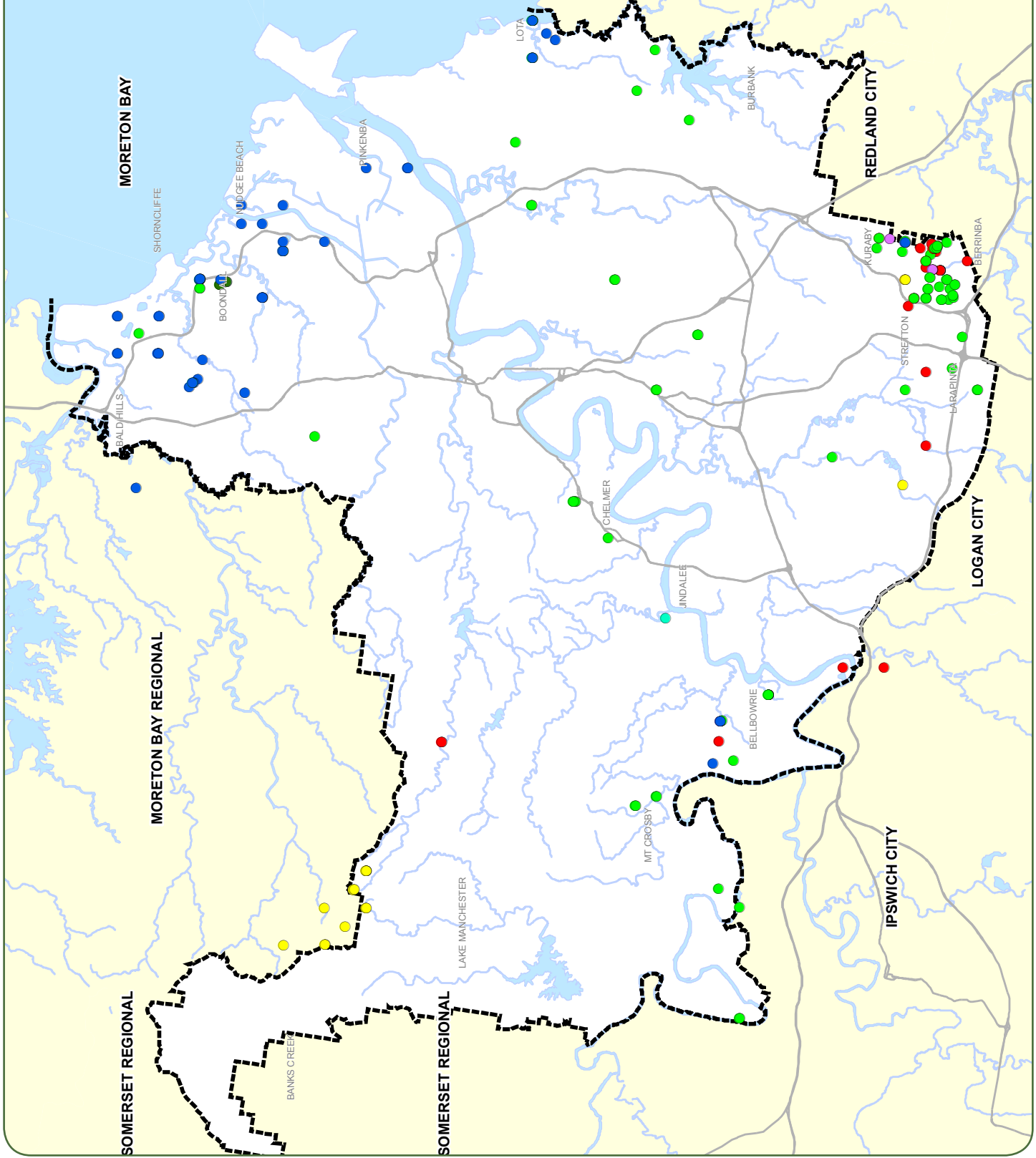
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 Horizontal Datum: Geocentric Datum of Australia 1994



#### Conservation Action Statement

### Records of temporary water frogs in Brisbane

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## 4 Ecology<sup>4</sup>

### Habitat

The distribution of frog species is often strongly influenced by characteristics of the ground layer e.g. leaf litter, woody debris, shrub layer, and soil properties (Chambers *et al.* 2005). Broad forest type may not significantly influence the suitability of habitat (Parris and McCarthy 1999).

Temporary water frogs are often cryptically coloured and this combined with the fact that the frogs move away from water once breeding is finished, makes observation difficult. Hence, studies on the ecological requirements for most of these species are limited.

### Green-thighed frog

- Prefers wetter forest types in the southern part of its range, however does inhabit open and drier forests in South East Queensland.
- There is limited information as to its preferred microhabitat because this species has rarely been observed at non-breeding times.
- Tadpoles are found in shallow temporary waters and are predominantly surface-dwellers.

### Green-striped frog

- Found in a variety of habitats from open woodland to semi-arid areas. Adults are associated with woodland, cleared land and drier forest (Anstis 2002).
- Usually found along the grassy edges of temporary ponds after rain. Often active during the day (Cogger 2000). Buries in soil during dry periods and can remain completely inactive for several months by forming a cocoon while underground to assist in water/moisture retention.
- Tadpoles are found in shallow water and are mostly bottom-dwellers.

### Southern laughing treefrog

- Most commonly encountered amongst vegetation adjacent to or overhanging permanent dams, swamps and ponds (Barker *et al.* 1995). Also occurs in larger ephemeral wetlands, such as melaleuca swamps.
- Lives in trees away from the water but forages on the ground on humid nights (Cogger 2000).
- Tadpoles are found in permanent ponds where they frequent the surface but are timid and are rarely observed in the field (Anstis 2002).

### Salmon-striped frog

- Prefers dams, flooded grassland and roadside ditches in areas that support loamy sand soils (Frost and Morgan 1999).
- Tadpoles are found in warmer, shallow water and typically hide among vegetation. They usually live at the bottom of the water body but will range throughout in search of food.

### Great brown broodfrog

- Usually found singly under rocks, logs etc. in both wet and dry sclerophyll forest. During the dry season refuge sites include damp areas that drain the watershed, in soaks around tree roots, under leaf litter and in seepage areas (Frost and Morgan 1999). Also utilises disused animal burrows.
- Breeding congregations usually occur in inundated grassy areas beside gutters or small creeks (Cogger 2000). Typically breeds in small ephemeral drainage lines laying their eggs before the site becomes inundated.
- Tadpoles are bottom-dwellers found in still, shallow pools.



## 4 Ecology continued...

### Habitat continued...

#### Spotted grass frog

- Inhabits open woodlands and grassy flats that are subject to periodic flooding.
- Usually shelters under logs and stones on the edge of both permanent and temporary swamps, lagoons and creeks. Also utilises temporary flooded depressions, ditches, ruts and flooded grassy soaks (Cogger 2000, Frost and Morgan 1999).
- Tadpoles are most often bottom-dwellers found in deep permanent or shallow temporary water bodies but will feed in any area of the water body (Anstis 2002).

#### Eastern gungan

- Inhabits areas of dry open forest and woodland near soaks, small permanent water bodies and dams (Frost and Morgan 1999).
- Most commonly found near water but also can be found in dry depressions that flood in winter or spring. Can be found well away from water.
- Tadpoles are bottom-dwellers found in shallow temporary water.

#### Chubby gungan

- Inhabits dry open forest, woodland, grassland and coastal heath generally in lowland areas.
- Emerges after heavy spring and summer rains to breed in flooded grassland or in billabongs and slow-flowing streams (Cogger 2000).
- Tadpoles are mainly sedentary bottom-dwellers found in semi-permanent water.

### Diet

To date there has been no research into the dietary requirements of any of the target frog species. All Australian endemic frogs will only recognise a food item if it is moving and do not eat dead organisms. Larger frog species require a greater volume of food than the small ones (Tyler 1994). Size of prey ingested by a frog species is limited by the gape of the mouth. Prey consists of ants, termites, beetles, bugs, grasshoppers, cockroaches, spiders and even other frogs. Habitat and season play a significant role in determining the type of food that is available.

#### Green-thighed frog

- Tadpoles feed on vegetation and detritus.

#### Green-striped frog

- Tadpoles feed on vegetation and sediment (Anstis 2002).

#### Great brown broodfrog

- Tadpoles appear to feed on sediment and algae (Anstis 2002).

#### Eastern gungan

- Tadpoles feed on sediment and algae (Anstis 2002).

#### Chubby gungan

- Tadpoles feed on detritus and sediment.

## 4 Ecology continued...

### Reproduction

Breeding seasons for each species are shown in Table 2.

#### Green-thighed frog

- Breeds after heavy rain anywhere from September to May, preferring larger temporary pools and flooded areas for breeding.
- Spawn is laid in loose clumps among waterweed in temporary ponds and their survival may depend on subsequent rains.
- About 500–600 eggs are laid and larvae are free swimming.
- Development takes six to ten weeks (Anstis 2002).

#### Green-striped frog

- Males call day or night after heavy rain in the warmer months, from the edges of temporary to semi-permanent dams and flooded ditches.
- An average of 2550 eggs is laid in large clumps near edge of water body.
- Larval life span is probably about three to four months (Anstis 2002).

#### Southern laughing treefrog

- Males call persistently throughout spring and summer from shrubs, trees or on the ground beside water during a variety of weather conditions.
- Eggs are laid singly or in small clusters at sides of water bodies.
- Development takes up to 80 days (Anstis 2002).

#### Salmon-striped frog

- Males call from beside or in water under vegetation, mainly from spring to autumn, but also after heavy rains in late winter.
- An average of 2000 eggs is laid in a large floating foam mass.
- Development takes approximately 46 days (Anstis 2002).

#### Great brown broodfrog

- Males choose nest sites under rocks, logs and leaf litter, among roots of grass/sedge clumps or in tunnels in moist soil. Nest sites are usually in slightly elevated areas beside swamps, creeks, ponds or regularly flooded roadside ditches.
- Eggs remain viable within the terrestrial nest until sufficient rainfall either inundates the eggs or washes them into the breeding pond.
- Larval life span is between 120-180 days (Anstis 2002).

#### Spotted grass frog

- Males call while afloat or sitting in shallow water, often among vegetation. Breeding is opportunistic, occurring whenever conditions are preferable, however reproduction usually peaks in summer and autumn.
- Eggs are laid in a small floating foam mass, averaging 850 eggs.
- Metamorphosis occurs after three to three and a half months (Anstis 2002).

#### Eastern gungan

- Males usually call from among thick tussocks of grass or other vegetation near waterbodies, although at the height of breeding may call while floating.
- Eggs are attached singly to submerged grass stems, leaves or twigs.
- Development is about three months (Anstis 2002).

## 4 Ecology continued...

### Reproduction continued...

#### Eastern gungan

- Males usually call from among thick tussocks of grass or other vegetation near waterbodies, although at the height of breeding may call while floating.
- Eggs are attached singly to submerged grass stems, leaves or twigs.

#### Chubby gungan

- Males call after rain around the waters edge, often from small cavities at the base of grasses or beneath ground debris, or from within depressions formed by the footprints of livestock in soft mud (Cogger 2000).
- During amplexus (where the male fertilises the eggs as the female lays them), the female dives down to a suitable grass stem, leaf or twig and attaches a single egg.
- Larval life span is approximately 94 days (Anstis 2002).

**Table 2:** Breeding seasons (green shading indicates breeding months)

Species	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Green-thighed frog												
Green-striped frog												
Southern laughing treefrog												
Salmon-striped frog												
Great brown broodfrog												
Spotted grass frog												
Eastern gungan												
Chubby gungan												

### Movement patterns

After breeding, juvenile and adult frogs disperse into habitats surrounding the breeding site to forage, locate shelter, hide from predators or to locate new breeding sites (Spieler and Linsenmair 1998, Bull and Hayes 2001).

There has been limited research into the movement patterns and home ranges of most Australian frog species. This lack of knowledge is most likely due to the often cryptic nature of most frogs, making it difficult to locate and capture individuals. The use of radio-transmitters on frogs is impractical due to the relatively heavy weight of transmitters.

Studies in which frogs have been tracked after breeding have shown that individuals move from less than 10 metres to hundreds of metres and even several kilometres from their breeding sites (Lemckert and Slatyer 2002, Sinsch 1990, Kusano *et al.* 1995).

Species that utilise non-permanent water bodies for breeding purposes, such as those listed in this Conservation Action Statement, are most likely to move further distances away from the breeding area than stream-dwelling frogs, in search of refuge sites that provide protection from desiccation.

Results of a study on the terrestrial habitat requirements of a suite of frogs inhabiting areas in semi-arid Queensland showed that green-striped frogs, salmon-striped frogs and spotted grass frogs were frequently captured less than 150 metres from water (Chambers 2008). Although chubby gungans were most frequently captured within 20 metres of the pond, they were occasionally found 100 metres away, as was Bibron's toadlet (a species with similar ecological requirements to the great brown broodfrog).

## 5 Threats

As with most amphibian species, there is no clearly identifiable cause of decline of populations of temporary water frogs, although several factors are implicated. It is well known, however, that amphibians are extremely susceptible to environmental changes due to their dependence on both terrestrial and aquatic environments throughout their lifecycle, in addition to having highly permeable skins. As such, amphibians are important indicators of environmental health.

### Habitat loss, fragmentation and simplification

- Since European settlement, an estimated 67,000 hectares, or two-thirds of the original woody vegetation in Brisbane City, has been cleared. This includes approximately 90% of lowland forests and more than 80% of all lowland vegetation (below 100 metres elevation). Habitat fragmentation is extensive – around 80% of the bushland remnants in the city are less than 20 hectares (Brisbane City Council 2001).
- The most important threat to the persistence of temporary water frog populations in Brisbane is habitat loss due to urban expansion. With the ever-increasing population growth of the city, much of the frog's remaining habitat on freehold land is likely to be under threat of development.
- Several populations of green-thighed frog have been directly affected by road construction and housing development. Fragmentation by roads and housing is probably significantly restricting movements between populations (Hines *et al.* 2004). Vital habitat at Berrinba needs protection.
- Land clearing and development creates barriers for dispersal of juveniles. This may increase the risk of local extinction for small isolated populations because migrating individuals will not be able to successfully integrate into these populations.

### Habitat degradation and modification

- Loss of vegetation surrounding water bodies can have detrimental impacts on frog populations, both during the aquatic and terrestrial stages of their life cycle.
- Apart from the obvious reduction in suitable terrestrial refuge sites, changes in vegetation can affect the breeding area by:
  - causing an increase in exposure to the sun's rays, thus increasing water temperature
  - increasing erosion causing sedimentation in water bodies
  - altering the composition and abundance of prey items
  - changing the physical and chemical properties of the water.
- Wetlands are an important habitat for temporary water frog species. Degradation and modification of wetlands directly impacts on frog populations.
- Drainage of wetlands has caused a significant decline in spotted grass frog abundance within the inner city area (Frost and Morgan 1999).

### Hydrological changes

- In areas with shallow groundwater bodies, land clearing and excessive extraction of water can lead to the encroachment of saline groundwaters which could then affect the chemistry/quality of frog breeding ponds (Ezzy and Cox 2003).

## 5 Threats continued...

### Predation, competition and invasive species

- The reduction in the size and number of temporary water bodies could cause an increase in competition for oviposition sites and food resources between frog species with more aggressive or generalist species ultimately outcompeting others.
- Invasive plant species can severely alter the structure and complexity of habitat surrounding breeding areas. Degradation of this habitat can reduce foraging and refuge sites which would have serious deleterious effects on frog population structure, abundance and distribution.
- Studies have shown that the presence of the invasive plant camphor laurel (*Cinnamomum camphora*), has a negative impact on the distribution and survival of Australian frog larvae (Friend 1998). Chemicals contained in the leaves of this species can leach into water bodies, and research has shown that exposure to very dilute concentrations of oil extract from camphor laurels have killed native frogs. Research suggests that the presence of this invasive plant species may contribute to the absence of frogs from areas where camphor laurel has invaded (Friend 1998).
- Weeds may also have negative impacts on frog habitat by changing light penetration to the forest floor or to breeding areas.
- Consumption of cane toad (*Rhinella marinus*) eggs and tadpoles is lethal to native tadpoles (Crossland and Alford 1998).
- Cane toads (including their larvae) can prey directly on the eggs, tadpoles and even adult frogs of native species and may outcompete native tadpoles for food and space, and adult frogs for shelter sites.
- The majority of the target species breed only in temporarily inundated water bodies that do not contain exotic predators. However, the spotted grass frog and southern laughing treefrog will breed in permanent waters such as dams, and can be prey to the mosquitofish (*Gambusia holbrooki*) or other invasive fish species (Gillespie and Hero 1999).

### Disease

- Globally diseases are now recognised as causing the decline and disappearance of many frog species (Skerratt *et al.* 2007).
- *Batrachochytrium dendrobatidis*, the cause of amphibian *Chytridiomycosis* (*Chytrid* fungus), is a potentially fatal skin disease of amphibians and is thought to be responsible for the decline and disappearance of several frog species in South East Queensland (Department of Environment and Heritage 2006). There are records of deaths for all of the temporary water frog species from this disease in Queensland (Berger *et al.* 2004). Adult frogs die within weeks of being experimentally infected. Tadpoles often carry the infection in their mouthparts, but otherwise appear and behave normally (Symonds *et al.* 2007). Because of this, licensed collectors or members of the public may unknowingly spread the disease to other environments (Anstis 2002). Temperature is known to have large effects on occurrence of the disease, with outbreaks of *Chytrid* fungus in South East Queensland mostly occurring in the winter months (Berger *et al.* 2004).

### Climate change

- Climate change is very likely to exacerbate the other threats previously listed here, and may increase frog susceptibility to pathogens such as the *Chytrid* fungus.
- Moisture is a crucial resource for amphibian reproduction regardless of reproductive mode. Changes in rainfall patterns as a result of a changing climate could reduce amphibian reproduction or recruitment (i.e. ability of tadpoles to become mature adults) (Lips 1999).
- Findings from recent research focusing on upland frogs in eastern Australia have concluded that declines in frog numbers significantly coincided with rising minimum temperatures (Laurence 2008).

## 6 Conservation

Several Council biodiversity initiatives are contributing to the protection and management of temporary water frogs and their habitat across the city. The following are key initiatives.

- Bushland Acquisition program. Through this program more than 2700 hectares of the city's most significant lowland habitats have been purchased and protected to date.
- Wildlife Conservation Partnerships program. More than 600 private properties have established conservation partnerships with Council, covering some 2000 hectares of principally lowland habitat in significant frog habitat areas.
- Conservation Reserve Estate. More than 13,700 hectares of parkland including 7755 hectares of bushland and wetland reserves are managed and protected. This reserve network provides habitat for Brisbane's significant species.
- *Natural Assets Local Law* (2003). Over 61,000 hectares of significant native vegetation is covered by the Natural Assets Local Law.
- *Brisbane City Plan* (2000). The *City Plan* designates a green space system throughout the city to recognise and protect the contribution of open space areas to ecological functions. The plan's Biodiversity Code and supporting Ecological Assessment Guidelines provide performance criteria and acceptable solutions to protect significant biodiversity values on, or adjacent to, proposed development. *City Plan* also includes statutory schedules of flora and fauna species considered significant in Brisbane. These schedules recognise the conservation significance of species at a citywide and/or regional level.

## 7 Research

There have been few detailed studies relating to temporary water frogs in Brisbane City or South East Queensland. Contemporary investigations relevant to Brisbane's temporary water frogs include the following.

- A Griffith University study investigating habitat components of temporary water frogs with emphasis on climate change.
- A study by Professor Hugh Possingham, University of Queensland into optimal monitoring techniques for detecting trends in threatened species and pests. Professor Possingham is also heading research into the optimal control of weeds and pests, and threatened species modelling.
- A recently-completed PhD research project into terrestrial habitat requirements for a number of temporary-water frogs by Dr Jo Chambers, Queensland University of Technology.
- A research program investigating the population dynamics of native and invasive plants together with modelling dispersal and its consequences in invasive plant populations by Dr Yvonne Buckley, University of Queensland.

## 8 Management intent

### Strategies

Council intends to contribute to the long-term conservation of the city's significant temporary water frogs through the following.

- Adopting and encouraging innovative voluntary and statutory mechanisms that protect important habitats and movement corridors.
- Securing and long-term protection of important habitat for temporary water frog species.
- Ensuring appropriate ecological assessment, reporting and survey procedures are adopted in development, planning and management activities.
- Encouraging land management practices that avoid, or minimise, direct and indirect impacts on frogs and their habitats on public and private lands.
- Ensuring the timely availability of accurate, adequate and contemporary information for policy, planning and management decisions and actions.
- Facilitating research that targets priority information gaps and contributes positively to the conservation of Brisbane's frogs and their habitats.
- Providing the Brisbane community with appropriate information and opportunities to contribute in a practical way to better understand and protect Brisbane's frogs.

### Actions

Table 3 describes priority conservation actions that Council will pursue with its partners to address the stated strategies. These priority actions have been drawn from studies undertaken for Council by recognised frog experts and from consultation with a range of stakeholders. Actions will be undertaken as funds become available through Council's budgetary process. It should be recognised that Council must consider the timing of these actions against other priorities across the whole of the city.

**Table 3: Management actions**

Management aspect	Action	Timing	Lead agent & key stakeholders *
Habitat protection	Conserve and protect important frog habitat on privately-owned land within Brisbane, through Council acquisition of significant habitat (Bushland Acquisition program) and through conservation partnerships with private landowners (Wildlife Conservation Partnerships program).	Ongoing	Council, private landowners
Habitat management	Develop assessment criteria and habitat management guidelines for developments and other potentially harmful activities occurring within or adjacent to known frog habitat.	2011	Council, universities
	Undertake control or eradication of identified harmful or potentially harmful invasive species from known frog habitat.	Ongoing	Council
	Maintain habitat connectivity by ensuring linear infrastructure does not detrimentally impact on habitat connectivity in areas of frog habitat through Council's Wildlife Movement Solutions program.	Ongoing	Council, DTMR

## 8 Management intent continued...

### Actions continued

Table 3: Management actions continued

Management aspect	Action	Timing	Lead agent & key stakeholders *
Research	Undertake habitat mapping across the city for the targeted frog species in the Brisbane area and develop associated baseline 'aquatic and terrestrial habitat requirement criteria' to ensure management strategies are directed to the most appropriate sites.	Commence 2010	Council, universities, QM
	Seek collaborative partnerships to undertake research on the potential threats to frog populations, particularly the effects of invasive species, degradation of breeding and refuge habitats and the effects of climate change on local frog populations.	Commence 2011	Council, universities, QM
	Undertake research on the effectiveness of wildlife movement solutions (such as road culverts).	Ongoing	Council, universities
Mosquito control	Continue the current use of specific and ecologically sound products for the control of mosquito larvae in aquatic habitats.	Ongoing	Council
Information management	Develop a central database for the collation of monitoring data.	Underway	Council
	Relevant Council field staff to undertake training in appropriate wetland management practices.	Commence 2011	Council, DERM
	Incorporate information relating to the impacts of invasive species on local frog species into Council's invasive species management community awareness programs.	2010	Council, community, community groups
Community involvement	Support a frog identification workshop each year.	Commence 2010	Council, QM, community
	Incorporate frog habitat management information for landholders into community programs, including Wildlife Conservation Partnership program, Creek Catchment Ranger and Habitat Brisbane programs and environment centres curricula.	Ongoing	Council, private landowners
	Support a workshop to inform community rehabilitation groups of techniques for rehabilitating waterways.	Commence 2010	Council, catchment and Habitat Brisbane groups
	Support community based monitoring.	Commence 2010	Council, community groups

\*Council: Brisbane City Council, QM: Queensland Museum, DERM: Department of Environment and Resource Management, DTMR: Queensland Department of Transport and Main Roads.



## 8 Management intent continued...

### Guidelines

The habitat protection and management guidelines detailed in Table 4 are provided to assist environmental planners, land owners, land managers, private industry and the broader community to maintain and enhance existing frog habitat in Brisbane. These guidelines are preliminary and will be refined as more information about these species and their habitat requirements becomes available.

**Table 4:** Habitat protection and management guidelines

Issue	Guideline	Explanatory notes
Destruction, clearing or alteration of riparian or wetland habitat due to local catchment development, localised invasions of invasive plant species and/or localised in-stream channel works.	Apply the Biodiversity, Waterway, Wetland and Stormwater Management Codes, Ecological Assessment Guidelines, other relevant state legislation and any species-specific assessment criteria	The guidelines provided within the existing codes are generally acceptable for most species but may require refinement to maintain viable populations of the targeted frog species. The largest identified threat to the persistence of temporary water frogs is habitat loss due to urbanisation.  Species specific guidelines will be developed to help Council and stakeholders protect populations when planning future development or changes in land use. The guidelines will suggest possible protective measures for frog populations under different situations.  Existing habitat should be protected from future development wherever possible.
Habitat restoration or rehabilitation within the wetlands or in vegetated areas surrounding breeding areas.	A minimum of 50 metres of intact terrestrial habitat and/or buffer should be retained and maintained around breeding ponds. Further research is however required to inform the specific management requirements for each frog species.	Some frog species may require additional terrestrial habitat as refuge sites to ensure persistence during dry spells. Information about species' micro-habitat requirements is essential for habitat protection.  Habitat restoration management plans must incorporate invasive weed removal and alternative techniques for the use of herbicides and pesticides.
Human activities.	Limit public access to known breeding areas and avoid, where possible, undertaking works in these areas during the breeding season.	Ensure that recreational access and use of water bodies and Council activities do not inappropriately disturb wetland-dependant wildlife.
	Educate landowners about the habitat requirements of temporary water frogs and support landowners in conserving such habitat, particularly farmland or areas close to agricultural practices.	Land use practices in areas near breeding sites should be monitored to ensure frog habitats are not contaminated by run-off of sediments or fertilisers and pesticides, which could cause eutrophication of the aquatic habitat. Trampling of terrestrial habitat surrounding breeding areas by domestic stock and wild pigs should also be monitored.
Mosquito control.	Employ 'best practice' principles, and use methods that are deemed to be 'safe' to frogs.	Council will continue to use mosquito control products that are not harmful to frogs. It will maintain its membership of the Mosquito and Arbovirus Research Committee to support research that ensures the use of world best practice in mosquito management.

## 8 Management intent continued...

### Guidelines continued...

Table 4: Habitat protection and management guidelines continued

Issue	Guideline	Explanatory notes
<b>Displacement of frog populations due to localised invasions of invasive plant and animal species.</b>	Invasive species management activities in important frog habitat areas should incorporate camphor laurel and cane toad control.	Certain invasive species may need to be locally eradicated to maintain frog population viability at a given location, this may be particularly important in areas overcome by camphor laurel and cane toads.
<b>Lack of knowledge.</b>	Landowners, community conservation groups and the broader community to be made aware through existing Council programs, of habitat requirements, threats and management recommendations in areas known to support significant frog populations.	Information on habitat requirements, threats and management recommendations should be made readily available to the community, particularly Habitat Brisbane and Catchment groups, Wildlife Conservation Partnership program landowners and landowners in areas known to support significant frog populations or where frog habitat is under threat.
<b>Community involvement.</b>	Community groups involved in restoration and rehabilitation works should, where relevant be encouraged to consider the habitat requirements of local frog species. Any activities undertaken must not negatively impact on the local frog population.	By fostering community involvement, suitable frog habitat on privately owned and public land can be restored, as can linkages that form dispersal corridors between breeding areas. If area already supports a diversity of frog species, expert advice should be sought before commencing further restoration work to enhance the frog habitat as it may not be necessary or may be detrimental to the existing balance.

## 9 Further information

### Agencies

- Brisbane City Council ([www.brisbane.qld.gov.au](http://www.brisbane.qld.gov.au))
- Department of Environment, Water, Heritage and the Arts (Commonwealth) ([www.environment.gov.au](http://www.environment.gov.au))
- Department of Environment and Resource Management (Queensland) ([www.derm.qld.gov.au](http://www.derm.qld.gov.au))
- Frogs Australia Network ([www.frogsaustralia.net.au](http://www.frogsaustralia.net.au))
- Queensland Frog Society ([www.qldfrogs.asn.au](http://www.qldfrogs.asn.au))
- Queensland Museum ([www.qm.qld.gov.au](http://www.qm.qld.gov.au))
- RANA Frog Group ([www.ranafrog.org.au](http://www.ranafrog.org.au))
- Threatened Species Network ([www.wwf.org.au](http://www.wwf.org.au))

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