

Comprehensive Regional Assessment of Old-Growth Forest in Western Australia

Review of Data and Methodology for Old-Growth Mapping in the South West Forest Region of Western Australia

This document has been prepared by the Environment Forest Taskforce, Environment Australia and Conservation and Land Management in Western Australia for the purpose of Comprehensive Regional Assessment

April 1997

Acknowledgment

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Review of Data and Methodology for Old-Growth Mapping

The review of data and methodology for old-growth mapping is the first of a number of old-growth related projects to be carried out in Western Australia (WA). The results of this project will assist in the scoping and preparation of subsequent old-growth projects. The data review is a collaborative project which involves staff from the Environment Forest Taskforce (EFT) and Conservation and Land Management (CALM) Forest Management Branch in WA.

The objectives of the project were as follows:

1. To review and assess existing information related to ecological maturity and disturbance available for old-growth forest assessment.
2. To identify data gaps to complete CRA old-growth survey according to statutory obligations.
3. Review growth staging techniques and disturbance mapping.
4. Identification of specific requirements, additional data collection and possible methodologies for subsequent old-growth projects.

The project proposal was divided into three major tasks as follows:

TASK 1: Collation and review of existing information;

TASK 2: Review database compatibility and agree on data formats.

TASK 3: Technical specification for the requirements of subsequent old-growth studies.

These tasks were achieved according to the criteria listed in headings 1 - 5 of the following discussion.

1. Collate all relevant information

On September 25 - 27 representatives of the Environment Forest Taskforce traveled to WA to commence the review of old-growth related information. CALM is the custodian for all data reviewed, most of which is stored and manipulated in the Forest Management Information System (FMIS - described in more detail below). The titles of the data which were reviewed are as follows:

Forest structural and floristic information

- Aerial Photograph Interpretation - height class
- Aerial Photograph Interpretation - total density
- Aerial Photograph Interpretation - upper strata density
- Aerial Photograph Interpretation - Forest type (species)
- Forest type (species)

Association of forest trees

Height of tallest native vegetation

Forest ecological maturity

Karri development stage

Pre European karri distribution

Disturbance data

Dieback occurrence mapped from pre 1976 photography

Dieback occurrence mapped from post 1976 photography

Sawlog cutting history

Sawlog cutting status

Year of last burn - prescribed burns and wildfires

Roading - major and minor

Administrative data

Regional boundaries

Tenure as proposed in the Forest management Plan (1994-2003)

2. Review and document existing information using the ANZLIC core metadata as well as a statement of scale/resolution, lists of attributes and their definitions.

The data given above were documented using the ANZLIC Metadata Entry Tool Version 4.00 (26 August, 1996), using core metadata as well as a statement of scale/resolution, lists of attributes and their definitions. Metadata statements are attached in Appendix 1.

3. Assess the data against criteria and standards including currency, scale, attributes, methodology, quality and availability in a digital form.

Forest Management Information System (FMIS)

Most of the metadata was collected on data sets stored in FMIS, which is a grid based GIS that has been developed in house (by CALM) specifically for the needs of the Forest Management Branch. Data is stored in Australian Map Grid co-ordinate system (Zone 50) with a current minimum polygon size of 2 hectares. The CALM Forest Management Branch are responsible for technical specifications of the data and coordinate the import and export of data to and from FMIS. Other interfaces used by CALM include Microstation design files (Intergraph), Mapinfo, ArcInfo (Ver. 7.02), and ArcView (Version 3). The main file exchange format is DXF.

All new and derived data are to be provided to the Commonwealth in a suitable Arc/Info format.

For any technical information related to FMIS the contact is as follows:

Mr Mike Green
Forest Management Branch
CALM
Kelmscott WA 6111
(09) 390 5511

The data for which metadata was collected are assessed below against the criteria and standards set out in the Commonwealth Old-Growth Assessment Framework, (EFT, 1996). The criteria are related to Project OG2: assessment of forest maturity; and Project OG3: description of the disturbance regime.

OG2: ASSESSMENT OF FOREST MATURITY

A. Stand structure

a) Growth staging

The 'Karri Development stage' data describes the interpreted 'stand-development stage' of (*Eucalyptus diversicolor*) dominated forest. The data is derived from 1:25,000 scale, colour print photography captured in 1993.

Development stages for karri are nominally : establishment (approx. 0 - 8 years), juvenile (8-25 years), immature (25 - 120 years), mature (120 - 250 years), senescent (250 +).

During photo interpretation, differentiation of the morphological condition of individual mature and senescent crowns (as shown by Jacobs, 1954) was found to be an unreliable (Bradshaw, *pers comm.*, 1996). Immature forest could be differentiated from mature forest on the basis of crown size and texture. Mature forest was differentiated from senescent forest when gaps in the canopy of mature trees provided the opportunity for regeneration. Stands were classified as immature, mature and senescent on the basis of the dominant cohort (i.e. the oldest cohort with more than 25% crown cover).

Individual tree age was estimated using the results of a regression analysis of tree age versus tree diameter. The regression equations were developed by counting the growth rings (dendrochronology) of a sample of 58 trees older than 100 years. Separate regression equations were calculated for two site qualities based on the top height of the oldest cohort¹ in the stand. To test the robustness of the air photo interpretation, 121 stands were sampled to obtain tree diameter measurements. A total of three trees, from the dominant cohort, were measured at each sample site. A site index was also measured. The diameter measurements were converted into age estimates using the regression equations and the results compared to the photo interpreted stages. A comparison of these

¹ A cohort is a group of individuals, within one population, of the same age.

two methods indicated a reliable delineation of young immature from mature age classes using photo interpretation. The delineation between mature and senescent age classes, though good, shows some expected overlap at the edge.

b) Existence of hollows

No specific information currently exists on FMIS but other information is available.

c) Large trees

For karri trees, relative numbers of large trees can be inferred from growth staging and measured samples. Extensive stratified inventory sampling exists for all types with modelled information on tree size. This data was not examined.

The 'API - Height Class' data describes the potential height for native species in the upper strata of a forest stand. The data were derived from API captured in the late 1950's and early 1960's for the production of the 1:25,000 API map series. No attempt has been made to update height classification, however it is still considered to be indicative of site potential even after forest operations have altered the original forest. A different height class classification is assigned to karri than for other species such as jarrah, marri and blackbutt.

B. Forest Composition

a) Crown cover

The 'API - Total Density' data describes the projective crown cover for all trees occurring in a forest stand. The data 'API Upper Strata Density' describes the projective crown cover for trees occurring in the upper strata only, of a forest stand. Upper strata density is used in multi-storey stands classified as Pole Forest or Sapling Forest from API Forest Type.

Both databases were derived from API captured in the late 1950's and early 1960's for the production of the 1:25,000 API map series. Although the detail may now be out of date no attempt has been made to update it. The detail may describe the stand structure after logging and silviculture treatment.

b) Presence of gap phase regeneration.

There is no direct mapping of gap phase regeneration, however, the mapped development stage together with cohort age sampling can be used to infer significant gap phase regeneration. Gap phase regeneration is not mapped for jarrah because of fine scale issues throughout unlogged areas.

c) Distribution Index (i.e. random, clumped, overdispersed)

No information currently exists on FMIS.

C. Floristic type and distribution

a) Dominant species in each stratum

The data set 'Forest Type (Species)' describes the type of native forest species in the upper strata of a forest stand and in general is related to the dominant overstorey species (i.e. crown cover greater than 25%) - however, in some regions mixed stands with co-dominant overstorey species were identified. This data was originally derived from API captured in the late 1950's and early 1960's for the production of the 1:25,000 API map series. This data set is regularly updated and corrected as necessary.

Species data is also represented as Forest Association with a slightly different emphasis on relativities. Refer to Bradshaw, Collins & McNamarara; Forest Mapping in the South West of WA, 1997.

b) Presence of endangered or rare species

This information exists in a range of formats which were not examined. There are currently no known relationships between rare or endangered species and old-growth forest.

D. Classification by forest maturity

a) proportion of canopy by growth stages

The 'Karri Development Stages' data describes karri maturity as the development stage of the oldest 'significant' cohort, or the 'dominant' cohort exceeding 25%. This was interpreted from 1:25,000 colour aerial photo prints taken in 1993. The output theme recorded in FMIS shows 10% crown cover classes above 30% for immature, mature and senescent development stages.

Due to the difficulty in identifying age related characteristics, no growth staging has been carried out in the Jarrah forests. It is proposed that unlogged forest is used as a surrogate for old-growth Jarrah forest.

OG3: DESCRIPTION OF DISTURBANCE REGIME

A. Spatial extent of disturbance

a) Logging

The 'Sawlog Cutting History' data provides the cutting history as pre 1920 logging, logging by decade from 1920 and logging by year from 1970 as the year of the most recent saw log operation to occur in a given area. In the Central Forest region individual years have only been collected since 1980. This data is updated annually with later forest operations overwriting former forest operations. It will be replaced with one which maintains data for all decades.

The 'Saw Log Cutting Status' data uses information collected in the data set above to classify the forest according to its cutting history. The data set is

classified as being either unlogged, selection cut or clear felled. It is only available for the Southern Forest region. Records for anything in the Swan or Central regions are derived directly from this decades cutting theme.

b) Fire

The 'Year of Last Burn - prescribed burns and wildfires' data has been collected prior to 1960, 1961 - 1966, 1967 - 1972, and then every year up to the present. Mapping undertaken before 1994 did not identify internal unburnt patches. Post 1994 improvements to data collection includes the season of burn. Data pertaining to the type and season of burn is managed by CALMfire in Microstation format.

c) Silviculture

Information relating to silviculture is currently not stored on FMIS but exists on other databases at CALM. Information relating to silviculture pre 1972 was derived by the WA Forest Department district maps at a variety of scales. Post 1972 silvicultural data is derived from large scale aerial photographs (1:25,000) and plotted on an in house recording system called CIMSIS. The resulting information provides a high level of detail for forest operations within a forest block. More recently, a new system called SILREC is being developed to provide a detailed works program for follow up treatment following logging.

d) Pests

No digital data currently exists on FMIS, however maps of the district of the distribution of some insect pests are available.

e) Disease

The 'Dieback Occurrence Mapped from Pre 1976 Photography' data was derived from broad scale (1:40,000) API and was used to locate areas showing advanced symptoms of *Phytophthora cinnamoni*. The results of this exercise were used to assist in determination of Disease Risk Areas.

The 'Dieback Occurrence Mapped from Post 1976 Photography' data is derived using a combination of large scale (1:4,500) shadowless photography and field data. The presence of dieback is identified by the death or dying of particular indicator species in the understorey. When an infected plant is located in the field a sample of the root system is sent to a laboratory for positive confirmation. Information on the presence or absence of the disease is used for forest management purposes and is updated only as required for any earth moving operation in the forest. Any knowledge of infected areas is required to prevent unwitting spread of the disease.

f) Grazing

No information currently exists on FMIS.

g) Agriculture

Records of forest regeneration following agricultural clearing are recorded in FMIS.

h) Mining

Information currently exists on FMIS for some areas but requires completion.

i) Development

The 'Roading - Major and Minor' data shows the road network derived from a number of sources and includes the main road network and new roading as a result of forest operations.

j) Catastrophic events

No information currently exists on FMIS, however where catastrophic events result in the regeneration of the forest, this is recorded.

B. Disturbance information for each mapped community at 1:25,000

a) Time and type of disturbance

No data currently exists on FMIS, however it is possible that it could be compiled from the information collected above.

4. Document the methodology used, or indicate reference where the methodology is explained.

The method used to define mapping of karri development stage is given in the following two papers:

Bradshaw, F.J. and Rayner, M.E. (in prep) Age structure of the karri forest: A methodology for mapping structural development stages.

Bradshaw, F.J. and Rayner, M.E. (in prep) Age structure of the karri forest. 2. Present and future age distributions.

These papers are currently undergoing peer review, and should be reviewed in detail by the Commonwealth as soon as possible. A summary of the techniques has been provided to the Commonwealth.

5. Advise on the suitability of these data for use in CRA old-growth survey, using agreed systematic and transparent criteria

A. FOREST MATURITY

Karri is defined as a wet sclerophyll species occurring in a limited area of high rainfall country in the South west forest region of WA, largely confined within the 1100 mm isohyet (Chrisentsen, 1992). The usual dimensions of this species are 45-70 metres tall with a diameter at breast height commonly 1.5 - 3 metres. The pole is straight and up to two-thirds of the tree height. The main occurrence of karri extends from Nannup and the upper Donnelly River in the north, southeast to Denmark. Two main outliers occur, one on soils derived

from coastal limestone at Karridale, the other on soils derived from weathered granite on the Porongurup Range north of Albany.

Karri occurs mostly in tall open-forest formation in pure stands and in association with marri (*Corymbia calophylla*) and, to a considerably lesser extent, jarrah (*Eucalyptus marginata*), red tingle (*E. Jacksonii*), or yellow tingle (*E. guilfoylei*). She-oak (*Allocasuarina decussata*) and *Acacia pentadenia* are common understorey species (Boland et al., 1992).

The assessment of forest maturity for karri dominated forests is based on the development stage of the oldest significant cohort within a patch of forest. The air photo interpretation has been derived at 1:25,000 and field work, the scale of which is adequate for CRA purposes.

The method used by CALM is attributed to karri forest dynamics which may regenerate after a severe stand replacing event, or after less severe damage that removes small patches of trees or as a result of age induced mortality and mild fire in the understorey. Approximately half of the mature and senescent forest contains younger significant cohort (>25% crown cover). Virtually all of it will show evidence of past fire disturbance in one form or another - fire being a part of the normal stand dynamics (Bradshaw, 1996).

It has been recommended by the CALM Forest Management Branch that due to similar structural and life history characteristics of the associated marri and tingle mixtures, the method used to map stand development stages in karri dominant forest could also be applied to tingle dominated forest and marri/karri and karri/tingle associations. All these forests occur predominantly in the high rainfall area (1100 mm isohyet) within the Walpole district of the southern forest region.

On the 4th of November, Bruce Cummings, Sean Cadman, Elizabeth McDonald of the Environment Forest Taskforce (Environment Australia) and Paul McDonald of Aerial Photo Interpretation Consultancy Services travelled to Manjimup to meet with Jack Bradshaw, Manager of CALM Forest Management Branch. The first objective of the trip was to assess the suitability of mapped stand development stages, in karri dominant forest, for use in CRA. The second objective of the trip was to assess the suitability of the mapping stand development stages in marri and tingle dominant forests and karri/marri and karri/tingle associations.

The following is a summary of the pathway that has and will be used to map stand development stages:

1. Karri dominant, karri/marri associations, karri/tingle associations and tingle dominant forests will be identified using the 'Forest Type (Species)' data currently stored on the FMIS database.
2. Unlogged forest will be identified from existing records and field validation as required (see old-growth disturbance history project).
3. The age of even-aged regrowth (unlogged i.e. following a fire event) or cutover) will be identified from existing records. Age classes will be based on

historical records or from linear regression equations based on dendrochronology.

4. Remaining forest will be interpreted for 'stand development stage' using 1:25,000 colour print photography taken in 1993.

5. Interpreted stand development stage will be transferred to the 1:25,000 API interpreted 'Forest Types (Species)' maps which will comprise the mapping base.

Stand development stage is defined as the development stage of the oldest 'significant' cohort, or the 'dominant' cohort, that is the oldest cohort with a crown cover of 25% or more. At this percentage crown cover, it will dominate other younger cohorts (Rotheram 1983).

Development stages for karri are nominally: Establishment (approx 0-8 years), Juvenile (8-25), Immature (25-120), Mature (120-250), Senescent (250+). All establishment and juvenile stages are within cutover forest and can be aged using current records. Immature stands will be differentiated from mature stands on the basis of crown size and texture. Mature stands will be differentiated from Senescent stands when gaps in the canopy of mature trees begin to provide opportunities for regeneration.

6. Where possible, early mature stands will be separated from late mature stands on the basis of recorded history.

Using the current technique early mature stands can not be differentiated from late mature stands on the basis of crown characteristics. However if a regrowth stand is known to have an age of approximately 120 - 180 years, and is clearly not old-growth, it will be classed as early mature and coded as such. A further analysis using the collected age data and the API crown cover density for the mature class will be tested to see if a split between early mature and late mature can be achieved on density to try and separate out cohorts of the mature class as NOT old-growth.

7. Where possible, attribute broad vegetation classes occurring in the gaps between senescent vegetation as Eucalypt (E); Tall shrubs/trees e.g. Allocasuarina, Acacia etc. (A); Low shrub/heath/bare ground (S).

8. Field samples will be used to compare API interpreted cohorts with the age of the dominant cohort measured in the field.

Age is estimated in the field using a regression of stand age versus diameter of dominant trees as mentioned above. At each stand a site index will be measured and a sample of three dominant trees measured for age estimation.

The frequency of stand age within each interpreted development stage will be determined from these samples.

9. The overall range of stand age for the whole forest will be determined by applying these proportions to the interpreted area and adding these to the areas of previously determined age.

10. Produce digital coverage showing the stand development stages for the forest types indicated above.

In jarrah and wandoo dominated forest, the method given above is inappropriate due to the fine scale at which age related cohorts occur. This makes it difficult to differentiate the overlap between dominant individuals of one cohort and suppressed individuals of another. Other methods of growth staging will also be difficult to apply using photo interpretation due to large amount of deadwood in the crowns of even very young trees. For this reason, disturbance mapping will be of major importance for identifying candidate areas of Jarrah and Wandoo old-growth. An overview of the disturbance layers and associated attributes required for this and other CRA purposes is given below.

B. DISTURBANCE

Logging

Logging disturbance identifies previously logged areas from unlogged areas. In areas that are identified as logged the attributes required for CRA purposes include the date of logging, the type of logging (ie. clearfell, selection cut etc.) and if possible the intensity of logging

Records of past harvesting activities exist for each decade from the 1920's and cover all known harvest and clearing activity for crown land from early colonial times. Records of disturbance in areas which are now reserves and which were previously vested in other than the Forests Department are less well known. For the purposes of defining old-growth, this data requires detailed validation - specifically, areas recorded as never been logged.

Field checking should not only include unlogged areas (i.e. never been logged) but also significant areas where the logging was recorded but may not in fact be correct.

It is recommended that the areas of forest that remain undisturbed by past harvesting be checked by field validation of existing records. The aim is to determine areas where harvesting has occurred and identify the date and type. Output should be in the form of a digital coverage and paper maps at a suitable scale showing forest areas undisturbed by harvesting and attributed harvesting disturbance.

Silviculture

Information related to even aged regeneration is stored on FMIS. Data derived pre 1970 were updated using WA Forest Department district maps at a variety of scales. Post 1972, data was derived from large scale aerial photographs and plotted on an in house recording system, CIMSIS. Since 1990 data is recorded in a systems called SILREC which is being developed to provide a detailed works programs for treatment areas.

Harvest and regeneration records in areas of recent disturbance should be updated to improve spatial reliability. Assessment can be carried out by digitising all harvest and regeneration areas in forest blocks in which clearfelling

or intense harvesting has occurred (since 1967 in karri and 1980 in jarrah) on the basis of improved base maps. The output could be incorporated in the coverage described above.

Information related to intensive silvicultural treatment and thinning in the 1930 - 1970's are held in FMIS based on detailed map records of the time.

Disease

Maps showing the symptoms of *Phytophthora cinnamomi* have been prepared since the 1970's. Coverage of all forest regions (excluding areas east of the Irwin Inlet) exists as at 1976. Since the advent of quarantine, areas subject to harvesting have been mapped using large scale shadowless photography or intensive field sampling (not all areas within the mapped areas are harvested). Because the disease is progressive and requires specific conditions to identify symptoms there is no intention of undertaking complete coverage mapping at any one time. For strategic purposes CALM accepts the areas affected by *Phytophthora cinnamomi* to be those mapped by the most recent shadowless photography where available, otherwise the areas shown on the broadscale mapping of 1976.

There is currently a backlog of areas mapped with shadowless photography that requires entry into CALM's FMIS database. This should be updated as required and any subsequent information also used to update the database.

Grazing

No metadata on grazing data was collected, however CALM has advised that there has been little or no grazing on the CALM estate since the 1960's. In the past grazing intensity was greatest in the south west, with summer grazing on the coast, most of which is now in National Parks. Some roading tends to follow old stock routes. The grazing disturbance information requires updating from the relevant databases as required.

Fire

Information relating to controlled burns and wildfires is managed by CALMfire, and should be updated, where available, to include date, type and intensity of burn.

Roading

Minor roading in areas of more recent disturbance may require some updating in CALM held GIS system, using information collected from orthophotos and/or GPS collection.

Agriculture Clearing and Mining

The mining data requires extension to cover areas not already recorded in FMIS.

CONCLUSIONS

- The method of mapping stand development stages for karri dominant forest is suitable for CRA purposes.
- The method used above for mapping karri dominant forest is also suitable for mapping tingle dominant and marri/karri and karri/tingle associations.
- The method of mapping stand development stages is not suitable for identifying old-growth forest in jarrah and wandoo dominated forests.
- A first approximation of old-growth in jarrah and wandoo forests will be based on collected disturbance information.
- The disturbance information listed above will be updated by CALM from the relevant databases. Disturbance layers will include: harvesting, identification of dieback infection; agricultural clearing, roading, burning, grazing and mining.
- The integration of stand development stages and disturbance information, used to identify extant old-growth forest, will be covered in a separate project proposal to be drafted in 1997.

Appendix 1: Old-Growth Metadata Statements

Title : WA Old Growth Metadata

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This dataset includes metadata for the WA old-growth study

Search Words :
FORESTS Natural

Geographic Extent Names :

Geographic Extent Polygons :
-35.1172 114.9370, -35.1172 117.8381, -31.0188
114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	02 Oct 1996	Progress :	In Progress
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Oct 1996		

Access

Stored Data Format : DIGITAL Data formats include microstation design files (Integraph). Other systems include MapInfo, Arc/Info (Ver 7.02) ArcView3 and FMIS. Main file exchange is DXF format.

Available Format Types :
DIGITAL

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Old-growth data audit carried out in WA. Datasets generally stored on FMIS.
Positional Accuracy : Variable
Attribute Accuracy : Variable
Logical Consistency : Variable
Completeness : complete

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
Position :	Manager, Forest Management Branch		
Mail Address 1 :	Jack Bradshaw	State :	WA
Mail Address 2 :	Brain Street	Country :	Australia
Suburb or Locality :	Manjimup	Post Code :	6258
Telephone Number :	097 717 959	Facsimile Number :	097 771 901
Email Address :	jackb@manji.calm.wa.gov.au		

Additional Metadata

ANZLIC Core Metadata Elements - Directory Item Report

Title : Year of last burn - prescribed burns and wildfires

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : Dataset shows both prescribed burns and wildfires - although these are not differentiated in the dataset stored in FMIS. Attributes recorded in FMIS include the year from pre-1960 to current.

Search Words :
FORESTS Management

Geographic Extent Names :

Geographic Extent Polygons :
-35.1172 114.9370, -35.1172 117.8381, -31.0188
114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1960	Progress :	In Progress
Ending Date :	Current	Maintenance and	Annual
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : DIGITAL FMIS
Available Format Types :
DIGITAL DXF
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : The data is provided by district officers on a financial year basis. Since 1994/1995 the data has been digitised. Microstation files retained by CALMfire include details of type and season of each burn. The recent data also identifies unburn patches within the burn boundary whereas earlier data did not.

Positional Accuracy : Variable dependent on district.
For areas at mapping scale 1:50,000 accuracy is approximately 100 metres.
South west cape has been mapped at a scale of 1:100,000 with a positional accuracy of approximately 200 metres.

Attribute Accuracy : Unburnt areas less than 50 ha not recorded

Logical Consistency : Consistency is dependent upon the district and type of data capture used.

Completeness : Complete

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
Position :	Manager, CALMfire		
Mail Address 1 :	Mr Rick Sneeuwjagt	State :	WA
Mail Address 2 :	50 Hayman Road	Country :	Australia
Suburb or Locality :	Comò	Post Code :	6152
Telephone Number :	09 334 0375	Facsimile Number :	09 367 9913
Email Address :	Not known		

Additional Metadata

Title : Tenure as proposed in the Forest Management Plan (1994-2003)

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : This dataset shows the proposed CALM estate for the south west forest region as proposed in the Forest Management Plan (1994-2003). Some new areas within the CALM estate are yet to be gazetted, however they are still managed as part of the CALM estate.

Search Words :
 BOUNDARIES Administrative
 Management

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1994	Progress :	Complete
Ending Date :	31 Dec 2003	Maintenance and Update Frequency:	Not Planned
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : DIGITAL Oracle tables

Available Format Types :
 DIGITAL FMIS
 DIGITAL Oracle
 DIGITAL ASCII
 DIGITAL mapinfo
 DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data is generated at DoLA and sent to CALM in NORM file format. At CALM data was translated to Oracle tables using the parcel identifier. Line work was generated in Mapinfo.
 Positional Accuracy : Variable dependant on spatial upgrade. This is done on a program basis organised by DoLA.
 Attribute Accuracy : 99% updated monthly for CALM tenure.
 Logical Consistency : Consistent for CALM Managed Regions.
 Completeness : Complete.

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
Position :	Manager, Information Management Branch		
Mail Address 1 :	50 Hayman Road	State :	WA
Mail Address 2 :		Country :	Australia
Suburb or Locality :	Como	Post Code :	6152
Telephone Number :	09 334 0333	Facsimile Number :	09 334 0357
Email Address :	Not Known		

Additional Metadata

Title : Sawlog cutting status

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This dataset describes the status of a forested area in terms of logging. The data is derived from a combination of district forest maps (pre-1972), from an in house recording system called CIMCIS and most recently from a new database called SILREC (silvicultural recording system). This information is derived for the southern forest region only. Sawlog cutting status is classified as being either uncut, selective cut or clearfell and depending on when the data was collected also provides information related to follow up treatments post cutting.

Search Words :
FORESTS Management

Geographic Extent Names :

Geographic Extent Polygons :
Southern Region: -34.4683 114.9531, -34.4683
116.8720, -32.6815 114.9531, -32.6815 116.8720, -
34.4683 114.9531

Currency and Status

Beginning Date :	01 Jan 1920	Progress :	In Progress
Ending Date :	Current	Maintenance and	Annual
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : DIGITAL FMIS
Available Format Types :
DIGITAL DXF
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Pre-1972 data derived from WA Forest Department district maps at a variety of scales.
Post 1972 data derived from large scale aerial photographs (1:25,000) then plotted onto an in house recording system called CIMCIS. Post 1988 Vertical photography accuracy combined with GPS derived ground co-ordinates provide very accurate spatial location. This information provides a high level of detail for forest operations within a forest block.
Most recently a new system called SILREC (Silviculture recording system) is currently being developed to provide a detailed works program for follow up treatment following logging. Works program includes information of cutting, treatments and regeneration progress.

Positional Accuracy : Pre 1972 unknown.
Post 1972 mapping conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +- 12.5 metres.

Attribute Accuracy : Dependent on date of capture.
Accuracy between clearfell and non-clearfell is very good however some other attributes are more difficult to detect.

Logical Consistency : Dependent on date of capture of the source map. Transcription of data from photos to FMIS is consistently derived.

Completeness : Validation of pre-1970 logging information is ongoing. Cutting status post 1970 is complete.

Contact Information

Organisation Name : Conservation and Land Management (CALM)

ANZLIC Page 0 Directory Items - Detail Report

Position :	Manager, Forest Management Branch		
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Additional Metadata

Title: Sawlog cutting history

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This data set provides the sawlog cutting history by decade and year (since 1970) of the last sawlog operation. This dataset is updated annually with later forest operations overwriting former forest operations. The Central Forest region only has individual years from 1980.

Search Words :
 FORESTS Management

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1920	Progress :	In Progress
Ending Date :	Current	Maintenance and	Annual
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : DIGITAL FMIS
Available Format Types :
 DIGITAL DXF
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Pre-1972 data derived from WA Forest Department district maps at a variety of scales.
 Post 1972 data derived from large scale aerial photographs (1:25,000) then plotted onto an in house recording system called CIMCIS. Post 1988 vertical photography accuracy combined with GPS derived ground co-ordinates to provide very accurate spatial location. This information provides a high level of detail for forest operations within a forest block.
 Most recently a new system called SILREC (Silviculture recording system) is currently being developed to provide a detailed works program for follow up treatment following logging. Works program includes information of cutting, treatments and regeneration progress.

Positional Accuracy : Pre 1972 unknown.
 Post 1972 mapping conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.

Attribute Accuracy : Dependent on date of capture. Pre 1972 attribute accuracy will be variable, post 1972 the attribute accuracy will be more consistent and of better quality.

Logical Consistency : Dependent on date of capture of the source map. Transcription of data from photos to FMIS is consistently derived.

Completeness : Central forest region is attributed for individual years from 1980.

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
Position :	Manager, Forest Management Branch		
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Mail Address 2 :	Brain Street	Country :	Australia
Suburb or Locality :	Manjimup	Post Code :	6258

ANZLIC Page 0 Directory Items - Detail Report

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Email Address : jackb@manji.calm.wa.gov.au

Additional Metadata

Title : Roding - Major and Minor

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : Road network for the south west forest region derived from a number of sources including historical records, main road network (updated using API) received from DoLA (Department of Land Administration), and new roading updated using Global Positioning Systems during forest operations.

Search Words :
 HUMAN ENVIRONMENT Structures
 and Facilities

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	Not Known	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Oct 1996		

Access

Stored Data Format : DIGITAL IBM-micostation design coverage
Available Format Types :
 DIGITAL DXF
 DIGITAL FMIS
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data set derived from a number of different sources and is updated and maintained by CALM Information Management Branch. Data is integrated into a single coverage showing the road network for the south west forest region.
 The main road network is derived from API by DoLA. Minor road networks are derived by CALM and Main Roads WA using GPS data. Main roads WA will eventually take over as custodian of this database.

Positional Accuracy : API derived information from DoLA Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 m.

Attribute Accuracy : 99%

Logical Consistency : Variable dependent on method of capture

Completeness : Complete for the south west forest region.

Contact Information

Organisation Name : Conservation and Land Management (CALM)
Position : Manager, Information Management Branch
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Mail Address 2 : **Country :** Australia
Suburb or Locality : Como **Post Code :** 6152
Telephone Number : 09 334 0333 **Facsimile Number :** 09 334 0357
Email Address : Not Known

Title : Regional boundaries

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : Regional boundaries demarking CALM jurisdiction in the South West Forest Region. Regional boundaries include the Swan, Central and Southern forest regions.

Search Words :
BOUNDARIES Administrative
Management

Geographic Extent Names :

Geographic Extent Polygons :

Swan Region: 340 000 6340 000, 490 000 6340 000, 490 000 6570 000, 340 000, 6570 000, 340 000 6340 000

Central Region: 310 000 6180 000, 510 000 6180 000, 510 000 6360 000, 310 000, 6360 000, 310 000 6180 000

Southern Region: 360 000 6100 000, 575 000 6100 000, 575 000 6260 000, 360 000 6260 000, 360 000 6100 000

Currency and Status

Beginning Date :	01 Jan 1994	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : DIGITAL Microstation design files

Available Format Types :
DIGITAL DXF
DIGITAL FMIS

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data set maintained by CALM Information Management Branch.
Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 m. Same as for all other topographic and cultural data
Attribute Accuracy : 99%
Logical Consistency : Consistent for all three regions
Completeness : Complete

Contact Information

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Telephone Number :	09 334 0333	Facsimile Number :	09 334 0357
Email Address :	Not Known		

Additional Metadata

Title : Pre European karri distribution

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : Map showing pre-European extent (all tenures) of karri forest. Extent of forests in the 1960's was obtained from 1950's and 1960's API. Evidence of pre-1951 clearing of karri was obtained primarily from ringbarked stags and supplemented by field inspection, interview with landholders and some extrapolation.

Search Words :
 FLORA Native Distribution

Geographic Extent Names :

Geographic Extent Polygons :
 -34.4683 114.9531, -34.4683 116.8720, -32.6815
 114.9531, -32.6815 116.8720, -34.4683 114.9531
 -35.1250 115.4635, -35.1250 117.9086, -33.9049
 115.4635, -33.9049 117.9086, -35.1250 115.4635

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	Not Planned
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : NON DIGITAL Published map at 1:350,000 scale
Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : The extent of karri forest in the late 1950's and early 1960's was obtained from 1950's and 1960's aerial photographs captured at a scale of 1:15,840 with linework transferred onto 1:25,000 scale maps. Further interpretation of more recent photos were used to identify areas that had been cleared since API mapping. Accuracy of clearing before API unknown, but estimates derived primarily from the direct evidence of ringbarked stags. Karri stags could be readily distinguished from jarrah by their relative size. Interpretation was supplemented by field inspection, interviews with landholders and to a minor degree by extrapolation on the basis of landform.

Positional Accuracy : API derived information conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
 Published map scale 1:350,000.

Attribute Accuracy : For API derived information accuracy is related to identification of forest types from API. Attribute accuracy of pre 1950's 1960's API is unknown.

Logical Consistency : Consistently derived

Completeness : Complete for extent of karri forest which includes part of Central forest region, part of the south coast region and all of the southern forest region. Pre European extent is mapped for all land tenures.

Contact Information

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Position : Manager, Forest Management Branch
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ANZLIC Page 0 Directory Items - Detail Report

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Additional Metadata

Title : National Estate Places and Sub-areas (1994)

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : The areas were identified in a joint CALM/AHC regional assessment in 1994. They are proposed for inclusion in the National Estate Register.

Search Words :
 BOUNDARIES Cultural

Geographic Extent Names :

Geographic Extent Polygons :
 Southern Region: -34.4683 114.9531, -34.4683
 116.8720, -32.6815 114.9531, -32.6815 116.8720, -
 34.4683 114.9531

Currency and Status

Beginning Date :	01 Mar 1994	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	Not Known
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : DIGITAL Integraph and FMIS
 Available Format Types :
 DIGITAL
 Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Captured from descriptions provided by the AHC.
 Positional Accuracy : Mapping scales vary from 1:25,000 to 1:50,000
 Attribute Accuracy : High
 Logical Consistency : Consistent for region
 Completeness : To be reviewed during the RFA process

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
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Email Address :	Not Known		

Additional Metadata

Title : Karri Development Stage

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : This data set describes the interpreted 'stand-development stage' of karri dominant forest derived from 1:25,000 scale colour print photography. Karri dominant forest was identified from existing FMIS records of forest type and excludes areas dominated by marri and any associations of red tingle. Even-aged regrowth (uncut or cutover) was identified from existing records and removed from further interpretation.

The overall range of stand age for the whole forest was determined by applying stand development stage proportions, of the photo interpreted area, and adding these to areas of previously determined age.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -34.4683, 114.9531, -32.6815, 116.8720, -35.1250,
 115.4635, -33.9049, 117.9086 South West Forest Regi

Currency and Status

Beginning Date :	01 Jan 1993	Progress :	Complete
Ending Date :	01 Sep 1996	Maintenance and	Not Planned
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : DIGITAL FMIS
 Available Format Types :
 DIGITAL DXF
 NON DIGITAL
 Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Karri dominant forest was identified from existing FMIS records of forest type. Uncut forest and the even-aged regrowth was identified from existing records (age based on historical record or ring counting) and excluded from further analysis. The remaining forest (approximately 95,000 ha) was interpreted for 'stand development stage' from 1:25,000 colour print photography.

Development stages for karri are nominally: establishment (approx 0-8 years), juvenile (8-25 years), immature (25-120), mature (120-250), senescent (250+). All establishment and juvenile stages were aged and are within cutover forest. Immature was differentiated from mature on the basis of crown size and texture. Mature was differentiated from senescent when gaps in the canopy of mature trees were beginning to regenerate. The condition of individual crowns was unreliable.

Karri age was derived using the following method: stand development stage is defined as the development stage of the oldest 'significant' cohort, exceeding 25%, i.e. the dominant cohort. This was done from 1:25,000 color aerial photo prints taken in 1993. The output theme recorded in FMIS shows 10% crown cover classes over 30% for immature, mature and senescent.

Age was related to development stage using samples taken within these stands to estimate the age of the dominant cohort. Age was estimated using a regression of stand age v diameter of dominant trees. The regression was developed from ring counting of a sample of 58 trees > 100 years old. Separate regressions were used for two site qualities.

Seventy stands were sampled to estimate stand age. At each stand, site index was measured and a sample of three dominant trees used for age estimation. Site index was based on top height of oldest co-hort within the stand. The frequency of stand age within each interpreted development stage was determined from these samples.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of the points tested will fall within +/-12.5 metres.
Aerial photo interpretation was transferred onto 1:25,000 base maps.
Approximately 20 - 100 m

Attribute Accuracy : Results of the validation showed that the interpretation was consistent with the dynamics of the karri forest.

Logical Consistency : Method was consistently applied by two photo-interpreters.

Completeness : Complete for karri dominate forest on CALM managed land. The main karri belt which includes some of the central region, and all of the karri in the southern region.

Contact Information

Organisation Name : Conservation and Land Management (CALM)

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Telephone Number : 097 717 959

Facsimile Number : 097 771 901

Email Address : jackb@manji.calm.wa.gov.au

Additional Metadata

Title : Height of tallest native vegetation

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This is a derived dataset which incorporates information from Forest type (species) and API - Height Class data sets. Height of tallest native vegetation is derived from 1950's and 1960's 1:15,840 scale aerial photographs. Each forest type is assigned a height class on the basis of the tallest dominant strata (i.e ignores emergents) of the stand at maturity. In the original interpretation, height classes differ for wet and dry sclerophyll forest however in this map they have been amalgamated to produce a broad index of potential forest productivity. That is, the tallest jarrah and the shortest karri class have been combined into one class (25-40m). These height classes conform with the productivity classes of the National Forest Inventory. The mapping covers only the eucalypt forest.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8383, -31.0188
 114.9370, -31.0188 117.8383, -35.1172 114.9370
 -33.0300 115.2439, -33.0300 116.8822, -31.0215
 115.2439, -31.0215 116.8822, -33.0300 115.2439

Currency and Status

Beginning Date :	01 Jan 1950	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	Not Planned
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : NON DIGITAL Published map at 1:600,000 scale
Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF
Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data derived mostly from from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions are National Parks and reserves not formerly of Forest Department jurisdiction. Data capture and interpretation of new CALM areas was carried out opportunistically using the best available data in terms of date and scale.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
 Resolution of data on FMIS 2 ha.

Attribute Accuracy : Approximately 10 metres.

Logical Consistency : Method used to assign height classess was consistent applied.

Completeness : Mapping only covers eucalypt forests in the south west forest region with trimming of the Swan region on the eastern extreme. Inclusion of small area of south coast.

Contact Information

Organisation Name : Conservation and Land Management (CALM)

ANZLIC Page 0 Directory Items - Detail Report

Position :	Manager, Forest Management Branch		
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Email Address :	jackb@manji.calm.wa.gov.au		

Additional Metadata

Title : Forest Type (species)

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : This data set describes the forest type (species) for native species in the upper strata of a forest stand. It is one of a set of five themes which describe forest structure derived from aerial photograph interpretation spanning from 1951 to 1965 for the production of the 1:25,000 A.P.I map series. This data set is regularly updated to keep pace with forest and mining operations such as clearing, rehabilitation and reforestation.

In general, forest type is related to the dominant overstorey species (i.e. crown cover greater than 25%) or in mixed stands the co-dominant overstorey species where identified. The Forest type theme also identifies non-timber areas such as swamps, rocks and agricultural clearing.

In recent years the coverage has been extended to areas not previously mapped. This was done using a combination of field work and aerial photographs. Updates and refinements to the original mapping has also been carried out in the Wandoo forests of the Swan region, and pure Karri in the Southern forest region.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	Complete
Ending Date :	Current	Maintenance and	As required
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : NON DIGITAL A.P.I published map series at 1:25,000 scale

Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : The data was derived mostly from from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions are National Parks and reserves not formerly part of Forest Department jurisdiction. Data capture and interpretation of new CALM gazetted areas was carried out opportunistically using the best available data in terms of date and scale.

Refinements to forest type for Wandoo was done in the 1960's using extensive road reconnaissance, aerial photographs and land form relationships.

Data related to forest type is updated on a regional basis, to keep pace with clearing, rehabilitation and reforestation as a result of forest and mining operations.

There are variations in the amount of detail shown for species mixes between the Northern, Central and Southern forest management regions. The attribute list shown below is for the southern forest region.

Title : Dieback occurrence mapped pre-1976 photography

Custodian Details

Name : Conservation and Land Management-(CALM)
 Jurisdiction : Western Australia

Description

Abstract : Broad scale (1:40,000) aerial photograph interpretation for dieback (*Phytophthora cinnamomi*) infected areas. Method was used to locate areas showing advanced symptoms of tree death from dieback. Air photo scale is too broad to be used for detection of initial infestations in the understorey.

The results of this exercise were used to assist in determination of Disease Risk Areas - which are subsequently managed to minimise the spread of the disease.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1973	Progress :	Complete
Ending Date :	01 Jan 1976	Maintenance and Update Frequency:	Not Planned
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : DIGITAL FMIS
 Available Format Types :
 DIGITAL DXF
 NON DIGITAL
 Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : First attempt at defining the spatial extent of dieback occurrence. Areas are labelled as having dieback present, absent or suspected. This information was used to develop a management plan for minimising the spread of the fungus by application of specific management prescriptions.
 Positional Accuracy : Originally mapped on imperial scale maps and later translated to 1:50,000 scale hard copy maps with an accuracy of +/- 50 metres.
 Attribute Accuracy : Variable, depending on the level of infection.
 Logical Consistency : The method was consistently applied to the area.
 Completeness : Complete for the south west forest region on all crown land.

Contact Information

Organisation Name :	Conservation and Land Management (CALM)		
Position :	Manager, Forest Management Branch		
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Telephone Number :	097 717 959	Facsimile Number :	097 771 901
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Title : Dieback occurrence mapped from post 1976 photography

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : Occurrence of dieback (*Phytophthora cinnamomi*) derived from large scale aerial photography (1:4,500) and field data. The presence of dieback is identified by the death or senescence of particular indicator species in the understorey. Indicator species are those particularly susceptible to the disease and include: *Xanthorea* sp, *Banksia grandis* and *Pattersonia* sp.

Information on the presence or absence of the disease is used for forest management purposes. Infected areas are managed specifically to reduce the impact of disease spread as a result of forest operations.

This dataset is updated as required prior to forest operations viz. roading, logging, mining. As information is collected, new data supercedes information mapped pre 1976.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1976	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : DIGITAL FMIS
 Available Format Types :
 DIGITAL DXF
 Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Dieback occurrence is derived as required for forest operations and includes two types of sampling:
 1. Large scale colour photography 1:4,500; and 2. Intensive ground survey. Usually the two are done in conjunction but when photography is not feasible the ground survey will be done on its own.
 CALM officers involved in the photo interpretation will also do the field work. When possible dieback infection is identified from the photography, officers will travel to the field to locate the dead or dying plant(s). The cause of death is determined by taking a sample of the root which is sent to a laboratory for a positive identification.

When the presence of dieback is confirmed in an area, a localised disease risk map will be drawn up showing contours, vegetation and soil. The disease risk map is used to identify possible impacts from forest operations. These maps are updated only as required for a given forest operation i.e. roading, logging, mining etc. This information is updated and maintained on a regional basis.

Positional Accuracy : 15 - 20 metres
 Attribute Accuracy : Very high - using field and laboratory verification described above
 Logical Consistency : Method is closely monitored for consistency across the region. ALCOA is also monitored for mining operations.
 Completeness : Mapped only for areas where forest operations will occur.

Title : Associations of Forest trees

Custodian Details

Name : Conservation and Land Management (CALM)
 Jurisdiction : Western Australia

Description

Abstract : This data set is a set of three published maps at 1:250,000 scale showing species associations in forest and woodland areas. Data is derived from Forest Type (species), and A.P.I total density stored in the FMIS (Forest Management Information System) database. Non forest areas are also identified.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	Complete
Ending Date :	01 Jun 1996	Maintenance and Update Frequency:	Not Planned
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : NON DIGITAL Set of three published maps at 1:250,00 scale

Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Source data data mostly from from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Supplementary mapping has refined the species associations and extended the API coverage.

Association of Forest trees was derived from Forest type (species) and A.P.I. density information and compiled using the FMIS grid based GIS.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
 Published scale: 1:25,000
 Resolution of data on FMIS 2 ha.

Attribute Accuracy : Related to the accuracy of identifying forest types from A.P.I. and tree density. Accuracy for tree density is approximately 10%.

Logical Consistency : Consistently derived for most crown land.

Completeness : Data set excludes eastern extreme of the Swan region and includes part of the South Coast region for map presentation.

Contact Information

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Additional Metadata

Title : Aerial Photograph Interpretation - Upper Strata Density

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This data set describes the projective crown cover (for opaque crowns) - for trees occurring in the upper strata, in multi-storey stands classified as either Pole Forest or Sapling Forest from A.P.I Forest Type. This data is one of a set of five themes which describe the forest structure derived from aerial photograph interpretation spanning from 1951 to 1965 for the production of the 1:25,000 A.P.I map series. Although the detail may now be out of date no attempt has been made to update it. The detail may describe the stand structure after logging and silviculture treatment.

Search Words :
PHOTOGRAPHY AND IMAGERY
Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
-35.1172 114.9370, -35.1172 117.8381, -31.0188
114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	In Progress
Ending Date :	Current	Maintenance and	As required
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : NON DIGITAL A.P.I. published map series at 1:25,000

Available Format Types :
DIGITAL FMIS
DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data derived mostly from from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions consist of National Parks and reserves not formerly of Forest Department jurisdiction. Data capture and interpretation of new CALM areas was carried out opportunistically using the best available data in terms of date and scale.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
published scale: 1:25,000
Resolution of data on FMIS 2 ha.

Attribute Accuracy : For Karri 5% and Jarrah 10%

Logical Consistency : Consistently derived for whole South West. Attempts made with newer imagery to keep method consistent with original interpretation.

Completeness : Complete for all CALM managed areas and most other crown lands tenures. Areas of crown land not covered occur mainly in the Swan district and include outlying reserves non-contiguous with the main forest estate.

Contact Information

Organisation Name : Conservation and Land Management (CALM)
Position : Manager, Forest Management Branch

ANZLIC Page 0 Directory Items - Detail Report

Mail Address 1 :	Jack Bradshaw	State :	WA
Mail Address 2 :	Brain Street	Country :	Australia
Suburb or Locality :	Manjimup	Post Code :	6258
Telephone Number :	097 717 959	Facsimile Number :	097 771 901
Email Address :	jackb@manji.calm.wa.gov.au		

Additional Metadata

Title : Aerial Photograph Interpretation - Total Density

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This data set describes the projective crown cover (for opaque crowns) - for all trees occurring in a forest stand. This data is one of a set of five themes which describe the forest structure derived from aerial photograph interpretation spanning from 1951 to 1965 for the production of the 1:25,000 A.P.I map series. Although the detail may now be out of date, no attempt has been made to update it. The detail however, is considered to be indicative of site potential.

Search Words :
PHOTOGRAPHY AND IMAGERY
Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
-35.1172 114.9370, -35.1172 117.8381, -31.0188
114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	In Progress
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : NON DIGITAL A.P.I. published map series at 1:25:000

Available Format Types :
DIGITAL FMIS
DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data derived mostly from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce the 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions consist of National Parks and reserves not formerly but of Forest Department jurisdiction. Data capture and interpretation of new CALM areas was carried out opportunistically using the best available data in terms of date and scale.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
published scale: 1:25,000
Resolution of data on FMIS is = 2 ha.

Attribute Accuracy : Within 10%

Logical Consistency : Consistently derived for the whole South West of WA. Attempts have been made with newer imagery to keep the method consistent with original interpretation.

Completeness : Complete for all CALM managed areas and most other crown lands tenures. Areas of crown land not covered by this data set occur mainly in the Swan district and include outlying reserves non-contiguous with the main forest estate.

Contact Information

Organisation Name : Conservation and Land Management (CALM)
Position : Manager, Forest Management Branch
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ANZLIC Page 0 Directory Items - Detail Report

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Additional Metadata

Title : Aerial Photograph Interpretation - Stand Type

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This data set describes the structure of a forest stand in terms of the number of strata present. It also provides a current indication of past logging and used in conjunction with other A.P.I. - upper strata density will indicate the intensity of logging. Stands are classified as either single-storey Massed Forest or two storey Pole or Sapling Forest.

This is one of a set of five themes which describe the forest structure derived from 1:15,840 scale aerial photograph interpretation spanning from 1951 to 1965 used in the production of the 1:25,000 A.P.I. published map series.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	In Progress
Ending Date :	Current	Maintenance and	As required
Metadata Date :	25 Jan 1999	Update Frequency:	

Access

Stored Data Format : NON DIGITAL A.P.I. Published map series at 1:25:000 scale

Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data derived mostly from from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions consist of National Parks and reserves not formerly but of Forest Department jurisdiction. Data capture and interpretation of new CALM areas was carried out opportunistically using the best available data in terms of date and scale.

Earlier interpretations did not attempt to identify multi-storey stands and were mainly confined to unlogged areas. In 1959 a decision was made to extend classification to describe multi-storey stands in areas where forest operations had occurred. This decision rule was later applied to all mapped stands.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
 Published scale: 1:25,000
 Resolution of data on FMIS 2 ha.

Attribute Accuracy : Forest type based on A.P.I. Stand density is to within 10%

Logical Consistency : Consistently derived for whole South West. Attempts have been made with newer imagery to keep the method consistent with original interpretation.

Completeness : Complete for all CALM managed areas and most other crown lands tenures. Areas of crown land not covered occur mainly in the Swan district and include outlying reserves non-contiguous with the main forest estate.

Contact Information

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Position : Manager, Forest Management Branch
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Additional Metadata

Title : Aerial Photograph Interpretation - Height Class

Custodian Details

Name : Conservation and Land Management (CALM)
Jurisdiction : Western Australia

Description

Abstract : This data set describes the potential height of native species based on the codominant height of a stand at maturity. It is one of a set of five themes which describe the forest structure derived from aerial photograph interpretation spanning 1951 to 1965 for the production of the 1:25,000 A.P.I map series. No attempt has been made to update height classification, however it is still considered to be indicative of site potential even after forest operations have altered the original forest.

Different height classes are assigned to karri than for other species such as jarrah, marri and blackbutt.

Search Words :
 PHOTOGRAPHY AND IMAGERY
 Aerial Classification

Geographic Extent Names :

Geographic Extent Polygons :
 -35.1172 114.9370, -35.1172 117.8381, -31.0188
 114.9370, -310.188 117.8381, -35.1172 114.9370

Currency and Status

Beginning Date :	01 Jan 1951	Progress :	Complete
Ending Date :	Current	Maintenance and Update Frequency:	As required
Metadata Date :	25 Jan 1999		

Access

Stored Data Format : NON DIGITAL A.P.I. published map series at 1:25,000 scale.

Available Format Types :
 DIGITAL FMIS
 DIGITAL DXF

Access Constraints : The digital data is available only with prior written permission of the custodian.

Data Quality

Lineage : Data derived mostly from 1950's and 1960's aerial photographs captured at a scale of 1:15,840. Data was interpreted by the former WA Forest Department to produce 1:25,000 A.P.I map series. Since the merger of the Forest Department into CALM, map coverage has been extended to cover the CALM estate shown in the Forest Management Plan (1994). Recent inclusions consist of National Parks and reserves not formerly part of Forest Department jurisdiction. Data capture and interpretation of new CALM areas was carried out opportunistically using the best available data in terms of date and scale.

Positional Accuracy : Conforms to 1:25,000 map accuracy standard where 90% of points tested will fall within +/- 12.5 metres.
 Published scale: 1:25,000
 Resolution of data on FMIS is = 2 ha.

Attribute Accuracy : Approximately 5 m for Jarrah and 10 m for Karri.

Logical Consistency : Consistently derived for whole South West. Attempts have been made with newer imagery to keep the method consistent with original interpretation.

Completeness : Complete for all CALM managed areas and most other crown lands tenures. Areas of crown land not covered by this data set occur mainly in the Swan district and include outlying reserves non-contiguous with the main forest estate.

Contact Information

Contact Information

Organisation Name : Conservation and Land Management (CALM)
Position : Manager, Forest Management Branch
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Additional Metadata

