# GEOCRINIA RECOVERY TEAM



# ANNUAL REPORT
# 1997

Project # 175

BY

KIM WILLIAMS
ON BEHALF OF THE
GEOCRINIA RECOVERY TEAM





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**Summary**

1997 was a year of highs and lows for the Geocrinia Recovery Team. Major achievements included:

- the discovery of seven new populations of *Geocrinia alba*
- consolidation of the population monitoring program by CALM district operational staff
- the agreement for the construction of another 4 500 m of conservation fencing on private property; and
- the further distribution of Frog Recovery Kits to landholders.

Disappointments during the year included:

- a fire entering the exclusion zone in the Spearwood Creek area, burning approximately 80% of the available habitat in this system; and three out of a total eight *G. vitellina* populations
- wildfires burning two *G. alba* sites; and
- failure to secure NHT funding to purchase part of Location 83 and secure the *G. alba* populations on this site in a formal conservation reserve.

Major goals for 1998 will be:
1) Completion of the conservation fencing on location 2718.
2) Continuation the population and fire ecology monitoring programs.
3) Enhancing the pig control program with particular attention given to the G. vitellina sites.
4) Review the pre and post fire management strategies of all sites.
5) Prepare operational guidelines for field translocation techniques
6) Continue with implementation of the communications plan.

**Introduction**

Envisaged to be the commencement of a period of consolidation and maintenance, 1997 evolved into a busy year for the Geocrinia Recovery Team with some substantial advancements in the research, monitoring and conservation fencing activities of the team. These highs were tempered by some major disappointments, the upper most being the significant disturbance to *G. vitellina* habitat and disruption to the research program following a fire in the Spearwood Creek area, and the unsuccessful attempt to secure NHT funds to purchase parts of Location 83-1 for inclusion into the conservation estate and thus secure the major *G. alba* populations.

As reported in the 1996 Annual Report. the major goals for 1997 were to be:

1) Where landholders are supportive and funds permit expand the conservation fencing program.
2) Continue the population and fire ecology monitoring programs.
3) Review the captive breeding program.
4) Review the communications plan and commence implementation of the next phase.
5) Maintain an effective pig control program.

I am pleased to report that items 1, 2, 3 and 5 were achieved during the year. Though some advances were achieved for item 4 (see section 3.2.5), the review of the communications plan was not completed during the year and remains a goal for 1998.

**Team Membership**

Four changes have occurred in the composition of the team since December 1996; including the loss of three of the founding members of the team.

Don Driscoll, the team's inaugural research student successfully completed his PhD studies and his contractual obligations with the Recovery Team and has taken up a position with the Department of Environment, Queensland. We thank Don for his enthusiasm and considerable commitment he made to the team through his field research and wish him all the best in his new appointment.

Ian Wheeler from CALM's Science and Information Division involvement in the team has been declining over the past two years in the annual monitoring program and liaison with landholders, tasks for which Ian has been involved with since prior to the formation of the team. During this time he has ably passed on his skills to local district and region staff, enabling them to continue with these programs. We thank Ian for all his past efforts, enthusiasm and contribution to the success of the team.

Ian Noakes, a landholder representing the Lower Blackwood Land Conservation District Committee has resigned from the team after five years representation. We thank Ian for his valued participation since the formation of the team and wish him all the best.

Councillor Justine Boow from the Augusta Margaret River Shire was not re-elected in the last round of Local Government elections. Councillor Sue Prater has taken up this position on the team.

Team Membership as at December 1997 comprised of:

| | | |
|---|---|---|
| Andrew Burbidge | Director WATSCU | CALM – Nature Conservation Division |
| Kim Williams | Rgnl. Nature Conservation Officer | CALM - Regional Office |
| Roger Banks | District Manager | CALM - District Office |
| Greg Voigt | Dist. Nature Conservation Officer | CALM - District Office |
| Dale Roberts | Zoologist | UWA - Zoology Dept. |
| Simon Conroy | PhD Student | UWA - Zoology Dept. |
| Jack Stannard | Shire Ranger | Augusta/Margaret River Shire |
| Sue Prater | Councillor | Augusta/Margaret River Shire |
| Sally Stephens | Endangered Species Unit | Environment Australia - Canberra |
| Lyn Serventy | Community Representative | Leeuwin Conservation Group |

**Recovery Plan - Annual Report on Actions**

***Geocrinia vitellina***

**3.1.1 Survey of Riparian Habitat**
refer to 3.2.1

**3.1.2 Land Mangement and Tenure**
This action was completed in 1994

**3.1.3 Fire Management and Research**

Spearwood Creek Fire
In 1983 a fire exclusion zone of approximately 136 ha was established using existing tracks between Denny Road and the Blackwood River, encompassing riparian habitat and immediate upland vegetation in the area of Spearwood and Geo Creeks. This was to be maintained in a fire-free state until the *G. lutea/G. rosea* fire

experiments at Walpole were completed and a more detailed understanding of the impact of fire on the species could be attained. In the interim, populations outside the exclusion zone were to be included in prescriptions for early spring routine prescribed burning operations and the area immediately adjoining the exclusion zone was to be regularly burnt to provide a fuel reduced buffer surrounding the Spearwood and Geo Creeks and to minimise the likelihood of a summer wildfire entering the exclusion zone from nearby recreation sites along the Blackwood River.

In late September, during the course of reducing the fuels in the forest surrounding the exclusion area, fire escaped and entered the geocrinia zone burning approximately 116 ha (85%) of the fire exclusion zone, affecting all of the frog population on Geo Creek (monitoring site GV6 and Egg Research site) and two of the five populations on Spearwood Creek (monitoring sites GV1b, GV1d).

This represents approximately 73% of the area of occupancy of *G. vitellina* within the fire exclusion zone and approximately 50% of the total area of occupancy for the species. Monitoring sites (GV1D and the Egg Research Site) were subject to mild to moderate fire intensity (ie: scorched foliage retained on the ti-tree stems). The populations at these sites represent 23.6% (1.18ha) of the total species area of occupancy. Sites GV6 and GV1b experienced intense fire behaviour (ie: total defoliation and almost complete surface litter removal), representing 25.6% (1.3ha) of the total species area of occupancy.

Accurate estimates of frog population size are difficult to obtain. Assuming a sex ratio of 1:1, the 1994 upper estimate for total population size across all *G. vitellina* sites was estimated at 2,230 animals. Using 1994 figures the number of animals contained in the burnt area (prior to the burn) was approximately 1,430 or 64% of the total.

An initial inspection of all burnt sites was undertaken on the night following the fire. All sites had frogs calling, though at greatly reduced numbers compared to pre-fire monitoring. It was expected that this number would increase over a few days as more of the surviving adult males (the calling animals) resumed calling and nest creation. This proved to be the case.

Short term Fire Impacts

The fire damaged only a small percentage of nests, so it is possible that the rate of embryonic development in the remaining nests will increase in response to removal of the vegetative cover and a resultant rise in soil temperature (Simon Conroy *pers. comm*). This would decrease the number of embryos held in nests late into the breeding season when the risk of desiccation is higher. This response has been recorded in a number of other species following moderately intense fire which removed vegetation cover.

While the indications are that the fire has had little immediate impact on calling adult males, the impact of the fire on other members of the population (females, sub-adults, non-calling males) is uncertain. Adult males are thought to be relatively sedentary, spending the majority of their time in a burrow, and thus relatively protected from the fire. Adult females and sub-adult animals are thought to be more mobile than adult males, the females moving from burrow to burrow to find mates and the subadults waiting on the periphery of the population for an opportunity to become reproductively active. Thus the opportunity for these animals to have been caught in the fire may be greater and they may have suffered higher mortality as a result. The consequences (if any) of changes in the age and sex structure of the population are unknown.

Medium & Longer term Fire Impacts

This site has been prescribed burnt at least 6 times since 1961/62, with most burns being in spring and at intervals of 4-9 years (CALM*fire* records). Given this, and the certainty that the site has a fire history which pre-dates records, it is likely that the frogs will recover from this fire.

Opportunistic observations made by Simon Conroy of populations of closely related *Geocrinia alba* following a spring burn at Forest Grove in 1995 found that there was a 45% reduction in calling males one year after the

fire and a 20% reduction 2 years after fire. He also found an increase in the recruitment of young adult males (years 1 and 2 post-fire) which commenced burrow construction and calling. There was an (apparent) change in the age structure of the population. However, as there was no control, these data must be interpreted cautiously.

There is the possibility that the temporary loss of vegetation could predispose this site to flooding, which could negatively impact on the frogs (they are susceptible to drowning - Dale Roberts pers. comm.).

**Impact of the Fire on the Research Program**

(refer also to Research Report)
Part of Simon Conroy's study was to investigate the growth, development and survival of frog embryos using a large sample size *in situ* in contrast to survival rates of "manipulated" or *ex situ* nest sites. Simon Conroy is investigating the potential for egg mass translocations as a means of improving the conservation status of this frog. This required access to a large frog population in a relatively open / accessible site. Geo Creek met these criteria.

The fire has disrupted this experiment such that natural egg survival (non-fire) data for 1997 will not be available. Conroy's dataset and subsequent modelling of survival will be restricted to one site for one year.

To compensate the research program will now have to:
- Locate a new egg study site in an undisturbed area.
- Possibly undertake an additional field season next year.
- Commence a new post-fire experiment to investigate survival rates and the effects of manipulating vegetation cover on adult male burrows and egg sites.

NB: While not part of the Conroy's PhD project, this fire provides a rare if not unique opportunity to examine the impacts of fire on the breeding biology and post-fire population dynamics of this frog.

**Outcomes**

This fire has necessitated a review of the fire management strategies for both species, in regard to developing an appropriate pre-suppression plan for the larger populations which are excluded from routine burning and post-fire habitat recovery strategies, especially for the many small *G. alba* populations. One aspect of the Spearwood Creek fire which contributed to the size of the area burnt, was the lack access within the exclusion zone for firefighting equipment. There is some consideration that had better internal access been available then perhaps fire crews may have been able to isolate the fire rather than have it move along the length of the creek systems. A review of fire management strategies will be undertaken during 1998.

**3.1.4 Habitat Protection**

**Pig Control**

The pig control program using volunteer pig hunters was maintained during the year. Through a combination of trapping and hunting 28 pigs were destroyed from the Blackwood River near the general locality of the *G. vitellina* sites, though no pig disturbance was recorded at the actual sites. Following the fire in Spearwood Creek and the impacts of a potential increase in pig activity over the summer months, an increase in the number of patrols and the placement of traps closer to the *G. vitellina* sites has been implemented.

Discussions between CALM and the Agriculture WA's vertebrate pest section have also taken place with the aim of coordinating pig control programs in the region to increase their effectiveness.

### 3.1.5 Wider Community participation

Refer to this heading for *G. alba*

### 3.1.6 Population Monitoring

A review of monitoring procedures, protocols and aims for both species was undertaken prior to the breeding season with the aim of rationalising the number, type and frequency of monitoring required. The major outcomes of this review were:

- establishment of a standardised field marking and identification system for all monitoring sites,
- documentation of the specific monitoring protocols and techniques to be applied at each of the sites,
- a modification of the transect count technique to provide for greater accuracy and precision,
- a modification of the point count technique to provide information of the lineal extents of the populations within the habitat.
- provision for the training and involvement of additional staff in the program to provide a greater flexibility of resources.

A further review of monitoring procedures will take place prior to next season to determine the need to refine the program following the experience gained in 1997.

Ten *Geocrinia vitellina* sites were monitored during the year using both point and transect counts. All populations were present, although for two sites (GV1b and GV1d) results were impacted upon following a major fire at these sites a few days prior to the commencement of the formal monitoring program.

The 1997 monitoring data has been entered into the Team's databases and first drafts of updated maps showing monitoring sites and species distribution have been produced. Accurate locational data via GPS were gathered for all of the *Geocrinia vitellina* sites and approximately 76 of the *G. alba* sites. The remaining *G. alba* sites will be GPS'ed next breeding season.

### 3.1.7 Genetic Studies

This action was completed in 1994

### 3.1.8 Translocations

Refer to this heading for *G. alba*

## *Geocrinia alba*

### 3.2.1 Survey of Riparian Habitat

Following discussions with the owners of Location 83-1, one half of this large forested private property location was resurveyed for the occurrence of *G. alba* as a precursor to the submission of conceptual development plans by the owner. This location was surveyed for *G. alba* populations in 1992-93 and was found to contain 9 sites including the largest populations of *G. alba* known to exist. The 1997 surveys resulted in a further 6 sites being confirmed as occurring on the property.

### 3.2.2 Land Tenure and Management

With the consent of the owner and support from the LGA and local conservation community an application was submitted to the Natural Heritage Trust, National Reserves System program for $3M to purchase 1080 ha part of the location 83-1containing the majority of the *G. alba* populations for inclusion into the states conservation estate. This would have secured a number of the largest *G. alba* populations in a relatively

undisturbed forested environment and significantly increased the number of *G. alba* populations occurring in the conservation estate. Unfortunately this application was not successful.

### 3.2.3 Fire Management and Research

A wildfire in mid September on a forested private property; location ?? burnt through and along the creek system including *G. alba* site: GA4a. It is estimated this site had not been burnt for over 10 - 15 years and as a consequence of the heavy fuel loads the creek system received moderate to intense fire behaviour. The population was monitored pre and post fire with 6 calling males recorded a few days prior to the fire and 5 animals recorded one night after the fire.

### 3.2.4 Habitat Protection,
### Conservation Fencing

Successful negotiations with the new owners of location 2718 were undertaken during the last quarter of 1997. This has resulted in an agreement to for the team to construct a 4500 m fence on the property which will provide protection for three *G. alba* sites, including a major egg development research site and bring to a total, 12 km of conservation fencing constructed since the commencement of the recovery team. It is planned construction of this new fence will occur over Jan-Feb 1998.

An inspection of the condition of the current fences was undertaken during the year with all fences being in sound condition with no maintenance required. In two locations pasture grasses were beginning to spread into the fenced area and though not considered a problem at this stage, the issue of weed control within the fenced areas will need to be addressed by the team. All landholders with conservation fences were contacted to ascertain any problems with the fences or the recovery program. No problems were raised.

Though funds are becoming limited, consideration will be given to identifying and fencing small areas on properties which do not currently support frog populations but which over time may become suitable as potential release sites for a translocation program.

### 3.2.5 Public Information and Land-owner participation

Further copies of the Geocrinia Recovery Plan and the Farmers Kit were circulated, especially to absentee landholders and the new information sheet "Fire and Frogs" was completed and included in the kit. Liaison with the Bush Fires Board and local volunteer brigades with the aim of having these organisations implement "frog friendly" fire regimes on the lands under their responsibility is still to completed.

Work is underway on the second edition of the Geocrinia Team Newsletter, which is planned to be circulated to landholders, local community groups and schools before the commencement of the breeding season in 1998.

As a point of interest, all of the 200 copies of the "Frog Calls of South Western Australia" cassette tape produced by the team in 1995 have been distributed or sold and regular stream of enquiries from community groups and the public seeking further copies. The team will be reviewing its budget with the aim of trying to finance another production run of tapes to meet the demand.

A number of landholders accompanied team members during the monitoring of the *G. alba* populations on their properties.

### 3.2.6 Population Monitoring

Seventy eight of the 82 *Geocrinia alba* sites were monitored during the year. This included all sites, historical and current which were known to support alba populations. This was the first major field check of all sites since 1994. Results were :

- Nine sites which had animals calling in 1994 did not have any calling males in 1997,
- Six sites recorded an increase in the number of calling animals in 1997 compared to 1994.
- Seven new sites were located in 1997, in areas which were previously searched 1992-1994.

- All other sites were recorded as having the number of calling males at similar or slightly reduced figures compared to the 1994 survey.
- At seven sites the survey technique was changed in 1997 and the results are not directly comparable with the 1994 count.

In general the trend of the previous years remains unchanged; that being the small sized populations continue to decline, medium sized populations fluctuate and large sized populations remain stable.

### 3.2.7 Genetic Studies

This action was completed in 1994

### 3.2.8 Translocations

As was reported in the 1996 Annual Report, the team sought a detailed report from the Melbourne Zoo on the status of the captive breeding program following reports from the zoo that this work had suffered a number of setbacks during 1996. As a result of this report and the progress made by Simon Conroy into researching egg and metamorph survival in the field, the team decided to formally cease the captive breeding program at Melbourne Zoo Herpetology Section and to concentrate its resources on refining the techniques for field translocations as the primary mechanism for boosting population numbers of *G. alba* and *G. vitellina*.

The opportunities for a rapid increase in populations using quantities of eggs which can be obtained relatively simply from the field as opposed to captive breeding is regarded by the team as a more attractive and potentially fruitful option. In addition with Conroy's studies expected to be completed by December 1998, the team is optimistic that techniques will be available to commence operational trials of egg mass and other translocation techniques in 1999 breeding season.

### Conclusion

Despite the disruptions caused by fire and the disappointment of not securing a major *G. alba* conservation reserve, 1997 was a fruitful year for the Recovery Team with consolidation of the monitoring program, a significant addition to the conservation fencing program and some promising results from the research program which should see the commencement of field translocations in one and half years time.

The forthcoming review of the fire management requirements and development of both pre-suppression and post-fire rehabilitation techniques will be both challenging and potentially rewarding, not only for the Geocrinia Project but with application to other species of threatened fauna confined to linear riparian habitats.

The team is now operating well, and hopefully if the membership can remain stable for the next few years, implementation of the remaining goals should be achievable.

Attached: map of Spearwood Creek fire
Attached: copy of Fkitfire handout
Attached: Geocrinia Newsletter

**Progress Report – Research Activities**
**December 1997. Simon Conroy**

During the 1997 field season my research continued in the two main areas of interest: mark recapture studies and pre-metamorphic survival. The progress in these areas is discussed below. One of the most important events during the field season was a CALM prescribed burn which jumped into the *Geocrinia vitellina* fire exclusion area and burnt most of this zone. While the impact of the fire on my mark-recapture studies was minimal, the impact on my pre-metamorphic survival study was significant.

Mark-recapture studies continued at three *Geocrinia alba* populations and at two *G. vitellina* populations. While the mark-recapture results have not yet been analysed, an examination of the number of males captured (minimum number known to be alive) suggests that some of the results are particularly interesting. Numbers at Bruce Rd (*G. alba*) are stable, while the Boathaugh B (*G. alba*) and Spearwood South (*G. vitellina*) populations continue to grow steadily. However, numbers at Spearwood North (*G. vitellina*) were well below those observed in previous years, even before the fire. The most interesting results were observed at Forest Grove South (*G. alba*). There was a fire at this site during the 1995 field season and capture numbers in 1996 were significantly lower than in 1995. This year capture numbers were considerably higher than 1996 levels, returning to the numbers observed in 1995. The interest was not in the increase in numbers but rather in the types of males captured. A large proportion of the calling males captured were very small, and many were smaller than recruits captured at any other site or previously at Forest Grove South. As I noted above the data has not yet been analysed, however recruits may be joining the calling population at a smaller size because the number of large sized surviving males is reduced. This indicates that there may be some competition for calling positions, and provides a clue as to a possible mechanism limiting the size of populations.

One exciting outcome during the 1997 field season was the recapture of individuals marked as metamorphs in 1995. These marked individuals were recaptured as recruits to the calling population at two *G. alba* and two *G. vitellina* sites. Only a small number of metamorphs were marked in 1995 so survival figures derived from these recaptures may not be robust. However, a large number of metamorphs were marked at three *G. alba* sites and one *G. vitellina* site in 1996 and these sites will be censused in October 1998.

The work on pre-metamorphic survival of *G. alba* was successful, with considerably more nests produced and monitored at the three sites in 1997 than in 1996. Further, my observations during 1996 enabled a more refined approach during 1997. Interestingly, the 1997 results suggest not only that mortality may vary considerably among years, but also that the factors contributing to that mortality may vary.

My work on egg and larval survival for *G. vitellina* was seriously affected by the fire in October. Geo Ck was crucial to my research in 1997. The egg/nest work must be done at relatively open sites. There are very few open sites for either *G. vitellina* or *G. alba*. Geo Ck was the only 'large' population of either species in an open site. The *G. alba* sites at which I work are all 'small' (as are most *G. alba* populations) and hence I cannot afford to use eggs in experiments because I need to obtain a "natural" survival figure for each site. Furthermore, there is an ethical problem with using eggs in experiments when populations are so small.

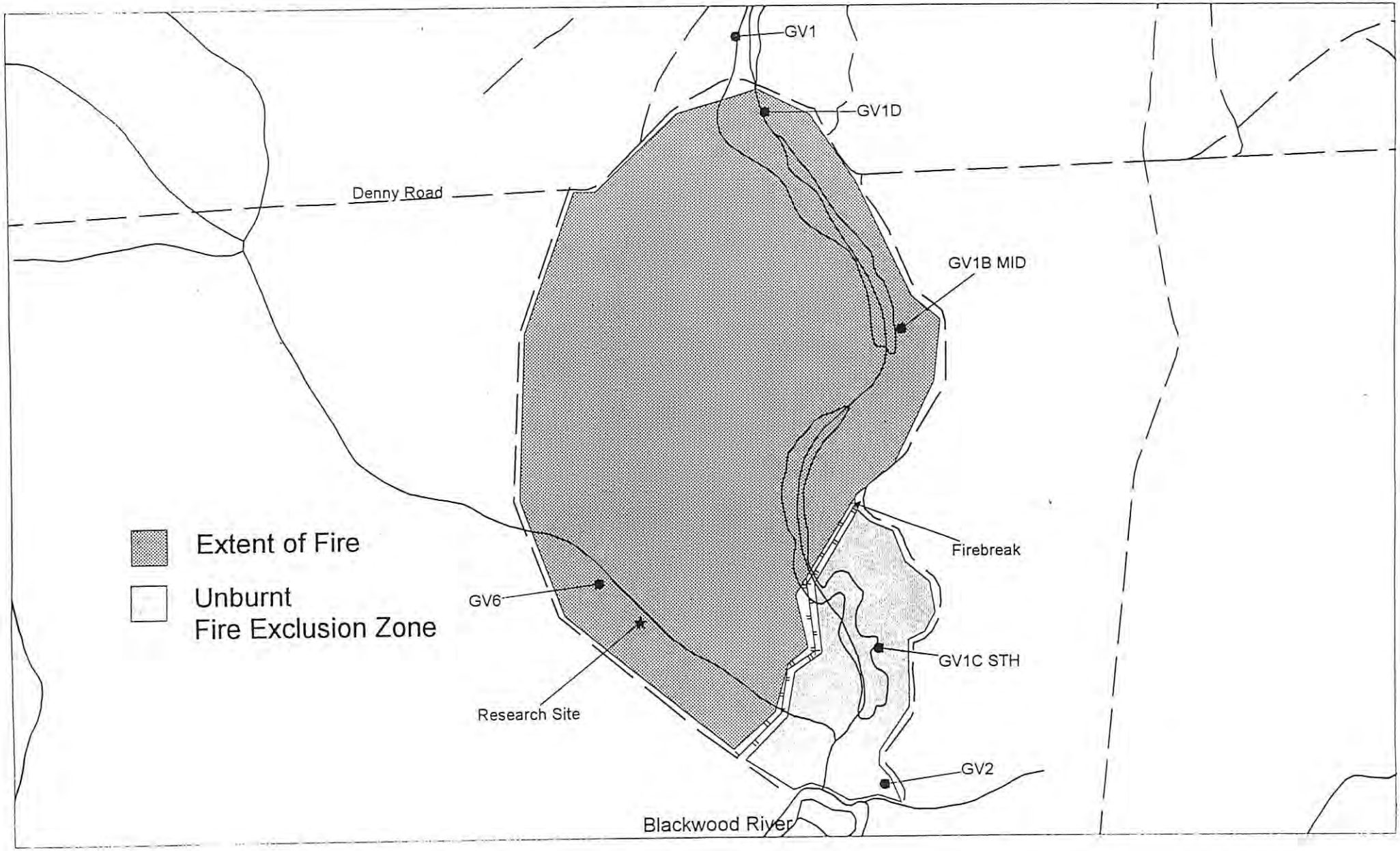
The experiments which I had set up in Geo Ck were destroyed during the fire and I was unable to resurrect them after the fire because I was unable to quantify the effect of the fire on individual nests. Further, immediately after the fire the production of nests slowed considerably. When I finally had enough nests to resurrect the experiments (in early December) soil conditions were too dry and the experiments failed.

Geo Creek was not only important as a source of eggs for experiments. I was also obtaining a "natural" survival figure for a large sample of nests. Because Geo Ck was the only *G. vitellina* site at which I was doing egg work (due to time constraints) I do not now have a "natural" survival figure for *G. vitellina* eggs for

1997. At this stage, therefore, my PhD dissertation, any future papers, and my modeling will be based on a survival figure for *G. vitellina* eggs and larvae from one year - not very robust!

Ironically, I spoke to Graham Keals in the Dept of CALM office in Margaret River on the Friday before the fire (17 September 1997) and stressed to him that it was essential that the Geo Ck site be protected from fire. The burning of any other site couldn't have had more impact on my research.

# Geocrinia vitellina Fire 22/10/97
# Spearwood Creek
# Adelaide Forest Block



# The Geocrinia Gazette

## Official Newsletter of the Geocrinia Recovery Team

**Date Issued: July 1997**
**No. 1**

**Further Information:**
Contact Kim Williams, Dept of CALM - Bunbury.
Ph: (08) 97254300

Welcome to the first issue of the "Gazette", and to what is intended to become a regular update on the activities and progress of the Geocrinia Recovery Team and the people in the local community who are taking an active part in the conservation of the White-bellied Frog and Orange-bellied Frog.

A special feature in this issue is a discussion on managing fire to achieve a balance between the conservation of white and orange-bellied frogs and achieving adequate fire protection for the surrounding lands. What time of year and how frequently should sites be burnt ? What are implications of more frequent fires ? A complex issue , which requires the cooperation and understanding from many organisations and individuals if the balance is to be found.

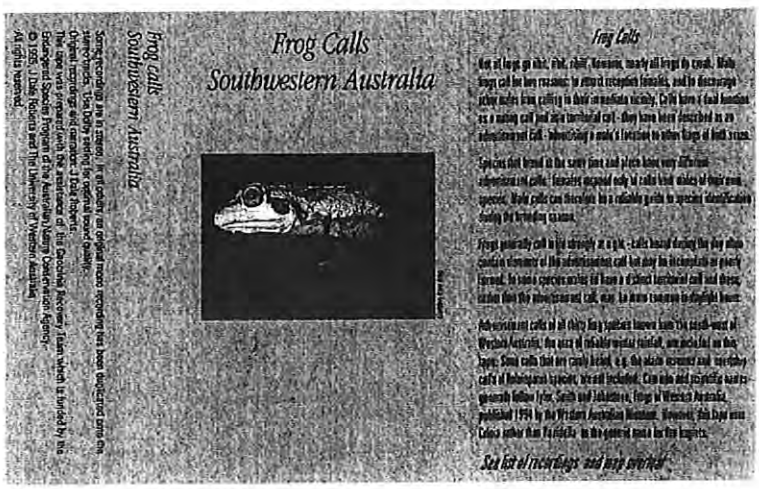
Kim Williams,
Chair, Geocrinia Recovery Team

### Who are We?

The Geocrinia Recovery Team was formed in November 1992 to implement actions needed to prevent both orange and white-bellied frogs from becoming extinct. Membership is voluntary and is comprised of ecologists, conservation managers and community representatives with an interest in conserving these species. The current membership of the team is;

| | |
|---|---|
| Andrew Burbidge | Director Threatened Species Unit - CALM |
| Kim Williams | Rgnl.Conservation Officer - CALM Bunbury |
| Dale Roberts | Zoologist UWA - Zoology Dept. |
| Sally Stephens | Threatened Species & Communities Section Environment Australia - Canberra |
| Greg Voigt | Dist.Conservation Officer - CALM - SW Capes |
| Simon Conroy | PhD Student UWA - Zoology Dept. |
| Ian Wheeler | Technical Officer CALM - Manjimup |
| Ian Noakes | Landholder Lower Blackwood LCDC |
| Jack Stannard | Shire Ranger Augusta/Marg River Shire |
| Lyn Serventy | Community Rep Leeuwin Conservation Group |

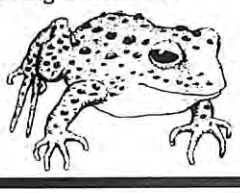
The team meets formally, twice per year in June/July and November/December in Margaret River. Subcommittees, comprising current team members and others, explore various actions and options such as fencing, pig control and research and report back to the full team.




*Newsflash... Frog Calls Cassette now available*

**Inside this Issue...**





## Research Activity

Research into the population biology of both G. alba and G. vitellina has been the main focus of contributions from Zoology at the University of Western Australia.

This work was initiated by Dale Roberts with Grant Wardell-Johnson from CALM and has been followed up since 1992 by the extensive field operations of Don Driscoll.

Don's work has been directed at understanding the populations structure of both species: are they sedentary with every site isolated from every other, or, are sites connected meaning animals frequently migrate to and breed at sites other than where they were born? Don's work has shown that these two frogs have one of the most sub-divided populations structures known for any vertebrate meaning that there is almost no migration between even adjacent populations.

Work on the karri and Walpole frogs (G. rosea and G. lutea) indicate this is a natural phenomenon, not a pattern generated by clearing and fragmentation of habitat. This level of subdivision is found in some other amphibians which also have direct developing eggs, such as terrestrial salamanders, but is not common to all frogs - many others, e.g. Litoria moorei, the motorbike frog, disperse over very large distances.

Don's work has been directed to obtaining a degree of Doctor of Philosophy and is currently being written up for submission early in 1996.

Simon Conroy has just embarked on his research program also directed at a degree of Doctor of Philosophy. Simon's work will build on Don's population studies looking at survival rates of adult frogs as well as focussing on survival of eggs and newly metamorphosed frogs.

In many frogs, egg survival, or more generally the lack of it, controls population size with less than 1% of eggs making it through to juvenile frogs in most species. Simon's work will focus on trying to model population structure and persistence using Population Viability Analysis (PVA) - a tool for simulating long term population growth. PVA might also allow us to investigate the impacts of fire, drought or excessive run-off on egg survival and then the flow on to the number of adults. Many of the populations of G. alba are very small and chance fluctuations in population size might be expected to cause their extinction. However, it may be that these populations have always been small and have evolved mechanisms to cope with environmental fluctuations caused by drought or fire: e.g. careful selection of sites for egg deposition or larger egg yolks to give a larger froglet coming out of the egg mass.

The Geocrinia Recovery Team has supported research work by both Don and Simon. This represents a very successful co-operation marrying the need for applied outcomes in population management with sophisticated, in many cases esoteric, techniques for analysis of population structure and persistence. It has made all of us acutely aware of the problems of day to day management and the need to translate science into management objectives.

J. Dale Roberts,
Department of Zoology,
University of Western Australia

## Frog Call Cassette Released

One of the aims of the Recovery Team is to raise awareness, understanding and an appreciation of the need to conserve not only orange and white bellied frogs, but also creekline vegetation. These creeks are home to many species of fauna, particularly frogs but how do you identify one species from the next ?

Recognising this problem, the Geocrinia team has produced: "***Frog Calls of South Western Australia***", a cassette containing calls of the 38 species of frogs commonly found the south west of Australia - Geraldton to Esperance. In addition to recordings, the inside cover provides information on where different species call from and at what time of year.

The best way to use the tape is to take it and a portable tape player down to your local swamp at night, listen to the frogs calling and play back the tape to identify them.

Copies of the tape are available from Dale Roberts - University of WA Zoology Dept Ph:(08) 93802224 .
Cost $15.00ea + postage.

# Fire Management for Orange- and White-bellied Frogs

**The Impacts of Fire on Frogs**

The impacts of fire on white- and orange-bellied frogs are unclear. A hot, autumn wildfire significantly reduced a population of the white-bellied frog in 1991 but after five years this population is showing signs of recovery. Many other sites have been through several fuel reduction burn cycles but retain populations of both species.

Because of this uncertainty the Recovery Team has taken two approaches to dealing with this issue:

i) fire exclusion and prescribed burning as immediate management options, and

ii) a continuing analysis of fire impacts, which may alter management actions in the future

**Current Management: Fire Exclusion and Prescribed Burning**

**Fire exclusion.**
Around Spearwood Creek (orange-bellied frog habitat),where there were existing roads or fire breaks, we have adopted a policy of fire exclusion. This area is protected by breaks on three sides and by the Blackwood River on the fourth.

For the white-bellied frog this is not feasible on CALM-managed lands as there are no existing roads or other features near the frog populations that could be used as fire breaks. We chose not to construct new roads in areas where these might encourage visitation, particularly in summer. Increased roading would also raise the risk of introduction of disease such as dieback.

**Prescribed burning.**
Most of the sites on CALM-managed lands have been through several fuel reduction burn cycles and some still retain reasonably large populations of both white-bellied and orange-bellied frogs, though others have only small populations. Sites on private land also have a varying history of fire exposure.

Young frogs come into the population after prescribed fires, indicating that some adults must survive, as studies of marked frogs and genetic analyses indicate very limited migration in both species. This suggests fuel reduction burns are not necessarily bad.

Sites where fire exclusion is not possible have been retained in the fuel reduction program but with two restrictions.

i) Fires are to be confined to early Spring to generate cool, low intensity fires that minimise probable impacts on swamp systems. This policy aims to reduce the risk of hot, wildfires occurring over summer and autumn.

ii) There is to be a minimum of eight years, roughly two frog generations, between prescribed fires, to allow some population recovery if fire does have an impact.

There is no certainty that fire exclusion is the best management option as the absence of fire in swamps may also have impacts on long term population survival. We are as ignorant of these impacts as we are of the effects of fires.

## Analysis of Fire Impacts

An experimental study of the effects of spring fires on population density of a closely related species, *Geocrinia lutea*, the karri frog from Walpole, has shown a significant reduction in population size two years after fire compared with adjacent unburnt sites. There was considerable variation in fire impact amongst the six study sites with all burnt populations declining in size after fire but with some unburnt sites also having a reduced population size.

These experimental populations of *Geocrinia lutea* will be monitored over the next few years for signs of recovery. The data so far suggest that small frog populations are at greater risk than larger ones. We also note that some populations of the white-bellied frog have gone extinct without recent fire impacts or other discernible disturbance indicating that many factors may cause local extinctions of small populations in this species.

We are starting a retrospective analysis of fire history of areas occupied by populations of both species. This study will collate data from CALM and private land holders on fire history of sites. We hope to be able to relate fire history to population size and swamp area. This is part of an ongoing analysis of fire effects that may lead to altered policies in the future.

## Using Fire on your Property

The team encourages landholders with frog swamps on their property to adopt the following recommendations:

1. For small areas, no deliberate fires.

2. For larger areas, e.g. swamps with a forested upland adjacent, no deliberate fires, or cool spring fires with a minimum eight year gap between fires, but try to keep fire out of swamp areas.

3. If areas are deliberately burnt, stagger the burn to produce a mosaic of burn ages over several years and aim for cool, spring fires.

## Further Information

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