

Management Plan

The Green and Golden Bell Frog Key Population within the Crookhaven River Floodplain



July 2007

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1. BACKGROUND

1.1 INTRODUCTION

The Green and Golden Bell Frog (GGBF, Figure 1) *Litoria aurea* is a relatively large, muscular species. Adult sizes range from approximately 45 mm to 100 mm with most individuals being in the 60-80 mm class. The colouration of the back is quite variable, being a vivid pea green splotched with almost metallic brass brown or gold. The backs of some individuals may be almost entirely green whilst in others the golden brown markings may almost cover the whole dorsal surface (DEC 2005).

The Green and Golden Bell Frog was formerly distributed from the NSW north coast near Brunswick Heads southwards along the NSW coast to Victoria, where it extended into East Gippsland, and west to Bathurst, Tumut and the Australian Capital Territory (DEC 2005). In the 1960s, the species was considered widespread, abundant and commonly encountered (Mahony, 1996; Osborne *et al.*, 1996). Today, the species exists as a series of isolated populations within its former range (White and Pyke 2005).

The Green and Golden Bell Frog (GGBF) is listed as an endangered species under Schedule 1 of the NSW *Threatened Species Conservation Act 1995*. At the national level, the species is listed as Vulnerable under Schedule 1 Part 2 of the *Environment Protection and Biodiversity Conservation Act 1999*.

As a consequence of being listed under both state and national legislation a draft recovery plan has been prepared for the GGBF (Department of Environment and Conservation 2005). The present Management Plan has been prepared to satisfy Action 11.3.4 of the draft GGBF Recovery Plan developed in accordance with the *Threatened Species Conservation Act 1995*. Action 11.3.4 calls for the NSW Department of Environment and Climate Change (DECC, former DEC) to prepare and implement a GGBF Management Plan for each key population on its own land and liaise with other landowners as necessary (e.g. local councils, industry, residents) to prepare and implement site specific Management Plans across the extent of the species distribution in NSW.

Where GGBF occur on public land, local councils are, under the Local Government Act, required to refer to the recovery plan for this species in any management plans. It is therefore envisaged that this Management Plan will satisfy this requirement of Shoalhaven City Council (with respect to the Crookhaven River floodplain population which occurs on private and public land). The Shoalhaven local government area has been identified in the draft GGBF Recovery Plan (DEC 2005) as supporting eight of the 42 Key Populations. This Management Plan is also intended to provide guidance, direction and coordination for other stakeholders, land owner/managers within this area where the frog and/or its habitat occurs.

The Southern Rivers Catchment Management Authority (CMA) has developed a Catchment Action Plan (CAP) that identifies a number of targets for managing natural resources. Biodiversity Catchment Target number 2 within the CAP is supported by the actions undertaken and proposed within this Management Plan (MP).

1.2 Objectives of the Management Plan

The Crookhaven River floodplain Management Plan covers GGBF and their habitat occurring within the catchment of the Crookhaven River, namely Brundee Swamp Nature Reserve, Culburra Beach, Currumbene State Forest (Butterfly Road) and Greenwell Point. This Management Plan has been prepared with the aim of ensuring that the population is managed and monitored such that the species continues to persist at the location and that measures of the population's viability are maintained or improved over time.

The objectives and aims of this MP are to:

1. Identify and where possible ameliorate threats and other issues/factors affecting, or likely to impact on, the conservation of the species within the Crookhaven River floodplain study area.
2. Manage the species in accordance with the strategies outlined within the draft GGBF Recovery Plan (DEC 2005).
3. Conduct assessments of habitat at sites where the frog has been detected in recent times.
4. Facilitate community consultation, including workshops and information days.
5. Co-ordinate habitat creation, restoration and protection measures.
6. Collate recent records of the species within the area covered in this management plan.

Appendix A details five strategies that aim to achieve the above objectives, including detailed actions assigned to each strategy, potential funding sources, and the agencies responsible for implementing each action.



Figure 1. Female Green and Golden Bell Frog at Greenwell Point © Garry Daly

2. THE CROOKHAVEN RIVER FLOODPLAIN POPULATION

2.1. Location and Land Ownership

The Crookhaven River Floodplain key population is composed of the following four sub-populations as identified in the draft GGBF Recovery Plan: Greenwell Point, Brundee Swamp, Saltwater Swamp and the northern drainage of Currambene State Forest. These populations also include areas at Lake Wollumboola near Culburra Beach. This management plan deals with all of these subpopulations because there is sufficient evidence that the species can disperse over many kilometres and thus migrate between the subpopulations (Daly 1995, Pyke and White 2001). All sub-populations described here are based on records obtained within the last decade (Table 1).

GGBF in the Crookhaven River floodplain area occur on both private and publicly managed land. The organizations responsible for management of GGBF on public land include Shoalhaven City Council (SCC - including Shoalhaven Water), Forests New South Wales (FNSW) and the Department of Environment and Climate Change (DECC). Publicly managed areas include the foreshores of Lake Wollumboola (SCC/DECC), Currambene State Forest (FNSW), Saltwater Swamp Nature Reserve (DECC) and Brundee Swamp Nature Reserve (DECC). The private organizations that have responsibility for managing GGBF include the Culburra Retirement Village and Culburra Bowling Club.

The following descriptions are of sites where the frogs have been detected (see Figure 2 for their locations).

2.1.1 Brundee Swamp and Saltwater Swamp (Nature Reserve and environs)

Location and Size

Brundee Swamp Nature Reserve (NR) was gazetted in 2001 and covers an area of 227 hectares. The NR lies about 7 kilometres south-east of Nowra (34°55'S, 150°39'E), between Worrigee Road and Mayfield Road. Saltwater swamp NR was also gazetted in 2001 and covers an area of 215 hectares. The two nature reserves are separated by a distance of about 1 km, comprising partially cleared freehold land, which occupies a low rise above the floodplain. Both nature reserves are located on the edge of the broad, lowland floodplain of the Crookhaven River.

Tenure

The Nature Reserves are managed by DECC, but much of the surrounding catchment is freehold land.

Habitat

Brundee Swamp and Saltwater Swamp formed at the end of the last glaciation, when sea levels rose and old coastal lagoons were filled with marine, estuarine and fluvial sediments (Dalmazzo *et al.* 2000). Today, drainage canals have been dug to drain the wetlands, and gates have been erected to exclude salt water as the wetland is below sea level. Prior to this, large areas of the wetland would have been inundated with brackish water at high tides, and periodically also with freshwater. Nevertheless, today the swamp is still extensive, and during times of flood, it extends beyond the nature reserve. The entire area within the reserve is considered habitat for the GGBF. Much of the land was grazed until 2001, and cleared areas exist within the swamps.

A comprehensive description of the vegetation within Brundee NR and Saltwater Swamp NR is given by Simpson *et al.* (2006). The southern third of the Brundee Swamp contains extensive areas of Swamp Paperbark. Cumbungi *Typha* spp. and Thatch Reed *Phragmites australis* occur in some areas, particularly close to the drainage canals. The cleared central area contains large stands of the weed Fleabane *Erigeron* sp. and the native sedge *Juncus kraussii*, but also regenerating stands of Swamp Oak *Casuarina glauca* and Swamp Melaleuca *Melaleuca ericifolia*. Prostrate species such as Sea Rocket *Cakile edentula* and *Sarcocornia quinqueflora* subsp. *quinqueflora* are also common and indicate that prior to the installation of the floodgates, the area was inundated with salt water. The adjacent forest includes a mixture of Swamp Oak *Casuarina glauca*, Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata* and Blackbutt *E. pilularis*. On adjoining freehold land dams have been dug in association with agricultural activities. Here, GGBF have been detected mostly along Springbank Road, either at night as they cross the road or in dams and drainage lines.

The vegetation in Saltwater Swamp is primarily Swamp Oak and estuarine saltmarsh including tussock rush *Juncus kraussii australasicus*. In gaps between dense patches of this rush, there is a more-or-less continuous cover of succulent forbs, *Selliera radicans*, *Sarcocornia quinqueflora* and *Lobelia anceps*, and the grass *Lachnagrostis filiformis* (Simpson *et al.* 2006).

Species status

Nocturnal surveys conducted in March 2007 detected five males calling on the north-western side of Brundee Swamp after rain filled the wetland to a depth of about 200 mm. Surveys on the southern and south-eastern side of the swamp failed to detect any GGBF. Diurnal surveys conducted shortly after revealed that Plague Minnow had invaded flooded areas on the east and southern portions of the swamp, and no further GGBF were detected (G. Daly, personal communication).

In the surrounding area, a survey in 1997 identified three frogs along the upper catchment of Crookhaven River (in a drainage canal to the west of Springbank Road), and two further individuals near a farm dam to the east of the road (G. Daly, personal communication). There are also records of the species from Rotten Creek (DECC Wildlife Atlas).

2.1.2 Currumbene State Forest – Butterfly Road

Location and Size

Currumbene State Forest is located to the south of Brundee Swamp (Figure 2), covers an area of 2110 hectares, and can be accessed via Butterfly Road (from Forest Road).

Tenure:

Currumbene State Forest is managed by Forests New South Wales.

Habitat

The site is a dam constructed as a result of quarrying for road base. There are extensive areas of Tall Spikerush *Elaeocarpus sphacelata* and Cumbungi around the edge of the dam. The dam is permanent, and no fish have been observed in the waterbody.

In the immediate catchment are stands of tall dry eucalypt forest dominated by *Corymbia maculata* with *Eucalyptus globoides* and *E. longifolia*. Scattered trees of *Acacia irrorata* and *Allocasuarina littoralis* make up the subcanopy. An open shrub stratum comprises *Daviesia ulicifolia*, *Leucopogon juniperinus*, *Persoonia linearis* and *Pittosporum undulatum*, with juveniles of the canopy species. An open groundcover is scattered amongst a semi-

continuous layer of eucalypt leaf litter and occasional patches of bare ground. It comprises species such as *Entolasia stricta*, *Echinopogon caespitosus*, and *E. ovata* (Simpson *et al.* 2006).

Species status

GGBF were first detected in Currumbene State Forest by Braithwaite *et al.* (1988). Subsequent inspections at a disused quarry revealed the presence of adult frogs in the mid 1990's (G. Daly, pers. obs.; Bower and Goldingay 1998). To date, a total of up to 56 adults have been seen at this site. However, no animals have been detected since November 2000 (G. Daly pers. obs.). Breeding has not been recorded from this site.

2.1.3 Greenwell Point

Location

The population is located at Green Road in Greenwell Point.

Tenure

The area where GGBF are still known to occur is freehold land and the one owner (Mr Green) has monitored and managed the population since 1998.

Habitat

Within the last decade, GGBF have only been found at Greenwell Point within a small area associated with farm dams located on the edge of the floodplain. The dam where GGBF were recorded recently is approximately 10 x 6 x 1 m deep. The pond has beds of Cumbungi and adjoins a grove of planted Swamp Oak. The site has been fenced to exclude domestic grazing animals. To the west, the land is cleared and grazed by cattle. The water level in the dam varies in response to rainfall. During drought (e.g. January 2007), the pond can dry to a residual mud layer. During floods, the dam is part of a broad shallow water body that covers several thousand square metres, and is colonised by the Plague Minnow *Gambusia holbrooki* and Short-finned Eel *Anguilla australis*.

The neighbouring property contains two dams. The sizes of these ponds are approximately 6 x 7 m and 10 x 10 m. One pond has Cumbungi, and GGBF were observed resting on this vegetation during daytime in February 2007. This pond is not permanent and dries such that the substrate is moist. No fish have been recorded from this pond. The second pond often dries to a mud layer, and Short-finned Eel *Anguilla australis* were observed in this pond.

Species Status

The population has been monitored since 1998 by Mr R. Green and varied from 0-30 (25 adults) frogs. Metamorphlings have been observed, indicating breeding activity occurs at the site. The number of frogs has declined since 2005, and in 2007, less than ten animals could be seen. DECC (Southern) had funded the purchase of a cattle trough to provide habitat for the frogs. However, so far, no GGBF have been recorded breeding in the trough.

2.1.4 Lake Wollumboola

Location

GGBF have been detected along the northern shore of Lake Wollumboola, in associated wetlands, particularly in the north east corner, in the surrounding residential area and to the west in the Lake Wollumboola catchment.

Tenure

The land where GGBF occur includes freehold land as well as land managed by DECC and Shoalhaven City Council.

Site Description

GGBF have been detected on the northern shore of Lake Wollumboola from the eastern most point of the lake west to Wattle Corner Creek wetland. The known habitat includes adjacent parkland and wetlands and the dunal swale along the northern shore, as well as residential areas.

Mr K. Campbell, a local historian, originally detected hundreds of the frogs in 1995 and 1996. The frogs were observed in SEPP 14 Wetland No 365, in drainage lines and vegetated verges/lanes and gardens from Silvermere St. to East Crescent. They were also observed on private land in the Wattle Corner Creek wetland. In April 2006, these sightings were confirmed by staff from DECC and Shoalhaven City Council as well as consultant G. Daly (Gaia Research 1998). The drainage lines were colonised by Cumbungi, and the adjacent vegetation around the lake included Swamp Oak and Swamp Melaleuca.

Breeding activity has been recorded at an ephemeral pond, which lies behind a dunal swale of the lake (G. Daly pers. obs.), the mouth of Sheepwash Creek and a number of small depressions, which may pool water (Grenadier and Mahony 2000). The vegetation within this swale includes Twig-rush *Baumea juncea*, the sedge *Cyperus polystachyos*, Marsh Clubrush *Bolboschoenus caldwellii* and Swampweed *Selliera radicans*.

The dunal swale is considered the main breeding site in this area and covers an area of approximately 10 x 30 m. Breeding activity has been observed after the swale pond has dried and the level of the lake was below that of the swale. When rains deposit freshwater into the swale it partially fills with water (approximately 300 mm deep), but the level is such that the lake water does not enter the swale. In these instances, the water in the dunal swale is free of fish.

Adult GGBF have been observed in the pond behind the Culburra Bowling Club (Gaia Research 1996) and in the ponds within the Culburra Retirement Village (G. Daly, pers. obs.). The population has been monitored in the retirement village, Goldfish and Eels have been removed from the ponds, and some Cumbungi and adjacent trees were removed to provide sufficient habitat for the frogs.

Species status

In 1995, Mr K. Campbell detected hundreds of juvenile GGBF, and in 1996, some of these individuals were observed as subadults (K. Campbell, pers. comm.). In the late 1990s, Grenadier and Mahony (2000) conducted a capture-mark-recapture study and estimated a population size of only 37-40 adult frogs. They caught a total of 32 adults (27 male and five female) and observed another three individuals. In May 2003, the level of Lake Wollumboola rose rapidly after days of heavy rain. The wetlands along the northern shore remained inundated until the lake was artificially opened in July 2006. No GGBFs have been observed in this general area since May 2003.

The population at the Culburra Retirement Village has been monitored since 1998 by Mr A. Parsons and varied from 0-32 adult frogs. Metamorphlings have not been observed at this site, indicating breeding may not occur. The number of frogs has declined since 1999 and none have been seen since November 2000.

Daly and Leonard (1996) conducted extensive fauna and flora surveys on the land adjacent of the Retirement Village (Long Bow Point), but no GGBF were detected. However, one adult and a juvenile GGBF were found to the west, on Copper Cup Point, in a Spikerush dominated tributary to a dam (Daly 1996).

Table 1. Significant sites where GGBF have been detected within the Crookhaven River floodplain since 1996

Site names relate to site assessments. All sites in Culburra Beach and Copper Cup Point are included in the Lake Wollumboola sub-population. Tenure: SF = Forests NSW, F = freehold, SCC = Shoalhaven City Council, and DECC = Department of Environment and Climate Change, BES = Bushfire Environmental Services. Eastings and Northings are given for AMG Datum 66, UTM co-ordinates in Zone 56. ALT = Altitude (m).

Site	Map	Eastings	Northing	Alt	Tenure	Years detected	Maximum no of frogs	Source
Copper Cup Point	Nowra	293200	6130500	10	F	1996	3	Daly and Leonard (1996)
Culburra Beach	Crookhaven	296300	6131300	10	F/SCC	1999	35-40	Grenadier & Mahony (2000)
Culburra Beach Ramp	Crookhaven	295600	6131600	10	SCC	1999	5	Grenadier & Mahony (2000)
Culburra Bowling Club	Crookhaven	294800	6131800	10	F	1999	30-40	M. Parsons, pers. comm.
Currambene SF	Nowra	287600	6129000	50	SF	1997	56	Bower and Goldingay (1998)
Greenwell Point 1	Nowra	292100	6134400	10	F	2001-07	30	R. Green, pers. comm.
Greenwell Point 2	Nowra	292000	6134360	10	F	2007	3	G. Daly, pers. comm.
Brundee Swamp 2	Nowra	286000	6132200	10	DECC/F	2007	5	G. Daly, pers. comm.
Wattle creek	Crookhaven	294800	6131450	10	F	1996	2	K. Campbell, pers. comm.
Mayfield Rd	Nowra	287090	6134425	10	F	2000	No data	E. Burns/B. Houlden, pers. comm.
Worrigee Road, Worrigee	Nowra	284480	6132390	10	F	2005	No data	BES, pers. comm.
Worrigee	Nowra	284550	6133750	10	F	2003	2	L. Mitchell, pers. comm.
Currambene SF	Nowra	287757	6129015	50	SF	2007	1	K. Rowley/ B. Goldspink, pers. comm.

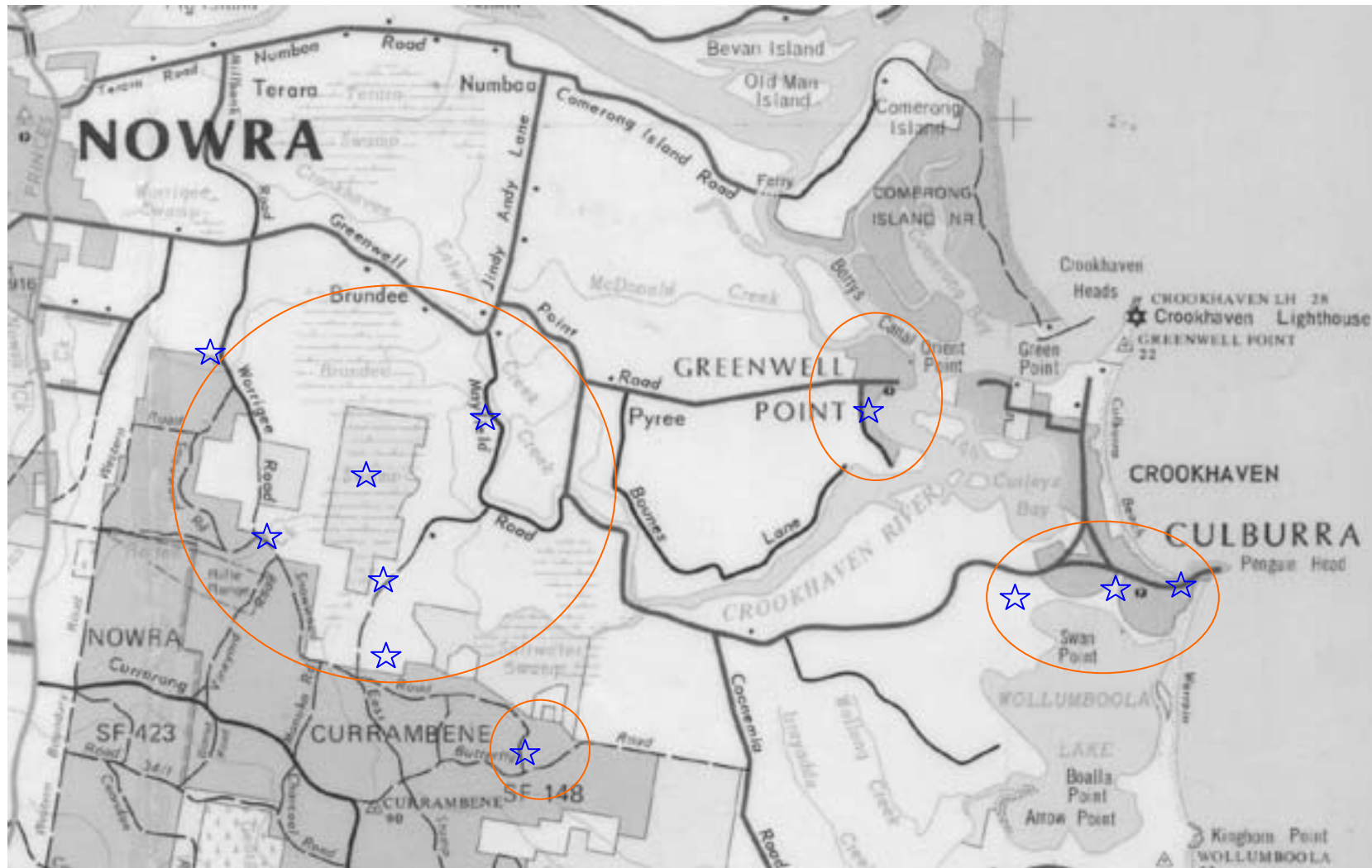


Figure 2:
detected

Sites covered within the Crookhaven River floodplain management plan. Blue stars represent locations where frogs were

3. THREAT ASSESSMENT

The identified threats to the Crookhaven River floodplain key population include:

1. Loss of habitat. The GGBFs occupy and utilise a wide variety of habitat types within the areas identified above. There is continuing pressure to further develop and modify bushland and agricultural areas for urban development that provide much of these habitats and their connectivity. Loss of habitat can also be as a result of sediment from urban areas silting up ponds in drainage lines, or of weed invasion, particularly invasion by Bitou Bush *Chrysanthemoides monilifera rotundata* (Gaia Research 1998), which is listed as a KTP.
2. Invasion by introduced predators that include Plague Minnow – *Gambusia holbrooki* (listed as a Key Threatening Process under the *TSC Act 1995*). Plague Minnow are present in Brundee Swamp, Lake Wollumboola, Greenwell Point dam, Culburra Bowling Club dam and the upper catchments of Crookhaven River. Plague Minnow also occurs in many other water bodies and dams in the area. The few fish-free water bodies may be critical for the successful breeding of the frog in the area. When managing sub-populations, there is a need to consider hydrological factors that may or may not favour the presence of Plague Minnow.
3. Feral and Domestic Cats - *Felis catus* and Red Fox *Vulpes vulpes* (the latter is listed as a Key Threatening Process under the *TSC Act 1995*) are known to prey on adult or juvenile GGBF.
4. Predation of GGBF from native predators is also considered a threat to the species because the population has declined to such an extent that it is not robust. Native predators include Eels *Anguilla* spp., Red-bellied Black Snake *Pseudechis porphyriacus*, Eastern Tiger Snake *Notechis scutatus* and Ibis *Threskiornis* spp.
5. Water quality. Runoff including sediments and chemicals from urban and agricultural areas may pollute GGBF habitat such as wetlands and drainage areas. Pollution can also be as a result of inappropriate application of chemicals for weed control (e.g. Glyphosate).
6. Disease. Frog Chytrid *Batrachochytrium dendrobatidis* - is listed as a Key Threatening Process under the *TSC Act* and *EPBC Act*. This disease may be the most serious threat to GGBF limiting population recovery. The hygiene protocol for the control of disease in frogs (Wellington and Haering 2001) should be adhered to at all times. Presently, it is not known how prevalent the disease is in this population.
7. Anthropogenic climate change (Listed as a Key Threatening Process). Rises in sea level and changes in rainfall patterns may impact on where and if GGBF can utilise sites for breeding. All of the breeding sites of GGBF covered in this Management Plan exist within less than two metres above sea level. During January 2007, the swale at Culburra Beach where GGBF had previously been detected breeding was dry. Drought inhibits the species from breeding in ephemeral waterbodies. The long term reduction of rainfall may reduce recruitment and lead to population decline or collapse at some sites. Saline invasion of wetlands caused by rises in sea level could threaten adult frogs and tadpoles.
8. Inappropriate Management. GGBF can be negatively affected by the use of herbicides or pesticides, the opening and closing, or emptying, of water bodies, as well as inappropriate fire frequency and intensity (listed as a KTP).
9. GGBF can be affected by direct human impacts, such as mowing and road mortality caused by collision with motor vehicles.

4. PREVIOUS MANAGEMENT PLANS

Two management plans (MP) have previously been completed for GGBF in the Crookhaven River floodplain. One plan was prepared for a dam in Currumbene State Forest (Bower and Goldingay 1998), the other for the sub-population at Culburra Beach (Grenadier and Mahony 2000).

4.1 Butterfly Road MP

The MP for Currumbene State Forest proposed to enhance the existing GGBF habitat around the quarry pond, to protect the quarry pond and to modify the nearby fire dam. So far, dumped cars and rubbish have been removed from the site.

4.2 Culburra Beach MP

The MP proposed four tiers of management which specified the maintenance/rehabilitation of natural systems, maintenance/rehabilitation of urban areas, community awareness and further research.

The MP identified several issues/threats including:

1. The protection of breeding sites for the GGBF along the edge of Lake Wollumboola from vehicular traffic, stormwater run off and pollution from residential areas.
2. The interactions of Lake Wollumboola and GGBF. The frogs are dependent on the water level of the lake, which in turn is affected when the lake is opened to the surroundings and water is allowed to run out .
3. The protection of GGBF habitat by considering re-zoning of the land. The zoning of the shores was 6(a) open space – recreation A and B and 4(d) industrial.
4. The presence of Mosquito Fish (= Plague Minnow) *Gambusia holbrooki*.
5. The creation of a frog pond for GGBF at drain 4 along East Crescent and at boat ramp park, Culburra Beach.
6. The maintenance of drainage lines along East Crescent.
7. Maintenance and protection of corridors for movement and dispersal of GGBF.
8. Increased community awareness and education.
9. Continued research and monitoring of the Culburra Beach GGBF population.

Management response:

- *Issue 1. Protection of breeding sites:* Shoalhaven City Council has protected the breeding sites for the GGBF along the edge of Lake Wollumboola from vehicular traffic by installing barriers. Currently there are no mechanisms to modify stormwater run off from residential areas.
- *Issue 2. Interactions of Lake Wollumboola and GGBF:* Although it is illegal to open the lake this has occurred at various times, and most recently in July 2006. This may have impacted negatively on the GGBF.
- *Issue 3. Protection of habitat of GGBF:* The zoning of the lake shore is now 6(a) open space – recreation and 7(a) environmental protection - ecology. Lake Wollumboola itself was gazetted part of the Jervis Bay National Park in November 2002, and a draft plan of management is in preparation. The National Park covers the lakebed, the sandbar at the mouth of the lake and an area of land south of the sandbar for approximately 500m.
- *Issue 4. Presence of Plague Minnow Gambusia holbrooki:* Although Plague Minnow is listed on the TSC Act (1995) as a threatening process there are currently few options for the eradication of this species. Given Plague Minnow occurs in Lake Wollumboola and some of the dams within the catchment, the eradication of this species at a local level could occur if the water in the dams in the upper catchment

were pumped out in conjunction with a period of severe drought, and when the lake was open to the sea.

- *Issue 5. Creation of a frog pond for GGBF:* SSC constructed a frog pond for GGBF at drain 4 along East Crescent. However, breeding has not been recorded at this site.
- *Issue 6. The maintenance of drainage lines:* Over the last few years, some of the drainage lines along East Crescent have filled from silt. However, SCC has slashed some drainage lines, and since 2000, has followed recommendations for how slashing should occur as outlined in the Grenadier and Mahony management plan.
- *Issue 7. Maintenance and protection of corridors:* The Lake Wollumboola Bushcare Group has, since 1999, conducted removal of Bitou Bush and other invasive species along the northern shore of Lake Wollumboola, east of Sheepwash Creek. This work is supported by Shoalhaven City Council and an Envirofund Grant. It was preceded by weed-removal work conducted in the Lakeside Park area in 1996 by the Culburra Landcare –Dunecare group (Gaia Research 1998).
- *Issue 8. Increased community awareness and education:* Grenadier and Mahony (2000) issued 150 questionnaires on GGBF in the Culburra Beach area relating to sightings. Only 14 were returned and nine indicated sightings of frogs to the west of Sheepwash creek and along Silvermere Street. In 2005, the Lake Wollumboola Bushcare Group, assisted by the Envirofund Grant and Shoalhaven City Council, initiated a community awareness workshop (run by G. Daly) and prepared and distributed an information brochure regarding SEPP 14 Wetland 365 and its value as GGBF habitat.
- *Issue 9. Continued research and monitoring of the Culburra Beach GGBF population:* Irregular monitoring of GGBF at the site adjacent to Lake Wollumboola/ Wetland 365 has been conducted since 1996 (F. Bray and G. Daly, pers. comm.). However, no GGBF have been detected since May 2003.

5. MANAGEMENT ACTIONS

Appendix A lists several Management Actions which aim to (a) maintain the existing GGBF population; (b) increase the population; and (c) improve habitat for GGBF in the Crookhaven River Flood Plain. These actions are based on recommendations made during a stakeholder meeting in March 2007 (see below) and the existing management plans and responses described in Section 4. They can be assigned to the following five strategies:

1. Community consultations and education to build awareness of the GGBFs;
2. Further on-ground actions such as removal of invasive weeds, creation of potential breeding habitat and fox baiting;
3. Habitat protection/restoration within the broader catchment of Crookhaven River floodplain;
4. Reduction of external threats to GGBFs; and
5. Monitoring and research to better understand the extent and dynamics of the GGBF population.

The management actions proposed in Appendix A build upon a range of past and current actions to manage the species, some of which are described as “Management response” in Section 4.2. above. Additional previous actions to manage the species are listed as follows.

5.1 Community consultations

In March 2007, a stakeholder workshop was held to identify the above threats and other possible management actions as a basis for preparing this management plan. The workshop

was attended by local residents and representatives from Shoalhaven City Council, Shoalhaven Water, FNSW and DECC. A draft of this plan was then distributed to these stakeholders for comment. Further comments are welcome and should be submitted to DECC (details see inside cover).

Grenadier and Mahony (2000), issued 150 questionnaires on GGBF in the Culburra Beach area relating to sightings. The Lake Wollumboola Bushcare group, assisted by SCC and G. Daly, conducted a workshop on GGBF habitat in April 2005. Discussions with landowners in Culburra Beach indicated that no GGBF have been detected since May 2003. Keith Campbell, Frances Bray, the Lake Wollumboola Bushcare Group and others have monitored GGBFs and their habitat and initiated habitat protection and community education activities. G. Daly has worked with Mr R. Green and has monitored the resident GGBF population at Greenwell Point since 1998. He has also worked with Mr A. Parsons and has monitored the population of GGBF that used the drainage line within the Culburra Retirement Village since 1996.

An interview with G. Daly was broadcasted on the local ABC on 14 March 2007 dealing with the plight of GGBF. However, the follow up of reported sightings did not reveal any new records in the Crookhaven River floodplain area.

5.2 Construction of additional breeding habitat

In February 2007, a breeding pond in the form of a dam was constructed at Greenwell Point, on the property of Mr Green. The dam is located four metres from an existing GGBF breeding site and measures approximately 10 x 10 m by 0.4 m deep. It is ephemeral, hence if Plague Minnow or eels colonised the dam their persistence would only be temporary. In addition the existing dam was partially filled in order to eliminate eels that existed in the mud.

On the adjoining property an existing dam (approximately 10 x 10 m x 1.5 m deep) was also partially filled in order to eliminate eels that existed in the mud. Works were conducted in February 2007, and the modified dam currently measures 30 x 30 m x 1 m deep.

After rain in late February and March 2007, one GGBF was heard calling from the modified dam and thousands of tadpoles (mostly Bleating Tree Frog *Litoria dentata*) were observed both in the modified and the constructed dam (G. Daly pers. comm.). Tadpoles were also observed in the constructed dam on the adjoining property but not in the partially filled dam. Future surveys will need to confirm whether the tadpoles include those of GGBF and if they persist in this new breeding habitat.

The initial success of the above project suggests that additional construction or modification of breeding habitat should follow similar procedures.

Shoalhaven City Council built a pond for GGBF at Drain 4 on East Crescent Culburra Beach. Frogs were observed around this pond for a few years post construction but no breeding activity has been recorded at this site. Another pond was constructed along an ephemeral watercourse in the nearby park. This was used by the Bleating Tree frog for breeding but was later colonised by Plague Minnow (G. Daly pers. comm.). A trough/pond was installed by local Culburra Beach residents Frances Bray and Keith Campbell in 2000. No GGBFs have been observed, however this pond was used for breeding by other frog species in 2006.

There is opportunity for additional ponds to be constructed in Currumbene State Forest (Bower and Goldingay 1998) and at decommissioned refuse sites at Greenwell Point and Culburra Beach.

5.3 Habitat restoration/protection

A number of bush regeneration programs have been undertaken in order to restore the native vegetation adjacent to GGBF key habitat locations. In particular, activities have been conducted at Culburra Beach, by the Lake Wollumboola Bushcare Group, supported by SCC, Envirofund and NSW Government grants. In the last two years, a total of \$48,000 has been spent on habitat restoration. This includes rehabilitation of SEPP14 wetlands around Lake Wollumboola (\$23,000), Bitou Bush control (\$15,000) and the control of Asparagus fern (\$10,000). In addition, contributions from volunteers have been made that tally to \$35,000 per annum (A. Stratton, Shoalhaven Bushcare Coordinator, pers. comm.). Future bush regeneration should benefit from the experience gained during these projects.

There is a need to manage traffic on East Crescent following the creation of a through road in 2007. This has resulted in increased traffic and the removal of a vegetated drainage line. The resulting increase in traffic is likely to threaten the GGBF population. The road should be gated at the point where the area was previously closed to traffic, with access only for SCC and authorized traffic (e.g. garbage disposal and sewage pumpout/inspection vehicles).

In addition the water quality of existing vegetated drainage lines should be improved and vegetation beside the road verges maintained. The condition of the drainage lines has deteriorated, mainly since road base, deposited in Silvermere Street, has washed into Drainage line 4 and Broadview Lane. This road base should be removed before it contaminates the wetland. The clearing, mowing and poisoning of vegetation has also contributed to habitat deterioration. It is also important to adhere to the mowing regime for drainage lines and verges, and controls on use of chemicals, as stated in the Culburra Beach GGBF Management Plan (Grenadier and Mahony 2000).

Dumped vehicles have been removed from the dam in Currambene State Forest but there is a need for continual monitoring and maintenance of illegal dumping at this site.

5.4 Habitat acquisition and conservation

Much of Crookhaven River floodplain is privately owned freehold land. A number of mechanisms are available that could be used to secure the conservation management of the habitat. These include:

- Rezoning
- Voluntary Conservation Agreements
- Property Management Plans
- CMA incentive programs
- Biobanking

Grenadier and Mahony (2000) proposed that Shoalhaven City Council give consideration to rezoning areas currently zoned 6(a), Sheepwash Creek and the riparian and remnant forested pockets either side of the creek, as well as other zonings along the northern shores of Lake Wollumboola (outside existing community recreation facilities at Lakeside Park and Boat Ramp parks).

The continuous protection of land used by GGBF could be achieved if land owners entered into a Voluntary Conservation Agreement or a Property Vegetation Plan for areas of wetland or bushland that can not be developed or used for agricultural activities. The incentive for land owners would be a reduction in rates on land that can not be used for agriculture. DECC could be proactive in this area through education and community consultation.

Note: A VCA is an agreement between landowners and the NSW Minister for the

Environment. The agreement is voluntary, in perpetuity, legally binding and registered on the land title. It protects significant natural and cultural values identified in a specific conservation area and can include land privately owned or leased from the Crown. It includes strategies for the on-going management of the identified conservation values as well as a monitoring protocol. Once a landholder has a VCA registered, he or she can apply to have the affected portion of the land exempt from rates.

PVP – A Property Vegetation Plan is a voluntary but legally binding agreement between a landholder and the local Catchment Management Authority. It is often used when seeking to utilise offsets associated with clearing, when approval under the *Native Vegetation Act 2003* is required.

5.5 Fox baiting and eradication of Plague Minnow

Fox baiting is conducted by DECC at Culburra Beach as part of the Little Tern conservation project. By default this program also benefits the GGBF. This program could be extended to twice a year and could extend along the northern shore of Lake Wollumboola.

Plague Minnow occur in dams within the catchment of Lake Wollumboola, Brundee Swamp and the Crookhaven River. These dams could be drained to eliminate this threat to GGBF.

5.6. Monitoring and research

There have been few systematic surveys for GGBF conducted within the Crookhaven River floodplain (Gaia Research 2007). Brundee Swamp NR and the swale area at Culburra Beach are of sufficient size to place a number of standard 30 minute/250 m transects for assessment (Daly and Craven, in press). The use of standard systematic sampling is recommended so that comparisons of population size can be made between key populations (Gaia Research 2007) and at sites over time. Targeted searches can also be conducted around specific dams that are historic breeding sites. Searches must be conducted when weather conditions are appropriate during the activity or breeding season, and after rainfall events, to enhance detection.

Chytrid fungus *Batrachochytrium dendrobatidis* is listed as a key threatening process to amphibians in many countries, including Australia (Berger *et al.* 1998, Hyatt *et al.* 2007). The disease has been implicated in amphibian deaths, species or population declines and extinction in some species of Australian frog. The disease is widespread in many different environments and is implicated in the decline and local extinction of the GGBF. There is an urgent need to sample GGBF (and /or other species of frog) within the Crookhaven River floodplain for the presence of chytrid. G. Daly has taken swab samples from GGBF at Greenwell Point in February 2007, and these will be analysed by CSIRO. Presently, it is not known how prevalent the disease is in the population.

6. DURATION

The duration of this plan will be three years, i.e. July 2007 to June 2010.

REVIEW

A review of the plan is required after 2.5 years as a basis for its next iteration after three years. Informal review of the plan is also encouraged both within organisations and through networks and partnerships. All recommendations to improve the plan should be directed to the DECC contact given in the inside cover of this plan.

FROG HYGIENE PROTOCOL

Individuals studying or surveying frogs often travel and collect samples of frogs from multiple sites and, without implementing the hygiene protocol, may be a cause for the spread of the chytrid disease. Green and Golden Bell Frogs can be particularly sensitive to the introduction of infectious pathogens, such as the frog chytrid fungus. Therefore, it is important that frog workers recognise the boundaries between sites and undertake measures that reduce the likelihood of spreading infection. The detailed procedures and measures are provided in the Hygiene Protocol for the Control of Disease in Frogs (Wellington and Haering 2001), that can be obtained from the Department of Environment and Climate Change, or downloaded from: <http://www.nationalparks.nsw.gov.au/pdfs/hyprfrog.pdf>

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Appendix A. IMPLEMENTATION PLAN

Strategy 1: Education and communications to build awareness of the GGBFs and encourage further on-ground actions

Action	Recovery plan links	Responsibility	Cost	Funding source	Timeframe
1.1 Liaise with Shoalhaven Water to produce site specific (Culburra Beach and Coonamia Road) GGBF management plans	Actions 10.3.1, 14.3.2	DECC Consultants Shoalhaven Water	In-kind to industries	Shoalhaven Water DECC	2007-10
1.2 Prepare, distribute, and report on, a community survey seeking GGBF observations. Re-distribute 'Have you seen any bell frogs' brochure	Actions 12.3.1, 14.3.2	DECC Shoalhaven City Council Environment groups	\$2,000 (advertising, printing). Environment groups distribute/collect and collate	DECC/Council	2007-09
1.3 Liaise with Illawarra Department of Education & Training (DET) to develop and implement GGBF education programs in local schools	Action 14.3.2	DECC Illawarra DET	In-kind DET; educational consultants \$1,500	Environmental Trust	2007-08
1.4 Develop a forum (e.g. email list and/or website) through which the community can access information about the local GGBF population and frog-friendly activities	Action 14.3.1	DECC, Other stakeholders	As required	CMA developed grants	2008-09
1.5 Liaise with local media (print, radio, TV) to encourage them to regularly report on GGBFs and the roll out of management actions in this plan	Action 14.3.1	DECC Other stakeholders	In-kind by DECC (e.g. media releases)	In-kind DECC	2007-09
1.6 Use or stage local community events to highlight GGBFs and encourage frog-friendly actions	Action 14.3.2	Shoalhaven City Council DECC	\$3,000 (production of static display for events)	SCC and Local sponsors	2007-10
1.7 Develop and maintain a network of stakeholders and partners including through a stakeholder list. Consider the formation of a local GGBF group.	Action 14.3.1	DECC Gaia Research Other consultants	In-kind by DECC and Gaia Research		2007-09

IMPLEMENTATION PLAN (continued)

Strategy 2: Further development of GGBF breeding habitat on public and private lands

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
2.1 Create additional breeding habitat at Greenwell Point and Culburra Beach.	Action 11.3.3	Shoalhaven City Council Consultants	> \$20,000	NHT/NSW Environmental Trust Grants/ Council/ Threatened Species Network Community Grants	2007-08 \$3000 thus far for 2007
2.2 Install plastic breeding troughs at appropriate locations with approvals	Action 11.3.3	DECC Consultants	\$2,000	NHT/NSW Environmental Trust Grants/CMA devolved grants	2007-08
2.3 Liaise with industries (e.g. Golf Course near Brundee Swamp) to retain and improve breeding habitat on site (link with Action 1.1)	Actions 10.3.1, 11.3.3	DECC Landowners	As required	Environmental Trust Grants/ Council/	2007-10

IMPLEMENTATION PLAN (continued)

Strategy 3: Improvement of habitat within and between the GGBF sub-populations

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
3.1 Investigate opportunities for improving sub-population connectivity between Greenwell Point and Brundee Swamp (link with Action 5.1)	Actions 10.3.1, 11.3.3	DECC	\$10,000 (same budget as for Action 5.1)	CMA devolved funding/NSW Environmental Trusts/local sponsors	2007-10
3.2 Improve habitat connectivity (e.g. create swales, wet areas, appropriate landscape plantings) based on findings from Action 3.1. Acquisition of freehold land under biobanking tradeoffs around edge of Lake Wollumboola	Action 11.3.3	DECC Landowners and State Government	>\$50,000	NHT/NSW Environmental Trust Grants/CMA devolved grants/Threatened Species Network Community Grants	2008-10

IMPLEMENTATION PLAN (continued)

Strategy 4: Reduction of external threats to GGBFs

ACTION	RECOVERY PLAN LINK	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
4.1 Promote responsible cat ownership in relation to GGBFs through education (link with Actions 1.4, 1.5, 1.6)	Actions 11.3.2, 14.3.2	DECC Consultants, Shoalhaven City Council	As required	In-kind, council and industry work budget in liaison with DECC	2007-09
4.2 Control feral predators (i.e. continue fox baiting) at Lake Wollumboola. Initiate further fox baiting programs	Actions 11.3.2, 11.3.6	Shoalhaven City Council DECC	As required	Council and industry works budgets in liaison with DECC	2007-09
4.3 Minimise stormwater impacts on GGBFs and their habitats through stormwater plans and actions	Action 11.3.1	Shoalhaven City Council DECC	As required	Stormwater plan budgets	2007-09
4.4a Investigate opportunities to remove Gambusia from dams within the catchment of Lake Wollumboola and Brundee Swamp NP in consultation with DPI Fisheries and SSC. Link with Gambusia TAP.	Actions 11.3.2, 11.3.6	DECC DPI Shoalhaven City Council	As required		2007-10
4.4b Investigate opportunities to exclude Gambusia from Brundee Swamp	Actions 11.3.2, 11.3.6	DECC	As required		2007-10
4.5 Investigate mechanism to reduce road toll on GGBF on East Crescent	Actions 11.3.2,	Shoalhaven City Council	As required		2007-08

ACTION	RECOVERY PLAN LINK	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
4.6 Liaise with landowners (Council, industries, residents) to encourage best practices (e.g. mowing, landscaping, maintaining wet areas) related to GGBF habitat (link with Actions 1.1, 1.4, 1.6, 1.7)	Actions 11.3.1, 14.3.2	DECC	See Actions 1.1, 1.4, 1.6, 1.7		2007-10

IMPLEMENTATION PLAN (continued)

Strategy 5: Monitoring and research to better understand the extent and dynamics of the Crookhaven River floodplain GGBF population

ACTION	RECOVERY PLAN LINKS	RESPONSIBILITY	COST	FUNDING SOURCES	TIMEFRAME
5.1 Map and identify existing and potential habitat and identify tenure of affected lands (link with Action 3.1)	Action 11.3.4, 12.3.2	DECC Consultants	\$10,000 (same budget as Action 3.1)	CMA devolved funding/NSW Environmental Trusts	2007-09
5.2 Conduct a coordinated and systematic survey to determine baseline population numbers and location. Reconcile with historic records	Action 12.3.1	DECC Gaia Research Other Consultants	\$30,000	CMA devolved funding/NSW Environmental Trusts/local sponsors, existing funds to Gaia Research	2007-10
5.3 Monitor effectiveness of management actions against baseline data from Action 5.2. Report findings to stakeholders and community (link with Action 1.5)	Action 12.3.1	DECC	\$20,000	CMA devolved funding/NSW Environmental Trusts/local sponsors	2008-10
5.4 Undertake sampling of frogs and water at different locations to see if frog chytrid is present. Link in with national Threat Abatement Plan (TAP) for chytrid.	Actions 11.3.5, 11.3.6, 12.3.2	DECC Consultants	\$10,000	CMA devolved funding/NSW Environmental Trusts/local sponsors/TAP funds, DECC,	2007-10