PART B: AN ASSESSMENT OF THE SPATIAL DISTRIBUTION OF SEAGRASS IN 1997 WITHIN THE GIPPSLAND LAKES

1. INTRODUCTION

This report presents the results of a survey to detail the spatial extent of seagrass meadows in the Gippsland Lakes.

2. STUDY OBJECTIVES

The aims of this stage of the study are to:

- map in detail the spatial extent of the seagrass meadows in the Gippsland Lakes.
- identify the distribution of species of seagrass in the Gippsland Lakes.

The study also provides an indication of the state of the seagrass in relation to algal cover.

2.1 Baseline Survey

Baseline surveys are necessary in order to document the extent and condition of seagrass meadows (Kirkman, 1995). This survey recorded the spatial extent of the seagrass meadows, density, species distribution and algal cover in the Gippsland Lakes.

Remote sensing techniques along with field verification using a semi-submersible observer pod and video transects were employed to undertake this work. An intensive field verification program was necessary because of the ineffectiveness of remote sensing to detect seagrass meadows in depths greater than one metre within the lakes system due to poor water clarity.

3. METHODOLOGY

3.1 Remote Sensing of the Estuarine Environment

Aerial photography was chosen as the most appropriate method for remotely sensing the spatial extent of seagrass meadows at the pre-determined scale of 1:10,000. In order to accurately quantify the spatial extent of the seagrass it is essential that the photography is taken when optimum conditions exist to maximise light penetration through the water column. Cloud free days and after a period of calm weather with low rainfall were the primary considerations. Other considerations that reduce water clarity include the occurrence of algal blooms and freshwater input from the numerous major rivers that discharge into the lakes system.

The Gippsland Lakes are in close proximity to major forest and logging areas. Each year in autumn a considerable amount of fuel reduction and regeneration burning is conducted in the area. This can create a significant amount of smoke that forms a haze over the lakes system (John Strong, NRE Bairnsdale pers. comm.) which can also make it difficult to achieve clear aerial photographs.

3.2 Aerial Survey Technique

A commercial aerial survey company, QASCO, was contracted to fly the project photography. QASCO uses a state of the art *LEICA RC 30* aerial survey camera. This aerial survey camera uses a 230mm x 230mm negative format and employs a distortion free lens system. It has a computerised forward motion compensation built into the camera. For any shot taken, the camera can identify film type/speed, available light, airspeed over ground, height above ground and calculate how far the image will move during exposure. Then in that split second, compensate for that movement by the film speed transport mechanism moving backwards at the appropriate speed. This aerial survey camera system is capable of producing exceptionally clear photography enabling the photography to be flown at the scale of 1:20,000 and then reproduced at 1:10,000 for final interpretation without compromising detail (Andrew Watts, QASCO pers. comm.).

3.3 Photography Specifications

The final map scale of 1:10,000 was adopted to display the extent of seagrass meadows within the Gippsland Lakes. Stereo photography (colour negative) at the scale of 1:20,000 of the Gippsland Lakes system was flown. The centroid of each frame of the photography was geo-referenced with a co-ordinate recorded by a Differential Global Positioning System (DGPS). The DGPS co-ordinate along with terrestrial features assisted with the geographic registration of the photography.

3.4 Habitat Classifications

During the field verification process two fields are recorded, bottom type and seagrass species/density. The categories recorded for bottom type and seagrass species is listed in Table 3.1. The seagrass species recorded are *Zostera* and *Ruppia*. The two species of *Zostera* that exist within the Gippsland Lakes (*Heterozostera tasmanica* and *Zostera muelleri*) cannot be differentiated from the semi-submersible**.**

Table 3.1: Habitat categories recorded during the survey.

Bottom Type Categories

- No bottom (i.e. too deep to record bottom features).
- Bare
- Sparse
- Dense
- Dead
- Sparse with algal cover
- Dense with algal cover
- Other algae
- Unidentifiable subtidal vegetation

Species Categories

- *Zostera (Heterozostera tasmanica* and/or *Zostera muelleri)*
- *Ruppia*
- Mixed

3.5 Semi Submersible

The Gippsland Lakes are a difficult environment in which to survey subtidal features. The clarity of the water is poor and visibility varies from 30 cm to 2 metres. In order to gain a further insight into this environment and to verify the aerial photograph interpretation, a survey vessel with a semi-submersible pod specifically designed for submarine imaging was employed (Figure 3.1). The vessel is equipped with a Differential Global Positioning System receiver (DGPS). The DGPS is connected to laptop computer which runs a program capable of recording the vessels position as well as observed changes in bottom type.

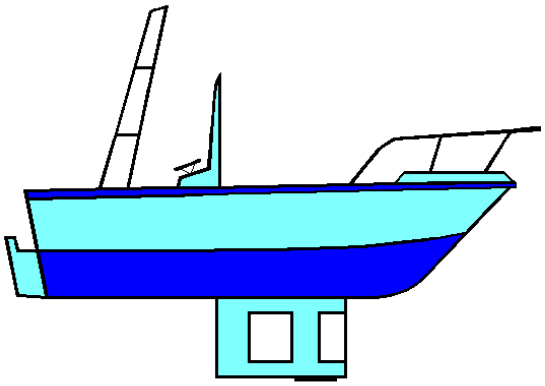


Figure 3.1: Semi submersible survey vessel with pod lowered

The vessel has a retractable observation pod that is elliptical in plan and is 1400 mm long, 620 mm wide and 1200 mm deep. This pod is lowered into position on a lifting frame through a well. The observation pod has a position for an observer with forward, side and bottom viewing ports. There are three camera ports in the floor of the pod as well as a viewing port. The pod is totally sealed apart from a weather tight hatch at the top.

The survey vessel is 5.2 m long with a beam of 2.46 m and draws 0.95 m with the pod lowered. The vessel is marine grade aluminium alloy construction and is powered by a 115hp outboard.

3.6 Video Transecting

A unique towable camera frame was designed to capture video footage of the lake floor. The lakes environment required a camera configuration that was able to be towed at a consistent height above the lake floor without accumulating seagrass, as a camera sled would. A camera frame was designed that could be dragged through seagrass at a consistent height above the lake floor.

4. DATA PROCESSING

4.1 Geographic Information Systems

Geographic Information Systems (GIS) incorporate digital databases which store spatially referenced information that have topology i.e. mathematical relationships exist between spatial features. The information can be displayed and analysed using various components or programs contained within the system. GIS provides a quantitative method of studying environmental processes and the relationships between physical, chemical and biological information (Roob *et al.,* 1995).

All data collected for this project are in a standard format and have been entered into a GIS, employing the *ArcInfo* software, providing a platform where multi-variate analysis of the various data sets can be conducted. Information relating to the distribution of seagrass and bathymetry was manually digitised, while data collected in the field has been entered into the GIS by up-loading electronic files.

4.2 Air Photo Interpretation

Colour positives of the aerial photography were contact printed and the boundaries of the seagrass meadows were then drafted onto stable base polyester sheets overlaying the photographs. The delineation of seagrass meadows on the stable base sheets was then transcribed employing a best fit approach using a process camera onto maps with survey control and 1:25,000 topographic base information. This linework was then digitised into the GIS using the *ArcEdit* package within the *ArcInfo* software.

Hardcopy bathymetric information for the lakes system was provided by the Victorian Channel Authority and this data was also digitally captured and stored in the GIS.

4.3 Field Verification Data Processing

Field data was recorded using a computer program that receives a “nema string” from the DGPS and logs it along with a selection of class and abundance. Latitude, longitude, abundance and classification were up-loaded directly from computer files into *ArcInfo* using the software functionality.

The video footage has latitude and longitude overlayed on it allowing the observer to post-analyse by classifying and recording positional information.

With all of the information loaded into the GIS and constructed into layers, analysis may be performed. The two dimensional spatial extent of seagrass meadows identifiable from the air photography is quantified and categorised in relation to species and density. The three dimensional extent including the depth at which seagrass grows in the lakes system has been ascertained. Distribution of algal cover on seagrass has also been identified.

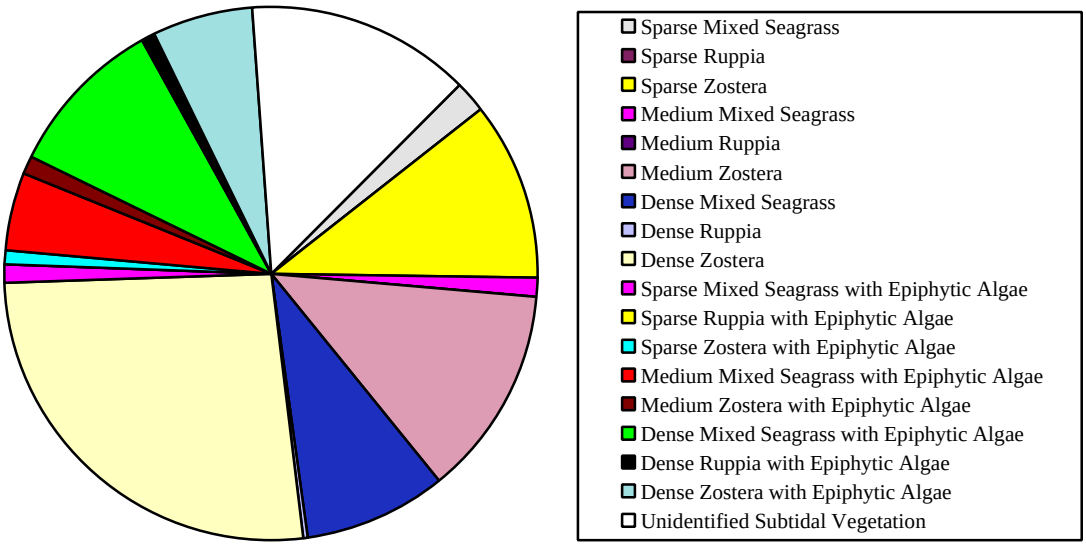
5. RESULTS

The results have been reported in a number of ways, initially the position of the survey transects and the spatial distribution seagrass meadows are displayed in map form. Then tables and graphs describe the sum of the area of unique categories. As outlined below:

Table 5.1: Summary Area Statement of Seagrass Communities in the Gippsland Lakes and Lake Tyers
Graph 5.1: Summary Area Statement of Seagrass Communities in the Gippsland Lakes and Lake Tyers
Table 5.2: Summary of the total number of transect sample points recorded in the Gippsland Lakes and Lake Tyers
Graph 5.2: Summary of the total number of transect sample points recorded in the Gippsland Lakes and Lake Tyers
Attachment 3: Map 1A: Transects of the survey vessel "Koorong" in the Gippsland Lakes
Attachment 3: Map 1B: Transects of the survey vessel "Koorong" in the Gippsland Lakes
Attachment 3: Map 2: Transects of the survey vessel "Koorong" in Lake Tyers
Attachment 3: Map 3: Series of 10 maps of seagrass distribution - Gippsland Lakes

Class	**Area (m^2)**
Sparse Mixed Seagrass – clean	1,031,845
Sparse Ruppia – clean	6,479
Sparse Zostera – clean	5,436,375
Medium Mixed Seagrass – clean	440,117
Medium Ruppia – clean	20,232
Medium Zostera – clean	6,363,234
Dense Mixed Seagrass – clean	4,402,763
Dense Ruppia – clean	90,106
Dense Zostera – clean	13,193,706
Sparse Mixed Seagrass with Epiphytic Algae	651,439
Sparse Ruppia with Epiphytic Algae	3,658
Sparse Zostera with Epiphytic Algae	409,483
Medium Mixed Seagrass with Epiphytic Algae	2,406,316
Medium Zostera with Epiphytic Algae	477,998
Dense Mixed Seagrass with Epiphytic Algae	4,888,688
Dense Ruppia with Epiphytic Algae	476,062
Dense Zostera with Epiphytic Algae	3,001,952
Unidentified Subtidal Vegetation	6,827,025
Bare	190,234,123

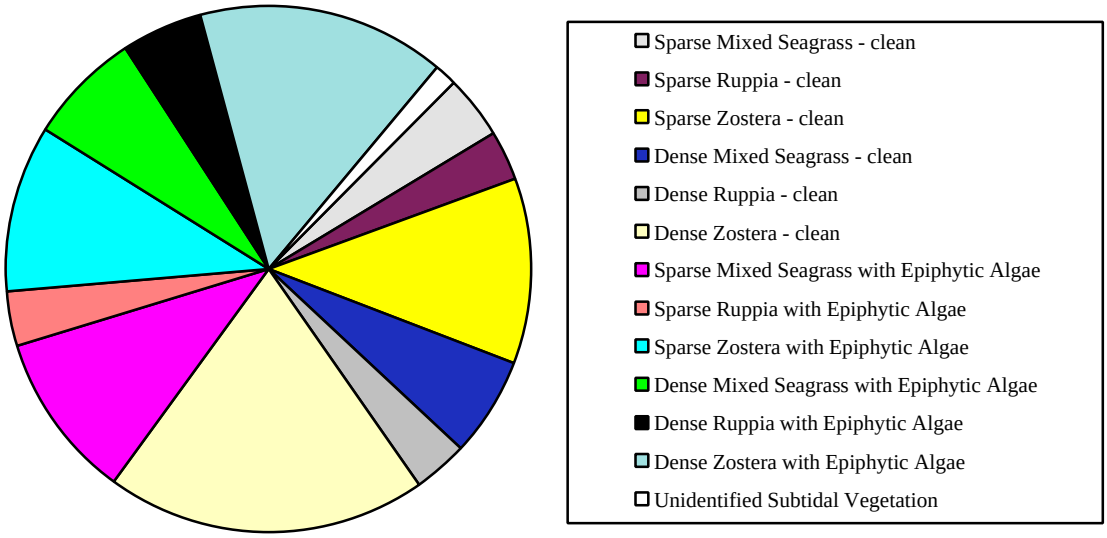
Table 5.1: Summary Area Statement of Seagrass Communities in the Gippsland Lakes and Lake Tyers



Graph 5.1: Summary Area Statement of Seagrass Communities in the Gippsland Lakes and Lake Tyers

Class	**Total N^{o} Points**
Sparse Mixed Seagrass – clean	2,188
Sparse Ruppia – clean	1,890
Sparse Zostera – clean	6,610
Dense Mixed Seagrass – clean	3,608
Dense Ruppia – clean	1,923
Dense Zostera – clean	11,502
Sparse Mixed Seagrass with Epiphytic Algae	6,002
Sparse Ruppia with Epiphytic Algae	1,846
Sparse Zostera with Epiphytic Algae	5,998
Dense Mixed Seagrass with Epiphytic Algae	4,034
Dense Ruppia with Epiphytic Algae	2,915
Dense Zostera with Epiphytic Algae	8,912
Unidentified Subtidal Vegetation	815
Bare	35,424

Table 5.2: Summary of the total number of transect sample points recorded in the Gippsland Lakes and Lake Tyers



Graph 5.2: Summary of the total number of transect sample points recorded in the Gippsland Lakes and Lake Tyers

6. DISCUSSION

Seagrass meadows are widely distributed throughout the Gippsland Lakes and Lake Tyers. The authors believe that most areas of seagrass within the Lakes system have been delineated during this study.

From the mapping it is apparent that the most widely distributed species within the Lakes system are *Zostera muelleri* and *Heterozostera tasmanica* while there are only a few small areas of *Ruppia spiralis* with the exception of Lake Tyers. There is a considerable area of seagrass that contains a mixture of all these species. *Lepilaena cylindrocarpa* was observed in a number of sites in Lake Tyers, however its distribution seemed confined to areas which were too small to map at the scale of 1:10,000.

The technique developed for this survey has enabled the to authors to map the distribution of seagrass with a 90% confidence level. The accuracy of the delineation between species, i.e. internal divisions within the seagrass meadows is estimated to be of the order of 70%. In areas where confidence in identifying species was lower than 70%, the description of "undefined subtidal vegetation" was assigned. The lower estimate of accuracy in the delineation between species within the one contiguous meadow is due to the complex mosaic and intermixture of species as well as the slight inconsistency between observers.

The depth distribution of seagrass within the Lakes system seems to be within the 0 to 2.5 metre depth range, but generally seagrass is only encountered in water less than 2 metres deep.

The distribution of epiphytic algae within the seagrass meadows seem to be confined to areas with low energy and relatively little tidal flow. High energy marine environments have a flushing effect on vegetation keeping them clean and limiting the settlement of epiphytic algae.

The distribution, density, length, and condition of seagrass within the Gippsland Lakes seems to be highly variable. There appears to be a number of contributing factors to these variations most of which change seasonally. Daylight hours, sunlight intensity, input from adjacent catchments and the species which feed and live amongst the seagrass are just some of these factors.

Further monitoring along with continuing research into the status of other environmental variables within the Gippsland Lakes will provide a broader understanding of changes occurring within this significant marine ecosystem. This will assist in providing information relating to the variations in health and changes in the spatial distribution of seagrass meadows so that management advice can be provided.

ACKNOWLEDGEMENTS

This study was commissioned by John Garnham of Fisheries Victoria. The authors wish to thank Dr Greg Parry and Dr David Currie of MAFRI for providing advice. Allister Coots and Penny Morris of MAFRI for data processing. Brett Mathews of MAFRI for developing the system for recording DGPS and habitat information. John Strong and Graeme Bills of Bairnsdale NRE for providing advice and assistance during the field work. Mark Ferrier and Ian Duckworth of MAFRI for their excellent seamanship and patience with skippering the survey vessel. Joe Leach of Melbourne University for the lease of the survey vessel the "Koorong". Stuart Kininmonth, Hans Van Elmpt and Steve Tulloch of NRS for the digital capture and rectification of the seagrass meadow boundaries. Andrew Watts of QASCO for managing the Aerial survey project.

REFERENCES

Abal, E.G. & Dennison, W.C. (1996) Seagrass depth range and water quality in Southern Moreton Bay, Queensland, Australia. *Mar. Freshwater Res*., 47:763-771

Allardice, B., McConnan, A. and Simmons, J. (1974) *Report on Tidal Phenomena in Lakes Wellington and Victoria*, unpublished final year project Environmental Fluid Mechanics, University of Melbourne?

Arnott, G (1983) *The zooplankton communities of the Gippsland Lakes during and following a period of drought*, Internal report no.26, MSL.

Axelrad, D.M. and Bulthuis, D.A. (1977) *Phytoplankton nutrient limitation in the Gippsland Lakes*, Ministry for Conservation, ESS 145.

Bird, E. C. F. (1978) *The Geomorphology of the Gippsland Lakes*, Ministry for Conservation, Victoria, Publication No. 186 in the Environmental Studies Series

Bird, E. C. F. (1993) *The Coast of Victoria*. Melbourne University Press

Ducker, S.C., Brown, V.B. and Calder, D.M. (1977) *An Identification of the Aquatic Vegetation in the Gippsland Lakes*, School of Botany, University of Melbourne, March 1977.

Hastings, K (1995) *Assessing Seagrass Change Off Western Australia,* GIS Asia Pacific.

Hickman, N.J., McShane, P.E. and Axelrad, D.M. (1984) Light Climate in the Gippsland Lakes Victoria, *Aust. J. Mar. Freshw. Res*., 35: 517-24.

Kirkman, H. (1995) Baseline and Monitoring Methods for seagrass Meadows *Journal of Environmental Management*

Lloyd, D., (1997) *Ocean Rescue 2000 - Sea Notes - Seagrass*. Environment Australia.

Malcolm, J (1995) Gippsland Lakes Fisheries Management in *Gippsland Lakes Conference Proceedings*, Lakes Entrance, 21 April, 1995 eds. Sjerp, E. and Youngs, L.

Morel, A. and Prieur, L, (1977) Analysis of variations in ocean color. Limn. and ocean 22(4) pp.709-721.

Poore, G.C.B. (1992) Benthic Communities of the Gippsland Lakes, Victoria, *Aust. J. Mar. Freshw. Res.*, 33: 901-15.

Ramm, D.C. (1986) *An ecological study of the Ichthyoplankton and Juvenile Fish in the Gippsland Lakes Victoria*, Ph.D thesis, Department of Zoology, University of Melbourne.

Rigby, B.A. (1984) *Ecology of fish in seagrass habitats in the Gippsland Lakes*, Master of Science Thesis, Department of Zoology, University of Melbourne, January 1984.

Strong, J. and Malcolm, J. (1996) *Gippsland Lakes Fisheries Management Plan*, Gippsland Region and Fisheries Victoria, Department of Natural Resources and Environment, October 1996.

Thom, B.G. (1984) Sand Barriers of Eastern Australia: Gippsland - A Case Study, in B.G. Thom (ed.) *Coastal Geomorphology in Australia*, Academic Press, Sydney: 233-61.

ATTACHMENT 1

GIPPSLAND LAKES AERIAL PHOTOGRAPHY

GIPPSLAND LAKES AERIAL PHOTOGRAPHY

Study sites presented in this report.

Date	Scale	Type	Project No.	Run	Roll	Photo No.	Assessment of Photograph
Fraser Island							
Oct 1959	1:12,000	B/W	352 352	3 2	1332 1332	2 51	Very good
12/12/68	1:7,920	Colour	715	2	2231	26	Excellent
26/12/69	1:15,840	Colour	84225	13	2342	104	Very good - some sun sheen
Oct 1975	1:13,000	B/W	1235	4	2989	134	Very good
26/8/76	1:25,000	Colour	8422	4A	3133	91	Very good
20/2/79	1:10,000	B/W	8422	10	3367	253	Fair - sun sheen and wind ripples
2/4/84	1:10,000	Colour	1738	6	3868	66	Excellent
25/11/86	1:25,000	B/W	8422	12	4054	198	Good
17/12/88	1:25,000	Colour	1989	74	4300	178	Poor - murky and sun sheen
1/3/94	1:20,000	Colour	2189	24	4607	62	Poor - sun sheen and wind ripples
21/6/97	1:20,000	Colour		2	3147c	3102	Excellent
Point Fullerton							
24/6/66	1:12,000	B/W	564	2	1949	32	Very good
25/8/69	1:15,840	Colour	84225	8	2305	53	Very good
26/8/76	1:25,000	Colour	8422	4A	3133	83	Good
20/2/79	1:10,000	B/W	84223	10	3367	234	Fair - sun sheen and wind ripples
2/4/84	1:10,000	Colour	1738	6	3868	45	Good
25/4/89	1:25,000	Colour	1995	107	4274	159	Poor - high sun sheen
21/6/97	1:20,000	Colour		2	3147c	3094	Excellent
Point King, Raymond Island							
25/8/69	1:15,840	Colour	84225	7	2305	22	Excellent
26/8/76	1:25,000	Colour	8422	4A	3133	85	Very good
20/2/79	1:10,000	B/W	84223	10	3367	239	Good
2/4/84	1:10,000	Colour	1738	5	3868	25	Excellent
17/12/88	1:25,000	Colour	1989	10A	28	36	Poor - murky and sun sheen
25/4/89	1:25,000	Colour	1995	10	4274	162	Very good
21/6/97	1:20,000	Colour		2	3147c	3096	Excellent
Gorcrow Point - Steel Bay, Lake Victoria							
25/8/69	1:15,840	Colour	84225	12	2305	112	Excellent
26/8/76	1:25,000	Colour	8422	7	3091	7	Very good
18/1/79	1:10,000	B/W	84223	17	3362	224	Very good
30/3/84	1:10,000	Colour	1738	9	3861	57	Excellent
17/12/88	1:25,000	Colour	1989	13A	27	119	Poor - murky and sun sheen
21/6/97	1:20,000	Colour		5	3148c	3140	Excellent
Waddy Island, Lake Victoria							
25/8/69	1:15,840	Colour	84225	10	2306	107	Excellent
14/3/76	1:25,000	Colour	8422	6	3091	75	Excellent
18/1/79	1:10,000	B/W	84223	14	3362	75	Good
30/3/84	1:10,000	Colour	1738	11	3861	5	Very Good
30/1286	1:12,800	B/W	8422	13	4068	14	Good
17/12/88	1:25,000	Colour	1989	12A	28	12	Poor - murky and sun sheen
21/6/97	1:20,000	Colour		4	3148c	3124	Excellent

Sites assessed by this study but where photos were assessed as being mostly unsuitable for seagrass interpretation.

Date	Scale	Type	Project No.	Run	Roll	Photo No.	Photo Quality for Assessing Seagrass
Toorloo Arm, Lake Tyers							
Oct 1959	1:12,000	B/W	352	1	1337	54	Good
24/6/66	?	B/W	568	1	1943	6	Poor - murky water
24/11/75	1:13,000	B/W	1235	10	2989	25	Poor - murky water
20/2/79	1:10,000	B/W	85223	7	3363	104	Poor - sun sheen and wind ripples
1/5/84	1:10,000	Colour	1738	3	3869	133	Good
17/12/88	1:25,000	Colour	1995	74	4300	178	Poor - sun sheen and wind ripples
21/6/97	1:20,000	Colour		13	3147c	3078	Excellent
Baxter Island							
25/8/69	1:15,840	Colour	84225	8	2305	42	Excellent
18/1/73	1:7,200	B/W	1054	3	2726	62	Fair - sun sheen and wind ripples
24/11/75	1:13,000	B/W	1235	1	2995	7	Poor - high sun sheen
26/8/76	1:25,000	Colour	8422	4A	3133	90	Very good
20/2/79	1:10,000	B/W	84223	11	3368	131	Good - some sun sheen
2/4/84	1:10,000	Colour	1738	6	3868	60	Excellent
25/11/86	1:25,000	B/W	8422	12	4054	200	Poor - murky water
17/12/88	1:25,000	Colour	1989	10A	28	33	Poor - very murky and sun sheen
1/3/94	1:20,000	Colour	2189	24	4607	60	Poor - murky and wind ripples
21/6/97	1:20,000	Colour		3	3148c	3112	Excellent
Swan Reach Bay, Lake King							
25/8/69	1:15,840	Colour	84225	5	2306	61	Excellent
18/1/73	1:7,200	B/W	1053	1	2726	80	Very good
17/2/76	1:25,000	Colour	8422	3	3084	81	Very good
20/2/79	1:10,000	B/W	84223	7	3633	131	Very good
1/5/84	1:10,000	Colour	1738	3	3869	102	Excellent
21/6/97	1:20,000	Colour		1	3147c	3082	Excellent
North West Jones Bay							
25/8/69	1:15,840	Colour	84225	5	2306	70	Fair - murky water
17/2/76	1:25,000	Colour	8422	3	3084	87	Poor - murky water
20/2/79	1:10,000	B/W	84223	7	3633	143	Good
1/5/84	1:10,000	Colour	1738	2	3869	66	Poor - murky water
27/4/90	1:25,000	Colour	2051	2	4338	29	Poor - very murky water
21/6/97	1:20,000	Colour		1	3147c	3088	Excellent
Banksia Peninsula, Lake Victoria							
24/6/66	1:12,000	B/W	564	1	1949	9	Poor - very murky
25/8/69	1:15,840	Colour	84225	10	2306	102	Fair - murky water
1973	1:7,200	B/W	1051	3	2726	108	Fair - wind ripples and sun sheen
14/3/76	1:25,000	Colour	8422	6	3091	72	Good
20/2/79	1:10,000	B/W	84223	14	3362	68	Fair - wind ripples
30/3/84	1:10,000	Colour	1738	9	3861	48	Very good
17/12/88	1:25,000	Colour	1989	12A	28	10	Poor - very murky water
21/6/97	1:20,000	Colour		4	3148c	3122	Excellent

Thalia Point, Lake Victoria							
1970	1:25,000	B/W	8321N	3	2439	181	Poor - high sun sheen
1976	1:25,000	Colour	8321	2	3105	44	Fair - murky water
1978	1:10,000	B/W	83211	6	3319	10	Poor - sun sheen and wind ripples
2/4/84	1:10,000	Colour	1738	16	3868	81	Fair - murky water
17/12/88	1:25,000	Colour	1989	15	27	11	Poor - very murky and sun sheen
21/6/97	1:20,000	Colour		9	3148c	3183	Excellent
White Cliff, Loch Sport							
1970	1:25,000	B/W	8321N	2	2439	134	Poor - high sun sheen
1979	1:10,000	B/W	84214	3	3361	231	Good
30/3/84	1:10,000	Colour	1738	14	3863	75	Good
17/12/88	1:25,000	Colour	1989	14	27	110	Poor - very murky and sun sheen
21/6/97	1:20,000	Colour		5	3148c	3142	Excellent

ATTACHMENT 2

SEAGRASS25 LAYER METADATA DOCUMENTATION

Name:	**SEAGRASS25**
Full Name:	**Seagrass at 1:25,000**
Spatial Extent:	**Estuarine and jurisdiction of Victorian Waters**
Owner:	**Department of Natural Resources and Environment**
Custodian:	**NRE - Fisheries Victoria**
Access:	**Unrestricted**
Map Input Scale:	**1:25 000**
Master Library Group:	**l25**
Search Words:	**Seagrass Meadows Heterozostera tasmanica, Zostera muelleri, Ruppia spiralis, Lepilaena cylindrocarpa, Posidonia australis, Amphibolis antartica**
Abstract:	**This layer contains the spatial extent, species distribution and density of seagrass meadows within the major estuarine systems in Victoria.**

Application of Layer:

General:
SEAGRASS25 is a 1:25,000 layer which represents spatial extent, species distribution and density of seagrass meadows within the major estuarine systems in Victoria. This layer is the result of a baseline survey of seagrass within Victoria.

Ecological research into the health of seagrass meadows requires the type of detailed information collected in this baseline survey. This information will be used to establish future monitoring programs and it is envisaged that these areas will be re-surveyed every 5 years to detect macro changes.

Layer Design Summary:

Current Layer Design Considerations:
This information represents a snap shot in time of the spatial extent of seagrass meadows in the major estuarine systems of Victoria. The area of coverage and density of the various species of seagrass constantly changes with time, both seasonally and yearly.

Future Layer Design Considerations:
Future design considerations may include the adding extra species and recording the condition of the seagrass in relation to epiphyte coverage.

Summary of Relationship to other Layers:
The SEAGRASS25 layer has little or no relation to any other layer, however the distribution of other dominant algae are recorded and consequently another layer incorporating this information may be derived. The landward boundary is the 1:25,000 coastal trace in most of Lake Tyers and Gippsland Lakes. The coastal trace is subject to change especially in areas subject to erosion or mass movement of coastal sediments.

Data Currency Information:

Data Set Status:
In Progress

Data Collection:
Collection Period:

Beginning Date:	February 1997
Ending Date:	November 1997
Update Frequency:	As required

Data Lineage and Quality:

Data Set Origin:

Originality:	Primary
Data Collection Method:	Remotely Sensed - Aerial Photography Field Measurements

Data Set Source:
1:20,000 Colour Aerial Photography
Flown on the 21st of July, 1997

Data Set Processing Details:
The delineation of the seagrass meadows was conducted through Aerial Photograph Interpretation. The linework was digitized from stable base overlays plotted on 1:10,000 colour photo prints.

Positional Accuracy:

Precision:	Horizontal accuracy of 5m to 10m. Vertical accuracy NA
Determination:	The seagrass meadows were registered to the new coastal trace of the Gippsland Lakes. Digital: Any departure between the digital and source material (measured between centrelines) will not exceed 1mm at the map scale of 1:25,000.

Attribute Accuracy:
There has been no assessment of attribute accuracy.

Logical Consistency
This layer has not been validated.

Completeness:
Gippsland Lakes, Lake Tyers

Further Information:

Authors/Collators:
Ralph Roob
Penny Morris

Supporting Documentation:

Administration:

Landmark Steps:
Provisionally Approved:
Approved:
Implemented:
Last Reviewed:

Documentation Details:

Documenter:	Ralph Roob
Address:	Weeroona Parade, Queenscliff 3225
Position	Senior GIS Scientist
Sponsor:	MAFRI

Support Group:
MAFRI
History:

ATTACHMENT 3

MAPS

IN ORDER TO REDUCE THE SIZE OF THIS FILE THE MAPS FROM THIS ATTACHMENT HAVE BEEN EXTRACTED TO THE FILES:

GIPPSLAND MAPS A.PDF
GIPPSLAND MAPS B.PDF