

# **NATIVE VEGETATION EXTENT BASELINE AND MONITORING FOR TASMANIA**

## **Final Project Report**

DPIW1 – P331

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**Native Vegetation Extent  
Baseline and Monitoring for  
Tasmania  
(DPIW1 – P331)**

**Final Project Report  
to the  
National Land & Water  
Resources Audit**

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# 1 Executive Summary

The 'Native Vegetation Extent Baseline and Monitoring for Tasmania' project has successfully completed and extended the predecessor 'Monitoring Vegetation Extent' project (MVEP).

The current project has implemented statewide the change detection methodology developed and trialed in the MVEP, to generate information on vegetation change from the time of TASVEG mapping up to 2005 (TASVEG\_change\_2005 dataset). A detailed methods/ instructions document is available for the change detection process, as is a Technical Report on the Trial.

Change data was intersected with current TASVEG mapping to create a provisional\_TASVEG\_2005 vegetation extent baseline with an 'as at' date of 2005. This represents the first extent baseline for Tasmania. From this dataset, summary statistics were generated that described the extent (in hectares) of native vegetation, non-native vegetation and non-vegetation at a statewide, IBRA (5.1), NRM and catchment level. The provisional\_TASVEG\_2005 dataset and summary statistics were release to NLWRA on 1 December 2007.

The provisional\_TASVEG\_2005 dataset was later refined to produce the TASVEG\_2005 extent baseline, and this improved dataset has been used to generate revised summary statistics describing: the extent (in hectares) and the percent total area of native vegetation for the state, IBRA (6.2) and NRM regions.

Limitations of the provisional\_TASVEG\_2005 and TASVEG\_2005 datasets are described in detail in the accompanying Final Technical Report.

This work has to improved the State's ability to report against M&E indicators and has provided the basis for a system of reporting on changes in native vegetation extent at appropriate intervals.

Implementation of this system to facilitate the development of an ongoing change detection program to comply with State and other National reporting requirements will require further effort.

## 1.1 Background

The Executive Steering Committee for Australian Vegetation Information (ESCAVI) has recommended a set of indicators under the National Monitoring and Evaluation Framework (NM&EF) covering the Matter for Target – "Native Vegetation Communities Integrity, Native Vegetation Extent and Distribution". The NRM Policies and Programs Committee has endorsed these indicators. They include –

1. The extent of present native vegetation by IBRA subregion (measured in hectares)
1. The extent of each priority native vegetation type by IBRA subregion (measured in hectares)
2. The remaining proportion of each priority native vegetation type in each IBRA subregion measured as a percentage of the estimated pre-1750 extent.

Initial discussions with ESCAVI members regarding the capacity to report against indicator 1 suggest that existing vegetation mapping and inventory data bases (including the nationally collated NVIS database) are not suitable. This relates mainly to the databases reflecting current knowledge of vegetation systems, rather than being monitoring systems. As such, temporal comparisons between collations show changes in the information base rather than real on ground changes to native vegetation.

Queensland is currently the only state/territory that has a native vegetation extent monitoring system in place. All other jurisdictions have expressed a need to further develop their vegetation mapping databases such that a baseline of native vegetation extent and distribution can be expressed. This baseline is essential for both setting and measuring progress toward regional

targets. The Audit requires a consistent baseline to be provided by all the jurisdictions such that national monitoring and reporting can be undertaken.

The Department of Primary Industries and Water (DPIW) has also recognised a growing need to monitor change in the extent of native vegetation in Tasmania. To build capacity in the State's ability to detect, document and report on changes in native vegetation extent, DPIW has funded a project that has developed a system to report on changes in native forest extent and facilitated the development of an ongoing change detection program in compliance with State reporting requirements. Recurrent funding has been supplemented by funding (\$70,000) from the National Land and Water Resources Audit to extend the scope across all vegetation. The Tasmanian Vegetation Monitoring and Mapping Program's (TVMMP's) Monitoring Vegetation Extent Project (MVEP) has developed a documented and accepted method to detect vegetation change in Tasmania and has successfully applied this method to detect change in our native forest over the interval 2000 to 2005. This change data has been applied to RFA mapping to provide a 2005 forest extent baseline for use in Sustainability Indicators reporting.

The Native Vegetation Extent Baseline and Monitoring for Tasmania project (Audit project) has extended the work begun by the MVEP, generating the non-forest vegetation change component and producing an extent baseline for 2005 that encompasses all vegetation types statewide.

Summary statistics for native vegetation, non-native vegetation and non-vegetation have been generated for the whole of Tasmania, as well as for a number of different regionalisations within the state. A process for the delivery of results through direct on-line services (web map and web feature) is being progressed.

## **1.2 Reason for Closing the Project**

The outputs for this project have been delivered and the closing date has been reached.

## **1.3 Highlights and Innovations**

The current project and its predecessor have successfully generated an 'as at' 2005 native vegetation extent baseline for Tasmania, improving the capacity for national monitoring and reporting of native vegetation extent and distribution. The TASVEG\_2005 extent baseline dataset represents the first vegetation extent baseline produced for the state.

A detailed and accepted method that uses satellite imagery to detect vegetation change over a five-year period has been developed, trialed and implemented across the State. A TASVEG\_change\_2005 dataset, which captures vegetation change up to 2005, is available.

Accompanying documentation includes a detailed methods document for the change detection process and technical reports on the trial and statewide implementation of the method.

## 1.4 Summary of Recommendations

- 1.4.1 It is recommended that unexpended project funds are used to bed down the processes developed during this project and its predecessor (2.6.1)
- 1.4.2 A formal accuracy assessment of the results for the statewide processing is recommended (2.6.2)
- 1.4.3 It is recommended that the TASVEG\_2005 vegetation extent dataset is used to update TASVEG mapping to increase the spatial accuracy of the latter and to facilitate the production of future extent baselines (2.6.3)
- 1.4.4 A review/edit of the tools developed to ensure improved consistency and logic of attributes (2.6.4)
- 1.4.5 Improve FPP matching (2.6.5)
- 1.4.6 Improve automatic validation through PI-type and plantation datasets (2.6.6)
- 1.4.7 Ensure ongoing access to imagery (2.6.7)
- 1.4.8 Review of available resourcing to ensure recruitment and retention of skilled staff (2.6.8)
- 1.4.9 Formal endorsement of methodology to facilitate policy acceptance of TASVEG for future Sustainability Indicators reporting (2.6.9)
- 1.4.10 A planned review of the TVMMP is completed to advise strategic direction for change monitoring and reporting (2.9.1)
- 1.4.11 The Steering Committee be reconvened to focus on the processes required to set up a program for ongoing change monitoring and reporting (2.9.2)
- 1.4.12 The Stakeholder Reference Group be reconvened to ensure continued stakeholder engagement (2.9.3)
- 1.4.13 A Technical Reference Group is formed to guide the technical requirements for ongoing change monitoring and reporting (2.9.4)
- 1.4.14 The project manager is responsible for managing the review of the TVMMP for best vegetation extent measurement and reporting outcomes (3.1.1)
- 1.4.15 The project manager is responsible for reconvening the Steering Committee, stakeholder and technical groups to guide ongoing change monitoring and reporting (3.1.2)
- 1.4.16 The Native Vegetation Extent Baseline and Monitoring for Tasmania project should now be deemed closed (3.1.3)

## 2 Project Performance

The objective of this project was to improve the State's ability to detect, document and report on changes in native vegetation extent against a number of indicators under the National Monitoring and Evaluation Framework covering the Matter for Target Native Vegetation Communities Integrity, Native Vegetation Extent and Distribution. This project's focus was to address only the initial information products for the first Native Vegetation Indicator – Extent of native vegetation by IBRA subregion (measured in hectares) through its input into the development of a nationally consistent baseline of the extent and distribution of native vegetation.

The project aimed to extend the work commenced during the forest change component of the predecessor project to develop and implement a system to report on changes in naive vegetation extent at appropriate (5 year) intervals, and to facilitate the development of an ongoing change detection program to comply with State and other National reporting requirements.

### 2.1 Performance against Objectives

The objective to improve the State's ability to report against M&E indicators has been achieved through the development of the nationally consistent TASVEG\_2005 vegetation extent baseline and summary statistics for the extent and distribution of native vegetation generated from this dataset. Delivery of the above data through Australia's Resources Online was not achieved, although effort external to this project is expected to result in achievement of this objective post-project closure.

The objective to extend the work commenced during the forest change component of the predecessor project to develop a system to report on changes in native vegetation extent at appropriate (5 year) intervals was achieved by completion of the non-forest change component and the integration of change data with TASVEG mapping to produce an initial vegetation extent baseline for Tasmania.

The objective of implementing this system to facilitate the development of an ongoing change detection program to comply with State and other National reporting requirements requires further effort, which will be guided by outcomes of an intended review of the TVMMP.

### 2.2 Performance against Outcomes

Three main target outcomes were planned for this project. Performance against each planned outcome is as follows:

- **Improved ability to measure the extent and distribution of major native vegetation types over time in Tasmania.**

The outcome of improved ability to measure the extent and distribution of major vegetation types over time in Tasmania was achieved through development of a methodology that enabled production of the TASVEG\_2005 dataset, which provides a snapshot of the extent and distribution of all vegetation at a statewide level 'as at' 2005, and the TASVEG\_change\_2005 dataset, which captures vegetation change from the time of mapping to 2005 and provides a snapshot of change between 2000 and 2005. An ongoing capacity for these measurements over time requires further development, which will be guided by outcomes of an intended review of the TVMMP.

- **Improved ability to report against a number of indicators under the National Monitoring and Evaluation Framework covering the Matter for Target – “Native Vegetation Communities Integrity, Native Vegetation Extent and Distribution”**

The outcome of improved ability to report against M&E indicators was achieved through development of a methodology that enabled production of the TASVEG\_2005 dataset. This dataset provides a snapshot of the extent and distribution of all vegetation at a statewide level 'as at' 2005 and provides summary statistics for native vegetation, non-native vegetation and non-vegetation for the whole of Tasmania, as well as for each of the three Tasmanian NRM regions, and for IBRA 6.1 bioregions, fulfilling the requirement for national M&E indicator reporting. The dataset also has the capacity for reporting to the level of vegetation community type. An ongoing capacity for reporting against M&E indicators requires further development, which will be guided by outcomes of an intended review of the TVMMP.

- **Improved capacity to provide reliable information regarding the extent and distribution of major native vegetation types over time in Tasmania in compliance with State and National reporting requirements**

The outcome of improved capacity to provide reliable information regarding the extent and distribution of major native vegetation types over time in Tasmania was achieved through development of a methodology that enabled production of the TASVEG\_2005 dataset, which provides a snapshot of the extent and distribution of all vegetation at a statewide level 'as at' 2005, and the TASVEG\_change\_2005 dataset, which captures vegetation change from the time of mapping to 2005 and provides a snapshot of change between 2000 and 2005. An ongoing capacity for provision of this information over time requires further development, which will be guided by outcomes of an intended review of the TVMMP.

## 2.3 Performance against Outputs

- **A statewide digital layer indicating where change in native forest and non-forest vegetation extent has occurred between 2000 and 2005**

This output has been delivered within revised project timeframes. A TASVEG\_change\_2005 dataset has been produced which provides change in extent of native forest and non-forest vegetation between 2000 and 2005 for the whole of Tasmania.

- **A provisional statewide digital layer indicating extent of native vegetation as at 2005 (provisional\_TASVEG\_2005). (ie pixelated change polygons over TASVEG)**

This output has been delivered within revised project timeframes. A provisional\_TASVEG\_2005 dataset was developed. This dataset was achieved through integration of TASVEG\_change\_2005 dataset with TASVEG 1\_3. This dataset provides a snapshot of the extent and distribution of all vegetation at a statewide level 'as at' 2005.

- **An integrated statewide digital layer (at best scale) indicating extent of native vegetation as at 2005 (TASVEG\_2005) (ie change polygons integrated into TASVEG by digitising appropriate high resolution imagery)**

This output has been delivered within revised project timeframes. An upgraded 2005 vegetation extent dataset (TASVEG\_2005) was developed, although the level of improvement in the spatial resolution of polygons was less than anticipated. The provisional\_TASVEG\_2005 dataset was unable to be substantially upgraded as intended through replacement of LandSat-generated change polygons with polygons from appropriate high-resolution imagery. The ability to improve the dataset by the intended method was hindered by a lack of high-resolution imagery of an appropriate time period, and by the inherent coarseness of the polygons derived from the change mapping, which corresponded only poorly with polygons from high-resolution imagery such as Quickbird. The provisional\_TASVEG\_2005 dataset was, however, improved through resolution of a number of issues inherent in this provisional dataset. These are documented in detail in the accompanying technical report on the statewide implementation of the method and summarised below.

- **Extent area calculations by agreed summary regions (eg Statewide, IBRA, NRMs, Catchments)**

This output has been delivered within revised project timeframe. Provisional summary statistics for native vegetation, non-native vegetation and non-vegetation were generated for the whole of Tasmania, as well as for each of the three Tasmanian NRM regions, and for IBRA 5.1 bioregions using the provisional\_TASVEG\_2005 dataset.

Revised summary statistics for native vegetation (including natural bare and natural water) were generated for the whole of Tasmania as well as for each of the three Tasmanian NRM regions, and for IBRA 6.2 bioregions using the improved TASVEG\_2005 dataset.

The TASVEG 2005 dataset also has the capacity for reporting at the level of vegetation community type, although these were not a required output of this project and have not been supplied at this time.

- **Web service ready products for reporting through Australia's Resources Online**

This output has not been achieved within project time frame. A process for the delivery of results through direct on-line services (web map and web feature) is being progressed by the Information and Land Services (ILS) Division of DPIW. Problems with the existing ILS web map server supporting re-projection to latitude/longitude have resulted in delays in progress against this output. ILS has done preliminary testing on a potential replacement mapserver, and positive results of this testing will result in replacement of the current mapserver for all web map services and web feature services provided by LIST. ILS has indicated that the TASVEG dataset will be made available as a web map service when the service becomes operational.

## 2.4 Performance against Schedule

The project was extended by two months from the original project schedule, with original Milestones 2 (Preliminary dataset based on existing mapping delivered through web services – 6/8/2007) and 3 (Delivery of provisional\_TASVEG\_2005 extent mapping and summary statistics table; Delivery of web services to Audit – 7/1/2008) collapsed into a single Milestone with a due date of 1/12/2007. This schedule change was approved due to problems with project staff turnover and project scheduling issues, and to the problems in developing web map services and web feature services through ILS as described above.

Not all key activities for Milestone 2 were completed within the required timeframe. While delivery of provisional\_TASVEG\_2005 extent mapping and summary statistics table to the Audit were achieved by the milestone date of 1/12/2007, continuing issues with delivery of web services to the Audit (as described above) will necessitate completion of this activity outside the project timeframe through continued liaison between the project manager and ILS.

All key activities for Milestones 3 and 4 have been achieved within the agreed timeframes, although, as described above, the degree of improvement of the final TASVEG\_2005 dataset over the provisional\_TASVEG\_2005 dataset is somewhat less than anticipated.

## 2.5 Performance against Budget

The budget provided for this project has been considerably under-expended (\$10,000). This under-expenditure is a direct result of delays experienced in recruitment of suitably experienced staff to the project, project staff turnover and project scheduling issues. It is intended that \$10,000 will be carried forward to further the project objectives to establish capacity for an ongoing program of measurement and reporting by bedding down project outputs.

## 2.6 Recommendations

- 2.6.1 It is recommended that unexpended project funds (\$10,000) are carried forward to bed down the processes developed during this project and its predecessor and increase the capacity for an ongoing program of measurement and reporting by resourcing, where possible, the implementation of the following recommendations.
- 2.6.2 A formal assessment of the results for the statewide processing is recommended to inform improvements to the TASVEG dataset, and to guide any review of the change detection methodology. An accuracy assessment for the trial produced positive results, showing that no change was omitted in the sample area. However, no formal accuracy assessments were completed for the statewide implementation. A quick visual accuracy assessment conducted on completion of the statewide change layer against the results from the trial data indicated that, while the overall results were acceptable, some non-forest change polygons appeared to have been omitted.
- 2.6.3 It is recommended that the TASVEG\_2005 vegetation extent dataset is used to update TASVEG mapping to increase the spatial accuracy of the latter and to facilitate the production of future extent baselines. A range of issues identified for the TASVEG\_2005 dataset and documented in the 'Final Technical Report of the Project' need to be addressed to ensure that dataset is as accurate as possible. Issues identified include a statistical analysis component for patches of polygons 1-20ha, the lack of field validation of change polygons, the likely shortfall in the amount of change detected under areas of cloud, and the inability to attribute a number of change polygons with the new TASVEG codes where change was very recent.
- 2.6.4 A review/edit of the tools developed is required to ensure more consistent and logical change attribution (ie if something is labelled "Does not appear to be change" then it cannot have validated attributes).
- 2.6.5 There was some success with the automated use of ancillary data to validate the change layer, although there is potential for this to be improved to reduce the number of polygons that require manual validation. The FPP data resulted in many mismatches and ambiguities, and also contained many positional errors.
- 2.6.6 Improve automatic validation through PI-type and plantation datasets to reduce the amount of polygons with New\_tasveg = XXX.
- 2.6.7 Ensure ongoing access to imagery. Ongoing access to Landsat Imagery at no cost through AGO will need to be established. Ongoing access to relevant high-resolution imagery such as Quickbird and orthorectified digital aerial photographs will need to be investigated to facilitate validation of change data.
- 2.6.8 Ensure that the planned review of TVMMP looks at resources available to ensure recruitment and retention of skilled staff
- 2.6.9 Progress the formal endorsement of methodology to facilitate policy acceptance of TASVEG for future Sustainability Indicators reporting

# Lessons Learnt

## 2.7 What Worked Well?

The support provided by the Steering Committee to this project and its predecessor made a positive and significant contribution to the successful outcome of the project. For the current project in particular, out of session strategic advice from Felicity Faulkner, Spatial Analyst with the Conservation Policy and Planning Branch of this Agency, was available to assist in the timely completion of some major milestones.

Advice provided by the Stakeholder Reference Group to the predecessor project was extremely valuable in ensuring acceptability of project outputs.

Advice provided by the Technical Reference Group to the predecessor project was critical to development of the change detection methodology underpinning the outputs of this project.

An early workshop initiated by the NLWRA to discuss vegetation extent with invited experts from the other states and territories was valuable in setting the direction and scope of this project. Regular feedback from Peter Wilson, the Data & Information Coordinator for the NLWRA, has facilitated the timely completion of the majority of project milestones through adjustment of the project schedule to accommodate earlier difficulties in project staffing.

## 2.8 What could be improved?

No meetings of the Steering Committee and Stakeholder Reference Group were held for the current project. A longer than ideal time-gap between the predecessor project and the current project due to difficulties described above in recruitment and retention of suitably experienced staff, meant that the momentum gained through more regular meetings of these groups was diminished for this project. Delays in project start date and the lack of a dedicated project officer seriously limited the amount of time resources that could be dedicated to convening and reporting to meetings of these groups. Nevertheless, out of session advice from the Steering Committee members was sought as required, particularly from Felicity Faulkner, Spatial Analyst with the Conservation Policy and Planning Branch of this agency.

## 2.9 Recommendations

- 2.9.1 A planned review of the TVMMP is completed to advise strategic direction for change monitoring and reporting and address resource requirements for these activities.
- 2.9.2 It is strongly recommended that the Steering Committee be reconvened at the earliest possible time to focus on the processes required to set up a program for ongoing change monitoring and reporting. This should be directly guided by outcomes of the planned review of the TVMMP.
- 2.9.3 It is also recommended that the Stakeholder Reference Group be reconvened to ensure continued stakeholder engagement in the above process.
- 2.9.4 It is recommended that a Technical Reference Group, which would ideally include experienced remote sensing practitioners and database managers, is formed to guide the technical requirements of a program for ongoing change monitoring and reporting.

### 3 Closure Activities

- There has been a high turnover of staff during this project. The project currently employs one GIS officer on a DPIW fixed term contract, and an additional external contractor. The external contract is completed with production of TASVEG 2005 extent baseline. It is intended that the fixed term GIS position is extended using funds carried forward.
- There are unexpended funds (\$10,000). It is intended that funds are carried forward to extend the fixed term GIS position for the purpose of bedding down the processes developed during this project and its predecessor and increase the capacity for an ongoing program of measurement and reporting.
- Web map and web feature services: continuing issues with delivery of web services to the Audit will necessitate completion of this activity outside the project timeframe through continued liaison between the project manager and ILS.
- Web map and web feature services: risk that delivery of web services to the Audit will not be possible via ILS. Project manager is responsible for monitoring this risk.
- No assets were acquired by this project.
- Data (shapefiles) and other documents (metadata, minutes, reports, business plans, images, spreadsheets, databases etc) generated through this project and its predecessor project are stored as electronic documents on the DPIW V: drive at V:\MVEP. Electronic documents (other than GIS layers) are also stored on DPIW's Document One System (File Reference: NH-NH-RS-104332).
- The project manager is responsible for managing the review of the TVMMP to ensure that ongoing needs of a system of measurement and reporting of vegetation extent and change in extent are considered fully.
- The project manager is responsible for reconvening the Steering Committee to focus on the processes required to set up a program for ongoing change monitoring and reporting. The project manager is also responsible for reconvening, when appropriate, stakeholder and technical groups to ensure continued stakeholder engagement and to guide the technical requirements for ongoing change monitoring and reporting.

### 3.1 Recommendations

- 3.1.1 The project manager is responsible for managing the review of the TVMMP to ensure that ongoing needs of a system of measurement and reporting of vegetation extent and change in extent are considered fully.
- 3.1.2 That the project manager is responsible for reconvening the Steering Committee to focus on the processes required to develop a program for ongoing change monitoring and reporting. The project manager is also responsible for reconvening, when appropriate, stakeholder and technical groups to ensure continued stakeholder engagement and to guide the technical requirements for ongoing change monitoring and reporting.
- 3.1.3 That the project sponsor agree that the Native Vegetation Extent Baseline and Monitoring for Tasmania project can now be deemed closed

## 4 Appendices

Appendix A: Membership of Steering, Stakeholder and Technical Groups

**Appendix A: Steering, Stakeholder and Technical Groups****Steering Committee**

Stephen Harris (Chair)	RMC
Penny Wells	RMC
John Harkin	RMC
Martin Stone	Forestry Tasmania
Fred Duncan	Forest Practices Authority
Anne Chuter	Forest Practices Authority
Felicity Faulkner	RMC

**Stakeholder Reference Group**

Alistair Graham	Tasmanian Conservation Trust
Graham Wilkinson	Forest Practices Authority
Stephen Waight	Resource Planning and Development Commission
Andy Warner	Private Forests Tasmania
Ruth Temple-Smith	Australian Government NRM
Nikki den Exter	NRM South
Richard Thackway	Bureau of Rural Sciences
Gary Richards	Australian Greenhouse Office
Leigh Walters	Tasmanian Farmers and Graziers Association

**Technical Reference Group**

Dr Arco Lucieer	Centre for Spatial Information Science, UTAS
Dr Mick Russell	Lecturer, School of Geography and Environmental studies, UTAS