

Native Vegetation net gain accounting



first
approximation
report

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Contents

Executive Summary	i
1. Policy context	1
2. Net Gain Accounting Approach	3
2.1 A diversity of types and circumstances	3
2.2 A dynamic situation combining different kinds of changes	3
2.3 A complex story that requires generalisation	4
2.4 Progressive inclusion of site-specific information	5
2.5 Consideration of strategic priorities	5
3. Contributing information	6
3.1 Current extent of native vegetation	6
3.2 Current quality of native vegetation	10
3.3 Rate of change in extent of native vegetation	11
3.4 Estimated trajectories of condition in different settings	13
4. Net Gain Accounting – first approximation	14
4.1 Summary of results	14
4.2 Key observations	17



Executive Summary

Since settlement, approximately half of Victoria's native vegetation has been cleared for agricultural and urban development, including 80% of the original cover on private land. In recent decades, in response to increasing recognition of the land protection and biodiversity conservation issues associated with this loss of native vegetation, the rate of clearing has been slowed by regulations and there has been an increasing policy focus on better management of remaining vegetation, more strategic revegetation and better offsetting of unavoidable losses.

The Government's policy objective for native vegetation - a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain - aims to address the circumstances and consequences of native vegetation management across the whole landscape.

This report provides a 'first approximation' account of progress with this objective, based on recent methodological developments that include an improved and more consistent Statewide map of native vegetation extent, and novel insights into the quality or condition of native vegetation.

Key elements of the Net Gain Accounting approach include the following:

- native vegetation is inherently dynamic and there is a need to discriminate between two overlapping narratives. In largely-intact landscapes, natural disturbances like fire and drought/flood lead to a complex mix of conditions, however the 'underlying stock' of native vegetation is generally considered to be 'stable' in that it can be expected to more-or-less recover from such disturbances (or related semi-natural disturbances like timber harvesting) without active management intervention. Methods of reporting on this narrative are still under development. In fragmented landscapes, where there has been widespread removal and on-going use of native vegetation for economic development, additional to natural disturbance drivers, native vegetation is suffering chronic and long-acting degradation problems, so the 'underlying stock' of native vegetation is generally considered to be 'declining, or at risk of decline'. These latter areas are a high priority for Government and voluntary efforts, and are the focus of this report.

- net outcomes are expressed in terms of ‘habitat hectares’ which is a scoring method that compares physical attributes at sites with reference points (benchmarks) for each vegetation type, and is designed to allow the combination of information on extent and quality, and comparison across all vegetation types.
- information on current site condition is combined with known or predicted types of land use/management, and the expected trajectories (improving, stable, declining) are expressed in terms of average annual rates (habitat hectares per year).

Whilst acknowledging the data limitations of this ‘first approximation’ analysis, the following summary figures are provided and explained in the report:

	Public Land	Private Land
Gains sub-total	+ 8,760 HHa / yr	+ 4,560 HHa / yr
Losses sub-total	- 2,860 HHa / yr	- 14,550 HHa / yr
Net Outcomes	+ 5,900 HHa / yr *	- 9,990 HHa / yr *

* due to significant uncertainties associated with the underlying assumptions, particularly about the amount of vegetation in each of the categories, these figures may be under- or over-estimates, possibly up to 20%

The report provides insights into the relative amounts and rates of positive and negative contributions. It also provides a basis for considering the strategic balance and effectiveness of programs. Changes in the **quality** of native vegetation are the major source of overall native vegetation change because they typically occur over extensive. On public land, processes that can cause on-going degradation of vegetation include weed invasions and inappropriate grazing regimes, which may arise from pest animals, excessive populations of native grazers, or licenced stock grazing. Small reserves, roadsides and river frontages are particularly affected. On private land, the same pressures exist, and there are also a range of entitled uses of native vegetation (e.g. timber for personal use, grazing and stock management) which can also lead to reduced levels of vegetation condition. Positive changes come from government programs and independent landholder activities which focus both on revegetation and on changing the management of existing native vegetation, either to actively improve site condition or to avoid further risk of damage.

Clearing of native vegetation also contributes to overall change, however given the previous extent of clearing and the regulated process for new clearing, this is no longer the largest source of native vegetation change in Victoria. A key result is that the estimated rate of clearing of **woody** native vegetation is similar if not reduced from the rate identified in an early 1990’s assessment. The cautious statement is because the two figures are not directly comparable due to changes in measurement technologies. The rate of clearing of **grassy** native vegetation is approximately 3,200 ha per year. This is the first time there has been a quantitative statewide insight into this issue, although it accords with anecdotal observations of regional staff. Most of this is due to conversion from native pasture grazing to more intensive agriculture, and this is usually in areas of lower quality native grassland.

The key issues identified in the report include:

- continuing concerns with the protection and management of endangered native grasslands;
- further effort is required to reduce the gap between the current rate of loss (particularly of site condition) and the current rate of investment in targeted incentives programs;
- addressing the current limitations to reporting by more systematic and complete capture of information on decisions and actions relating to native vegetation;
- stronger application of strategic priorities for intervention, particularly with respect to the emerging risks associated with climate change.



1. Policy Context

The Government's policy – the Native Vegetation Management Framework – released in 2002, reiterates one of the five objectives of Victoria's Biodiversity Strategy:

".....a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain."

The State Planning Policy for Conservation of Native Flora and Fauna (Clause 15.09) in the Victoria Planning Provisions incorporates reference to this Strategy, and related Practice Notes and Technical Guidelines support implementation of this objective as it relates to regulation of the retention of native vegetation.

The Native Vegetation Management Framework provides the following definition:

"Net Gain is where, over a specified area and period of time, losses of native vegetation and habitat, as measured by a combined quality – quantity measure (habitat hectare), are reduced, minimised and more than offset by commensurate gains".

The Net Gain concept and commitment is expressed in Growing Victoria Together II –

"protecting the environment for future generations" as the goal of an increase in extent and quality of native vegetation."

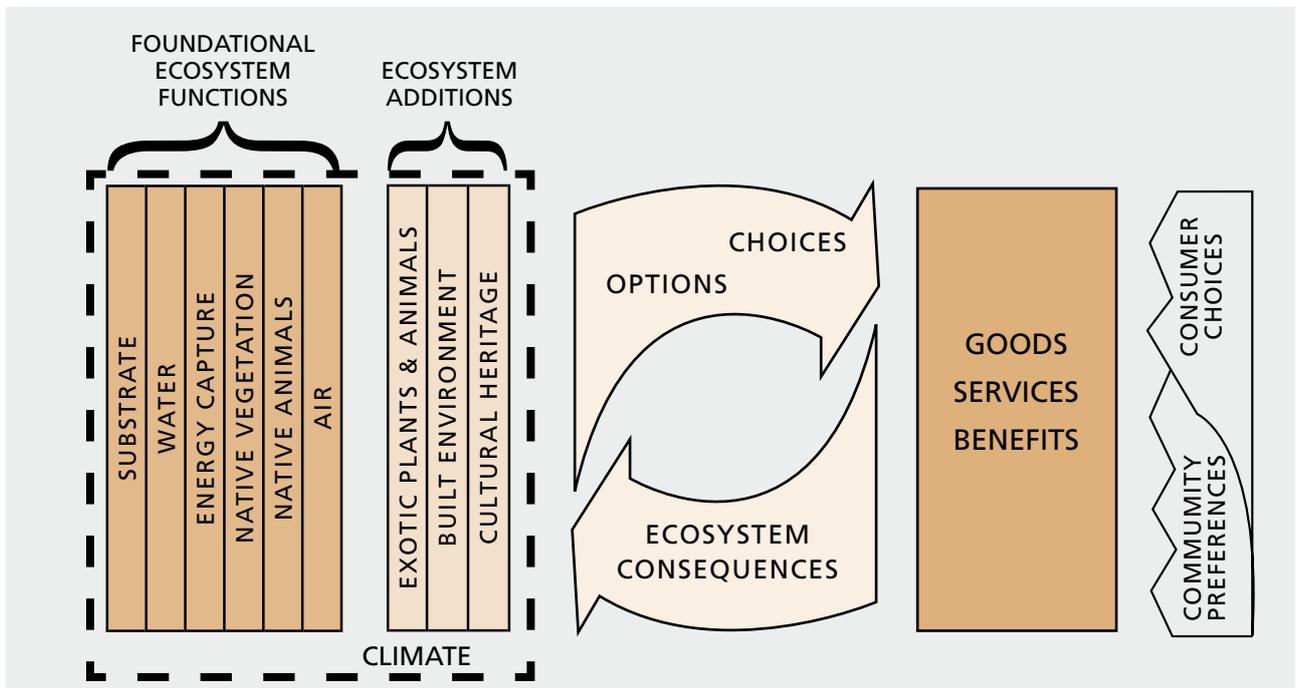
In a historical context, the decline of native vegetation was greatest during the expansionary phases of European settlement that included the widespread alienation of Crown Land into freehold title. The rate of decline in extent inevitably slowed as the great majority of private land became cleared. In recent decades, in response to increasing recognition of the land protection issues associated with loss of native vegetation, this rate was further slowed by the introduction in 1989 of Native Vegetation Retention regulations. However these regulations had inadequate offset requirements and did not address the on-going decline in quality.

The objective of Net Gain in extent and quality goes beyond the focus on the rate of clearing on private land, and aims to address the circumstances and consequences of native vegetation management across the whole landscape.

A wide range of circumstances require consideration under the Net Gain objective:

LOSSES	LOSSES & GAINS intended to be balanced over time	GAINS
<p>Clearing on private or public land that is not subject to specific offset requirements.</p> <p>Incremental losses of quality:</p> <ul style="list-style-type: none"> • allowable uses • pest plants & animals • intensive fuel reduction • tree decline legacies (salinity, exposure, age). <p>Illegal clearing.</p>	<p>Natural disturbances: e.g. wildfires.</p> <p>Semi-natural disturbances: e.g. harvest & regeneration within broad areas of forest.</p> <p>Clearing by permit & related offset requirements.</p>	<p>Voluntary and Government-assisted management & revegetation, on public land and private land, for example by:</p> <ul style="list-style-type: none"> • agencies • Friends Groups • Land for Wildlife, Trust for Nature, Landcare • Incentives.

Implementation of the Net Gain commitment is being approached within the Government’s broader sustainability framework. Native vegetation is a key ‘foundational ecosystem function’ within the ecosystem services concept that provides insights into the dynamic relationships that underpin sustainability (see following diagram). In addition to its’ inherent value, native vegetation has a strong role in the protection of soil and water quality, the provision of habitat for native animals, and the sequestration of carbon. Previous conversion of native vegetation for rural and urban development has produced important goods and services (e.g. food, fibre, housing, infrastructure) but has also had consequences for the functioning of the ecosystem (e.g. soil erosion, disruption to surface and groundwater movement, dryland salinity) that have undermined the ability of our landscapes to continue to provide the services and other benefits the community and consumers seek.



As part of the suite of concepts, processes and tools to guide implementation of the Net Gain policy, the Native Vegetation Management Framework identifies the need to develop a Net Gain accounting process that reports on overall gains and losses in extent and condition of native vegetation. This reporting ultimately seeks to discriminate between public and private land contributions, between strategic priorities (e.g. protection of different threatened species), and according to various geographic views (e.g. Catchment Management Areas, bioregions) to the extent this is possible with available data.



2. Net Gain Accounting approach

Following release of the Native Vegetation Management Framework there has been considerable on-going effort to build supporting information standards, datasets and technical training which can progressively contribute to the overarching accounting task. The 'habitat hectare' condition measurement methodology introduced in the Framework has been widely promulgated, and this has also stimulated developments beyond Victoria. Another key innovation has been the new area of mapping / modelling current native vegetation condition (from "proof of concept" projects to complete Statewide coverage). This modelling supplements mapping of native vegetation extent, which has been recently updated with the completion of Statewide re-analysis of Landsat time series data. There is now a sufficient base to develop this 'first approximation' report that aims to introduce the accounting ideas to a wide audience, provide the first insight to progress with the policy objective, and identify the most important contributions that will improve subsequent reports.

The Net Gain accounting (NGA) approach needs to deal innovatively with the challenges created by the particular characteristics of native vegetation. These characteristics and the way they have been accommodated are summarised in the following section.

2.1 A diversity of types and circumstances

Native vegetation is very diverse with respect to type, land use history and current management, however for accounting purposes the amount, location and significance of native vegetation need to be considered in combination and to be compared across sites and regions.

Extent and quality of native vegetation are combined in the Habitat Hectare metric, and condition is measured with respect to a reference scale (benchmark) for each type, allowing for comparisons to be made across different native vegetation types (see website www.dse.vic.gov.au/conservation&environment and click on **Native Vegetation Information for Victoria**).

Accounting is preferably spatially based so that discrimination with respect to priority assets and/or locations is possible, and so that overall views can be prepared for different regional classifications (e.g. Statewide, Catchment Management Areas, bioregions). There is not yet full coverage of some of the required spatial datasets (e.g. habitat models for all threatened species) so there is limited ability to prepare comprehensive views for priority assets at this time.

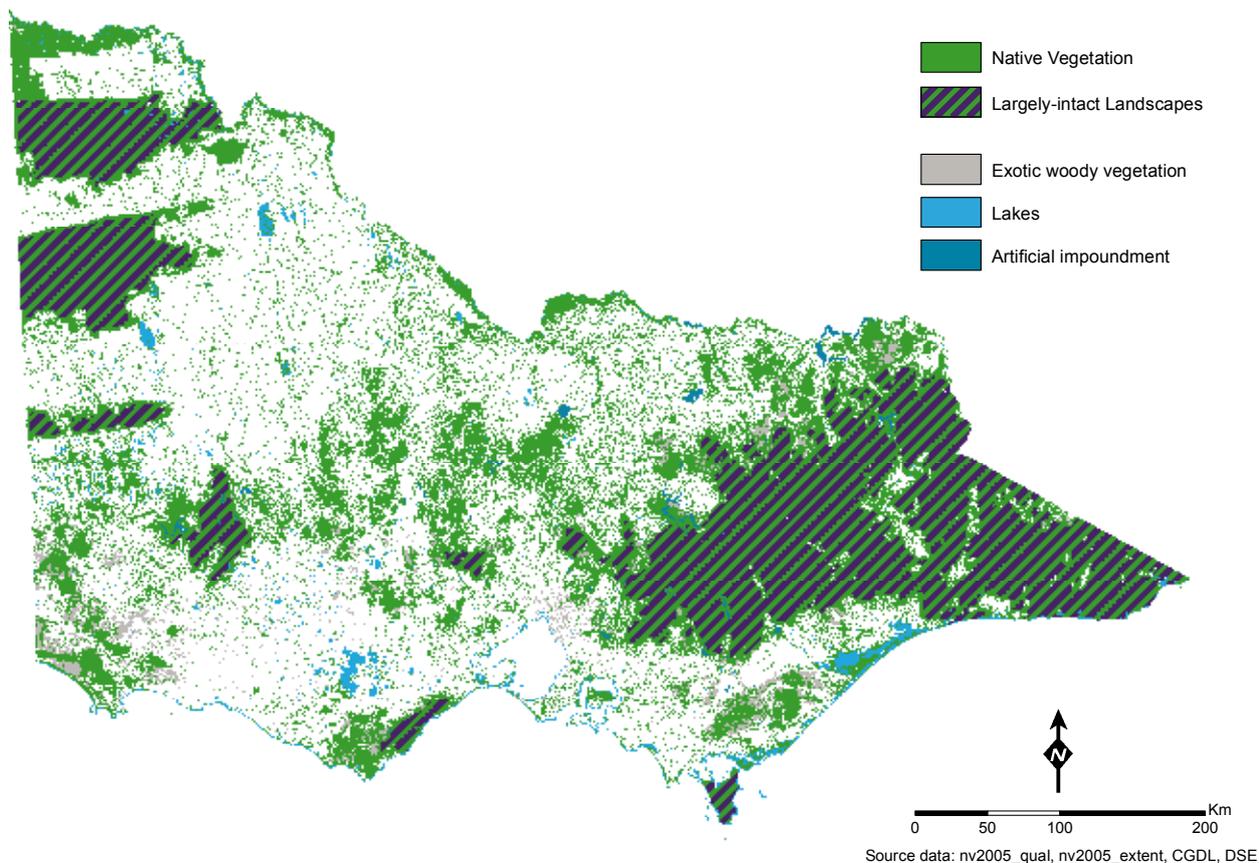
2.2 A dynamic situation combining different kinds of changes

Native vegetation is inherently dynamic, with regenerative cycles erratically triggered by natural disturbances like fire or flood. In naturally-functioning landscapes, this leads to a complex spatial and temporal mix of condition states. However the 'underlying stock' of native vegetation is generally considered to be 'stable' in that it can be expected to more-or-less recover from disturbances without active management intervention. In developed landscapes, where there has been widespread removal and on-going use of native vegetation for economic development, these are additional to natural disturbance drivers. These include native vegetation suffering chronic and long-acting degradation problems, with associated 'legacy' issues (e.g. threatened species extinction debts, gaps in the recruitment profile of trees, reduced soil health in potential revegetation areas). In developed landscapes, the 'underlying stock' of native vegetation is generally considered to be 'declining, or at risk of decline', and these areas are the focus of Government and voluntary efforts to address these issues.

Two different but overlapping narratives are therefore required for reporting:

1. Largely-intact landscapes, where natural or semi-natural dynamics are the dominant driver, the landscape-scale configuration of disturbances and responses in space and through time needs to be the focus (see following map). This narrative could be reported on at a later date when current projects on identifying and evaluating ecologically-appropriate fire regimes are completed; and
2. Fragmented landscapes, or areas affected by invasive processes within largely-intact landscapes, where degradation and recovery are the dominant drivers. Here the changing status of extent and quality at the on-ground level will be the focus. An overview of this perspective is provided in this report.

Native vegetation and areas considered Largely-intact Landscapes* for the purposes of NGA.



* contiguous areas of native vegetation greater than 20,000 ha, with high Landscape Context scores and Site Condition scores that are high (or if scores are not high, this is primarily due to natural or semi-natural disturbances.)

2.3 A complex story that requires generalisation

Generating a quantitative overview of ‘changes of concern’ in a complex environment where there are also ‘changes of interest not necessarily of concern’ is a challenging task. Changes of concern are where there are losses and gains in the underlying stock of native vegetation. Changes of interest are where there are fluctuations associated with stable underlying stock. Without prohibitive levels of investment and a sufficient period of time, simple ‘point to point’ comparisons of condition measures do not have the power to usefully detect change or to discriminate between the two types of change across the whole landscape. The NGA approach will at this time focus on the ‘changes of concern’ elements, and be based on a combination of current clearing rate, current state (i.e. condition as the net result of post-settlement management) and the estimated typical trajectories of change of condition under current management regimes. This generalised modelling approach provides a ‘first approximation’ view; supplementary on-ground monitoring and research will be required to progressively refine the assumptions underlying these estimates.

2.4 Progressive inclusion of site-specific information

Site-specific data from formal ‘transactions’ (i.e. decisions about vegetation clearing and associated offsets, or about investment in improvements in vegetation condition, typically involving government agencies) are also potentially information-rich contributions to NGA, although such data only provides a partial insight given that the majority of losses and gains currently occur outside of formal transactions. These data are increasingly being collected in a standardised manner that will allow it to be more fully included in NGA in the future.

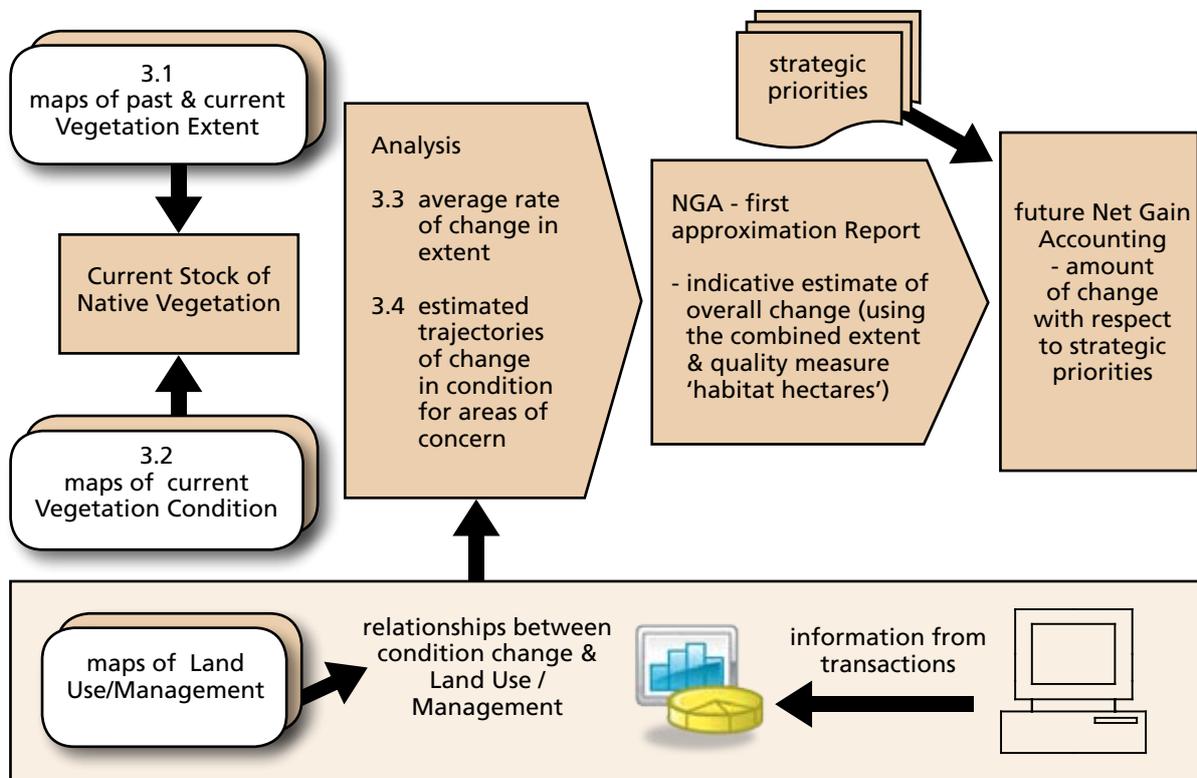
2.5 Consideration of strategic priorities

A number of criteria and processes direct the strategic priorities for protecting and enhancing native vegetation. The Framework identifies Land Protection Hazard Ratings (associated with waterway protection, salinity control, soil conservation, land susceptibility, productive capability) and Conservation Significance criteria (associated with conservation status and condition of vegetation types, conservation status of species and habitat importance, significant sites for National values or functional processes) see website www.dse.vic.gov.au/conservation&environment and click on **Native Vegetation Information for Victoria**. Regional strategies (e.g. Catchment Management Authority Native Vegetation Plans) and plans for specific assets (e.g. Flora and Fauna Guarantee Action Statements) add further details to the task of establishing priorities.

Whilst some of these criteria are available as comprehensive statewide coverages (e.g. Ecological Vegetation Class - Bioregional Conservation Status), others are not (e.g. threatened species habitat). NGA with respect to these priorities cannot be quantitatively assessed until these coverages are available.

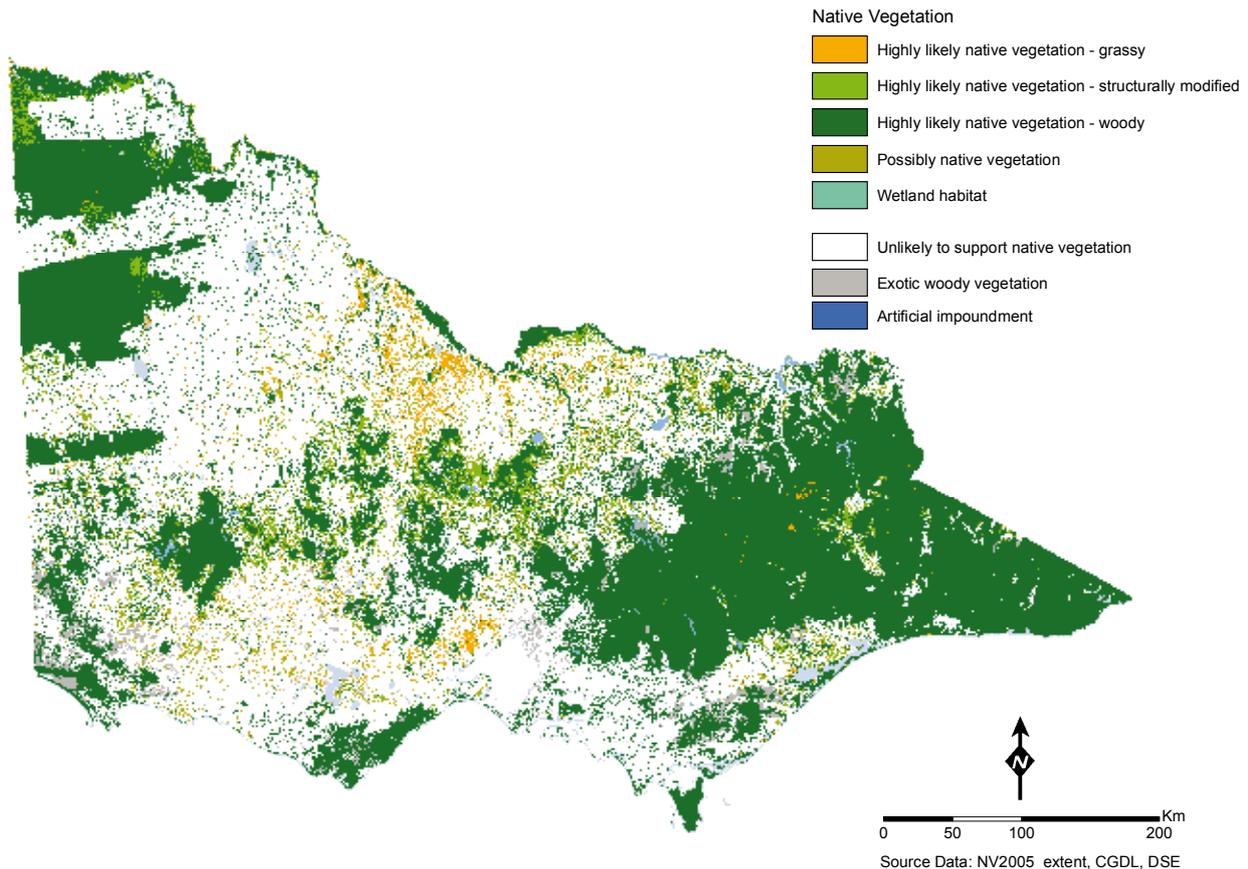
3. Contributing information

A number of types of information are required to enable NGA - the following diagram outlines the relationships between these data sources:



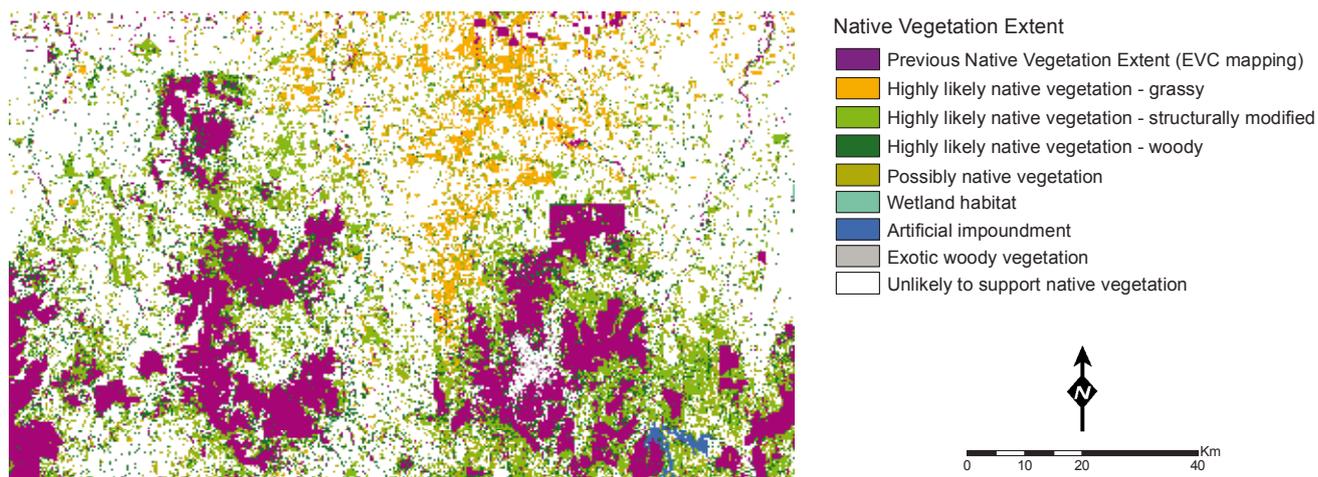
3.1 Current extent of native vegetation

Assessment of native vegetation extent is reliant on readily available remotely-sensed spectral data. A multi-temporal set of Landsat data (1998-2005) has been analysed to establish probabilities of native vegetation persistence, given the spectral variations between the datasets from year to year. This analysis was supplemented by use of available Spot imagery to increase the detection of small examples of woody vegetation (e.g. scattered trees in paddocks). Areas of woody vegetation that are not native (e.g. plantations, urban gardens) are 'masked out' during this analysis. Temporary changes in woody native vegetation cover (for example, recent fire scars / post-fire recovery and timber harvesting / regeneration) that were detected by satellite imagery have also been 'masked out' during this analysis – they are treated as changes in condition rather than extent. Areas of grassy native vegetation are less straight-forward to detect than woody vegetation, and are modelled using additional datasets and further analysis of Landsat data.



The new extent mapping methodology is much better at detecting occurrences of native vegetation than the previous mapping available in a statewide coverage (the following map example illustrates this improved detection - earlier mapping is overlaid in purple). This is primarily due to the inclusion of grassy native vegetation (orange on the map) and structurally modified vegetation (bright green on the map), although these classes represent native vegetation that is often in reduced condition. A further class, 'possibly native vegetation', is shown but this is not counted in extent analyses - it is included to indicate where further consideration (potentially including ground-truthing) is recommended before specific planning or investment decisions are made.

Example of improved detection of native vegetation by new mapping.



Changes in recorded amounts of native vegetation due to improved detection

Dataset	Native vegetation remaining in Victoria (ha)		
	Private land	Public land	Total
Previous mapping (various dates, mostly prior to 2004)	1,370,805	6,987,693	8,358,498
New mapping (all the same date - effectively 2004/5)	3,027,113	7,315,358	10,342,471

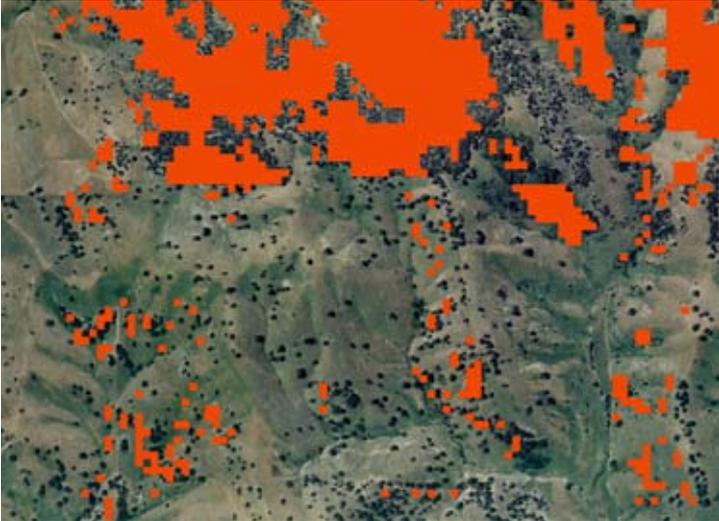
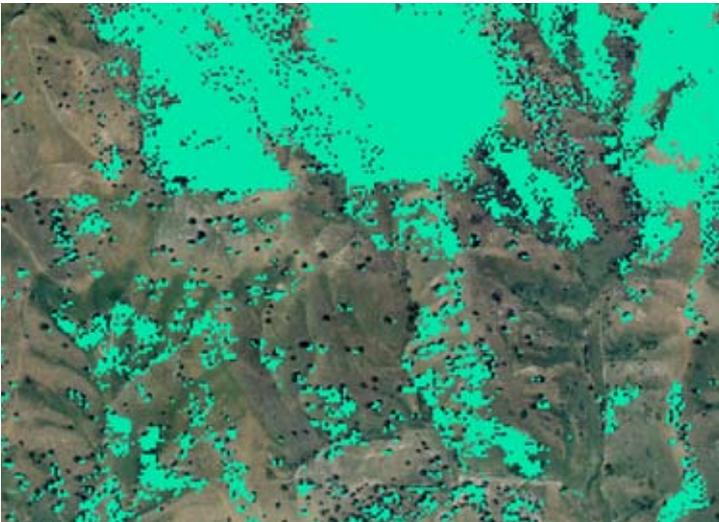
Mapping Limitations

Maps and models are necessarily simplifications of reality - NGA needs to be mindful of the associated limitations, particularly those that relate to scale and interpretation of change. With respect to these issues:

- for Landsat (25m pixel) data, a key strength is the ready availability of statewide coverages including an archive of images over a number of years, and a key limitation is fine-scale accuracy, particularly with scattered trees;
- for Spot (10m pixel) data, a strength is better detection of scattered trees, small remnants and boundaries of remnants, and key limitations are unavailability (within the Department of Sustainability and Environment) of an archive of Statewide coverages, and inability to detect grasslands (even at broad scale).

An additional limitation exists where, in order to better include sparse woodland trees, Spot data has been combined with Landsat data and converted to a larger grid. In these cases this leads to an inherent exaggeration of the spatial extent and this must be considered when interpreting the results of area-based analyses.

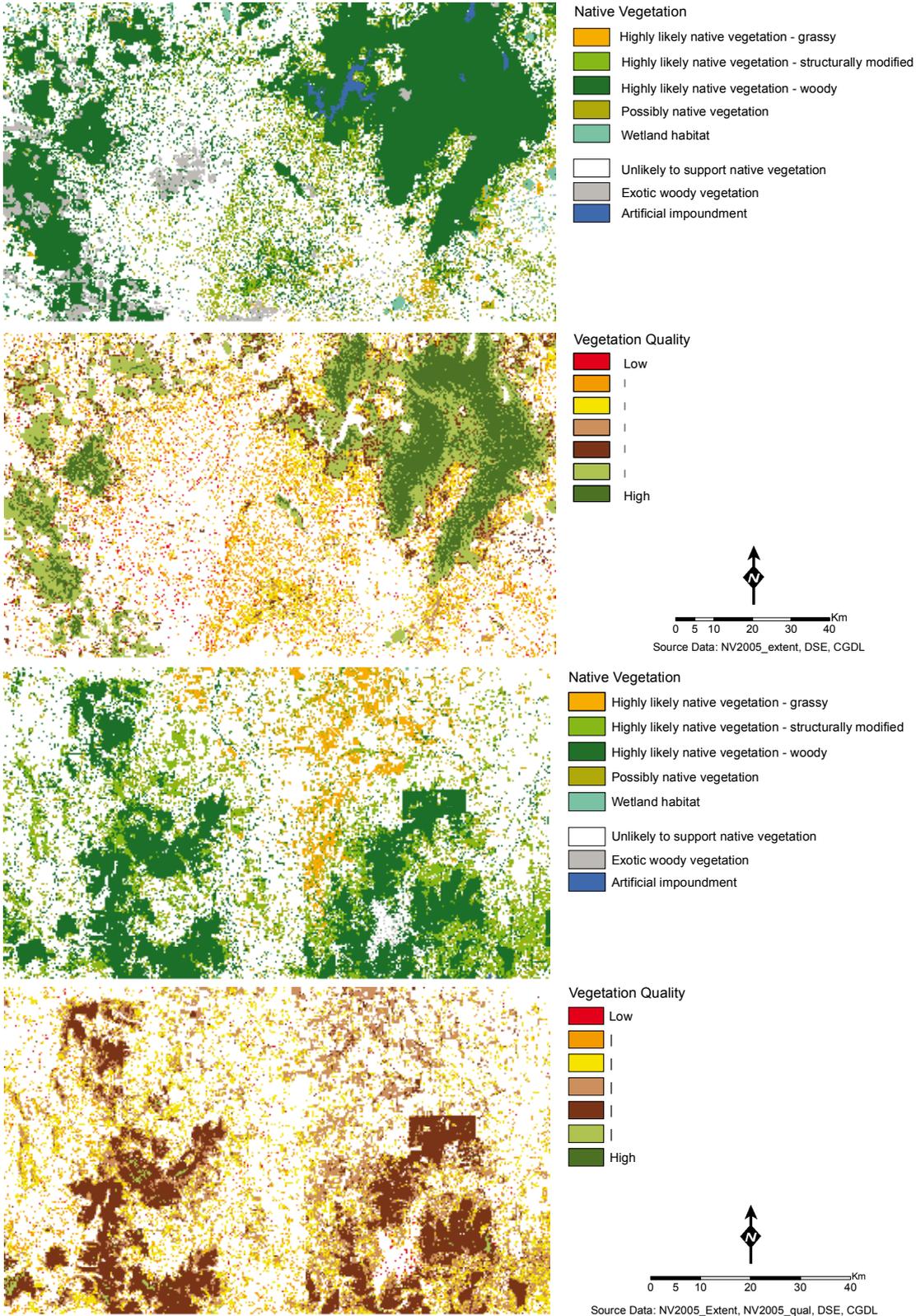
The following images provide a visual example of the limitations of woody vegetation detection based on different imagery.

Aerial photo	Rushworth/ Waranga Basin 
Landsat interpretation superimposed on aerial photo	Rushworth/ Waranga Basin 'Tree Extent' 25m pixels 
Spot interpretation superimposed on aerial photo	Rushworth/ Waranga Basin 'Tree 10' 10m pixels 

3.2 Current quality of native vegetation

A statewide survey and modelling project has been undertaken by the Arthur Rylah Institute for Environmental Research with the support of Victorian CMAs and NAP funding sources. The following examples illustrate the mapping output of the project that will become available through DSE databases:

South West (top pair) and North Central (bottom pair) Victoria



3.3 Rate of change in extent of native vegetation

Assessment of changes in extent is reliant on time series of remotely-sensed spectral data.

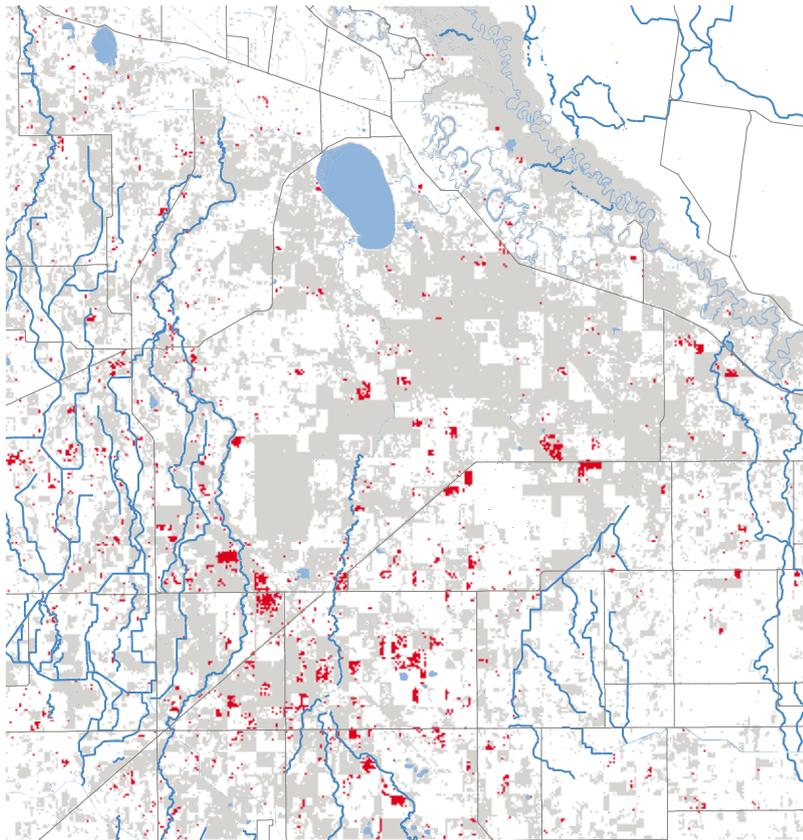
Detecting gross changes to woody biomass is already undertaken using Landsat imagery at national scale by the Australian Greenhouse Office for the purpose of carbon accounting. However, a carbon-focussed analysis has some inherent limitations with respect to the NGA approach: non-native woody vegetation is included, native grasslands are not included, and there is potential for confusion between change in extent of native vegetation and fluctuations in biomass within remnant native vegetation due to seasonal factors, tree health and/or selective harvesting. Accordingly, datasets have been re-analysed with a focus on native vegetation, with the change of extent analysis based on comparison of two multi-temporal sets of Landsat data – 1989-1995 and 1998-2005. Losses in extent are where there is a relatively high likelihood of stands of native vegetation having been removed between the two periods. Gains in extent are where there is a relatively high likelihood that predominantly native vegetation has re-established on an area between the two periods; this is typically due to unassisted regeneration of native species on farmland that is no longer in active use, but may also include intentional revegetation which is in large enough contiguous areas, and has matured sufficiently, that it can be readily detected by remote sensing.

Since NGA combines extent and quality, changes in extent must be converted to habitat hectares. Spatial data on losses and gains in extent are combined with modelled condition data to enable this conversion, and these are then expressed as an average annual rate of change in habitat hectares over the 1989-1995 to 1998-2005 measurement period (effectively for the decade between 1994 and 2004).

AVERAGE ANNUAL RATE OF CHANGE IN EXTENT (and associated change in habitat hectares) between 89/95 & 98/05 multi-temporal assessments		
Gain in extent – woody ^{1, 2}	+ 400 ha / year	yielding + 30 habitat ha / year
Loss in extent – woody ¹	- 1,200 ha / year	yielding - 430 habitat ha / year
Loss in extent – grassy ³	- 3,200 ha / year	yielding - 1,150 habitat ha / year
NET CHANGE IN EXTENT	- 4,000 ha / year	yielding - 1,550 habitat ha / year

- 1 these figures may include some temporary losses and gradual gains associated with harvesting and regeneration of native forest on private land. This scenario is preferably treated as a change in condition rather than a change in extent (as for public land forestry) but there is a limited ability to 'mask out' these areas using available datasets.
- 2 these figures are an underestimate because they do not include areas of revegetation that cannot be readily detected by remote-sensing – other records are used in the overall analysis to represent this additional contribution.
- 3 loss of grassy native vegetation has been determined more conservatively than loss of woody native vegetation, because uncertainties around prediction of grassland presence using remote-sensing techniques are greater.

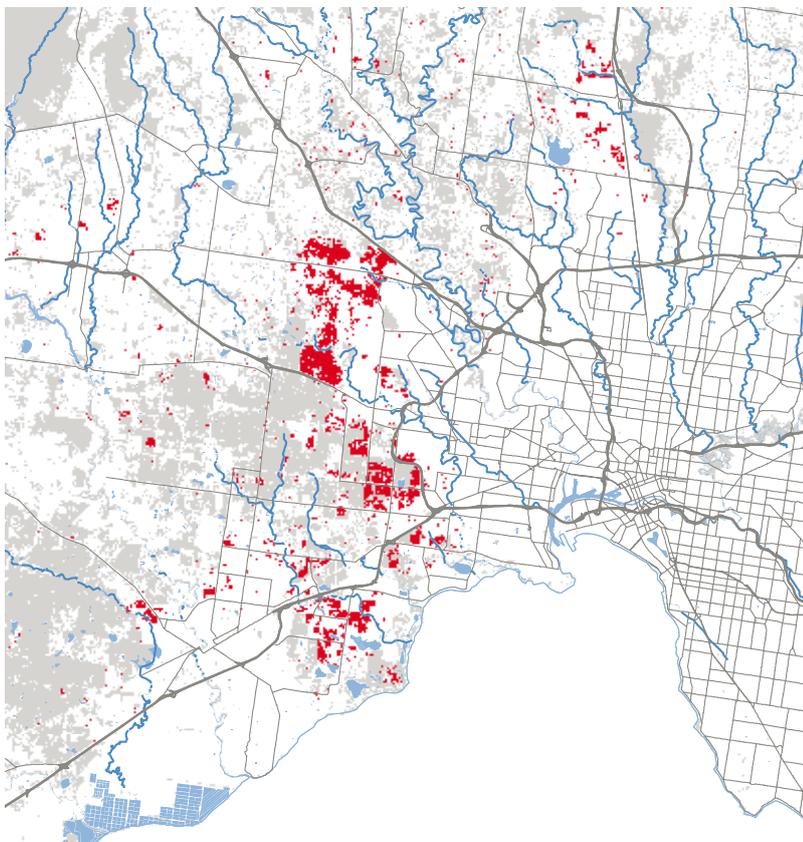
Examples of mapping of native grassland clearing.



Clearing of Native Grassland in the decade 1989/1995 to 1998/2005 part of Northern Plains, Victoria

Native Vegetation
Clearing of Native Grassland

Source: DSE, CGDL & ARI Change Analysis 2007



Clearing of Native Grassland in the decade 1989/1995 to 1998/2005 (part of the Volcanic Plains west of Melbourne, Victoria)

Native Vegetation
Clearing of Native Grassland

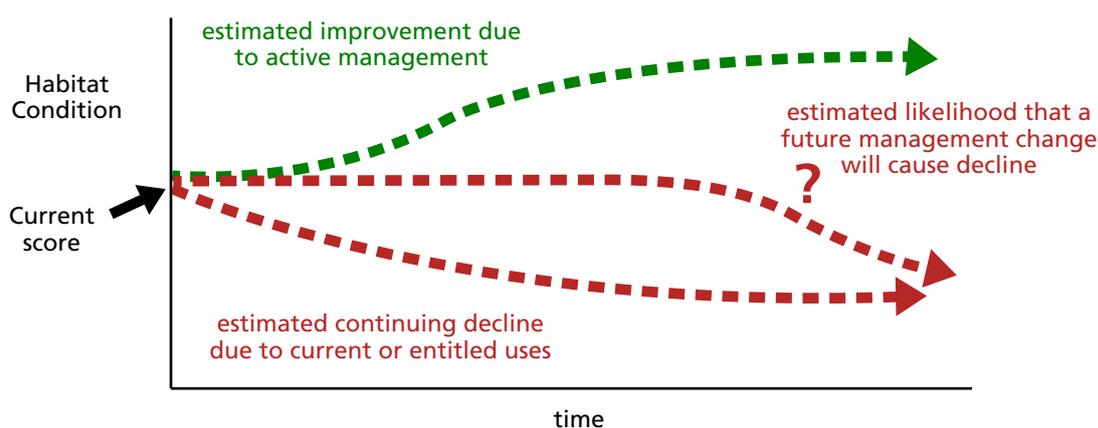
Source: DSE, CGDL & ARI Change Analysis 2007

3.4 Estimated trajectories of condition in different settings

DSE has developed guidelines on how expected changes in condition can be estimated based on existing or proposed native vegetation management (Gain Guide - <http://www.dse.vic.gov.au> and search for 'gain approach'). The detail of these relationships depends on:

- the current condition;
- the feasibility and predictability of recovery options and pathways;
- the length of time any changed management is in place;
- the reliability with which management actions can be expected to occur.

The following figure illustrates the nature of these potential changes:



The guidelines describe Improvement Gains (arising from positive actions that are beyond current obligations and lead to increases from current condition level), Maintenance Gains (arising from foregoing entitled activities or addressing major threats, either of which could progressively reduce current condition), and Security Gains (arising from actions to lessen the likelihood of future management changes that would reduce condition). The different types of Gains are used to calculate offsets where required for permitted clearing, and increasingly are used as part of calculating improved outcomes in some investment programs. They are also the basis for this NGA report, however depending on the detail of available information there are two different levels of confidence in estimating changes that arise as follows:

1. Specific estimates possible

- the best case is where the location, starting condition & actions are all specifically known and are the basis for estimating changes (e.g. BushTender management contracts);
- in other cases, although one of these types of information may be specifically known, others are only broadly known: for example, locations are only identified by remote-sensing rather than specific records (e.g. changes in extent); starting condition is only modelled rather than assessed on-ground; actions can only be assumed based on management objectives rather than specified in detail (e.g. Trust for Nature covenants).

2. Broad assumptions only

- in many cases (currently the majority) none of the above types of information are specifically known. In these situations broad assumptions can be made which, although inherently imprecise and uncertain, allow a comprehensive Statewide coverage for a 'first approximation' report, and identify the areas where further improvements can be made.

In both of the above cases, changes in condition are estimated over a notional 10 year period, assuming a level of fluctuation during this time due to variations in rainfall, and then expressed as an average annual rate of change.



4. Net Gain Accounting – first approximation

Given the previous extent of clearing and the regulated process for new clearing, it is to be expected that changes in extent are no longer the major driver of native vegetation change in Victoria. Conversely, changes in the condition of native vegetation can be expected to be a major driver because they typically occur over extensive areas. On public land, processes that can cause ongoing degradation of vegetation include weed invasions and inappropriate grazing regimes, which may arise from pest animals, excessive populations of native grazers, and licenced stock grazing. Small reserves, roadsides, native grasslands and grassy woodlands, and river frontages are particularly affected. On private land, the same pressures exist, and there are also a range of entitled uses of native vegetation (e.g. timber for personal use, grazing & stock management) which can also lead to reduced levels of vegetation condition. With respect to positive drivers of change, government programs and independent landholder activities focus on both revegetation and on changing the management of existing native vegetation, either to actively improve condition or to avoid further risk of damage. This report provides insights into the relative amounts and rates of positive and negative drivers, and a basis for considering the strategic balance and effectiveness of programs.

4.1 Summary of results

The following table summarises the current estimates of the overall rate of change in extent and quality of native vegetation. Information is presented in terms of:

- public and private land;
- the two different levels of confidence in estimations (as discussed in the previous section); and,
- gains, outcomes intended to be neutral over time, and losses.

In order to allow some insights into relative contributions, each is expressed in terms of a common unit of rate of change - habitat hectares per year. However, comparisons (and notional additions) need to be undertaken with caution, given the following:

- the assessment technique and the availability of data influence how tightly prescribed a measurement period can be for each particular contribution, so the annual rate of change is typically taken over a number of years (e.g. Landsat data from multiple dates are required to separate 'permanent' changes from seasonal and other fluctuations);
- changes may represent 'realised' outcomes (e.g. cleared vegetation) or 'averted risk' outcomes where the potential for future loss has been reduced (e.g. vegetation on private land that may have been subject to future utilisation or threats, but has been purchased and included in the conservation reserve system);
- a gain of 'one habitat hectare in one year' actually represents a more substantial change than it first appears because improvements are inherently slow and depend largely on incremental change to existing vegetation (e.g. a gain of one habitat hectare may arise from the habitat score changing from 0.4 to 0.5 over 10 years over a 10 ha area); conversely, a loss of 'one habitat hectare in one year' is a more substantial step backwards than it first appears; and,
- the estimates carry high, variable and poorly quantified levels of uncertainty.

PUBLIC LAND	PRIVATE LAND
GAINS	
For maintenance / improvement gains (where specific estimates can be made):	
<p>where active conservation management is being directly undertaken (usually only for high priority areas) and there are specific records:</p> <ul style="list-style-type: none"> • associated with grazing management in conservation reserves (e.g. rabbit and kangaroo control in Mallee woodlands, removal of stock grazing in the Alps) 422,000 ha / yr yielding + 4,220 HHa / yr • associated with weed control in conservation reserves and on the boundaries with private land 243,000 ha / yr yielding + 2,430 HHa / yr 	<p>where specific management contracts are in place (e.g. BushTender and related market-based incentives): 12,150 ha of existing remnants yielding + 205 HHa / yr 485 ha of revegetation yielding + 6 HHa / yr</p> <p>where general management incentives are in place (e.g. NAP / NHT): 21,500 ha of existing remnants yielding + 172 HHa / yr 14,000 ha of revegetation yielding + 112 HHa / yr</p> <p>where on-going conservation management is associated with formal government programs (e.g. Trust for Nature, Land for Wildlife): 175,000 ha yielding about +1,750 HHa / yr</p> <p>where remotely-sensed increases in extent have taken place (predominantly passive recovery of no longer utilized farmland), although this has not been ground-truthed: 4,000 ha over 10 years yielding about + 30 HHa / yr (from Table in Section 3.3)</p>
OR for maintenance / improvement gains (where broad assumptions only are possible):	
<p>where conservation management is undertaken but is either not formally recorded or records cannot be readily accessed or interpreted (e.g. some areas of weed control; improvements to environmental flows):</p> <ul style="list-style-type: none"> • if this applies to 5% of the vegetation on public land in Fragmented Landscapes then 120,000 ha yielding + 1,200 HHa / yr 	<p>where voluntary conservation management is undertaken but without connection to any formal government programs: (estimate is based on the "2 times assumption" used by some CMAs i.e. for the change generated by direct government investment, there is an equivalent amount generated independent of this investment) if this applies to 224,500 ha then yielding + 2,245 HHa / yr</p>
AND for security gains (where specific estimates can be made):	
<p>where State Forest has been added to the reserve system since release of the policy framework in 2002: 160,000 ha yielding + 770 HHa / yr</p> <p>where private land has been added to the reserve system since release of the policy framework in 2002: 14,270 ha yielding + 140 HHa / yr</p>	<p>where areas have been placed under new covenants or other on-title agreements (i.e. since release of the policy framework in 2002) - predominantly associated with the Trust for Nature program: 14,500 ha yielding + 35 HHa / yr</p>
GAINS SUB-TOTAL:	
+8,760 HHa /yr (rounded)	+4,560 HHa /yr (rounded)

PUBLIC LAND	PRIVATE LAND
NEUTRAL	
Where outcomes are intended to be neutral over time:	
<ul style="list-style-type: none"> For losses that are authorised under formal regulatory and/or planning processes, subject to measurement and outcome uncertainties, specified offsets are assumed to deliver no net loss over time. <p>For example, in 2006/07, 577 cases were processed by DSE, which resulted in approximately 1,000 ha of proposed clearing being avoided, and 260 ha of remnant vegetation patches being approved for clearing with associated offsets to be delivered through improved management of 1460 ha.</p>	
<ul style="list-style-type: none"> For the majority (possibly 90%) of Largely-intact Landscapes, subject to further research, changes in condition are deemed to be natural or semi-natural fluctuations (e.g. wildfire & recovery, timber harvesting & regeneration) that are assumed to deliver no net loss over time. 	
LOSSES	
For losses (where specific estimates can be made):	
where remotely-sensed reductions in extent have taken place, although this has not been ground-truthed: <ul style="list-style-type: none"> for public land, at the statewide level, such losses are considered to be negligible. 	where remotely-sensed reductions in extent have taken place, although this has not been ground-truthed: <p>yielding - 1,580 HHa / yr (from Table in Section 3.3)</p>
OR for losses (where broad assumptions only are possible):	
where there is no active management being undertaken - this will usually only be for lower-priority areas: <ul style="list-style-type: none"> if this applies to 5% of Largely-intact Landscapes then 246,000 ha yielding - 307 HHa / yr if this applies to 95% of vegetation on public land in Fragmented Landscapes then 2,240,000 ha yielding - 2,850 HHa / yr 	where entitled land uses (e.g. wood for personal use; grazing) or clearing that is exempt from regulation are likely to be occurring, although there is uncertainty about the level of these activities: <ul style="list-style-type: none"> if this applies to the vegetation on private land in Fragmented Landscapes that is not accounted for above then 2,594,000 ha yielding - 12,970 HHa / yr
LOSSES SUB-TOTAL:	
- 2,860 HHa / yr (rounded)	- 14,550 HHa / yr (rounded)

	PUBLIC LAND	PRIVATE LAND
GAINS SUB-TOTAL:	+ 8,760 HHa / yr	+ 4,560 HHa / yr
LOSSES SUB-TOTAL:	- 2,860 HHa / yr	- 14,550 HHa / yr
NET OUTCOME	+ 5,900 HHa / yr *	- 9,990 HHa / yr *

* due to significant uncertainties associated with the underlying assumptions, particularly about the amount of vegetation in each of the categories, these figures may be under- or over-estimates, possibly up to 20%

4.2 Key observations

Whilst recognising the current limitations of this 'first approximation' analysis, the following observations can be made:

- new insight into changes in extent

The rate of clearing of woody native vegetation on private land (probably less than approximately 1,600 ha/yr between 89/95 & 98/05) continues to be relatively low, particularly in relation to the total amount of woody native vegetation on private land (over 2 million ha). In comparison to the last assessment (2,500 ha/yr in the period leading up to 1995) this rate is possibly lower, although the assessments are not directly comparable due to changes in measurement technologies and it is more appropriate to think in terms of the same order of magnitude. This is the first time there has been an insight into the rate of clearing of grassy native vegetation (conservatively estimated at approximately 3,000 ha/yr between 89/95 & 98/05) which is significantly greater than the rate for woody native vegetation. Most of this is due to conversion from native pasture grazing to more intensive agriculture. The rate of clearing of grassy native vegetation is of concern, particularly given that much of this appears not to be considered in regulatory processes that may trigger the requirement to apply the 'avoid – minimise – offset' responses of the Native Vegetation Management Framework. DSE is trialling a new 'prior notification' approach for landholders with native grasslands which aims to increase recognition of the need for planning permits and signposts potential funding from incentive programs.

- new insight into current and changing quality

Recent work undertaken by DSE to provide the first Statewide data-driven model of native vegetation quality has confirmed the magnitude of the chronic loss of quality over a long period and the importance of the Native Vegetation Management Framework having taken both extent and quality into consideration. Declining quality of existing native vegetation (which in many ways is just a long-drawn-out version of clearing) is clearly estimated to make a significant contribution to the current net outcome for private land (proportion of total loss due to loss of quality of existing native vegetation is about 90%). Addressing this decline, particularly on private land, has become a key focus for opportunities to achieve gains from voluntary or government-assisted conservation management actions. Existing government extension and incentive programs are increasingly delivering targeted and cost-effective gains but the level of investment remains well below the size of the task, even just for priority locations.

- better operational information is urgently required

The limited amount of specific data, particularly on which areas are being impacted by degrading processes and where these issues are being actively addressed, is a clear limitation on how well we currently understand progress towards policy objectives. Consistent recording systems and reporting processes for native vegetation 'transactions' exist for investments (e.g. the Catchment Activity Management System) but are not yet universally used, and are still under development for clearing permits and offsets (e.g. the Native Vegetation Tracking System). Accelerating the adoption of these systems across the agencies that coordinate natural resource management on public and private land is a clear priority.

- additional remote-sensing data is highly desirable

The current analysis of change of extent has worked with a readily available time-series of Landsat datasets, supplemented by a single Spot dataset. The modelling approaches have effectively 'pushed the limits' of what can be reasonably detected using these data, and there are limitations to the spatial accuracy and currency of these models. In lowland Victoria, due to the widespread occurrence and importance of scattered woodland trees, and to the extensive clearing of private land, it is highly desirable to be able to detect fine-scale occurrences and changes of the remaining native vegetation. A number of technical options for finer-scale and more information-rich remote sensing exist, and it will be highly desirable to have access to Statewide coverages of such datasets on a regular basis in the future.

- further insights from research are important

Estimates of changes in vegetation condition in response to existing or new management actions provide a critical underpinning for any views on net outcomes for native vegetation. There is a small and growing body of operational experience that enables some level of validation and refinement for assumptions about the nature and rate of change. However, this is a diverse and generally poorly-known field and it is critical to ensure that targeted research into land management / condition trajectory assumptions is conducted. Recent research activities that the Victorian government participates in (e.g. the Landscape Logic research hub) can make an important contribution.

- links to emerging developments are important

Although the focus of this report is native vegetation, the accounting measures also need to connect with emerging developments in the broader natural resource management arena such as decision-making tools (e.g. Environmental Sustainability Action Statement - ecoMarkets project) and reporting processes (e.g. Victoria's Catchment Condition Report and State of Environment reports, and the developing area of National Environmental Accounts) for multiple environmental outcomes.

- further reporting

Given the complexities of the native vegetation story and the inherently fluctuating dynamics of vegetation condition, a realistic period between statewide assessments is in the order of 5 years. However, there is an urgent need to address some of the limitations identified in this report and this suggests a 'second approximation' report in two to three years is warranted.

