



Office of
Environment
& Heritage



Sloane's Froglet Interim Habitat Guide & Management Recommendations

Introduction

Sloane's Froglet *Crinia sloanei*, is a small frog (Figure 1), that is listed as Vulnerable on the NSW Threatened Species Conservation Act 1995. It occurs in the western slopes and plains of NSW and in northern central Victoria. Very little is known about Sloane's Froglet. Significant declines of this species have occurred across its range. Important populations occur in Albury and Corowa (Knight 2013).



Figure 1: A male Sloane's Froglet at a wetland on Davey Road, Thurgoona. (Photo: David Hunter)

This document aims to provide some interim information about Sloane's Froglet habitat requirements which can assist in the management of the Thurgoona population. It is based on research undertaken from 2010 to 2013 into the habitat which Sloane's Froglet has been found to use in Thurgoona (Knight, unpublished data). It also draws upon more general amphibian research. It is divided into two parts: 1) habitat information, which covers features of the water, vegetation, size and complexity of wetlands that Sloane's Froglet uses; and, 2) management recommendations.

Sloane's Froglet uses both constructed and natural wetlands and so it is possible that with targeted and informed management this species may continue to survive in the rapidly developing Thurgoona region. As little is known about the species the information provided here should be used cautiously and actively. Careful monitoring and assessment of management actions and the response of the population are essential to ensure that Sloane's Froglet continues to survive within the region.

1) Habitat

Sloane's Froglets use a variety of wetlands as breeding habitat. This includes natural and manmade wetlands, from tiny depressions less than 1m² to very large wetlands 200 ha in size. In the Albury area Sloane's Froglets have been found calling in dams, shallow depressions, natural wetlands, roadside and irrigation drains, oxbows and gilgais.

Sloane's Froglet may not breed successfully in all these types of waterbodies. As with other frog species, some areas may be used for dispersal and refuge rather than breeding. Despite the range of wetlands Sloane's Froglet use, there are some common features to the habitat it is found in and, like most frog species, it has particular requirements, especially regarding water depth and vegetation.

Water

Water Depth

A common feature of all waterbodies occupied by Sloane's Froglet is that they contain an area of shallow (vegetated) water, or they overflow into an adjacent flat area that only becomes inundated occasionally.

Calling male Sloane's Froglets have only been found within shallow areas ranging in depth from 1 to 31 cm, with 50% of those measured sitting in water less than 5 cm deep and 80% in water less than 8 cm deep.

Figure 3: Sloane's Froglets call from clay cracks in autumn prior to rain. The dry surface of this dam has not been disturbed by stock, and so provides good refuge habitat in dry times. (Photo: Alexandra Knight)



Figure 2: Wetlands supporting breeding Sloane's Froglets in winter may completely dry out over summer. In this condition (dry, overgrazed, & pugged) this dam does not appear to be good Sloane's Froglet habitat. Despite this, it has been used consistently over the past 4 years for winter breeding (when stocking rates were lower and the vegetation taller). (Photo: Alexandra Knight)



Length & Season Of Inundation

Sloane's Froglets use permanent and ephemeral wetlands to breed in. The lifecycle of Sloane's Froglet is strongly linked to the length and season of inundation of wetlands. In addition to the wetting phase, the drying phase of the wetland (as shown in Figure 2) is likely to be important as it influences nutrient levels, the vegetation structure and the number and types of predators at the site. The key features of Sloane's Froglet lifecycle that are linked with wetting and drying are described below.

For the years 2010 to 2013, male froglets commenced calling in Thurgoona in mid-April and continued throughout winter and into spring. Male calling has been observed from both wet and completely dry waterbodies (from deep, clay cracks as shown in Figure 3 and from the dry bottom of the waterbody) prior to inundation.

Pairs of breeding Sloane's Froglets have been observed twice in Albury and Corowa in 2010 and 2013, both in mid-July. Littlejohn (1958) reported breeding in spring. This breeding behaviour suggests that it is important for the waterbodies to become inundated in autumn, which is consistent with the local weather pattern of an 'Autumn break'.

Sloane's Froglets eggs hatch 10 to 21 days after laying (Anstis 2013). While very little research has been undertaken into tadpole development, metamorphosis has been observed in spring and possibly in summer. Under captive conditions in Sydney, Sloane's Froglet tadpoles took 11 weeks to reach metamorphosis from hatching (Anstis 2013), but it may take longer in the cooler winter temperatures around Thurgoona.

These lifecycle observations suggest that for successful breeding it is important that waterbodies contain water from mid to late autumn, through the winter months, and into late spring/early summer. Water needs to lie in wetlands for a minimum of 3 months after a winter breeding event to allow the tadpoles sufficient time to reach metamorphosis – at least until November. Nothing is known of the requirements for young metamorphs. As Sloane's Froglets use shallow areas for breeding that are prone to drying out, continual 'topping up' of these areas needs to occur throughout the winter breeding period. Tadpoles may be particularly sensitive to issues associated with water quality and temperature during this time.

Inundation across the landscape is also important for Sloane's Froglets as it allows them to move between breeding sites. The slow creeping floods that inundate grasslands and connect smaller ponds in the Thurgoona area provide stepping-stones that allows Sloane's Froglet to spread into areas uninhabited in dryer seasons.

Water Quality

Temperature, pH, turbidity, dissolved oxygen and conductivity have been measured at sites occupied by Sloane's Froglet, and those where it doesn't occur throughout Thurgoona. There was no significant difference between the water quality parameters at sites which Sloane's Froglet uses and doesn't use (Knight, unpublished data). Water is sourced from rainfall, stormwater, and sewerage treatment plants.

Several studies have examined whether water quality parameters influence the distribution of frogs. These studies have generally shown that habitat, particularly aquatic vegetation, is more important than water quality (Wassens et al. 2011, Healey et al. 1997). However, it is known that poor water quality can affect tadpoles of most species (Smith et al. 2007).

The difference between general water quality characteristics and the addition of toxins to water needs to be made clear. While frogs may occur in areas with poor water quality, many studies have shown that their health may be affected by toxins including pesticides, herbicides and fertilisers. While not always leading to immediate death, some chemicals and fertilisers can affect a frogs' immune systems, providing an opportunity for disease to take hold (Mann et al. 2009).

Flow Rates

Generally, Sloane's Froglet is found in waterbodies where the water is still. No research has yet been undertaken into the flow rates of water that Sloane's Froglet occurs in. Sloane's Froglet are found in some roadside drains and irrigation channels. Within still ponds they often locate themselves at the in- and out-flows (if there is suitable habitat). They have not been located in streams, creeks or fast flowing stormwater drains. This suggests that they tolerate a level of water flow after rainfall events, but do not tolerate continually flowing water. Further investigation is required.

Vegetation

Vegetation available in the wetlands is very important for all life stages of Sloane's Froglet. Female froglets lay eggs singly, mostly attached to submerged vegetation such as grass stems as shown in Figure 4. Some eggs are laid on the substrate in shallow water. Vegetation also provides shelter and food resources for both tadpoles and adult froglets. Anstis (2013, p. 582) remarks that the tadpoles live on the bottom and "feed on fine particles and algae in sediments...and on vegetation".



Figure 4: Sloane's Froglet eggs are laid attached to grass and reeds. (Photo: Alexandra Knight)

Vegetation Species

When actively calling and breeding, Sloane's Froglets are generally found in waterbodies that contain inundated grasses, small-stem diameter reeds and other submerged and floating aquatic vegetation as shown in Figures 5 and 6. Field observations (Knight, unpublished data) suggest that the denser and larger populations of Sloane's Froglets are located in shallow wetlands with large areas of emergent *Eleocharis acuta* (Common spikerush) and *Cynodon dactylon* (Common couch). Sloane's Froglet are also common in inundated grazing areas, including areas dominated by Ryegrass and native grasses such as Wallaby grasses. Other vegetation commonly found in wetlands occupied by Sloane's Froglets includes; *Juncus ursitatus*, *Carex* species, *Paspalum distichum*, *Poa* species, *Potamogeton ochreatus*, and *Myriophyllum* species.

Wetlands occupied by Sloane's Froglet in the Albury area are often fringed by *Carex* species. Wetlands also contain areas of taller and larger stem-diameter reeds (such as *Phragmites* sp. and *E. sphacelata*), but Sloane's Froglets have not yet been recorded breeding in these areas. Many of these wetlands also contain the threatened *Amphibromus fluitans*, but this species appears to emerge later than the peak Sloane's Froglet breeding season. Sloane's Froglet may use other vegetation species where available. The majority of wetlands in the Albury area used by Sloane's Froglet have been disturbed or constructed and so lack native vegetation diversity and are often dominated by weed species.



Figure 5: Good Sloane's Froglet habitat at the Thurgoona equestrian centre. This wetland also contains high frog diversity. (Photo: Alexandra Knight)

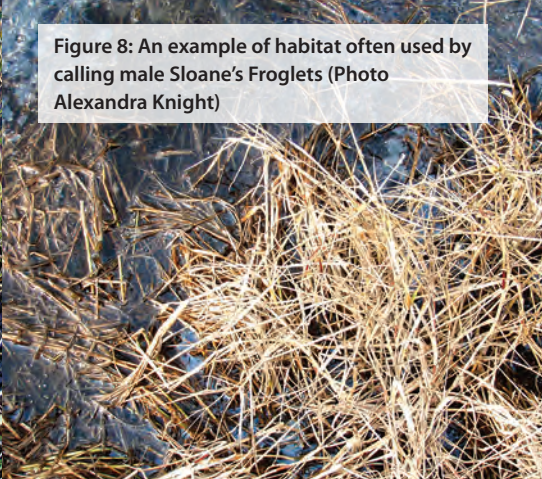


Figure 6: Good Sloane's Froglet habitat near the Albury airport. (Photo: Alexandra Knight)

Figure 7: Good habitat for calling male Sloane's Froglets (Photo: Alexandra Knight)



Figure 8: An example of habitat often used by calling male Sloane's Froglets (Photo: Alexandra Knight)



Structure

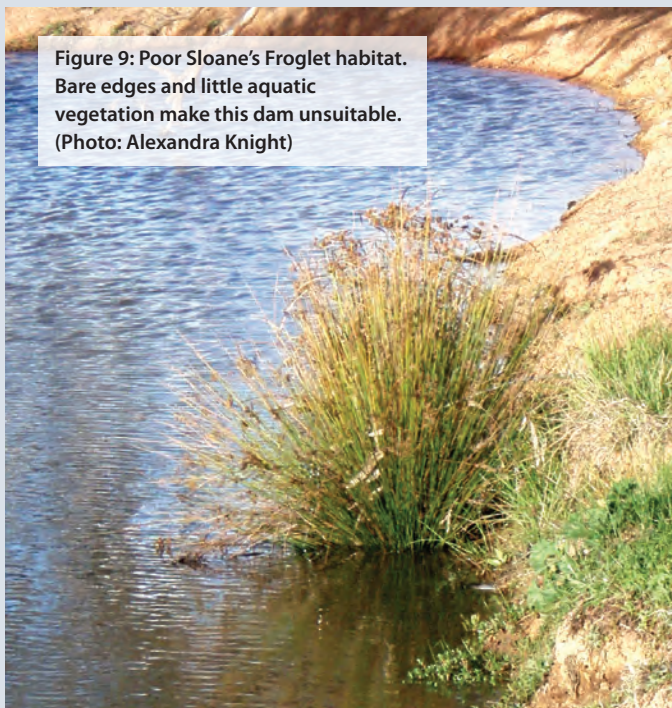
Vegetation structure is important. Calling male Sloane's Froglets often perch in areas which contain vegetation with an average maximum emergent height (height above the surface of the water) of 42 cm and moderate cover (the vegetated part of the wetland has 30 to 70% cover) (Figures 7 and 8). It is likely that females also lay eggs in these areas.

Vegetation On The Edges Of Wetlands

Most wetlands that Sloane's Froglet occur in have edges well vegetated with grasses, reeds, and sedges during winter and spring, unlike that shown in figure 9.

Usually only a small percentage of the bank area is bare of earth. In grazed paddocks the banks of occupied wetlands may show some pugging, but there is usually intact groundcover for most of the bank. Very few of the wetlands Sloane's Froglet occur in have shrubs and trees on the banks. In summer and autumn as water recedes the banks may become bare.

Figure 9: Poor Sloane's Froglet habitat. Bare edges and little aquatic vegetation make this dam unsuitable. (Photo: Alexandra Knight)



Shading

Around Thurgoona most of the wetlands that Sloane's Froglet use have little shading (<5% canopy cover). Sloane's Froglet does occur in some wetlands with more trees around them, and trees will benefit other local frog species such as the Victorian Tree Frog and Peron's Tree Frog. Many of the wetlands have been disturbed or constructed, so the lack of trees and shading may be an artificial phenomenon. However, Sloane's Froglet occurs abundantly at other locations in NSW where there is little or no shading. Direct sunlight is likely to be important for productivity and thermal properties of wetlands, which is often important for egg and tadpole development and adult breeding activity.

Wetland Shape And Complexity

Shape and slope

Sloane's Froglet use waterbodies of all shapes. In some cases they are found in drains as shown in Figure 10. At this stage, only a few drains and channels occupied by Sloane's Froglet have been investigated. The area with surface water was from 0.9 to 3.6 metres wide (the edges of the drains themselves were wider than this). More investigation is required.

Figure 10: Drains containing vegetation and sitting or slow flowing water are used by Sloane's Froglets (Photo: Alexandra Knight)



Figure 11: Fast flowing concreted drains are unsuitable for Sloane's Froglet (Photo: Alexandra Knight)

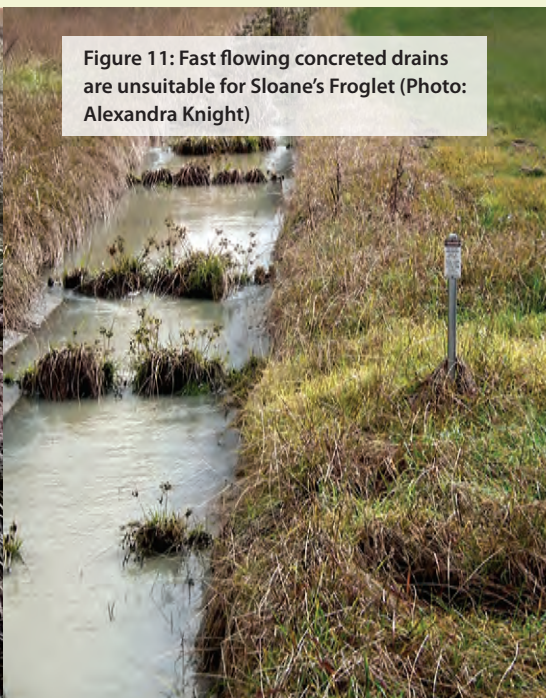


Figure 12: Poor Sloane's Froglet habitat. This stormwater retention pond is too steep and has no aquatic vegetation (Photo: Alexandra Knight)



The slope of the bed of the waterbody from the edge of the water to the point where Sloane's Froglet was perching in the water was measured at 52 sites within 12 wetlands (Knight, unpublished data). 50% of sites measured had a slope of less than 1% and 80% had a slope less than 4%. The remaining sites had a slope less than 18%. Steep bank slopes as shown in Figure 12 are unsuitable for Sloane's Froglet.

Size

For populations of Sloane's Froglet to be viable into the future, habitat that can support larger numbers of froglets (>100 calling males) and which has a variety of depths with suitable vegetation is essential. Examples of larger wetlands in Albury that have an area of habitat supporting larger populations include the David Mitchell wetlands at CSU, the Gilgai wetland adjacent to the airport, the Davey Road sites, and the wetland system at Mungabareena.

Minimum habitat size is not simply related to the size of the wetland. There are a number of large wetlands within the Thurgoona/Tabletop area that contain Plain's Froglet and/or the Common Eastern Froglet, but do not contain Sloane's Froglet. Investigation into 104 sites (Knight, unpublished data) showed that those wetlands that support larger numbers of Sloane's Froglets contain a minimum of 3000m² of vegetated water (reeds, grasses and aquatic vegetation) with an average area of 7600m² as well as areas of deeper and clear water. Regardless of wetland size a large proportion of the vegetation needs to be small-stem diameter, emergent vegetation as described above. Larger wetlands that contain large areas of open water with fringing vegetation such as *Carex* sp. or large stem-diameter reeds such as *Phragmites* sp. may support large populations of the other frog species, but do not support many Sloane's Froglets.

Many sites within the Thurgoona area contain only a small number of Sloane's Froglets (<20 calling males). These waterbodies are a vital part of the complex mosaic of habitat that will support Sloane's Froglet into the future. A good example of a system of medium sized ponds supporting Sloane's Froglet occurs at the Riverina TAFE's National Environment Centre at Thurgoona. Ponds that contain small to medium areas of aquatic vegetation (an average of 1300 m² of vegetation within a larger pond) or inundated grassland may support small populations over a shorter time period, but as development increases and the climate becomes hotter with more sporadic rainfall events, ensuring connection between these types of wetlands will be essential for the continued survival of Sloane's Froglet.

Complexity

Sloane's Froglet is a dynamic species and moves between waterbodies within and between seasons. The viability of the Thurgoona Sloane's Froglet population is dependant not just on individual wetland characteristics, but also on broader habitat features including the proximity and abundance of breeding and refuge habitat and the variety and availability of dispersal routes across the landscape.

Determining these requirements requires carefully designed research. Where this has been done for other species, for instance, the Growling Grass Frog (Hale et al., 2013), research has been undertaken at a number of sites over a number of years. For Sloane's Froglet no research has been undertaken into refuge habitat; the habitat used during dry months; the populations ability to disperse; or, metapopulation dynamics. More research is required to guide the overall landscape design of wetlands and stormwater in the Thurgoona region. It is recommended that an adaptive management approach involving monitoring is used to evaluate Sloane's Froglet response to wetlands that are modified, constructed, fragmented or connected.

Many of the areas where Sloane's Froglet occur within the Albury area are part of complex wetland systems that include multiple ponds of varying depths as well as drains and creek overflows. Survey work undertaken in 2009 (at the end of the Millennium drought, but before the very wet period commencing in March 2010) located Sloane's Froglet mostly in waterbodies adjacent to regulated water supplies, in particular sewerage treatment works (at CSU, near Lake Lara and other sites in Victoria) or near stormwater retention ponds (such as the Gilgai near the airport). This suggests that the larger deeper ponds that occur throughout Thurgoona (for instance at the racecourse, on Kerr's Rd, and at Norske Skog), although not used for breeding, may play an important role as refuge sites.

2) Management Recommendations

Slashing

Slashing may be a useful tool to reduce thick, tall vegetation adjacent to wetlands and along drains as shown in Figure 13. This reduction will potentially benefit the dispersal of Sloane's Froglet, making areas more permeable. Slashing during peak breeding and dispersal periods of mid-winter to early autumn should be avoided.



Figure 13: Mown drain used by Sloane's Froglets adjacent to Lake Lara. (Photo: Alexandra Knight)

Herbicide

No research has been undertaken into the effect of herbicides and other toxins on Sloane's Froglets. It is reasonable to suppose that herbicides may directly and indirectly impact Sloane's Froglet tadpoles and frogs as they do other amphibians. Where herbicide use is required, it should be limited to times when the waterbody is dry. The routine spraying of roadside drains is likely to significantly impact on Sloane's Froglet and should be avoided. In these areas, slashing or spot spraying specific weeds is preferable.

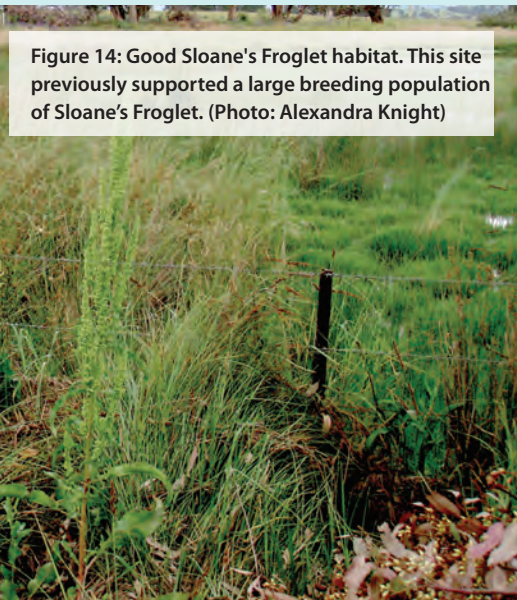
Grazing

Sloane's Froglets occur in wetlands and dams grazed by sheep, cattle and horses. However, sites where Sloane's Froglet are most abundant have no or very low numbers of stock. Grazing should be managed to ensure a minimum 70% ground cover is maintained at all times and that areas likely to be inundated support medium height reeds and grasses. Stock should be removed from Sloane's Froglet wetlands during peak egg-laying and tadpole growth periods (winter to early spring). Grazing may also cause pugging of the bank and beds of wetlands, which can impact frog habitat and the flow of water into and out of wetlands. Alternative sources of stock water should be provided where possible. The site shown in Figures 14 and 15 has been adversely affected by grazing. Well-managed grazing may benefit Sloane's Froglets.

Sloane's Froglets have not been shown to coincide with foraging pigs. Pigs should not be allowed within or adjacent to Sloane's Froglet wetlands.

Figure 14: Good Sloane's Froglet habitat. This site previously supported a large breeding population of Sloane's Froglet. (Photo: Alexandra Knight)

Figure 15: The same site has deteriorated due to overgrazing. (Photo: Alexandra Knight)



Revegetation

Revegetation with trees and shrubs in areas that are seasonally inundated (as shown in Figure 16), and used by Sloane's Froglets for breeding, may significantly impact on this species, and therefore should be avoided. Revegetation of dam edges and riparian edges of slow moving shallow waters should be patchy, allowing for the entry of sunlight and provision of basking areas. Establishing a diverse range of aquatic vegetation in constructed wetlands is likely to benefit Sloane's Froglet. Monitoring and assessment of such actions should be undertaken.



Figure 16: Revegetation of shallow inundations used by Sloane's Froglets destroys habitat and adversely impacts the species. (Photo: Alexandra Knight)

Predation by fish

It is highly likely that Weather Loach, Gambusia and Carp predate upon and compete with froglets, eggs and tadpoles. Control of these invasive species in Sloane's Froglet habitat is highly recommended.

A final word

Sloane's Froglet is a dynamic little frog which moves within and between wetlands and whose population fluctuates depending on conditions. Its survival is dependent on it having continued access to sufficient, suitable and connected habitat across the landscape. Designing and building individual wetlands that are not part of a broader landscape plan will not in itself ensure the conservation of Sloane's Froglet. The importance of many wetlands and the need to facilitate movement across the landscape means community education and capacity building is critical.

The little we know about Sloane's Froglet is from limited studies. Recent research has been focussed on determining very basic characteristics of habitat that may assist in managing the species. Any management for Sloane's Froglet should be undertaken within an adaptive framework, with continued consultation with experts and land managers and formal opportunities for monitoring, evaluation and feedback.

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