INTERIM RECOVERY PLAN NO. 48

Unwooded fresh water wetlands of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subspecies *abdita* and *Tecticornia verrucosa* across the lake floor

Interim Recovery Plan 1999-2002

by
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Photograph: Val English

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Natural Heritage Trust
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Department of Conservation and Land Management

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos 44 and 50

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered ecological communities are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by CALM's Director of Nature Conservation.

This Interim Recovery Plan will operate from 26 November 1999 but will remain in force until replaced by a full Catchment Recovery Plan.

The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at 31 May 1999.

SUMMARY

Name: Unwooded freshwater wetlands of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor.

Description: This shrub-dominated community is characterised by intermittent fresh water inundation and sometimes holds little water for several consecutive years. The major components of the community and other biota depend on relatively fresh water and regular drying out of the wetland bed for survival. In addition to the species referred to in the title, the wetlands support a fringing open woodland of *Eucalyptus occidentalis* over *Melaleuca strobophylla* dominated scrub.

CALM Region(s): Wheatbelt Region

CALM District(s): Katanning

Shire(s): Kent (formerly Nyabing/Pingrup South)

Recovery Team: The establishment of a Recovery Team is a high priority. At the time of finalising this document, the entire Lake Bryde wetland system (including this community) and catchment was declared a Recovery Catchment under the Sate Salinity Action Plan. A Recovery Team is to be established for the whole Recovery Catchment .

Current status: Assessed 1 September 1998 as Critically Endangered. Endorsed 6 November 1988.

Habitat requirements: Intermittent inundation with fresh water.

IRP Objective(s): To maintain or improve the overall condition of the lake-bed communities and reduce the level of threat.

Criteria for success: The maintenance of a freshwater community dominated by *Muehlenbeckia horrida* subsp. *abdita* and *Tecticornia verrucosa* in both known occurrences.

Criteria for failure: Loss of area or further modification of the community due to increased salinity or other means.

Summary of Recovery Actions

Establish Recovery Team
Locate further occurrences on private land
Assess and monitor the condition of the community
Investigate the requirements of the community
Investigate and monitor water quality and hydrology
Manage water quality and ensure stability in hydrological regimes
Establish an East Lake Bryde catchment group
Explore options for catchment revegetation
Seek to have Lake Bryde vested in the National Parks and Nature Conservation Authority (NPNCA)
Write a full Recovery Plan

1. BACKGROUND

History, defining characteristics of ecological community, and conservation significance

Lake Bryde and East Lake Bryde are two fresh water wetlands - located in a water and a nature reserve respectively in the shire of Kent – whose catchments are part of the Swan Avon system (Giraudo, 1995).

Lake Bryde and East Lake Bryde are regionally ecologically significant, particularly because most fresh water wetlands in the Wheatbelt are suffering secondary salinisation and excessive inundation as a result of large-scale clearing of their catchments. Clearing of the Kent Shire began in the 1960's and presently, sixty-six percent of the Lake Bryde catchment and fifty percent of the East Lake Bryde catchment are cleared.

Of one hundred and six wetlands in nature reserves of the south-west of Western Australia, Lakes Bryde and Bryde East were found to be the only wetlands with beds dominated by shrubs (Halse *et al*. 1993). They are, in fact, the only known occurrences of the community 'Unwooded fresh water wetlands of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor'. Given the level of survey of wetlands in the southern Wheatbelt and the opinions of qualified people who have spent many years in the general area and survey of other nearby wetlands (eg. Mattiske 1999), it is unlikely that there are any more occurrences of this community type - particularly not in reserves.

The Lake Bryde wetland system has been nominated as a wetland of outstanding ornithological importance (Raines 1995). A survey of the aquatic invertebrates of Lake Bryde has shown that fauna to be highly diverse in relation to other Wheatbelt wetlands such as Toolibin Lake (NPNCA 1999) and probably richer than those on the Swan Coastal Plain (Davis *et al.* 1993). The wetlands' ecological uniqueness and human community concern (Lake Bryde is a recreation site as well) have become an impetus for conservation.

Extent and location of occurrences

Lake Bryde is located 34 km south-west of Newdegate in a relatively large reserve (1,315 ha) for purposes of emergency water supply, recreation and the conservation of flora and fauna, vested in the Minister for Water Resources and managed by the Water Corporation. 32 km south-south-west of Newdegate, East Lake Bryde (= Lake Bryde East) is located in a larger reserve (1,528 ha) for the conservation of flora and fauna, vested in the National Parks and Nature Conservation Authority and managed by the Department of Conservation and Land Management (Table 1, Figure 1).

Table 1: Summary of occurrence information and threats

Occ. No. & Location	Land Status	Estimated area of occurrence (ha)	Condition	Threats
1 (Lake Bryde) Reserve 28667	Nature Reserve	50 ± 1	Insignificantly modified	Salinity
2 (East Lake Bryde) Reserve 29020	'A' Nature Reserve	85 ± 5	Slightly modified	Salinity

Biological and ecological characteristics

This shrub-dominated community is characterised by intermittent fresh water inundation and sometimes holds little water for several consecutive years. The major components of the community and other biota depend on relatively fresh water and regular drying out of the lake bed for survival.

Lake Bryde and East Lake Bryde are fresh water wetlands with low shrubs across the lake bed and surrounded by *Eucalyptus occidentalis* woodland (Table 2). There are no other known occurrences of this type of wetland in the southern Wheatbelt - other fresh water wetlands in the area have a different plant community on the lake bed (K. Wallace, personal communication[1]; Mattiske 1999).

Table 2: Vegetation classification of Lake Bryde and East Lake Bryde (based on Muir 1977)

Occurrence	**Lake bed**	**Margin (relation to water mark)**	
		Below	**Above**
Lake Bryde	Dwarf Scrub C	Open woodland	Woodland
East Lake Bryde	Dwarf Scrub D	Scrub	Woodland

Information on the biological and ecological characteristics of the lake bed community is limited to taxonomic descriptions (Wilson 1972; Wilson 1996) and personal observations: *Muehlenbeckia horrida* subsp. *abdita* is only known from these two wetlands (A. Coates, personal communication[2]) and, like its closest relative *Muehlenbeckia horrida* subsp. *horrida*, is probably restricted to fresh water (Wilson 1996). *Muehlenbeckia horrida* subsp. *abdita* can survive prolonged inundation so long as it dries out within a year or thereabouts (K. Wilson, personal communication[3]). *Tecticornia verrucosa* is generally on fresh water or slightly saline claypans and lakes (Wilson 1972) and is probably a different variant to those known from coastal flats (P. Wilson, personal communication[4]).

[1] Ken Wallace – Department of Conservation and Land Management. PO Box 100, Narrogin 6312.

[2] Ann Coates – Landholder, Shire of Newdegate.

[3] Karen Wilson - Royal Botanical Gardens. Mrs Macquarie Road, Sydney, NSW 2000.

[4] Paul Wilson – Department of Conservation and Land Management. Locked Bag 104, Bentley Delivery Centre 6983.

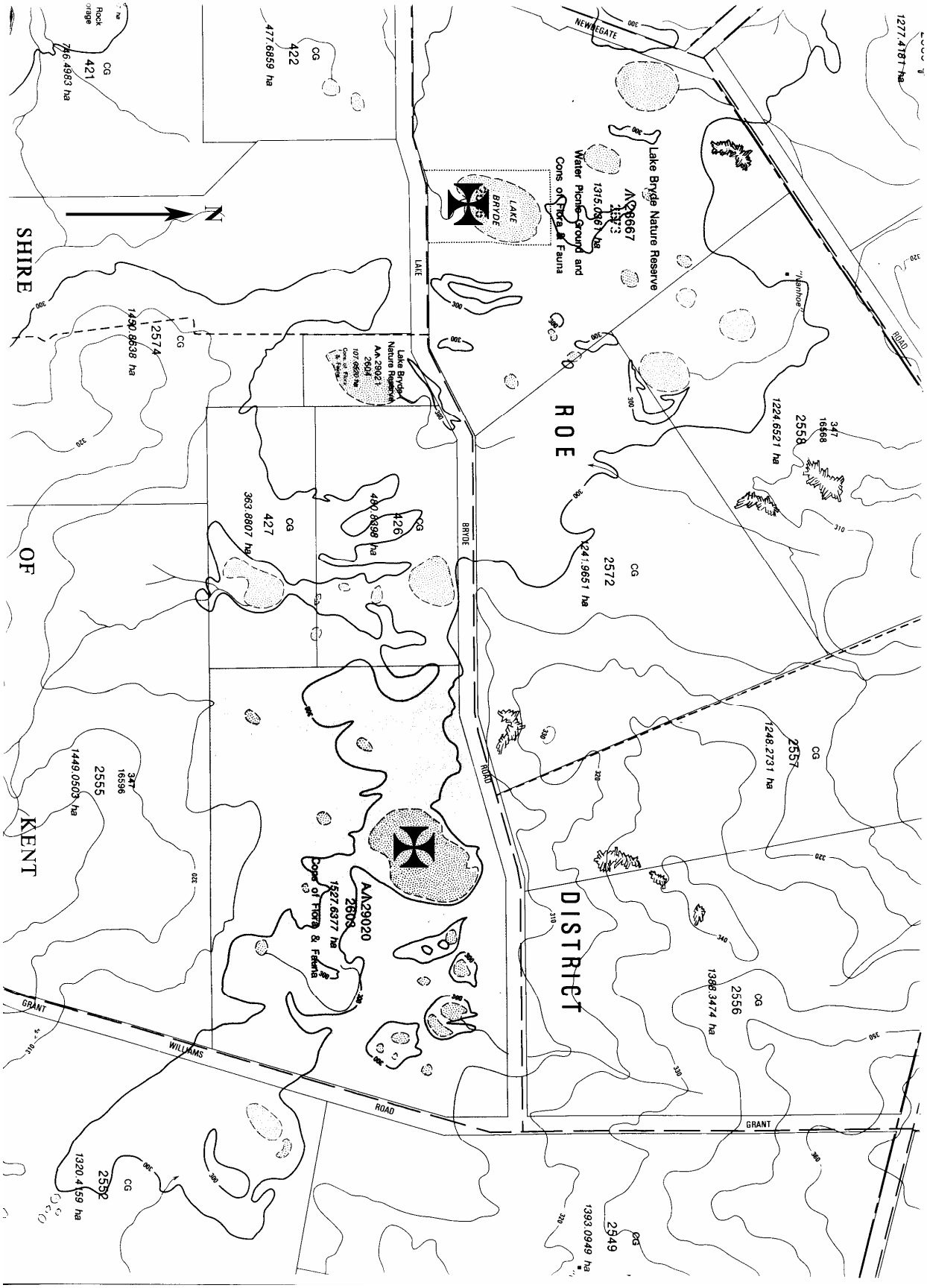

Figure 1: Locations of Lake Bryde and East Lake Bryde on a portion of Lake Bryde 1: 50,000 cadastral map

Hydrology and Water Quality

Both Lake Bryde and East Lake Bryde are situated at the head of a chain of lakes that extend from Lake Magenta Nature Reserve (Breheny 1995). They lie in an asymmetrical basin and are thought to be perched with an impermeable layer of silt and clay.

Lake Bryde

Lake Bryde fills only when the annual rainfall of the area exceeds 400 mm (Giraudo 1996). Since monitoring of Lake Bryde began in 1979, it has flooded six times, in 1983, 1988, 1990, 1992, 1993 and 1996. It is not known exactly how often it filled prior to monitoring, but it is considered to have been approximately every four years in the previous century, and less in the present. As it takes about fifteen months for the lake to dry out from full, Lake Bryde is more dry than it is wet (Giraudo 1995; Davies 1996).

Surface water drainage from the alluvial plain that fills Lake Bryde is via a single channel that runs northwards into the lake. The water evaporates rather than leaves the lake via an outflow channel, unless the lake fills beyond the maximum depth of two metres, at which time it flows outwards along the inflow channel until it falls below two metres. As a result, no flushing of the lake occurs unless depth exceeds two metres.

When monitoring of water levels and salinity began in 1979, Lake Bryde had a salt concentration of 0.036 parts per thousand (ppt) and in 1992, 1.27 ppt. It is thought that the salt load in the lake came from the run-off of saline surface water rather than from the ground water as the lake bed is thought to be impermeable (Giraudo 1996). The Lake Bryde catchment of 45,200 ha is sixty-six percent cleared and consists of four sub-catchments – Southern, Magenta, South Western and North Eastern. The Southern catchment may be responsible for the increased salt load into Lake Bryde as it is the most saline (Giraudo 1995), but this needs confirmation.

East Lake Bryde

Much less is known about East Lake Bryde. Its catchment of 27,730 ha is fifty percent cleared, with most of the vegetated area in the Lake Magenta Nature Reserve. It has always been known to be fresh and since monitoring began in 1979, there has been no significant change in salinity (J. Lane, personal communication[5]).

Historical and current threatening processes

Given the degradation of fresh water wetlands throughout much of the Wheatbelt and the significant clearing that has taken place in the catchments of these two lakes since about 1960, there appear to be three major, interacting processes threatening their long term survival. These are increased periods of inundation resulting from increased run-off following clearing of much of the catchment; increased levels of salinity resulting from input of saline surface water; and finally, the threat of both inundation and salinity increasing massively if regional water tables rise to the surface within the lakes themselves or nearby in their catchments.

Monitoring of the water in Lake Bryde began in 1979 and the salt concentration recorded was 0.036 ppt. There have been increases in the salinity since then but the majority of the salt load (75%) was deposited in 1992 - probably due to hyper-saline run-off from the upstream alluvial flat (Giraudo 1996). It is not known if ground water is contributing to the salt load, although it is thought that the lake bed is sufficiently impermeable that ground water would not rise up through it. However, even if the saline ground water may not be able to permeate the lake bed itself it would probably soon penetrate all around it where the soil type was more permeable and would simply run into the lake. Although the lake is still essentially fresh, it is anticipated that the next inflow may double the salt load (Giraudo 1995) and presumably this increase will continue without action.

Less is known about changes in the quality of the water in East Lake Bryde. Monitoring has not shown a significant salt concentration (J. Lane, personal communication), yet the vegetation has been noted by the local community to have been in decline for a number of years (A. Ralph, personal communication[6]).

[5] Jim Lane – Department of Conservation and Land Management. 14 Queen Street, Busselton 6280.

[6] Arletta Ralph - Ex- Lake Grace Community Landcare Coordinator, Shire of Lake Grace

The first known survey of the wetlands plant bed community was by Watkins and McNee (1987) who mapped *Muehlenbeckia declina* (= *M. horrida* subsp. *abdita*.), *Tecticornia verrucosa* and *Halosarcia lepidosperma* as the dominant plant species on the bed of Lake Bryde and *Muehlenbeckia horrida* subsp. *abdita* as the dominant species on East Lake Bryde. In the summer of 1989/90, Halse *et al.* (1993) mapped the vegetation of Lake Bryde as dominated by *Muehlenbeckia horrida* subsp. *abdita* with *Tecticornia verrucosa* on some parts of the lakebed. The vegetation of East Lake Bryde was mapped at the same time as *Muehlenbeckia horrida* subsp. *abdita* with occasional *Halosarcia pergranulata* and *Carpobrotus* sp.

No more surveys were carried out until after 1996, when A. Coates (personal communication) mapped the vegetation of Lake Bryde as *Muehlenbeckia horrida* subsp. *abdita* with scattered plants of *Tecticornia verrucosa* on the lakebed. She found *Tecticornia verrucosa* with populations of live *Muehlenbeckia horrida* subsp. *abdita* occurring only occasionally with *Disphyma crassifolium* and *Carpobrotus* sp. on the bed of East Lake Bryde. In 1996, some of the *Melaleuca strobophylla* fringing the lake bed of East Lake Bryde were dying (English, personal communication[7]).

Although it appears that the vegetation on the bed of Lake Bryde is changing (that is, samphires encroaching, fewer *Muehlenbeckia* sp.) as a result of the increased salt concentration in 1992 there have been no empirical studies to confirm this. An attempt to document the change (that is, percentage cover and species composition) of the lake bed vegetation has been made using aerial photographs taken since 1956, but Lake Bryde had always had water in it and the differences in the vegetation in East Lake Bryde cannot be adequately resolved.

Conservation status

The 'Unwooded fresh water wetlands of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor' community meets the following criteria for Critically Endangered (CR) ecological communities:

B(i) current distribution is limited and currently subject to known threatening processes that are likely to result in total destruction in the immediate future (within approximately 5 years) if trends continue.

B(ii) current distribution is limited and there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes.

[7] Val English - Department of Conservation and Land Management. PO Box 51, Wanneroo 6946.

Strategy for recovery

To design recovery actions for both occurrences; and identify and influence the management of the two catchments, so maintaining natural biological and non-biological attributes of the sites and the current area covered by the community.

To conduct appropriate research into the ecology of the community to develop further understanding about the management actions required to maintain or improve the condition of the community.

2. RECOVERY OF BJECTIVE AND CRITERIA

Objective

To maintain or improve the overall condition of the lake bed community (*Muehlenbeckia horrida* subsp. *abdita* and *Tecticornia verrucosa*) of both Lake Bryde and East Lake Bryde and reduce the level of threat to them.

Criteria for success

- Maintenance or improvement of the vigour and extent of the community.
- Reduction of threatening processes as defined in this document, in particular the maintenance of salinity at less than ten parts per thousand.

Criterion for failure

- Continuing increases in salinity of either or both occurrences and significant loss of area or further modification of the lake-bed community.

3. RECOVERY ACTIONS

1. Establish a Recovery Team

A Recovery Team oversees and advises on any Recovery Actions. The Lake Bryde wetland system has been designated a natural diversity recovery catchment under the State Salinity Action Plan and a Catchment Recovery Team will be established under that program. That recovery team will take responsibility for recovery actions for the CR community. Because of the diversity of interests over the whole catchment, the recovery team will need to include a wide range of local people and representatives of appropriate Government agencies. The Recovery Team will report annually to CALM's Corporate Executive.

Action: Establish a Recovery Team
Responsibility: Department of Conservation and Land Management (CALM)
Estimated cost: $10,000 per year

2. Seek further occurrences on private land

Field surveys are required to locate other occurrences of the community that may occur on private land. Aerial photography may be used to locate appropriate sites. Publicity methods such as radio interviews and articles on the community as well as actions taken to secure the community's future may also aid in locating further occurrences.

Action: Seek to locate further occurrences on private land
Responsibility: CALM (WATSCU)
Estimated cost: $2,000 for the first year

3. Assess and monitor the condition of the community

It is important to assess the current condition of the lake bed community at each of the occurrences. A suitable method would be to estimate percentage cover of the lake bed community using a long linear transect (as the lake bed community is sparse). As well, another line transect should be placed elsewhere on the wetland that would show a change in cover up-slope. This procedure, performed annually, would be one of a number of suitable ways to monitor

any changes to the community. In addition, annual aerial and land photography from the same position as previous studies (eg. Watkins and McNee, 1987) could be used to further monitor changes in the vegetation.

Actions: Assess and monitor the condition of the community.
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

4. Investigate the requirements of the community

The optimum conditions for the success of the two key species of the community need to be determined. Research on the biology and ecology of these species could be the basis for their management on the occurrences. This research should at the least include seed germination requirements, optimum soil and water conditions and response to changes in salinity and periods of inundation, particularly at different stages of their life-cycles.

Action: Investigate the requirements of the community
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

5. Investigate and monitor water quality and hydrology

This requires monitoring the salt load into each of the lakes as well as the salinity level within each lake throughout the filling and drying cycle. At present it is accepted that the salt load into Lake Bryde comes from surface water drainage upstream – although this has not been conclusively proven, but present monitoring by Agriculture WA should give results by 2001 (R. Notts, personal communication[8]).

5.1 Surface water – Investigate feasibility of monitoring stations on occurrences and catchments

Depth gauges – to measure lake water depth and salinity - were placed in both lakes by the Department of Conservation and Land Management. Monitoring began in 1979 and continues. It is recommended that monitoring stations be placed along both catchments to determine the influx of salts to the lakes. This should include installation of a monitoring station that continuously measures water level, conductivity and temperature as well as a field officer to interrogate the unit on a regular basis to ensure it is working correctly and 'download' data (M. Pearcey, personal communication[9]).

Action: Investigate feasibility of monitoring stations
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

5.2 Ground water – Design and erect piezometers on East Lake Bryde

In the 1990s, three piezometers were placed adjacent to Lake Bryde and another seventeen throughout the Lake Bryde catchment (Giraudo 1995). Salinity measurements have been taken four times a year since 1997 by Agriculture WA and comprehensive results should be available in 2001 (R. Notts, personal communication). Recently, more piezometers are also being placed at the edge of the Lake Bryde by CALM, adjacent to the Salinity Action Plan wetland monitoring vegetation transects and will be monitored regularly (S. Halse, personal communication[10]).

There are no piezometers adjacent to East Lake Bryde and its catchment. At least two are required around East Lake Bryde and at least two more along the main drainage lines on the catchment. It is important – to understand ground water processes - that appropriate sites are designed, the piezometers erected, and salinity measurements taken regularly.

Actions: Design and erect piezometers on East Lake Bryde
Responsibility: Catchment Recovery Team

[8] Rosemary Notts - Agriculture Western Australia. 50 Stubbs Street, Lake Grace 6353.

[9] Mark Pearcey – Waters and Rivers Commission. 3 Plain Street. East Perth 6004.

[10] Stuart Halse - Department of Conservation and Land Management. PO Box 51, Wanneroo 6946.

Estimated cost: Catchment Recovery Team to calculate and pursue funds

6. Manage water quality and ensure stability in hydrological regimes

Design and implement strategies to manage water quality and ensure stability in hydrological regimes at that level. This includes liaising with land managers to respond to the results of water monitoring with appropriate actions eg. management of water draining into the wetlands.

Actions: Manage water quality and ensure stability in hydrological regimes
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

7. Establish an East Lake Bryde catchment group

As the source of threat to East Lake Bryde is unknown and the effects are seen as greater than on Lake Bryde, it is imperative that such an East Lake Bryde catchment group be established and encouraged.

Action: Establish an East Lake Bryde catchment group
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

8. Explore options for catchment revegetation

Liaise with landholders/catchment group to be involved in catchment revegetation and to promote agronomic practices that increase water usage and help in lowering the water table. Lists of suitable species and the various agronomic practices should be available from Agriculture WA and the Land Conservation District Committee.

Actions: Explore options of catchment revegetation
Responsibility: Community Landcare Coordinator & Agriculture WA via Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

9. Seek to vest Lake Bryde under NPNCA

Negotiate with the Water Corporation to transfer the care, control and management of Lake Bryde to the NPNCA.

Action: Seek to vest Lake Bryde under NPNCA
Responsibility: CALM and NPNCA
Estimated cost: CALM/NPNCA to determine costs

10. Write a full Recovery Plan

This IRP constitutes a preliminary step to the production a full Catchment Recovery Plan, the writing and implementation of which will be overseen by the Catchment Recovery Team.

Action: Write a full Recovery Plan
Responsibility: Catchment Recovery Team
Estimated cost: Catchment Recovery Team to calculate and pursue funds

4. TERM OF PLAN

This Interim Recovery Plan will operate from 26 November 1999 until replaced by a full Catchment Recovery Plan.

5. ACKNOWLEDGMENTS

Bruce Bone, Mal Graham, Stuart Halse, Paul Wilson and Karen Wilson provided useful information on this IRP.

6. REFERENCES

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Summary of recovery actions and costs

Recovery Action	Year 1		Year 2		Year 3	
	NHT*	Other	NHT*	Other	NHT*	Other
1. Establish a Recovery Team.		$10,000**		$10,000**		$10,000**
2. Locate further occurrences on private land.	$2,000					
3 Assess and monitor the condition of the community.		***		***		***
4. Investigate the requirements of the community.		***		***		***
5. Investigate and monitor water quality and hydrology.		***		***		***
6. Manage water quality and ensure stability in hydrological regimes.		***		***		***
7. Establish an East Lake Bryde catchment group.		***		***		***
8. Explore options for catchment revegetation.		***		***		***
9. Seek to have Lake Bryde vested in NPNCA.		***		***		***
10. Write a full Catchment Recovery Plan.		***		***		***

*Funds NHT has already contributed
**In-kind contributions
***Recovery Team to calculate funds