Hopkins/Beeston Program of Collaborative Research Report

July 1997

Background

This program involves the development and subsequent use of a vegetation map database for the whole of Western Australia. The data are derived primarily from published and unpublished work by J S Beard but include the work by F G Smith and by E M Heddle, O W Loneragan and J J Havel and others where appropriate.

Formal projects involving the use of the vegetation map data include:

- Publication of a new 1:3,000,000 map of the Vegetation of Western Australia with explanatory memoir and with a new map of the Biogeographic Regionalisation of Western Australia;
- Pilot project to examine the basis for the Biogeographic Regionalisation of Western Australia and to review boundaries; and
- Analysis of the conservation status of vegetation types throughout Western Australia through an intersection of the vegetation data with the cadastral data for CALM-managed lands and waters.

In addition, the Department of Conservation and Land Management places inquiries for advice on the vegetation of specified blocks of land within the Agricultural Region and specified pastoral properties elsewhere in the State, and the reservation status of those vegetation types, for possible acquisition for addition to the conservation estate.

Other projects which draw on the data or which are contemplated include:

- Study of the implications of global climate change for nature conservation (with Dr Odile Pouliquen-Young, Murdoch University, and Mr Steve Connell, Edith Cowan University);
- Production of a new 1:1,000,000 map Vegetation of the Swan Region; and
- Study of reserve design and adequacy in the Agricultural Region.

Work under dot points 1 and 2 is funded by project grants to CALM (Hopkins) from the National Reserves System Program (NRS) administered by Environment Australia (formerly Australian Nature Conservation Agency ANCA). An application for funding for work under dot point 3 is currently being considered; however the work will continue irrespective of availability of additional funds through use of existing funds. Dr Pouliquen-Young has research funds for the global change project. The last two projects are unfunded.

Clearly the projects are interrelated and, therefore, work on one is likely to support or to provide the foundations for work on another. However, it is important to remember, when doing work on any one of the projects, that the underlying objective is to develop, maintain and, where possible, enhance the vegetation map database. That is not to say that the database should become an end in itself; rather the individual projects provide an opportunity to verify the data and to correct errors, thereby supporting the custodial functions of Hopkins and Beeston. A well maintained database of the kind developed here is an enormously valuable tool for day-to-day management, decision-making and research.

Project 1. Publication of a new 1:3,000,000 map of the Vegetation of Western Australia with explanatory memoir and with a new map of the Biogeographic Regionalisation of Western Australia;

(NRS Project N714. Publication: The Vegetation of Western Australia. 1:3 000 000 Map with Explanatory Memoir).

Project Objectives: to publish a new 1:3,000,000 map of the Vegetation of Western Australia with explanatory memoir together with a new map of the Biogeographic Regionalisation of Western Australia.

Background to the project.

The project involves the development of a simplified version of the vegetation map database, flood colouring the polygons with agreed colours (and adding stripes for vegetation mosaics and tree symbols for specified woodlands), production of a legend and other map text, production of a set of geographic data to sit behind the vegetation data, and bringing the map to the point of publication including making arrangements for the production of colour separations.

The simplified database has been produced by tiles that correspond to the 1:1,000,000 map sheets produced by J S Beard: (from N to S) Sheet 1 Kimberley, Sheet 2 Great Sandy Desert, Sheet 5 Pilbara, Sheet 3 Great Victoria Desert, Sheet 6 Murchison, Sheet 4 Nullarbor, Sheet 7 Swan. The data simplification process involved :

- identification of vegetation types to be merged/amalgamated, based on the classification hierarchy which groups like vegetation types (maintained as an Excel table by Ms Judith Harvey),

1.1 The 1:250,000 graphics data.
1.1.1 File name(s) and date of last corrections ie version details
1.1.2 Details of structure of the data including tiles
1.1.3 Other important details including coastline(s) and projections, zones
1.1.4 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.1.5 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task).

1.2 The Oracle tables associated with the graphics data

1.2.1 File name(s) and date of last corrections ie version details
1.2.2 Details of the structure of the data ie the number of tables, how they are linked and the attributes included in each table
1.2.3 Other details relevant to following users
1.2.4 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.2.5 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task).

1.3 The integrated, 1:3,000,000 vegetation data for the final vegetation map
1.3.1 File name(s) and date of last corrections ie version details
1.3.2 Details of structure of the data including how this data set was generated from the 1:250,000 data, tiles
1.3.3 Other important details including coastline(s) and projections, zones and incorporation of symbols within polygons
1.3.4 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.3.5 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task).

1.4 The colour codes and imbedded symbols and labelling for the 1:3,000,000 map
1.4.1 How these data are stored, file name(s) and date of last corrections ie version details
1.4.2 Details of how the data are linked to the 1:250,000 tables and the 1:3,000,000 data set
1.4.3 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.4.4 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task).
1.4.5 Suggestions on how the colour scheme might easily be used in production of individual 1:1,000,000 maps eg a new Swan Sheet which will include linework at 1:250,000 scale and/or individual 1:250,000 sheets

1.5 The key for the 1:3,000,000 map
1.5.1 How these data are stored, file name(s) and date of last corrections ie version details
1.5.2 Details of how the data are linked to the 1:250,000 tables and the 1:3,000,000 data set
1.5.3 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.5.4 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task)
1.5.5 Suggestions on how the key might easily be reformatted for use in production of individual 1:1,000,000 maps eg a new Swan Sheet

1.6 Other layout features including the logos, details fo the projection used etc

1.6.1 Details of what you were proposing and how far these ideas were progressed, how data are stored, file name(s) and date of last corrections ie version
1.6.2 Suggestions on progressing this aspect of the work that might be taken up by your successor

1.7 The background geographic data for the 1:3,000,000 vegetation map
1.7.1 Details of data sources accessed and/or yet to be accessed, details of file name(s) and date of last corrections ie version details
1.7.2 Details of structure of the data
1.7.3 Other important details including coastline(s) and projections, zones
1.7.4 Details of what you were proposing and how far these ideas were progressed
1.7.5 Suggestions on progressing this aspect of the work that might be taken up by your successor

1.8 Making corrections to vegetation map including the tables
1.8.1 Notes on sources of errors, how they have been revealed throughout the project (from inception), possible origins of each type of error, the procedures you have developed for correcting the errors and for keeping a record of those changes to the database(s)
1.8.2 Specifically, the procedured developed in collaboration with Ms J Harvey for identifying and correcting errors and for keeping records, and for ensuring that the most up-to-date database is used for all work thenceforth
1.8.3 Specifically, the identification of errors by other users such as Mr S Connell and Ms R Wilson, and how you have corrected each category of error, the records you have kept and procedures you have adopted for ensuring that the most up-to-date database is used for all work thenceforth

1.9 Busselton Augusta Sheet
1.9.1 Sources of data, file name(s) and date of last corrections ie version details
1.9.2 Details of structure of the data
1.9.3 Other important details including coastline(s) and projections
1.9.4 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.9.5 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task)
1.9.6 Details of what you were proposing to do to complete this sheet (including checking consistency with adjoining sheets), and how you would go about incorporating the data into the main database, and how far these ideas were progressed
1.9.7 Suggestions on progressing this aspect of the work that might be taken up by your successor
1.9.8 Status of work on the IBRA boundaries for this sheet and details of how you were proposing to complete this aspect of the work

1.10 Pemberton Irwin Inlet Sheet
1.10.1 Sources of data, file name(s) and date of last corrections ie version details

1.10.2 Details of structure of the data
1.10.3 Other important details including coastline(s) and projections
1.10.4 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed
1.10.5 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task)
1.10.6 Details of what you were proposing to do to complete this sheet (including checking consistency with adjoining sheets), and how you would go about incorporating the data into the main database, and how far these ideas were progressed
1.10.7 Suggestions on progressing this aspect of the work that might be taken up by your successor
1.10.8 Status of work on the IBRA boundaries for this sheet and details of how you were proposing to complete this aspect of the work

1.11 Other versions of vegetation database and status of those, translations
1.11.1 Who has copies of the data (that you can recall), the format of these data, the time they were provided as an indication of how up-to-date the versions might be
1.11.2 Outstanding requests for data (Peter Dostine Parks and Wildlife Commission of the NT)
1.11.3 Procedures adopted for providing copies of the data including procedures for translating the data into other formats, pitfalls in using these procedures

1.12 IBRA linework and attributes
1.12.1 Sources of data including coastline used, file name(s) and date of last corrections ie version details
1.12.2 Details of structure of the data (?tiles)
1.12.3 Other important details including coastline(s) and projections, zones
1.12.4 Status of up-grading of IBRA linework on Busselton Augusta Sheet, Pemberton Irwin Inlet Sheet, location of data, file names etc
1.12.5 Status of any outstanding corrections waiting to be incorporated into the data and where details of those corrections are filed.
1.12.6 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task)
1.12.7 Other relevant data that could be incorporated at some future stage such as Griffin's Vegetation Systems etc and possible file details etc

1.13 The background geographic data for the IBRA final map
1.13.1 Details of data sources accessed and/or yet to be accessed, details of file name(s) and date of last corrections ie version details (where is the copy of Beard's original, published map that I gave you?)
1.13.2 Details of structure of the data
1.13.3 Other important details including coastline(s) and projections, zones
1.13.4 Details of what you were proposing and how far these ideas were progressed
1.13.5 Suggestions on progressing this aspect of the work that might be taken up by your successor

To: Mr Ted Griffin
From: Angas Hopkins
Date: Friday 4 April 1997
Subject: Dryandra Distributions, Irwin Study Area

Ted

I refer to to our discussions on Monday 24 March 1997. In those discussions I offered you payment of up to $1,000.000 to work on the data on the distribution of *Dryandra* throughout the South West Botanical Province, with particular emphasis on the Irwin Botanical District. I want to confirm that offer formally, setting out the tasks involved, which are somewhat expanded on those which I outlined on 24 March. Secondly, I would like to offer you joint authorshop in a paper which looks at the bioregionalisation in the Irwin Study Area (defined below), using your data on *Dryandra.* and also the results of your analysis of floristic data from Moore River to Geraldton. Indeed the approach that I want to adopt in this particular case study builds on the work that you have done in the Irwin Study Area and takes up some of the ideas that you have had about the bioregionalisation and that you have discussed with me over the years.

As you know, I have a grant from Environment Australia, formerly the Australian Nature Conservation Agency, through the National Reserves System Program, to assemble a range of spatial data sets relevant to development of a bioregionalisation, to develop methodologies to evaluate the data and to apply those methods at at least three study areas. The principal objective is to assess the scientific validity of IBRA, since IBRA is to be used as the basis for decisions about funding for further survey and for land purchase under the NRS Program which is to be a part of the Natural Heritage Trust.

I have selected four potential study areas:

1. Irwin Study Area. Between Perth and Geraldton containing portions of the Swan Coastal Plain, Geraldton Sandplains and Avon Wheatbelt IBRA Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°50'S, 116°00'E (NE corner), 31°15'S, 116°00'E (SE corner), 31°15'S, 114°10'E (SW corner), 28°50'S, 114°10'E (NW corner).
EAG notes 29°00N 116°15E, 32°00N 116°15E, 32°00N 115°15E, 29°00N 116°15E.

2. Nullarbor Study Area. The area covered by the Nullarbor Biological Survey which is located within the Nullarbor IBRA Region with overlap into Coolgardie, Mallee and Hampton Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 29°00'S, 132°30'E (NE corner), 33°00'S, 132°30'E (SE corner), 33°00'S, 124°00'E (SW corner), 29°00'S, 124°00'E (NW corner).

3. Eastern Goldfields Study Area. The area of the WA Museum/CALM Eastern Goldfields Biological Survey including the Murchison, Coolgardie, Mallee IBRA Regions with some overlap into the Avon Wheatbelt and Great Victoria Desert Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 26°45'S, 123°30'E (NE corner), 32°45'S, 123°30'E(SE corner), 32°45'S, 118°15'E (SW corner), 26°45'S, 118°15'E(NW corner).

4. Carnarvon Basin Study Area. The area covered by the present Carnarvon Basin Biological Survey in the Carnarvon IBRA Region with some overlap into the Geraldton Sandplain Region.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°30'S, 115°45'E (NE corner), 32°45'S, 115°45'E(SE corner), 32°45'S, 112°30'E (SW corner), 28°30'S, 112°30'E(NW corner).

I have assembled a range of bioregionalisations and relevant data sets for the State as a whole including the work done by a range of people (see list attached) as well as copies of map data on geology, soils and soil landscapes, drainage basin boundaries and, of course, vegetation and the spatially corrected IBRA boundaries. I am also accessing a range of climatic data (details from Mr Greg Beeston).

For the Irwin Study Area, I have asked Mr Julian Coker to assemble the following additional data:
environmental geology, Beard's Phytogeographic Districts (from EAG), distribution of *Dryandra* (in collaboration with EAG) and results of EAG's analyses of floristic survey data, Moore River to Geraldton. (You might also consider contributing the results of your coastal geomorphology survey work in the same area).

For this project and the climate change project being run with Dr Odile Pouliquen-Young (Murdoch University). Mr Greg Beeston and Mr Steve Connell (Edith Cowen University), I want to compile a database on the distribution of all species of *Dryandra* (both presence and absence at specified sites) based on Herbarium records and your own field survey records and any other site records that you regard as reliable. In the course of doing this I would like to be able to do a quality check on the Herbarium's data, providing them with a list of records that require checking including those with questionable coordinates and those with labels that should be checked.

Once we have a reliable set of distribution data for *Dryandra*, I will want Mr Connell to produce distribution envelopes based on a BIOCLIM (or the newer version, Mr Beeston has details) =/- soils data. These envelopes are presented as coloured grid cells. I am hoping that Mr Coker will be ablle to translate these data into envelopes with isolines defining contours of probability of occurrence.

At the same time, I would like you to draw manually the distribution envelopes as you envisage them based on your own appreciation of the data (distribution data and other environmental data as necessary). I recollect that you attempted this task at about the time you were working on *Dryandra* in the lead-up to your paper in Herbarium Research Notes. I would like Mr Coker to capture your linework on a species-by-species basis.

I want Mr Coker to be able to overlay distribution envelopes of different species using GIS techniques. He will be able to make comparisons between the envelopes derived subjectively ie the ones you draw and those derived using BIOCLIM. But, much more importantly, he will be able to examine the relationship between these and a range of environmental parameters based on the regionalisations database.

Once we have the results of all this work to hand, further approaches to analysis to gain insight into the biogeographic patterns in the Irwin Study Area will almost certainly present themselves and we can follow those up.

I plan to write up the work on the Irwin Study Area as a separate paper, perhaps the first of a series on the biogeography of Western Australia. A working title might be "The biogeography of Western Australia: a case study in the Irwin area. Probable authors would be you, me and Julian Coker. It could be ready for submission in November/December 1997.

I would like to invite you to participate in a further aspect of this biogeography project. This is the case study of the Eastern Goldfields Study Area. The task which I would like you to take on in the first instance is the databasing of all the floristic data from the survey. By this I mean creating a sitexspecies matrix which can later be used in a PATN-type analysis. I have obtained from Mr Norm McKenzie the site-flora lists for Barlee, Borabbin, Dundas, Kernalpi & Wanjarri cells as now pubished. The floristic data from the other cells may be with Mr McKenzie on some old 5" discs in his laboratory and will need to be translated from whatever wordprocessing software it is now in to Word. Mr McKenzie has the necessary software. I will pay you up to $1000.00 for the databasing (it is possible that additional funds will become available shortly). I suggest that, if you agree to do this work, you begin with the data which is already available and progress to the data on the old disks after 1 June 1997 when I return from leave. But if you are feeling very energetic, you can speak with Mr McKenzie earlier: he knows about this project and your involvement and so an approach would not be out of order.

I look forward to working together on some of these projects.

A

Julian Coker - Completion and Projects Documentation

It will be necessary to document the projects comprehensively so that others wishing to use the data will be able to locate it quickly and easily and comprehend the status of each part of the data in terms of currency and status of error detection and correction processes.
Data should be backed up to CD with each disk showing a listing of files and a time of creation.

1. Project N714. Publication:The Vegetation of Western Australia. 1:3 000 000 Map with Explanatory Memoir.

1.1 The 1:250,000 graphics data.

1.1.1 File name(s) and date of last corrections ie version details
1.1.2 Details of structure of the data including tiles
1.1.3 Other important details including coastline(s) and projections, zones
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1.4 The colour codes and imbedded symbols and labelling for the 1:3,000,000 map
1.4.1 How these data are stored, file name(s) and date of last corrections ie version details
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1.6 Other layout features including the logos, details fo the projection used etc
1.6.1 Details of what you were proposing and how far these ideas were progressed, how data are stored, file name(s) and date of last corrections ie version
1.6.2 Suggestions on progressing this aspect of the work that might be taken up by your successor

1.7 The background geographic data for the 1:3,000,000 vegetation map
1.7.1 Details of data sources accessed and/or yet to be accessed, details of file name(s) and date of last corrections ie version details
1.7.2 Details of structure of the data
1.7.3 Other important details including coastline(s) and projections, zones
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1.8.1 Notes on sources of errors, how they have been revealed throughout the project (from inception), possible origins of each type of error, the procedures you have developed for correcting the errors and for keeping a record of those changes to the database(s)
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1.9.6 Details of what you were proposing to do to complete this sheet (including checking consistency with adjoining sheets), and how you would go about incorporating the data

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1.9.8 Status of work on the IBRA boundaries for this sheet and details of how you were proposing to complete this aspect of the work

1.10 Pemberton Irwin Inlet Sheet
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1.11.1 Who has copies of the data (that you can recall), the format of these data, the time they were provided as an indication of how up-to-date the versions might be
1.11.2 Outstanding requests for data (Peter Dostine Parks and Wildlife Commission of the NT)
1.11.3 Procedures adopted for providing copies of the data including procedures for translating the data into other formats, pitfalls in using these procedures

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1.12.1 Sources of data including coastline used, file name(s) and date of last corrections ie version details
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1.12.4 Status of up-grading of IBRA linework on Busselton Augusta Sheet, Pemberton Irwin Inlet Sheet, location of data, file names etc
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1.12.6 Details of procedures developed for making corrections of various kinds (for the benefit of the next person to undertake that task)
1.12.7 Other relevant data that could be incorporated at some future stage such as Griffin's Vegetation Systems etc and possible file details etc

1.13 The background geographic data for the IBRA final map

1.13.1 Details of data sources accessed and/or yet to be accessed, details of file name(s) and date of last corrections ie version details (where is the copy of Beard's original, published map that I gave you?)
1.13.2 Details of structure of the data
1.13.3 Other important details including coastline(s) and projections, zones
1.13.4 Details of what you were proposing and how far these ideas were progressed
1.13.5 Suggestions on progressing this aspect of the work that might be taken up by your successor

1.14 Outstanding issues to be dealt with including coastlines used for Veg map at various scales and for IBRA map

2. Project N715. Pilot project to assess the biophysical integrity of the biogeographic regionalisation for Western Australia.

2.1 Capture of existing hard copy maps
2.1.1 Name of each map and other bibliographic reference data, cross referenced to details of each related computer/database file name, with other relevant data such as date of last corrections ie version details
2.1.2 Details of structure of each data set and other important details including coastline(s) and projections, zones, etc

2.2 Accessing digital data sets
2.2.1 Details of source of each data set, file names and date of access ie version details
2.2.2 Details of structure of each data set and other important details including coastline(s) and projections, zones, etc

2.3. Four selected study areas: Irwin, Nullarbor, Eastern Goldfields, Carnarvon Basin
2.3.1 Details of data captured for each study area, file names, data structure etc; should include coordinates of each study area, and a subsample of other spatial data including IBRA, vegetation, soils and landforms/ soil landscapes, geology, pastoral lands survey data, climatic data etc
2.3.2 Details of *Dryandra* data captured in collaboration with Mr E Griffin, file names, data structure etc and status of the processing of those data towards analyses for the Irwin study area component of the project
2.3.3 Details of the capture of Nullarbor biological survey sites, the results of the survey, file names, data structure etc
2.3.4 Details of data captured for the Eastern Goldfields study area (in collaboration with Mr E Griffin), file names, data structure etc
2.3.5 Details of what you were proposing and how far these ideas were progressed
2.3.6 Suggestions on progressing this aspect of the work that might be taken up by your successor

3 Analysis of the conservation status: update

3.1 Details of the CALM estate data recently obtained (and when), file name(s), data structure etc
3.2 Details of the apparent problems experienced in using the data and suggestions on how the problems may be addressed
3.3 Details of the overlay/intersection procedure used previously including file structures, particular software (and hardware) used and other relevant technical details (including the specific listings of each category of CALM estate used in those analyses ie the particular 5g reserves and pastoral properties)
3.4 Location, file name(s), file structures etc resulting from previous set of analyses
3.5 Procedures for extracting data from individual reserve records and generating tables for each vegetation type (?software by Mr L Heinrich) for further sorting by Ms J Harvey
3.6 Suggestions on progressing this aspect of the work that might be taken up by your successor

BEARD VEGETATION MAPPING PROJECT
WHAT NEEDS TO BE DONE
4/7/97
JUDITH HARVEY

Murchison 1:1,000,000 plot

Do corrections to colours for 1:3,000,000 plot. This will involve some changes to line-work but mainly just be changes to labels which I can do once the plots are loaded.
Extend these corrections with their associated changes to Beard numbers through to the 1:250,000 data base. (this does not have to be done straight away, probably best when all corrections have been made to the 1:1,000,000 series before any analysis is done)
Correct IBRA line work. This may involve overlaying the IBRA lines onto the 1:250,000 line work, however the smoothing out of these lines in the process of compiling the 1:1,000,000 maps doesn't seem to show up as being different from the IBRA lines which were put in at the 1:250,000 scale. There wil probably be changes to IBRA linework on other sheets (especially on Swan) so this excercise may be best done all at once towards the end.

Kimberley 1:1,000,000 plot

Major correction to flood colour line work due to my error. Some of the savanna woodland on basalt won't come out with black trees differentiating it from the savanna woodland on sandstone which has green trees. So the line work will have to be recaptured from the 1:250,000 line work after the changes (brd no.

739 has colour 216b rather than 216g) have been made. This may mean the flood colouring (and smoothing ?) process needs redoing.

We also have th co-ordinates of the rainforest patches which won't show up on the 1:3,000,000 plot (?or even the 1:1,000,000 plot) but should be included in the 1:250,000 data base.

Tree symbols

There hasn't been any plots done with the tree symbols so I don't know if other errors like the one above may become obvious.

Mosaics

At present the mosaics are coming out with the first mentioned colour predominating abd the second colour coming out as thin stripes. These need to be of equal thickness and horizontal (AH?). I don't know if this should be done at the 1:1,000,000 scale where it is easier to check. This may prove difficult to transpose to the smaller scale and be better done at the 1:3,000,000 stage.

IBRA boundaries

There are some corrections to be made to the Murchison sheet and along the eastern boundary. Other corrections may become evident when the plots requested below are examined. If it is difficult to do this along the way it may be best if the IBRA boundaries are corrcted all at once.

Colour & legend.

Two units which have the same colour occur in the Kimberley and adjacent Great Sandy Desert (I thought one would be only in the south-west). So the relevant Brd_nos. (988,953,412,2041,1080,328 & 683) change thier colour from 200 to 201. (DON'T DO THIS UNTIL ** HAS BEEN DONE)
There are some changes to be made to the colours as the final colours will be like those printed out on the laser printer. (e.g the colours for mangroves malle and riverine tree savanna come out to similar) This may involve some trial plots printed on the laser printer. These vary from the ones produced by the big ?plotter. After finding out which veg groups occur in relatively small areas these are being amalgamated into other larger groups. **This means changes to the legend. The 3 or 4 categories of bare ground need to added to the legend as well as some explanation of mosaics.

Plots needed

I need 1:1,000,000 colour plots of Pilbara, Great Sandy Desert, Great Victoria Desert Nullarbor and Kimberley (after the above corrections have been made) with

1. Red or black lines around each colour (the Murchison has red lines and we need to see what black lines look like)
2. Tree symbols these are given in the colour veg_code as suffix g, r or b for green, red or black trees.
3. Mosaic stipes equal (if possible)
4. IBRA boundaries in a contrasting red or black or blue.

Once these plots have been checked and necessary corrections made the we need to look at some of them at a 1:3,000,000 scale or if the Swan sheet is ready the whole state can be plotted.

Swan sheet
Still work to be bone in the line work, checking for boundary matching, defining IBRA boundaries

Memoir
A full explanation if each of the colour groups needs to be written

Work Schedule, Julian Coker, April/May 1997

10 Apr1l 1997

1. Pemberton Irwin Inlet Sheet
1.1. Recapture karri forest linework and spatially correct to be consistent with other AgWa data for the same area, particularly soils and landforms (Ground Control Points marked on tracing film and on paper/hard copy which shows soils and landforms with present karri).
1.2. Attribute karri forest linework as indicated on paper/hard copy. Check with FMIS data (use paper/hard copy which shows soils and landforms with present karri, noting that I have mapped original, pre-European karri indicated by the pencil lines on that paper/hard copy) and, in consultation with Ms Judith Harvey, correct glaring anomalies.
1.3. Attribute Smith linework as indicated on paper/hard copy.
1.4. Warp Smith linework using ground control points indicated, to be consistent with spatial features of soils and landforms data. Add coastline.
1.5. Insert karri forest linework into this warped version of Smith linework, substituting the karri forest linework for Smith where there are attributed polygons of karri and karri mixtures and jarrah mixed with tingles. Do not, for the time being, insert the areas of jarrah forest and/or swamp such as those south and south-east of Lake Muir). In consultation with Ms Harvey, check and resolve issues of polygons immediately surrounding karri forest polygons.
1.6. Replace relevant section of Beard's Albany Mt Barker Sheet linework as indicated (karri forest and karri mixtures) and ensure matching of linework and attribution etc (see

my notes on paper/hard copy).
1.7. Replace karri forest section of System 6 linework (from S portion of Collie Sheet) with new linework.
1.8. Check matching with Collie Sheet (our simplified version of System 6 linework, with linework extended to the east to cover whole Collie Sheet and with southern extension to System 6 boundary), Albany Mt Barker Sheet, and Busselton Augusta Sheet boundaries (Ms Harvey to provide assistance).
1.9. Incorporate new vegetation data (linework and tabular data) for Sheet into main vegetation database.
(Ms Judith Harvey to check new entries to list of beard_nos and ensure consistency, update all relevant tables)
(Ms Judith Harvey to revise boundary for IBRA Warren Region to be incorporated into relevant file).

2. Busselton Augusta (Augusta Margaret River) Sheet
2.1. Capture additional linework as indicated on paper/hard copy and correct existing linework as indicated in margin etc.
2.2. Attribute as indicated on paper/hard copy.
2.3. Check E margin matching with System 6 linework and attribution and, in collaboration with Ms Judith Harvey, correct anomalies.
2.4. Check final linework and attributiion, plotting out whole sheet with beard_nos or H codes. At the same time, plot out areas of adjacent sheets to check matching at borders.
2.5. Incorporate new vegetation data (linework and tabular data) for Sheet into main vegetation database.
2.6. Incorporate new boundary of IBRA Swan Coastal Plain Region into appropriate database. Incorporate new boundary of IBRA Warren Region (Ms Harvey to check existing linework and advise corrections).
(Ms Judith Harvey to check new entries to list of beard_nos and ensure consistency, update all relevant tables).
1.10/2.7. Plot out new Swan Sheet to ensure adequate incorporation of all new data, matching at 1:250,000 sheet boundaries etc (consider doing with all linework in black but using the colour scheme developed for the 1:3,000,000 map sheet: this will provide the opportunity to check all aspects of map scheme for this corner of the State).

3. 1:3,000,000 Map Product
3.1. Finalise background geographic data as for previous 1:3,000,000 vegetation map (need not be 100% consistent but there should be more detail than shown on draft version based on Soils map).
3.2. Finalise linework and attribution in collaboration with Ms Judith Harvey. (Ms Harvey to update rainforest/vinethicket data).
3.3. In consultation with Mr Greg Beeston and Mr Greg Mlowawski, produce a simplified set of linework for external boundaries of polygons that are merged as a consequence of merging vegetation types recognised at the 1:250,000 scale to Supergroups recognised at the 1:3,000,000 scale. The process may involve weeding and dissolve functions. You should also look at deleting very small polygons but for important features such as granite

rocks and rainforest/vinethickets a symbol could be used to represent each feature. (It may be necessary to do this processing in stages, leaving the tile containing the Pemberton Irwin Inlet Sheet and the Busselton Augusta Sheet until last).
3.4. Produce a draft map complete with key and with relevant cartographic reference detail (ie projection, datum etc) and logos (ANCA logo will need to replaced with an Environment Australia logo).
3.5. Obtain costings for production of colour separations.

4. 1:3,000,000 IBRA Map.
4.1. Finalise background geographic data as for previous 1:3,000,000 Phytogeographic Regions map.
4.2. Finalise linework in collaboration with Ms Judith Harvey (Ms Judith Harvey to have State border matching linework and to complete Swan Coastal Plain and Warren).
4.3. Produce a draft map complete with relevant cartographic reference detail (ie projection, datum etc) and logos (Environment Australia, CALM and AgWA).

5. Biogeographic Regionalisations Database.
5.1. Capture additional biogeographic regionalisations as indicated and assemble them into a single database.
5.2. Produce a series of A4 plots (1:10,000, 000 for whole State, 1:5,000 000 for those available only for South West & Eucla Land Division) showing all available regionalisations (annotated with attributes or with key on separate A4 page if necessary).
5.3. Prepare a series of overlays as examples showing relationships between different regionalisations (these will be for demonstration purposes only).

6. Irwin Study Area
Study Area 1. Between Perth and Geraldton containing portions of the Swan Coastal Plain, Geraldton Sandplains and Avon Wheatbelt IBRA Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°50'S, 116°00'E (NE corner), 31°15'S, 116°00'E (SE corner), 31°15'S, 114°10'E (SW corner), 28°50'S, 114°10'E (NW corner).
EAG notes 29°00N 116°15E, 32°00N 116°15E, 32°00N 115°15E, 29°00N 116°15E
6.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, environmental geology, soils and soil landscapes, drainage basin boundaries, Beard's Phytogeographic Districts (see Mr Ted Griffin), other regionalisations and available climatic data (see Mr Greg Beeston for details).
6.2. In consultation with Mr Ted Griffin, assemble spatial data on distribution (presence and absence) of species of *Dryandra*. (data set will extend beyond specified study area, we will take a subset of distributions later).
6.3. In collaboration with Mr Ted Griffin, define species distribution envelopes for each species. This may involve overlaying species distribution data on soil landscapes data and selection out only those soil landscapes where species occurs and including these dtat within the envelopes. Envelopes may be drawn using some MGE software or by hand.
6.4. In collaboration with Mr Steve Connell, develop a dataset of distribution envelopes of *Dryandra* species based on up-to-date distribution data (ie the dataset developed through

6.1 above) and use of latest version of BIOCLIM (recent release by Professor Henry Nix, see Mr Greg Beeston, Dr Odile Pouliquen-Young for details).
6.5. Compare and contrast envelopes developed through procedures 6.2 and 6.3 on a species-by-species basis.
6.6. Plot species distribution envelopes in groups to highlight common boundaries vs differences (see some earlier work by Mr Ted Griffin) and as overlays with other data sets.
6.7. Obtain from Mr Ted Griffin sample site location data from study of floristic variation Moore River to Geraldton and incorporate into a design file. Obtain results of Mr Griffin's classification of floristic data from that study and plot groupings. Check output with Mr Griffin. Plot out groupings as overlays with other datasets to permit comparisons to be made.

7. Nullarbor Study Area
Study Area 2. Nullarbor Biological Survey located within the Nullarbor IBRA Region with overlap into Coolgardie, Mallee and Hampton Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 29°00'S, 132°30'E (NE corner), 33°00'S, 132°30'E (SE corner), 33°00'S, 124°00'E (SW corner), 29°00'S, 124°00'E (NW corner).
7.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details)
7.2. From the Nullarbor biological survey report, capture study site locations (latitude and longitude data) and plot study sites on a map with annotated vegetation types (?A4 landscape or A3).
7.3. From the McKenzie publication, copy into a design file isolines (contours) of species richness/ diversity nodes derived from analysis of survey results from study sites captured in 7.1. Plot out isolines as separate overlays on vegetation, geology and pastoral land survey data (as above, A4 landscape or A3).

8. Eastern Goldfields Study Area
Study Area 3. Eastern Goldfields Biological Survey including the Murchison, Coolgardie, Mallee IBRA Regions with some overlap into the Avon Wheatbelt and Great Victoria Desert Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 26°45'S, 123°30'E (NE corner), 32°45'S, 123°30'E(SE corner), 32°45'S, 118°15'E (SW corner), 26°45'S, 118°15'E(NW corner).
8.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details).
8.2. From the CALM & Museum biological survey reports, capture study site locations (latitude and longitude data) and plot study sites on a map with annotated vegetation types (?A4 portrait or A3) (Mr Griffin has some of the data on disk, and Ms Harvey should be able to obtain additional data as published reports or on disk from Mr Norm McKenzie).
8.3. In collaboration with Mr Ted Griffin, plot distributions of selected *Acacia* species for

the region and define species distribution envelopes, as for *Dryandra* in 6.1, 6.2 above (Mr Griffin will be databasing all the Goldifelds floristic data).
8.4. Plot distribution envelopes as overlays with other datasets to permit comparisons to be made.
Await availability of further data.

9. Carnarvon Basin Study Area
Study Area 4. Carnarvon Basin Biological Survey in the Carnarvon IBRA Region with some overlap into the Geraldton Sandplain Region.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°30'S, 115°45'E (NE corner), 32°45'S, 115°45'E(SE corner), 32°45'S, 112°30'E (SW corner), 28°30'S, 112°30'E(NW corner).

9.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details).
9.2. Obtain Carnarvon Basin biological survey study site locations (latitude and longitude data) from Mr Norm McKenzie (via Ms Judith Harvey) and plot study sites on a map with annotated vegetation types (?A4 portrait or A3).
Await availability of further data.

10. Analysis of Conservation Status: Update
10.1 Obtain up-to-date CALM estate from CALM (Dr Colin Pearce/Mr JohnDunn). Plot data out at about 1:3,000,000 scale with different categories of land wirh boundaries colour-coded and check in collaboration with Ms Harvey. Correct as necessary in consultation with CALM IMB staff.
10.2 Obtain up-to-date digital data for CALM estate for Swan, Central Forest and Southern Forest Regions (CALM Regions) (via Mr Mike Lyons @ Woodvale if necessary, Ms Harvey can arrange this) and check against main CALM estate database. Discrepancies should be noted for subsequent analyses.
10.3. Run overlay/intersection of CALM estate with vegetation data as previously. Also run overlay of IBRA boundaries as previously. (It may be possible to do this overlay/intersection in stages, leaving the tile with the Swan Sheet until last).
10.4. In collaboration with Ms Harvey, prepare tables of conservation status of vegetation types as previously (This may require additional parcels of land to be added into the non-IUCN category, for example, there have been some additional pastoral properties purchased recently: consult with Ms Harvey on this). This will need to include analysis on status on a by-IBRA-region basis to produce an up-date of Table 12.

Priority Ranking for Components
1,2>3>4>10>5>6,7 ,8,9 but it should be possible to make some progress on all components including 6,7,8,9 during the period.

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MEMORANDUM

To: Mr Julian Coker
From: Angas Hopkins
Date: Thursday 10 April 1997
Subject: Work Schedule

Julian
I have left all the material for you, the working sheets for the Pemberton Irwin Inlet Sheet and some notes, on Judith's desk at Woodvale. I am asking her to deliver them all to you as soon as convenient. There will be quite a lot of work to do to complete this Sheet. And even when you have done all you can there will probably be some finishing off to do as I was not able to complete the edge matching because I was uncertain what the final Smith plus karri forest linework would look like. It may be that you and Judith can finish the map off... see what you can do.
Please read the notes I have written into the margins of the working sheets that Judith now has.
I have lined up the various map versions using a series of ground control points. The location of the control points is indicated on the very large plot of soils and landforms plus FMIS present karri types. I have then drawn these control points onto all the relevant working sheets. I hope tese will enable you to colocate the various datasets satisfactorily. You should use the soils and landforms as your prinary guide, as I think the FMIS data seem to line up fairly well with those data.
You will note that I have suggested that you warp Smith before inserting the Hopkins karri forest types linework. I hope that by doing things in this order, my karri forest polygons will ilne up well with Smith and that this will reduce the potential for complications at the margins of the new polygons.
You will be working closely with Judith while I am away: I hope that works out OK. And you will have some interactions with Ted Griffin and Steve Connell. Ditto
Good luck with all the work and with your forthcoming batchelorhood....
Angas

Tasks, Judith Harvey, April/May 1997

Draft 7 Apr11 1997

Judith
I would like you to give priority to the vegetation map project, with the aim of having the map close to completion by 1 June 1997 when I return from leave.
Once the map is complete, or substantially complete, I anticipate that Mr Coker will commence the overlay/intersection with the CALM estate. It may be that compilation of the tables can begin once the first few tiles of the overlay/intersection are done, or it may be necessary to wait until the whole overlay/intersection is complete. Please liaise with Mr Coker on this.
Specific tasks that relate to the work schedule for Mr Coker are listed below.

1. Pemberton Irwin Inlet Sheet
1.1. Add new beard_nos and vegetation descriptions to the main table, checking to avoid duplication and/or confusing cross-references and to ensure consistency. Update all subsidary tables at the appropriate time. Allocate H codes in accordance with the hierarchical classification scheme and allocate colour numbers for the 1:3,000,000 map.
1.2. Once Mr Coker has captured the new linework and attributed the polygons as given, it will be necessary for you to work together to check the detail including the attribution. There will be some orphan polygons from Smith that will require beard_nos. And there will be a major issue of deciding attributes for sliver polygons surrounding the new karri forest linework which is to be superimposed on Smith. For all the non-karri forest areas, I have asked Mr Coker to stay with Smith for the time being.Please check closely that the new linework is consistent with other data sets including the FMIS data for the original karri and related forests.
1.3. Matching along eastern border with Albany Mt Barker Sheet (note that new karri forest linework intrudes into this Sheet) and along northern border with Collie sheet and with System 6 detail is especially important. Please pay particular attention to attribution: perhaps it will be desirable to remove the map sheet boundaries completely to ensure that polygons merge satisfactorily and that all polygons are attributed.
1.4 Check the boundary of Warren IBRA Region to ensure that it includes all occurrences of Tc vegetation types as described in Beard's Swan Sheet memoir (p193 onwards). I expect you will have to draw in detailed linework to link in with the IBRA boundary linework on the Albany Mt Barker Sheet. At the same time you should check that the IBRA linework on the Albany Mt Barker sheet is consistent with the new, inserted Tc linework for that sheet.

2. Busselton Augusta (Augusta Margaret River) Sheet
2.1. Add new beard_nos and vegetation descriptions to the main table, checking to avoid duplication and/or confusing cross-references and to ensure consistency. Update all subsidary tables at the appropriate time. Allocate H codes in accordance with the hierarchical classification scheme and allocate colour numbers for the 1:3,000,000 map.
2.2. Once Mr Coker has captured the new linework and attributed the polygons as given, it will be necessary for you to work together to check the detail including the attribution.

2.3. Match eastern border with the newly revised Pemberton Irwin Inlet Sheet with System 6 linework in the northern portion and with modified Smith linework for the remainder. For the System 6 border, I have drawn a prefered option on the plot which Mr Coker is using for attrbution. As far as I have seen so far, the Smith linework I am using for the remainder is consistent and the attribution should be also.
2.4. Check IBRA linework for the Swan Coastal Plain Region to ensure consistency with the Collie Sheet and onto the Pinjarra Sheet. Spatially correct the boundary of the western extension of the Warren Region to include the Scott River and Boranup Systems (see Swan Sheet memoir pp 194, 195). The northern margin of the Scott River system is probably coincident with the BU 0027/BU 0003 boundary. To locate precisely the eastern boundary of the Boranup Systen it might be necessary to refer to the Soils and Landforms mapping by Tille and Lanske which Mr Coker has: there are 1:100,000 plots with him including one which I have partly annotated.
1.5/2.5. Plot out new Swan Sheet to ensure adequate incorporation of all new data, matching at 1:250,000 sheet boundaries etc (consider doing with all linework in black but using the colour scheme developed for the 1:3,000,000 map sheet: this will provide the opportunity to check all aspects of map scheme for this corner of the State).

3. 1:3,000,000 Map Product
3.1. Dr Ray Bailey in CALM Corporate Relations Division has a copy of the map of rainforest/vinethickets in the Kimberley (see note in your pigeon hole). You should contact him to obtain this and then see about incorporating the data into the vegetation database. You will need to develop appropriate beard_nos and H codes. When the simplified 1:3,000,000 map linework is produced, the polygons of rainforest/vine thicket may disappear, so it may be desirable to indicate general location on the final 1:3,000,000 map with a symbol, as suggested By Mr Beeston for the granite exposures. If you do this, please ensure that the symbol is syhown on the key of the final map (along with symbols for other small, specially-identified vegetation types such as granite).
3.2. Mr Coker is to finalise background geographic data for the new map, copying as far as possible the original Beard 1:3,000,000 map. You should maintain an overview on this aspect of the project, and offer assistance with checking the map detail.
3.3. As Mr Coker finalises the linework and attribution at the 1:250,000 scale, he will require your technical advice from time to time.
3.4. Once the simplified linework is produced, on a tile-by-tile basis if necesary, you should obtain coloured plots to check the results and the colouring. Please note that we will be wanting to have a some kind of border around each polygon to define it clearly and precisely. Whether this should be a black line or a line of the colour of the fill of the polygon I will leave to you but you and Mr Coker should examine the options before finalising the map.
3.5. Mr Coker will produce a draft map complete with key and with relevant cartographic reference detail (ie projection, datum etc) and logos which should be checked. It would be good to pass on a copy to Br Beard for comment.

4. 1:3,000,000 IBRA Map.
4.1. Finalise linework including incorporation of changes along the State border, as

provided.
4.2. Check final version of background geographic data: it should be very detailed as is the previous 1:3,000,000 Phytogeographic Regions map.
4.3. Mr Coker will produce a draft map complete with relevant cartographic reference detail (ie projection, datum etc) and logos which should be checked. Again it would be good to pass a copy on to Br Beard for comment.

5. Analysis of Conservation Status: Update
5.1. Mr Coker will obtain an up-to-date version of the digital cadastral data of the CALM estate from our Information Management Branch (Dr Colin Pearce/Mr John Dunn). Once he has this, he should plot out the data at a reasonable scale, say 1:3,000,000, distinguishing the various categories of land by colour, for you to check in comparison to an up-to-date printed map of similar source. (It may be possible to plot the data at the same scale as the Departmental map and just overlay the two on a light table). If you identify any discrepancies, it will be necessary for you to consult with IMB to resolve them.
5.2. I have asked Mr Coker to obtain up-to-date digital data forthe CALM estate for Swan, Central Forest and Southern Forest Regions (CALM Regions) in order to check these against the TENIS data. The data are available on the server at Woodvale: you should consult with Mr Mike Lyons to obtain details. The reason I am asking for this particular cross check is that after we had completed our earlier set of analyses, I discovered that some important forest reserves had been omitted. The reason that I was given at that time is that, for technical reasons and DOLA reasons, the TENIS digital data set may be up to 2 years behind Land Act classification changes. Check these two data sets against each other and consult with IMB regarding any discrepancies that may come to light.
5.3. Obtain from TENIS, the version available on the Departmental network, a listing of any National Parks, Nature Reserves, Conservation Parks, etc, by land category that have been created since August 1995. At the same time, obtain area statements for each one: these will be necessary to update Table 7. It will be necessary to check the vesting of each one so it can be correctly allocated to the reserve categories used in the analyses: IUCN I - IV, Other CALM-Managed Conservation Estate and CALM-Managed Areas Not Classified AS Conservation Estate (see my memo to Mr Coker dated 24 August 1995, copy attached).

6. Other
6.1. I have asked Mr Ted Griffin to do some databasing of *Dryandra* data and the results of the biological survey of the Eastern Goldfields, both as part of the biogeographic regionalisations project. Mr Griffin may ask for assistance to access data on disks held by Mr Norm McKenzie in some disk storage boxes in his lab. Mr Keighery may have a disk of text from Dr Ric How of the WA Museum. This project has Mr McKenzie's full support.
6.2. Mr Steve connell, Edith Cowan University Joondalup Campus, will also be working on the Dryandra data.
6.3. Could you obtain for Mr Coker a copy of Mr McKenzie's publication on the

Nullarbor survey results showing nodes of biological importance. I think it is a paper with Dr Chris Margules in Biological Conservation. It shows isolines or contours of richness of similar around the survey sites. Mr Coker will need to digitise the isolines for the biogeographic regionalisations project.

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MEMORANDUM

To: Ms Judith Harvey
From: Angas Hopkins
Date: Thursday 10 April 1997
Subject: Task list

Judith
I have left rolls of maps and an envelope of beard_no code details together with some additional papers for you to look after. I have tried to leave explanations for you and for Julian in the notes and written onto the working sheets that I have been using. I hope I have said enough!
If you have additional queries, all the background map data are there on your desk. Except that I have a roll of sheets of IBRA linework which I will pass on.
Please keep notes on any changes you make to the IBRA linework or in the Busselton - Pemberton area so I can go through those things with you on my return.
Have a pleasant and productive time!
And finally, I have arranged with Ms Cade that you should sign Julian's accounts on my behalf.
XA

10.1 Obtain up-to-date CALM estate from CALM (Dr Colin Pearce/Mr JohnDunn). Plot data out at about 1:3,000,000 scale with different categories of land wirh boundaries colour-coded and check in collaboration with Ms Harvey. Correct as necessary in consultation with CALM IMB staff.
10.2 Obtain up-to-date digital data for CALM estate for Swan, Central Forest and Southern Forest Regions (CALM Regions) (via Mr Mike Lyons if necessary) and check against main CALM estate database. Discrepancies should be noted for subsequent analyses.
10.3. Run overlay/intersection of CALM estate with vegetation data as previously. Also run overlay of IBRA boundaries as previously.
10.4. In collaboration with Ms Harvey, prepare tables of conservation status of vegetation types as previously (this may require additional parcels of land to be added into the non-IUCN category, for example, there have been some additional pastoral properties purchased recently). This will need to include analysis on status on a by-IBRA region basis to produce an up-date of Table 12.

5. Biogeographic Regionalisations Database.
5.1. Capture additional biogeographic regionalisations as indicated and assemble them into a single database.
5.2. Produce a series of A4 plots (1:10,000, 000 for whole State, 1:5,000 000 for those available only for South West & Eucla Land Division) showing all available regionalisations (annotated with attributes or with key on separate A4 page if necessary).
5.3. Prepare a series of overlays as examples showing relationships between different regionalisations (these will be for demonstration purposes only).

6. Irwin Study Area
Study Area 1. Between Perth and Geraldton containing portions of the Swan Coastal Plain, Geraldton Sandplains and Avon Wheatbelt IBRA Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°50'S, 116°00'E (NE corner), 31°15'S, 116°00'E (SE corner), 31°15'S, 114°10'E (SW corner), 28°50'S, 114°10'E (NW corner).
EAG notes 29°00N 116°15E, 32°00N 116°15E, 32°00N 115°15E, 29°00N 116°15E

6.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, environmental geology, soils and soil landscapes, drainage basin boundaries, Beard's Phytogeographic Districts (see Mr Ted Griffin), other regionalisations and available climatic data (see Mr Greg Beeston for details).
6.2. In consultation with Mr Ted Griffin, assemble spatial data on distribution (presence and absence) of species of *Dryandra*. (data set will extend beyond specified study area, we will take a subset of distributions later).
6.3. In collaboration with Mr Ted Griffin, define species distribution envelopes for each species. This may involve overlaying species distribution data on soil landscapes data and selection out only those soil landscapes where species occurs and including these dtat

within the envelopes. Envelopes may be drawn using some MGE software or by hand.
6.4. In collaboration with Mr Steve Connell, develop a dataset of distribution envelopes of *Dryandra* species based on up-to-date distribution data (ie the dataset developed through 6.1 above) and use of latest version of BIOCLIM (recent release by Professor Henry Nix, see Mr Greg Beeston, Dr Odile Pouliquen-Young for details).
6.5. Compare and contrast envelopes developed through procedures 6.2 and 6.3 on a species-by-species basis.
6.6. Plot species distribution envelopes in groups to highlight common boundaries vs differences (see some earlier work by Mr Ted Griffin) and as overlays with other data sets.
6.7. Obtain from Mr Ted Griffin sample site location data from study of floristic variation Moore River to Geraldton and incorporate into a design file. Obtain results of Mr Griffin's classification of floristic data from that study and plot groupings. Check output with Mr Griffin. Plot out groupings as overlays with other datasets to permit comparisons to be made.

7. Nullarbor Study Area
Study Area 2. Nullarbor Biological Survey located within the Nullarbor IBRA Region with overlap into Coolgardie, Mallee and Hampton Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 29°00'S, 132°30'E (NE corner), 33°00'S, 132°30'E (SE corner), 33°00'S, 124°00'E (SW corner), 29°00'S, 124°00'E (NW corner).

7.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details)
7.2. From the Nullarbor biological survey report, capture study site locations (latitude and longitude data) and plot study sites on a map with annotated vegetation types (?A4 landscape or A3).
7.3. From the McKenzie publication, copy into a design file isolines (contours) of species richness/ diversity nodes derived from analysis of survey results from study sites captured in 7.1. Plot out isolines as separate overlays on vegetation, geology and pastoral land survey data (as above, A4 landscape or A3).

8. Eastern Goldfields Study Area
Study Area 3. Eastern Goldfields Biological Survey including the Murchison, Coolgardie, Mallee IBRA Regions with some overlap into the Avon Wheatbelt and Great Victoria Desert Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 26°45'S, 123°30'E (NE corner), 32°45'S, 123°30'E(SE corner), 32°45'S, 118°15'E (SW corner), 26°45'S, 118°15'E(NW corner).

8.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details).

8.2. From the CALM & Museum biological survey reports, capture study site locations (latitude and longitude data) and plot study sites on a map with annotated vegetation types (?A4 portrait or A3).
8.3. In collaboration with Mr Ted Griffin, plot distributions of selected *Acacia* species for the region and define species distribution envelopes, as for Dryandra in 6.1, 6.2 above.
8.4. Plot distribution envelopes as overlays with other datasets to permit comparisons to be made.
Await availability of further data.

9. Carnarvon Basin Study Area
Study Area 4. Carnarvon Basin Biological Survey in the Carnarvon IBRA Region with some overlap into the Geraldton Sandplain Region.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°30'S, 115°45'E (NE corner), 32°45'S, 115°45'E(SE corner), 32°45'S, 112°30'E (SW corner), 28°30'S, 112°30'E(NW corner).

9.1. For the described pilot project study area, assemble relevant datasets including vegetation, geology, pastoral land survey data, and available climatic data (see Mr Greg Beeston for details).
9.2. Obtain Carnarvon Basin biological survey study site locations (latitude and longitude data) from Mr Norm McKenzie (via Ms Judith Harvey) and plot study sites on a map with annotated vegetation types (?A4 portrait or A3).
Await availability of further data.

Priority Ranking for Components
1,2>3>4>10>5>6,7 ,8,9 but it should be possible to make some progress on all components including 6,7,8,9 during the period.

I would like you to give high priority to capturing the new linework so I can progress to the next phase of the mapping work. I need to be able to complete those two map sheets before I head off os. Once the new linework is available, I will need a plot of it on plain paper that I can write on to attribute the polygone (and add in any missing linework!). It would also be useful if you could do a plot with the FMIS all karri data* in a light colout so that I can make sure that I have not missed any signifiacnt bits of karri.
Julian, there was something strange innthe various vertsions of the karri data you gave me previously. I had expected the map of original karri (preEuropean) distribution would have included all the present karri on CALM land (leaving aside the problem of the large polygon of karri that didn't fill). But I found areas mapped as karri on CALM land now (ie present karri) that were not included in the original karri map. Perhaps you could check it out and if I am right, speak with Pat Collins (or John Dunn). Anyhow for this exercise, I need a plot with all the original karri and all the present karri.
Next I would like you to plot out a map with soils and landforms (Churchward etc)plus all the remaining FMIS categories for the areas I have been working on so far. So you have given me all the combinations of karri plus jarrah and tingle combinations. I have remapped these now, so I now the remaining FMIS data plotted so I can complete the veg map for that area. I will then need to complete the two !:250,000 map sheets. This means the area N and E of Lake Muir (up the eastern boundary of the System 6 area I guess) and the area west of the current study area over to Leeuwin-Maturalist. I will need the Landsat TM coverage with soils and landforms as available (ie Tillie's work to the west) together with Smith and the existing Beard. And I will need soild and landforms with various combinations of FMIS data: it can probably be done in two lots, separating different jarrah types on one plot and other forest types and non forest types on another. See what you can do to give me good material to work from.
I'm off to Brisbane for a meeting on Friday, but I'll be back to speak with you on Monday.
Good luck with all of this
Angas
19/03/97

Study Area 1. Between Perth and Geraldton containing portions of the Swan Coastal Plain, Geraldton Sandplains and Avon Wheatbelt IBRA Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°50'S, 116°00'E (NE corner), 31°15'S, 116°00'E (SE corner), 31°15'S, 114°10'E (SW corner), 28°50'S, 114°10'E (NW corner).
EAG notes 29°00N 116°15E, 32°00N 116°15E, 32°00N 115°15E, 29°00N 116°15E
Study Area 2. Nullarbor Biological Survey located within the Nullarbor IBRA Region with overlap into Coolgardie, Mallee and Hampton Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 29°00'S, 132°30'E (NE corner), 33°00'S, 132°30'E (SE corner), 33°00'S, 124°00'E (SW corner), 29°00'S, 124°00'E (NW corner).

Study Area 3. Eastern Goldfields Biological Survey including the Murchison, Coolgardie, Mallee IBRA Regions with some overlap into the Avon Wheatbelt and Great Victoria Desert Regions.
Coordinates: Area enclosed within a rectangle described by the coordinates 26°45'S, 123°30'E (NE corner), 32°45'S, 123°30'E(SE corner), 32°45'S, 118°15'E (SW corner), 26°45'S, 118°15'E(NW corner).

Study Area 4. Carnarvon Basin Biological Survey in the Carnarvon IBRA Region with some overlap into the Geraldton Sandplain Region.
Coordinates: Area enclosed within a rectangle described by the coordinates 28°30'S, 115°45'E (NE corner), 32°45'S, 115°45'E(SE corner), 32°45'S, 112°30'E (SW corner), 28°30'S, 112°30'E(NW corner).

A Hopkins
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MEMORANDUM

To: Mr Julian Coker
From: Angas Hopkins
Date: Thursday 10 April 1997
Subject: Work Schedule

Julian
I have left all the material for you, the working sheets for the Pemberton Irwin Inlet Sheet and some notes, on Judith's desk at Woodvale. I am asking her to deliver them all to you as soon as convenient. There will be quite a lot of work to do to complete this Sheet. And even when you have done all you can there will probably be some finishing off to do as I was not able to complete the edge matching because I was uncertain what the final Smith plus karri forest linework would look like. It may be that you and Judith can finish the map off... see what you can do.
Please read the notes I have written into the margins of the working sheets that Judith now has.
I have lined up the various map versions using a series of ground control points. The location of the control points is indicated on the very large plot of soils and landforms plus FMIS present karri types. I have then drawn these control points onto all the relevant working sheets. I hope tese will enable you to colocate the various datasets satisfactorily. You should use the soils and landforms as your prinary guide, as I think the FMIS data seem to line up fairly well with those data.
You will note that I have suggested that you warp Smith before inserting the Hopkins

karri forest types linework. I hope that by doing things in this order, my karri forest polygons will ilne up well with Smith and that this will reduce the potential for complications at the margins of the new polygons.
You will be working closely with Judith while I am away: I hope that works out OK. And you will have some interactions with Ted Griffin and Steve Connell. Ditto
Good luck with all the work and with your forthcoming batchelorhood....
Angas

To: iSMTP@CALM.COMO.1@Servers["Nahrel Dallywater" <nahrel_dallywater@environ.wa.gov.au>], iSMTP@CALM.COMO.1@Servers["Paul Davis" <fortytwo@highway1.com.au>],iSMTP@CALM.COMO.1@Servers["Andrew Higham (ISTP)" <ahigham@central.murdoch.edu.au>], iSMTP@CALM.COMO.1@Servers["Nicole Hodgson (hm)" <nhodgson@nettrek.com.au>],iSMTP@CALM.COMO.1@Servers["Stephano" <smazzilli@hotmail.com>],iSMTP@CALM.COMO.1@Servers["David Sutton" <dcsutton@cyllene.uwa.edu.au>],Angas Hopkins@WOOD.SID@CALM
From: "Andrew Higham" <andrew_higham@environ.wa.gov.au>
Cc: iSMTP@CALM.COMO.1@Servers["Neil Blake WRC" <neil.blake@wrc.wa.gov.au>]
Subject: Councillor meeting
Attachment:
Date: 16/05/00 15:25

Hi

as agreed last Wednesday we are meeting again this Wednesday at my home. I will be expecting you from 7pm. I will organise a big hearty soup and bread, and we can sit by the fire. The main agenda items flowing from our last meeting:

1. Annual plan for 2000-2001
2. Election strategy
3. the campaign centre and Melbourne
4. other matters for executive

Please add any others as you wish.
See you then.

Andrew

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