

Action Statement

Flora and Fauna Guarantee Act 1988

No. 112

Spotted Tree Frog *Litoria spenceri*

Description and Distribution

The Spotted Tree Frog *Litoria spenceri* (Dubois 1984) is a medium-sized species in the Family Hylidae. Females may attain a length of 61mm (snout-vent), while males are smaller, reaching 50mm (Watson *et al.* 1991). The dorsum is highly variable: it may be pale brown, bright green to olive-grey, with or without darker blotches, usually with numerous small, raised 'warts'. The ventral surface is pale and granular, often becoming flushed with pale orange towards the rear and on the underside of the hind limbs. Toes and fingers are distinctly flattened, with the discs moderately expanded; the fingers have distinct basal webbing and the toes are fully webbed. The head is broad and a distinct fold is present above the indistinct tympanum.

The tadpole is free swimming. The body is elongated and flattened, and individuals reach a total length of 40mm prior to metamorphosis. The tail is moderately thick and has a rounded tip. The eyes are dorso-lateral and the mouth is ventral. The oral disc is large relative to other closely related species, and the oral papillae have a wide anterior gap. There are two rows of anterior labial teeth and three posterior rows. The body is dark brown to black above, with fine silver chromatophores extending onto the flanks.

Darker spots may be present on the dorsal surface. The ventral surface is darkly pigmented. The tail fin and muscle are covered with fine melanophores (Hero *et al.* 1995).

The Spotted Tree Frog is confined predominantly to the north-western side of the Great Dividing Range, between the Central Highlands of Victoria and Mt Kosciusko in NSW. Despite extensive



Spotted Tree Frog *Litoria spenceri*
(photograph by Graeme Gillespie)



Distribution in Victoria
+ before 1985, ■ since 1985
[source: Atlas of Victorian Wildlife, NRE]

surveys of most major streams within the species' range, only 12 populations have been located in Victoria; these occur in the catchments of 17 streams (several populations occurring around the confluences of streams). Two further populations are known from Kosciuszko National Park in NSW, including one in the upper Murray River along the Victorian border. The species seems likely to have a limited and fragmented distribution and may have suffered a significant decline during the past 20 years.

Spotted Tree Frogs inhabit naturally vegetated, rocky, swift-flowing upland streams in dissected mountainous country, between 280 and 1110 metres above sea level. Frog populations are generally in areas with limited access and disturbance. Distribution along streams is patchy, most individuals being associated with loose rock substrates, rocky banks and rapids. Adjacent streamside vegetation is also used for sheltering and basking. Eggs are deposited under large in-stream boulders, and tadpole development occurs within the stream (Hero *et al.* 1995, Gillespie 1997a,b).

The full range of habitats used by the species is unknown; other species of riparian tree frogs range widely from streams during the non-breeding period. Spotted Tree Frogs may use similar off-stream habitats. The stream environment is used by this species from October to April; it is not known what habitats are used at other times.

Current conservation status

ESP Act (1992).... Endangered

NRE (2000)..... Critically Endangered

The Spotted Tree Frog has been listed as a threatened taxon under the **Flora and Fauna Guarantee Act 1988**.

Reasons for conservation status

The Spotted Tree Frog is known from only 13 streams (11 in Victoria, two in NSW). Surveys during the past five years have found it along eight streams in which it had not been recorded before, but it could not be found along four streams in which it had previously been recorded. The surveys failed to detect Spotted Tree Frogs at historical sites on a further four streams, but located the species elsewhere along those streams (Gillespie and Hollis 1996, Gillespie 1998).

This evidence suggests that the Spotted Tree Frog may have suffered a general decline in distribution and abundance. All extant populations appear under threat from various disturbances; many populations are small, and some have declined. An analysis of disturbance histories at individual sites indicates an association between the contraction in

distribution and recreation/human access, road construction and clearing of stream bank vegetation (Gillespie and Hollis 1996).

Disturbances which might result in changes to the physical or biotic habitat in or adjacent to streams include roading, timber harvesting, eductor dredging, human disturbance (e.g. angling), weed invasion, predation by exotic animals (including introduced fish), impoundments, herbicides, inappropriate fire regimes and possibly grazing.

Important concerns include changes in flow rates, which may affect the viability of eggs or the survivorship of tadpoles; increases in sediment levels, which may affect the availability of egg-deposition sites or the survivorship of tadpoles; and predation of tadpoles by introduced fish, which may reduce or preclude recruitment to the adult population.

Remaining populations of *L. spenceri* are thought to be quite insular, based upon preliminary genetic examination (Gillespie 1997a). Natural recolonisation of adjacent streams is highly unlikely.

Only one of the known Victorian localities is completely within a permanent conservation reserve, and the population is thought to be extinct at this locality. All other Victorian localities are within State Forest, although part of the catchments of some are within conservation reserves. The *Code of Forest Practices for Timber Harvesting* (NRE 1996) requires protection of the stream environment and the application of a 20m buffer on either side of permanent streams. Additional protective measures may be needed to ensure protection of Spotted Tree Frog habitat beyond the 20m buffer.

In its final recommendation the Scientific Advisory Committee (SAC 1991a) has determined that the Spotted Tree Frog is:

- in a demonstrable state of decline which is likely to result in extinction;
- significantly prone to future threats which are likely to result in extinction; and
- very rare in terms of abundance or distribution.

Major Conservation Objectives

The major conservation objectives are to:

- Prevent further loss of populations of this species from Victorian streams, and ensure the long-term viability of all existing populations (twelve in Victoria and two in NSW).
- Manage the habitat so that there is no more than 1% probability of extinction of the species in Victoria within 100 years (as determined by population viability analysis). As a short term aim, until detailed ecological information is

available to enable such analyses, all extant populations should be maintained at least at their present levels. The long-term aim (dependent upon research findings) may require enhancement of existing populations, and could conceivably involve reintroduction of the species at sites where it has become extinct. A target of over 200 adult frogs per population is desirable; and

- Identify and control any imposed disturbances which may potentially affect populations, until such time as the actual effects of any such disturbances are known.

Management Issues

Ecological issues specific to the taxon

Spotted Tree Frog populations are isolated, possibly indicating a much wider distribution in the past with a decline to present levels. The small size and isolation of these populations exposes all populations to risk of extinction from stochastic events, with little chance of natural re-colonisation.

Potentially threatening processes implicated in the decline of this species include disturbance in and adjacent to streams and in catchments of streams, which may result in changes to water flow, water quality, stream sedimentation or other changes to the physical or biotic habitat (Gillespie and Hollis, 1996). These include stream sedimentation and physical disturbances associated with poorly-managed roads or road construction activities, timber harvesting in the immediate vicinity of frog populations, eductor dredging, human disturbances (e.g. angling and the illegal use of frogs as bait), weed invasion, impoundments, careless application of herbicides or pesticides, individual wildfire events and inappropriate fire regimes, and possibly grazing. Sheltering and foraging sites away from streams may also be affected by such disturbances, although the extent to which the species moves from the immediate stream environment is unknown.

Change in various stream parameters (e.g. increased sedimentation, flow rates, turbidity, etc.) might particularly affect egg and larval viability - a major factor in frog population dynamics (Gillespie 1997b).

Brown Trout *Salmo trutta* and Rainbow Trout *Salmo gairdneri* have been introduced throughout the range of the Spotted Tree Frog. These exotic species are able to prey upon the tadpoles of the species and reduce recruitment (Gillespie 1997b). Other exotic species may also pose a threat to the species.

Natural fluctuations in population numbers occurring as a result of yearly variations in weather patterns, stream flow rates, levels of predation and

subsequent recruitment are yet to be investigated. However, populations do appear to experience extremely variable recruitment, and thus might be particularly vulnerable to further disturbances.

Some catchments still supporting Spotted Tree Frogs have undergone various disturbances in the past, and may be able to tolerate low levels of these disturbances. However, populations have become extinct in the past, and may do so in the future (with little or no possibility of recolonisation from other populations) if inappropriate levels of disturbance are allowed.

Wider conservation issues

Research into the Spotted Tree Frog will assist in the conservation of other riverine frog species in Australia, in particular the Blue Mountains Tree Frog *Litoria citropa*, Leaf Green Tree Frog *L. phyllochroa*, Lesueur's Frog *L. lesueuri* and Southern Barred Frog *Mixophyes balbus* in Victoria.

The sites of extant populations of this frog are often on streams of high conservation value for other reasons. Other threatened stream or riparian flora and fauna (e.g. Barred Galaxias *Galaxias fuscus*, Mountain Galaxias *Galaxias olidus*, Central Highlands Spiny Crayfish *Euastacus woiwuru*) exist in catchments supporting Spotted Tree Frogs. A broad approach to catchment protection and management aimed at frog conservation will enhance the conservation of these other species.

A number of threats to in-stream fauna have been recognised as potentially threatening processes under the **Flora and Fauna Guarantee Act 1988**. These include increased sediment input to streams (SAC 1991b); changes to temperature (SAC 1992a) and flow regimes (SAC 1992b) of streams; the introduction of live fish outside their natural range (SAC 1992c); the input of toxic substances to streams (SAC 1993); and the degradation of riparian vegetation (SAC 1995). All of these could affect populations of Spotted Tree Frogs.

Previous Management Action

Watson *et al.* (1991) consolidated all information on Spotted Tree Frogs at the time, and developed a management strategy for the species. The following actions have since been implemented.

Research

Extensive searches have been conducted within the species' range (Watson *et al.* 1991, Gillespie and Hollis 1996, Hunter and Gillespie *in press*, Gillespie 1998). Every major stream (approximately 100) within the broad distribution of the species in Victoria was examined. Intensive monitoring and ecological studies of the Taponga River - Still Creek and Bogong Creek (NSW) Spotted Tree Frog

populations was conducted between 1993 and 1997 (Gillespie 1993, Gillespie and Hollis 1996, Gillespie 1997a,b).

Investigation of biology

The frog's advertisement call has been recorded (Watson *et al.* 1991), and its larvae have been described (Hero *et al.* 1995). The egg deposition sites and stream habitats used by larvae and adults have been determined and compared to other riverine species in south-eastern Australia (Gillespie 1997b). Life history and population dynamics of the species have been investigated. The palatability of tadpoles of the Spotted Tree Frog and other riverine species in south-eastern Australia to native and introduced fish has been examined (Gillespie 1997b). The effects of sediment upon eggs and tadpoles has been investigated (Gillespie 1997b). Spotted Tree Frogs have been maintained at the Melbourne Zoological Gardens (1990-96) and the Amphibian Research Centre, Coburg (1996-present) for development of captive husbandry techniques.

PVA modelling

A Population and Habitat Viability workshop was conducted in August 1996. The modelling, based upon preliminary life history and demographic information, indicated that the level of recruitment from the larval phase was a particularly important determinant of population size and probability of extinction, and that management should attempt to enhance survivorship through this phase. Clear identification of threats, suggested measures for threat amelioration, and guidelines for genetic investigations were produced.

Monitoring

Long-term monitoring transects have been established for all populations of the Spotted Tree Frog, to detect any yearly fluctuations in population numbers.

Awareness and education

Conservation of the Spotted Tree Frog was promoted by an education exercise targeted at NRE staff and other special-interest groups. Educational information was disseminated, a poster was produced (Habitat Series No. 4), an identification pamphlet and sighting report form was circulated, and extensive media promotion was undertaken.

Management

A Recovery Team has been established to provide advice on direct research and management of the species. Representatives from NRE, NSW National

Parks and Wildlife Service, University of Canberra, University of Melbourne, La Trobe University, Environment Australia (formerly ANCA) and conservation groups are included.

Habitat protection

The Victorian populations have been included in the Comprehensive, Adequate and Representative Reserve System (Commonwealth of Australia 1999, 2000) providing a 300 m protection zone for off-stream habitat around known populations and mapped habitat areas, with additional streamside buffers to minimise disturbances for at least 1 km upstream of the populations.

In addition, an interim approach was initiated:

- no new stream crossings to be constructed within 1 km upstream of the populations of the Spotted Tree Frog
- existing roads or tracks not required for management, harvesting or protection purposes to be progressively closed and/or rehabilitated
- fuel reduction burning to be restricted to protect in-stream and off-stream habitat for the frog.

Increased policing of illegal eductor dredging operations was instigated and legal action was undertaken against operators. Eductor dredging was reviewed in 1993 (ENRC 1994), and is not permitted in Victoria.

Regional NRE staff were trained in searching techniques for Spotted Tree Frogs. The river bank area at the Taponga River camping ground was fenced and revegetated, and an information display was erected. The Taponga camping area and Still Creek picnic areas were subsequently closed and fenced in 1997.

Recovery Plan

A national recovery plan for Spotted Tree Frog has been prepared and is currently being implemented with funding support under the Natural Heritage Trust .

Intended Management Action

Research

1. The Department of Natural Resources and Environment Parks, Flora and Fauna Division will undertake biological and habitat studies to provide information necessary for the development of management procedures to redress population declines, and to enhance the conservation of the species throughout its distribution. Information is required on:

- population demography;

- genetic variability within and between populations;
- habitats used and extent of dispersal into forest habitats away from the riparian zone;
- the impact of various disturbances, both natural and anthropogenic, upon aspects of Spotted Tree Frog ecology, habitat use and population size;
- the effects of timber harvesting and other forest management activities on sediment and stream flows in Spotted Tree Frog catchments, and
- ways of reducing the effects of predation by introduced salmonids on Spotted Tree Frogs.

Interim Management

NRE (PFF) will coordinate the implementation of management prescriptions to prevent or control the impacts of any future disturbances to the habitats of all populations; and will instigate remedial measures to reduce current disturbances to both the in-stream habitat and the off-stream habitat. Such prescriptions are to apply to all catchments within which Spotted Tree Frogs are known to occur, and to some catchments where the species is thought to be extinct, to cater for possible future re-introductions. The prescriptions will be documented in the North East and Gippsland Forest Management Plans.

Disturbances which may adversely affect frog populations include:

- an increase in in-stream sediments associated with roading in the catchments;
- disturbance to off-stream habitat by forestry activities;
- predation by introduced fish, and
- direct disturbance to frog habitat by intensive recreation.

Protect in-stream habitat

2. Input of sediment from roads and timber harvesting will be controlled using the recommendations of O'Shaughnessy and Associates (1997). They suggest that permanent and temporary streams warrant a very high degree of protection from sediment input. Accordingly, a Special Management Zone will be established for at least 1km upstream from the Spotted Tree Frog's 'stream habitat', (see definition below in Action 3), and the following prescriptions will be applied:
 - No new stream crossings may be constructed in the management zone.
 - Minimum buffer widths (within which no timber harvesting or associated activities are to

take place) along either side of all streams and drainage lines and around wetlands within the management zone as recommended by O'Shaughnessy and Associates (1997) and summarised in Table 1.

- Any new road (and the fill slope toe of any new road) in the management zone and elsewhere in the catchment upstream of the management zone (i.e. beyond 1 km) to be at least 50 m from any stream, unless site specific sediment management operations are put in place to prevent sediments entering perennial and ephemeral streams in the management zone.
- Any new roads or stream crossings required in the catchment upstream of the management zone to be kept to a minimum, and to be constructed according to the recommendations detailed in O'Shaughnessy and Associates (1997).
- All existing roads and stream crossings to be examined and to be subject to a progressive rationalisation or modification, where required according to O'Shaughnessy and Associates (1997). Within the management zone, this will involve closure of some roads and stream crossings. Elsewhere in catchments containing Spotted Tree Frog stream habitat, this will also require progressive upgrading of stream crossings and roads to O'Shaughnessy and Associates (1997) recommended standards (where this can be achieved without increasing sediment risk). This is a large task and may take many years to achieve. Consequently, priority will be given to the best quality Spotted Tree Frog catchments and to the stream crossings, roads and tracks most likely to be significant sources of sediment (see priorities below).
- Maintenance of all roads and stream crossings in catchments upstream of the stream habitat, to be undertaken as required to ensure that crossings, culverts, road surfaces, etc do not deteriorate and become significant sources of sediment input to streams in the future.
- Within coupes, practices will be as detailed in the O'Shaughnessy and Associates 1997 report. Particular attention will be given to suspension of logging and snig track drainage during wet weather, bar and silt trap construction on snig tracks, construction of temporary stream crossings, location of log landings remote from streams and drainage lines, and progressive closure within coupes.
- Establishing, through forest management plans, for each catchment, an appropriate minimum time allowed between harvesting of coupes in the one area, and a maximum area allowed to be harvested each year.

Table 1: Summary of recommendations of O’Shaughnessy & Associates (1997) on minimum width in metres for buffer strips and filter strips to be applied to various stream categories, in relation to soil type and slope, for coupe management.

Stream class	Soil permeability		
	High	Low	
	slope <30°	slope <20°	slope 21-30°
Permanent	30	40	50
Temporary	20+10F	20+20F	30+20F
Veg. drainage lines	10F	10F	15F
Wetlands	30	40	50

F = filter strip in which harvesting may be permitted, but without machinery entry.

Table 1. provides a summary of recommendations of O’Shaughnessy & Associates (1997) on minimum width in metres for buffer strips and filter strips to be applied to various stream categories, in relation to soil type and slope, for coupe management.

To prioritise any remedial works to be undertaken, the catchments have been divided into three categories, reflecting current perceptions of the relative importance of these populations to the overall conservation of the species, and the consequent relative risk tolerable to each population at this stage.

Priority 1. Catchments with the highest importance, considered critical for conservation - River system (includes Still and White Creeks); Wongungarra River; Black and Goulburn Rivers; Snake Creek; Big River (Mitta Mitta); Bundarra River (within Alpine National Park); Indi (Murray) River (NSW); Bogong Creek (NSW).

Priority 2. Includes most other catchments in which the Spotted Tree Frog has been recorded. Generally smaller populations with moderate levels of disturbance. The last two of these localities are thought to no longer support populations, but they are potential reintroduction sites at which remedial measures may be practicable - Howqua River; Snowy Creek/Lightning Creek; Jamieson River (north branch); Wheeler Creek; West Kiewa River; Big River (Eildon); Buffalo Creek; King River.

Priority 3. Large catchments thought not to have an extant population, which have high levels of disturbance, and within which any remedial measures may be impracticable - Buckland River; Thomson River.

Protect off-stream habitat

3. In the interim, a 300m Special Protection Zone will be established around locations on streams where frogs have been recorded and where suitable habitat has been mapped (collectively these will be known as “stream habitat”). It is not known how far Spotted Tree Frogs move away from streams into the adjacent forest. Further research should provide better information on this matter which will be used to confirm or modify the interim management prescriptions established here. Timber harvesting, new road construction and other potentially threatening activities (such as prescribed fire) will be excluded from the protection zone. All existing roads in this zone will be assessed, and a strategy developed to identify which roads should and can be closed and/or rehabilitated.

Introduced Fish Control

4. NRE, in cooperation with Parks Victoria, will endeavour to minimise deleterious effects that predation by introduced fish may have upon Spotted Tree Frog populations by:
 - monitoring introduced fish numbers seasonally in selected Spotted Tree Frog catchments; in particular, the Buffalo, Wongungarra and Taponga/Still/White catchments, to allow initiation of Spotted Tree Frog protection works as required;
 - experimentally excluding introduced fish from sections of Spotted Tree Frog streams, and subsequently monitor both the frog and

introduced fish populations to measure effects on the frog populations and to assess the feasibility of exclusion measures;

- if it proves desirable and feasible to exclude introduced fish from Spotted Tree Frog populations, identifying sections of streams from which introduced fish may be excluded or controlled without adverse effects on other values;
- liaising with recreational angling groups and seek their support for any control measures; and
- cease liberations of introduced fish in Spotted Tree Frog streams, and consider similar restrictions on liberations of all fish in these streams.

Weed Control

5. Spraying with herbicides may be very risky in areas known to support frogs. Where weed control is required for land management purposes, Parks, Flora and Fauna Division will liaise with land managers to ensure that alternative techniques are implemented in preference to spraying. In areas of heavy infestations, spraying will be implemented only as a last resort after consideration of application method, knowledge of toxicity, and best time to spray to minimise impact upon frogs. The effects of any spraying will be monitored.

Recreation Management

6. NRE and Parks Victoria will prevent human disturbance to frog behaviour and deterioration of frog habitat by:
 - not increasing access to streams, and close access to frog habitat in some areas;
 - actively managing camping areas close to Spotted Tree Frog habitat to minimise recreational impacts or, where feasible, relocating these camping areas away from Spotted Tree Frog catchments to exclude disturbance; and
 - restricting road use to a minimum in catchments, particularly in wet weather, when sediment risk would be greatest.

Fire Management

7. The Code of Practice for Fire Management on Public Land (CNR 1995) requires consideration of environmental values in fire management operations which will generally aid the conservation of Spotted Tree Frog populations. In addition to these requirements, NRE will endeavour to prevent changes in Spotted Tree

Frog habitat or changes to water quality or yield in Spotted Tree Frog streams by:

- excluding, as far as practicable, fuel reduction burning in the 300m Special Protection Zone around Spotted Tree Frog sites - where fuel reduction burning is considered essential to meet statutory obligations under the Forests Act 1958, a detailed proposal will be developed in consultation with senior wildlife management staff to minimise the risk of adverse impacts;
- conducting any necessary fuel reduction burning in a manner which ensures the risk of encroachment of fire into Spotted Tree Frog habitat is minimal;
- managing the extent and frequency of fuel reduction burning elsewhere in Spotted Tree Frog catchments to ensure the risk of adverse impacts on water quality or yield is minimal;
- recognising Spotted Tree Frog sites as a high value asset in fire protection plans and wildfire suppression plans and adopting fire prevention and suppression procedures which seek to ensure the risk to Frog populations from wildfire is minimised;
- recognising the importance of Spotted Tree Frog habitat in the development and implementation of wildfire suppression plans and seeking to minimise disturbances resulting from suppression operations. The application of these measures in Spotted Tree Frog catchments will be detailed in Fire Protection Plans and will be given a high priority in the development of annual Works Programs prepared for each NRE Fire District.

Mineral Exploration and Mining

8. NRE's Parks, Flora and Fauna Division and Minerals and Petroleum Division will endeavour to prevent disturbances to Spotted Tree Frog habitat, and prevent changes in water quality (particularly sediment levels) and quantity in streams by:
 - strictly enforcing the ban on eductor dredging at all Spotted Tree Frog streams;
 - including prescriptions to protect Spotted Tree Frog habitat, as described in Actions 2 & 3 above, in licence conditions for exploration licences; and
 - rigorous assessment of mining proposals from areas in all catchments where these activities may affect Spotted Tree Frog habitat, and development of suitable management prescriptions to prevent such

direct and indirect disturbances to frogs and their habitat.

Grazing by domestic stock

9. NRE and Parks Victoria will endeavour to prevent disturbances to Spotted Tree Frog habitat, and prevent changes in water quality by:
 - investigating the impacts of cattle grazing in Spotted Tree Frog catchments, with regard to the potential deterioration of riparian habitat or changes to water quality in streams (the Howqua River, in particular, should be examined); and
 - instigating measures to ameliorate the disturbance, such as (for example) preventing cattle access to streams via appropriate licence conditions, (where feasible stock management options are available) if grazing is shown to be affecting Spotted Tree Frog populations or habitat.

Maintenance of existing flow regimes

10. NRE will endeavour to prevent changes in flow regimes which may result in reduced breeding opportunities for Spotted Tree Frogs or reduced survivorship of tadpoles by:
 - liaising with water management authorities in each catchment to ensure that any potential stream works (e.g. diversions, impoundments) and maintenance works (e.g. de-silting of water storages) do not impinge upon Spotted Tree Frog habitat, do not cause changes in water quality, and do not substantially affect current flow regimes.

Additional specific management prescriptions for particular catchments.

11. A range of actions in addition to the general management guidelines given above are readily identifiable. These include actions to ameliorate the impacts of road systems, stream crossings and public access on the Spotted Tree Frog throughout its range. NRE will develop and implement work plans for each catchment to address these issues and will monitor compliance with management prescriptions by:
 - conducting on-site monitoring audits of these activities, to identify any adverse effects of imposed disturbances upon Spotted Tree Frog populations and develop contingency plans to quickly remedy the situation;
 - monitoring all new roads and coupes in Spotted Tree Frog catchments, both during

and after construction/utilisation, for compliance with prescriptions;

- monitoring the effectiveness of the prescriptions in preventing changes to stream parameters (particularly sediment) in all catchments in which disturbances are imposed, at the time of the disturbance and during subsequent peak storm events, to enable cessation of activities and/or remedial actions to be instigated should breaches or threats to the frogs be detected; and
- reviewing and revising the prescriptions as necessary for all catchments.

Population monitoring

12. NRE (PFF) will develop and implement a monitoring program, with appropriate experimental design, to monitor frog populations at all extant sites, the distribution of populations, the condition of key habitat characteristics and any changes in response to management activities. Similarly, monitor fish populations at selected sites to investigate any responses of frog recruitment to introduced fish.

PVA analyses

13. When demographic information from the initial research becomes available, NRE (PFF) will perform detailed population viability analyses to assist in management planning.

Education/public awareness

14. NRE (PFF) will maintain extension and media activities, targeted at education of anglers, bushwalkers and the public, such that acceptance of any restriction of activities on streams will be enhanced and will continue training of field staff in identification and monitoring, to facilitate long-term monitoring of frog populations by field staff.

Contingency for newly discovered populations

15. Should further populations of the Spotted Tree Frog be discovered, then the management prescriptions outlined above will apply, until such time as 25 populations are secure, after which a reappraisal of the conservation program will be required.

Other Desirable Management Action

Reintroduction

16. Examine the desirability and feasibility of reintroducing a population of Spotted Tree Frogs to Buffalo Creek, where the species is

now thought to be extinct. Such a reintroduction should be contemplated only if the factors responsible for extinction are understood and can be managed. Rigorous monitoring of any such introduced population is essential.

Survey

17. Survey limits of known populations on streams. Encourage relevant agencies to survey potential habitat in NSW streams.

Captive studies

18. Establish captive groups of riverine frog species, where appropriate and without compromising wild populations, for studies on reproductive biology, as a source of animals for genetic studies, as a potential reservoir and source of animals for re-introduction, and as a public education resource.

Management at Bogong Creek, Kosciusko National Park

19. Support the NSW National Parks and Wildlife Service in the following actions to minimise disturbance to the habitat of the frog:
 - in conjunction with the Snowy Mountains Authority, investigate coordinating annual water releases so as to minimise impacts on the frog population.
 - examine the impact of five-year maintenance flushing of the Bogong Creek by the Snowy Mountains Authority.
 - improve drainage of Bourkes Road to ameliorate run-off into the stream.
 - restrict further activities which may encroach on the stream environment, e.g. new roads, stream crossings, spoil areas.
 - examine the feasibility of rehabilitation of riparian habitats near Bourkes Road crossing and the tunnel spoil area.
 - investigate alternative measures of weed control to herbicide spraying in the vicinity of the stream.
 - maintain restricted access to Bourkes Road.

References

ANZECC (1991) Australian and New Zealand Environmental Conservation Council: List of Endangered Vertebrate Fauna. Australian National Parks and Wildlife Service: Canberra.

Bennett, S., Brereton, R., Mansergh, I., Berwick, S., Sandiford, K. & Wellington, C. (1991) The Potential Effect of the Enhanced Greenhouse Climate Change on Selected Victorian Fauna. Arthur Rylah Institute Technical Report Series No. 123. Department of Conservation and Environment: Heidelberg.

Bury, R. B. & Corn, P. S. (1988). Responses of aquatic and stream-side amphibians to timber harvest: A review, in

Raedeke, K. J. (ed.), Stream-side management: riparian wildlife and forestry interactions. Contribution No. 59, Institute of Forest Resources, University of Washington, USA.

Campbell, I. C. & Doeg, T. J. (1989) The impact of timber production and harvesting on streams: a review. *Australian Journal of Marine and Freshwater Research* **40**: 519-39.

CNR (1995) Code of Practice for Fire Management on Public Land. Department of Conservation and Natural Resources, Melbourne.

Commonwealth of Australia. (1999) North East Regional Forest Agreement between the Commonwealth of Australia & the State of Victoria.

Commonwealth of Australia (2000) Gippsland Regional Forest Agreement between the Commonwealth of Australia & the State of Victoria.

Ehmann, H., Ehmann, J. & Ehmann, N. (in prep.) The rediscovery of the endangered Spotted Tree Frog (*Litoria spenceri*) in New South Wales and some subsequent findings.

ENRC (1994) Report into educator dredging in Victoria. Environment and Natural Resources Committee, Parliament of Victoria.

Gillespie, G.R. (1992) Survey for the Spotted Tree Frog (*Litoria spenceri*) in Victoria, February-March 1992. *Vic. Nat.* **109**: 203-11.

Gillespie, G.R. (1993) The distribution and abundance of the Spotted Tree Frog (*Litoria spenceri*) in Victoria. Report to the Endangered Species Unit, Australian National Parks and Wildlife Service, Canberra (unpublished).

Gillespie, G. R. & Hollis, G. J. (1996) Distribution and habitat of the Spotted Tree Frog *Litoria spenceri* Dubois (Anura: Hylidae), and an Assessment of Potential Causes of Population Declines. *Wildlife Research* **23**: 49-75.

Gillespie, G. R. (1997a) Recovery Plan (Research Phase) for the Spotted Tree Frog - Annual Report to April 1997. Unpublished report to the Biodiversity Group, Environment Australia, Canberra.

Gillespie, G. R. (1997b) The Biology of the Spotted Tree Frog (*Litoria spenceri*) and Examination of factors Responsible for Population Declines. Final report of the Recovery Plan (Research Phase). Unpublished report to Biodiversity Group, Environment Australia, Canberra.

Gillespie, G. R. (1998) Spotted Tree Frog Recovery Program - Annual Report to April 1998. Unpublished report to the Biodiversity Group, Environment Australia, Canberra.

Hero, J-M. (1990) Interim report to CFL on Wongungarra survey (unpublished).

Hero, J-M, Watson, G. F. & Gillespie, G. R. (1995) The tadpole of *Litoria spenceri* Spencer (Anura: Hylidae). *Proc. Royal Soc. Victoria* **100**: 39-43.

Hunter, D. & Gillespie, G. (in press) The Distribution, Abundance and Conservation Status of Riverine Frogs in Kosciuszko National Park. *Australian Zoologist*.

Littlejohn, M. J. & Watson, G. F. (1989) Conservation Status, Ecology and Management Requirements of the Spotted Tree Frog, *Litoria spenceri*. Interim report to the Department of Conservation, Forests and Lands, East Melbourne (unpublished).

NRE (1996) Code of Forest Practices for Timber Production. Revision No. 2, November 1996. Department of Natural Resources and Environment, Melbourne.

NRE (1999a) Atlas of Victorian Wildlife (electronic fauna database). Information Management Section, Flora and Fauna Program. Department of Natural Resources and Environment: Heidelberg.

NRE (1999b) Proposed Forest Management Plan North-east. Department of Natural Resources and Environment, Melbourne.

NRE (2000) Threatened Vertebrate Fauna in Victoria 2000: A systematic list of vertebrate fauna considered extinct, at risk of extinction or in major decline in Victoria.

Department of Natural Resources and Environment, Melbourne.

O'Shaughnessy P. & Associates (1997) Water Quality Protection Measures for the Conservation of the Spotted Tree Frog. Unpublished report to NRE.

Robertson, P., Alexander, J., Duncan, P., Johnson, P., Lumsden, L. & Silveira, C. (1983) Preliminary report on the Mt Wills (Alpine area) faunal survey. Arthur Rylah Institute: Heidelberg.

SAC (1991a) Final recommendation on a nomination for listing: Spotted Tree Frog *Litoria spenceri* (Nomination No. 88). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1991b) Final recommendation on a nomination for listing: Increase in sediment input to rivers and streams due to human activities (Nomination No. 181). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1992a) Final recommendation on a nomination for listing: Alteration to the natural temperature regimes of rivers and streams (Nomination No. 230). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1992b) Final recommendation on a nomination for listing: Alteration to natural flow regimes of rivers and streams (Nomination No. 197). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1992c) Final recommendation on a nomination for listing: Introduction of live fish into waters outside their natural range within a Victorian river catchment after 1770 (Nomination No. 204). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1993) Final recommendation on a nomination for listing: Input of toxic substances into Victorian rivers and streams (Nomination No. 263). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Environment: East Melbourne.

SAC (1995) Final recommendation on a nomination for listing: Degradation of native riparian vegetation along Victorian rivers and streams (Nomination No. 354). Flora and Fauna Guarantee. Scientific Advisory Committee. Department of Conservation & Natural Resources, East Melbourne.

Schulz, M., Macfarlane, M., Parkes, D. M., Traill, B. J., Triggs, B. & Menkhorst, K. A. (1987) Flora and fauna of the Mount Murray Forest Block, North-eastern Victoria. Ecological Survey Report No. 14. Public Lands and Forests Division, Department of Conservation, Forests and Lands: East Melbourne.

Watson, G. F., Littlejohn, M. J., Hero, J-M. & Robertson, P. (1991) Conservation Status, Ecology and Management of the Spotted Tree Frog (*Litoria spenceri*). Arthur Rylah Institute Technical Report Series No. 116. Department of Conservation & Environment: Heidelberg.

Compiled by Graeme Gillespie, Arthur Rylah Institute, NRE, Peter Robertson, Wildlife Profiles Pty. Ltd., Kim Lowe, Flora and Fauna Directorate Sustainability and Environment Gippsland Region.

Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

This Action Statement was first published in 2000 and remains current. This version has been prepared for web publication. It retains the original text of the action statement, although contact information, the distribution map and the illustration may have been updated.

© The State of Victoria, Department of Sustainability and Environment, 2004

Published by the Department of Sustainability and Environment, Victoria. 8 Nicholson Street, East Melbourne, Victoria 3002 Australia

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

ISSN 1448-9902