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Annexes

A VicForests' harvesting and regeneration systems
## Abbreviations

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>DJPR</td>
<td>Department of Jobs, Precincts and Regions (Victoria)</td>
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<tr>
<td>DELWP</td>
<td>Department of Environment, Land, Water and Planning (Victoria)</td>
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<tr>
<td>FAP</td>
<td>Forest Audit Program</td>
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<td>FMZS</td>
<td>Forest Management Zoning Scheme</td>
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<td>FMA</td>
<td>Forest Management Area</td>
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<td>FMU</td>
<td>Forest Management Unit</td>
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<td>FSC</td>
<td>Forest Stewardship Council</td>
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<tr>
<td>ha</td>
<td>Hectare</td>
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<tr>
<td>HBT</td>
<td>Hollow bearing tree (also described by VicForests as habitat trees)</td>
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<tr>
<td>HCV</td>
<td>High Conservation Value</td>
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<tr>
<td>RFA</td>
<td>Regional Forest Agreement</td>
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<td>SFM</td>
<td>Sustainable Forest Management</td>
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<td>VFMP</td>
<td>Victorian Forest Monitoring Program</td>
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</table>
Plate 1 Variable retention harvesting at Drum Beat coupe, Marysville District

Source: VicForests (M Ryan)

Plate 2 Seed tree harvesting operation at Tops coupe, Toolangi district

Source: VicForests (M Ryan)
1 Introduction

This document sets out VicForests’ current suite of harvesting and regeneration systems, as part of its broader remit and responsibility for the sustainable harvest, regrowth and commercial sale of timber from public native forests on behalf of the Victorian Government.

These harvesting and regeneration systems comprise an integral component of the company’s Forest Management Plan\(^1\), which communicates the policy settings that govern our operations, describes our responsibilities and proposed approaches to forest management, and invites ongoing collaboration with stakeholders to help us realise continual improvement in the way we look after Victoria’s unique native forests.

This document presents an overview of:

- VicForests’ enterprise responsibilities and the State forest areas in which it operates (section 2);
- An overview of VicForests’ approach to selecting and applying harvesting and regeneration systems for timber production (section 3);
- An update on VicForests’ approach to adaptive management, as it relates to the application of harvesting and regeneration systems (section 4); and
- Occupational health and safety considerations, for staff, contractors and other stakeholders (section 5).

A detailed description of VicForests’ harvesting and regeneration systems is set out in Annex A.

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2 About VicForests

VicForests is a State-owned business responsible for the sustainable harvest, re-growing and commercial sale of timber from public forests on behalf of the Victorian Government. VicForests has an eastern FMU and a western FMU (Figure 1). VicForests’ eastern FMU is delineated in its Forest Management Plan\(^2\); which refers to a defined forest area comprising approximately 1.82 million hectares of State forest, located east of the Hume Highway, and defined by the Allocation Amendment Order 2019.

**Figure 1 VicForests’ eastern and western FMUs**

![Map of VicForests' eastern and western FMUs](source: VicForests)

In the eastern FMU, VicForests’ operations are limited to allocated areas of public native forests within State forest that are designated as available for commercial timber production. The annual area harvested and regenerated is approximately 3,000 ha, less than 0.05% of the total public native forest estate (Figure 2).

Under the Sustainable Forests (Timber) Act 2004, the Minister for Agriculture is responsible for allocating timber in State forests to VicForests for the purposes of harvesting and selling, or harvesting or selling, timber resource\(^3\). The allocation to VicForests is made through an Allocation Order, which is intended to provide long-term access to Victoria's timber resources. VicForests may only harvest and/or sell vested timber resources in accordance with the Allocation Order where harvesting is permitted outside the Allocation Area, harvest is licensed under a Forest Produce License regulated by DELWP (e.g. roading through SPZ, modelling or mapping errors).

\(^2\) Ibid.
In accordance with the Act, the Allocation Order describes the forest stands within State forest to which VicForests has access (Figure 3). This description includes the location of those forest stands, the total extent and available areas of those forest stands, the maximum area available for timber harvesting in any five-year period, and, the conditions VicForests must comply with in carrying out its functions under the Order.

The conditions that VicForests must comply with include complying with all relevant Codes of Practice, including but not limited to the Code of Practice for Timber Production 2014. In addition, VicForests must comply with the Forest Management Zoning Scheme for Victoria. The Department of Environment, Land, Water and Planning (DELWP) is responsible for managing the Forest Management Zoning Scheme, comprising Special Protection Zones, Special Management Zones and General Management Zones.

*Figure 3 Geographic extent of the Allocation Area for VicForests’ allocation*
3 VicForests’ Harvesting and Regeneration Systems

VicForests recognises that to be a leader in sustainable forest management, it must continue to develop further and continuously improve its forest management practices. VicForests’ approach to forest management has evolved over its history, and now incorporates an increased focus on a more adaptive approach to selecting and applying harvesting and regeneration systems that retain and protect a broad range of forest values, including High Conservation Values (HCVs), as defined by the Forest Stewardship Council (FSC) and FSC Australia in the National Forest Stewardship Standard for Australia4.

3.1 Background

In Victoria, there has been considerable forest research work on silvicultural systems for public native forests dating back over 30 years. The Victorian Timber Industry Strategy (TIS) of 1986 made a major commitment to research and development on silvicultural systems alternative to clear-felling and to explore the potential for commercial thinning of regrowth stands to improve future saw log production5. The TIS led to the Silvicultural Systems Project (SSP), which involved the establishment of major research sites in Mountain Ash forests near Tanjil Bren and in Low Elevation Mixed Species (LEMS) forests at Cabbage Tree Creek in East Gippsland.

Tasmania initiated a similar study some years later at its Warra Long Term Ecological Research Site (referred to as the ‘Warra’ trials).

Research facilitated by the Forest & Wood Products Australia (FWPA) over the past decade has noted that silvicultural systems are often named to reflect the spatial and temporal distribution of harvested trees. Whilst this terminology implies a separation of systems, most systems essentially fall on one of two continuums that relate to either the size of the gap (small to large) or the level of retained over-wood (none to high). Studies such as SSP in Victoria and Warra in Tasmania have provided managers with alternative approaches to the traditional clearfelling system involving large and often contiguous coupes in Mountain Ash and LEMS forests and tall wet Tasmanian forests. For example, the Tasmanian research proposed the adoption of a “mixed” silvicultural approach with variable levels of retained overwood, including retention of unharvested “aggregates” within coupes, clear-felling in steep country (but using smaller coupes), and group or single tree selection in special areas providing it is safe and cost-effective. FWPA research6 has highlighted studies that indicate the SSP findings in Victoria follow a similar pattern7. VicForests acknowledges SSP and Warra trials reflect findings after 15-20 years of research; and more time will be required to evaluate fully the impacts on forest structure and forest values (including habitat values) over the longer term.

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6 Ibid.
7 Turner, et al. 2011; selected studies by Rob Campbell (Centre for Forest Tree Technology in Victoria), published in 1997, viz:
In this context, VicForests also acknowledges the research facilitated by FWPA that has identified the development of variable retention in the Pacific Northwest of western USA and Canada, and in Tasmania, as good examples of adaptive management applied to silviculture\(^8\). This adaptation has contributed to variability in implementation across forest management operations. For example, in Tasmania, research in the Warra silvicultural systems trials have found that dispersed retention, which is commonly practised in the Pacific Northwest, was unsafe in old-growth wet eucalypt forests; hence Tasmania’s shift to systems described as ‘aggregated retention’. Further adaptation has occurred to overcome difficulties with regeneration burning in wet eucalypt forests.

VicForests has committed to adapting and further developing its systems, in ways that are aligned with a shift towards increasing use of variable retention. Over the past five years, this has included development of the Regrowth Retention Harvesting (RRH) system, which it has been applying to Ash regrowth stands since 2014 to protect and enhance habitat for Leadbeater’s Possum in particular.

Over the same period, in East Gippsland, VicForests has substantially increased the level of retention of hollow bearing trees and trees with other conservation values; and reduced the use of high intensity regeneration burns.

However, following an FSC Controlled Wood standard evaluation audit conducted in 2017/18, VicForests identified the need to conduct a more comprehensive review of its harvesting and regeneration practices. While the audit found VicForests’ operations conformed with most indicators, it raised a number of areas which required further attention by VicForests in order to conform with the FSC Controlled Wood standard. In relation to harvesting and regeneration systems specifically, the audit identified the need for further attention in relation to clear-felling and regeneration burns that may impact on old-growth forests, rainforest areas and threatened species habitat.

3.2 Primary objectives

VicForests has reviewed its harvesting and regeneration systems ('silvicultural regimes') following its FSC Controlled Wood standard evaluation audit conducted in 2017/18. To address these audit findings specifically, VicForests has committed to three key objectives for the transformation of its harvesting and regeneration systems (Figure 4). These objectives underpin the strengthening of VicForests’ management systems and use of a broader suite of harvesting and regeneration systems across its operations. Further guidance on each of these three key objectives is set out below.

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3.2.1 Strengthen the HCV management system

In response to the findings from its FSC Controlled Wood evaluation audit in 2017/18, VicForests has revised its HCV management system to strengthen its processes for identifying, retaining and protecting HCVs; most notably old-growth forests, rainforest areas and threatened species habitat. An overview of the revised management system for HCVs is available for review on the VicForests’ website.\(^9\)

The revision of this management system involved an extensive process of engagement with staff, contractors and external stakeholders. It has also involved further work and further modifications of key practices such as clear felling and burning as well as the delineation of special values, including but not limited to old-growth forest values, to demonstrate VicForests’ clear intent and conformance with Controlled Wood standard principles and criteria relating to the retention and protection of HCVs.

Most notably, the findings from the 2017/18 evaluation audit have directed VicForests to increase its focus on retaining and protecting hollow bearing trees, particularly where they exist outside the extent of field verified areas of old-growth forest, i.e. small patches (e.g. less than three hectares) or scattered trees within coupes. These areas of focus are addressed in part through VicForests intent to increase the use of variable retention harvesting systems across its operations. This intent is discussed further below.

3.2.2 Increase use of variable retention harvesting systems

As part of its shift to increase the use of variable retention harvesting systems, VicForests is focussed on increasing the retention and protection of hollow bearing trees.

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With this objective, VicForests’ has devised a field data collection process that records the attributes of trees (including location and types of hollows) and assigns tree categories according to the physical characteristics of the tree. As described in its management system for HCVs\textsuperscript{10}, these tree attributes and classifications are based on the dynamics of hollow formation in different Eucalypt species presented in the scientific literature. VicForests will aim to maintain category 1 habitat trees and cohorts of category 2 and category 3 trees to eventually replace this resource as it declines over time. On coupes or in areas where a history of timber harvesting, or other anthropogenic disturbance, has disproportionately removed habitat trees, structural complexity will be created by retaining both extant habitat trees and a selection of regrowth trees, i.e. the next habitat cohort.

Having completed its field data collection process and piloted an assessment of hollow bearing trees across different forest types, VicForests will select the most suitable harvesting and regeneration system to achieve these objectives while also ensuring that a productive forest results from any harvest activity. Generally, as the density of habitat trees increases, VicForests will tend to adopt harvesting systems that facilitate high-density tree retention and regeneration systems that minimise post-harvest burning in favour of more mechanical disturbance techniques.

There are other factors beyond habitat trees that need to be considered in the decision of the most suitable harvesting and regeneration system, e.g. social/community values and cultural/heritage values. However, under VicForests’ HCV management system, other factors will only complement the priority for retention and protection for Habitat Trees and other HCVs, and not diminish their values in any way.

It should be noted these objectives do not preclude the use of clear-felling and seed tree harvesting systems or the use of controlled burns for regeneration in specific settings. Clear-felling has historically been the most commonly employed silvicultural system in ash eucalypt forests of Victoria because it is the most reliable method for achieving successful eucalypt regeneration of this light-dependant species\textsuperscript{11}. Furthermore, clear-felling is generally the safest and most efficient system for harvesting contractors as it minimises the risks to workers associated with retained trees and falling limbs.

However, VicForests has committed to progressively reduce its reliance on the predominant use of clear-felling and regeneration burning. This shift is guided by a range of contemporary national and international studies on forest silviculture, i.e. harvesting and regeneration systems.

\subsection*{3.2.3 Minimise the use and intensity of controlled fire for regeneration}

As noted above, VicForests has committed to progressively reduce its reliance on the use of controlled burns for regeneration treatments.

VicForests notes that its mixed species operations in East Gippsland have already incorporated a significantly higher level of retention and modified burning prescriptions, including a shift away from use of high intensity burning. The alternative options now employed

\textsuperscript{10} Ibid.
in East Gippsland are low/moderate intensity burns or no burning. The East Gippsland region is now shifting its focus to current operating procedures in Ash forests in Tambo region.

VicForests has some experience with the use of mechanical disturbance instead of controlled burns for effective regeneration outcomes; however, further testing and refinement of techniques will be required to implement mechanical disturbance across a larger and broader area of sites; particularly where controlled burns have been favoured previously. Mechanical disturbance involves exposing the soil surface using machinery or hand tools to provide suitable regeneration conditions. Mechanical disturbance is generally more expensive and time-consuming than regeneration burning, however VicForests may choose this technique when:

• specific site assessment indicates mechanical disturbance will provide the best opportunity for the protection of retained trees;
• there is a risk that burning will deplete organic matter and nutrients below levels required for successful regeneration on inherently low soil fertility sites;
• harvesting operations have inadvertently caused soil compaction (e.g. landing rehabilitation); and
• early re-colonisation of non-eucalypt species has created unsuitable conditions for burning and an unacceptable level of competition that may preclude regeneration of eucalypts.

The further development and implementation of mechanical disturbance across a broader range of sites represents a good example of VicForests’ adaptive practices, discussed further in section 4. VicForests will refine its mechanical disturbance practices and other alternatives to regeneration burning, to meet the overall management objectives and desired outcomes.

### 3.3 VicForests’ suite of harvesting and regeneration systems

Following its review of silvicultural regimes and the concurrent review of protection measures for HCVs, VicForests has redefined a suite of harvesting and regeneration systems for application across State forests in Victoria. This suite of systems is illustrated in Figure 5. The redefined suite of systems features a shift towards:

• increased focus on variable retention harvesting operations that will tend to increase the level of tree retention (whether dispersed or aggregated) within and around coupe areas, to enhance habitat resources and facilitate multi-cohort forest management; and
• increased focus on alternative methods for post-harvest regeneration that minimise the use of post-controlled burns to breakdown the woody debris and create a receptive seedbed.

Variable harvesting retention involves lighter harvesting that can see up to 80% of a forest stand retained within coupes. Further, the regeneration of harvested forest may be achieved by re-seeding without burning or, where appropriate, using low intensity or limited burning.

The much-reduced reliance on high intensity post-harvest burning will enhance outcomes for retained habitat elements.
Descriptions of the five main types of harvesting and regeneration systems, including target levels for tree retention and multi-cohort forest management, are set out in Annex A.

VicForests expects that by 2020, variable retention harvest systems will account for more than 75% (by area) of its annual program of harvesting operations across the State. The use of clear-felling and seed tree systems will be restricted to specific sites with relatively uniform stand features, and VicForests expects that it will account for no more than 25% of its annual program of harvesting operations.
4 VicForests’ Adaptive Practices

Adaptive forest management is a continual process of implementation and review to strengthen decision-making in the face of uncertainty\(^\text{12}\). VicForests has elected to take an active approach to adaptive management that involves learning by doing, testing uncertainties, and using information gathered from internal reviews, as well as research, stakeholder engagement and monitoring to improve our systems and management approaches\(^\text{13}\).

Adaptive management is particularly critical to improving the most visible part of our business, timber harvesting operations. ‘Silviculture’ describes the way timber harvesting is undertaken to meet economic, forest vitality and regeneration objectives. Silvicultural decisions must adapt and evolve around sound economic and ecological practices and be mindful of community expectations that might demand alternative, non-traditional approaches. Dynamic and flexible silvicultural planning will be driven by processes within our sustainable forest management System and the effectiveness of adaptive approaches monitored through Management System reviews.

In this context, VicForests subscribes to the principles of the adaptive management cycle outlined in Figure 6.

*Figure 6 Adaptive management cycle applied by VicForests*

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VicForests has identified six key components of the adaptive management cycle; and has addressed each of these components as part of its approach to strengthening its harvesting and regeneration systems. A summary of this adaptive management program is set out below.

4.1.1 Determine management objectives

In the context of its harvesting and regeneration systems, VicForests has determined its overall management objectives are to:

1. maintain a demonstrable capacity to manage the sustainable harvest, regrowing and commercial sale of timber from public forests on behalf of the Victorian Government
2. enhance forest biodiversity and resilience to climate change.

These represent management objectives for both the short term and the longer term. The desired outcomes and indicators associated with these objectives include the following:

- The HCVs and other conservation values within or around forest areas in which VicForests has conducted timber harvesting operations are identified, retained and protected throughout pre-harvest, harvesting and post-harvest operations, and not threatened in any way by the harvesting, regrowing and commercial sale of timber from public forests;

- The forest areas in which VicForests collectively conducts annual timber harvesting operations are further developed as healthy, multi-cohort forest stands, with natural species diversity, represented by post-harvest tree retention, on average between 30% and 80% when measured from the gross coupe area (as per allocation order), depending on the selection of harvesting system to suit the site-specific values; and

- VicForests maintains its commercial viability of timber harvesting across a broad range of State forest areas that have been designated as available and suitable for timber production.

4.1.2 Develop management strategies and actions

VicForests has developed management strategies and actions to achieve these management objectives and desired outcomes. Specifically, VicForests will:

1. Conduct a systematic set of site-specific assessments over a five-year planning cycle to ensure that all values important to stakeholders, including HCVs and hollow-bearing trees, are clearly identified and factored into design considerations for harvesting operations within designated sites and areas;

2. Use the systematic site-specific assessment of forest values to determine the most suitable harvesting and regeneration system (or multiple systems) for each coupe area;

3. Enhance engagement with community stakeholders on the site-specific assessments and coupe planning processes for coupe areas in which they have expressed interest.

4. Focus on increasing tree retention levels within harvest areas, beyond Code obligations and HCV management requirements, to maintain if not enhance habitat resources for the present and the longer term – and in this context, VicForests will aim to:

   a. recruit two or more emergent habitat trees for every existing category type 1 habitat tree; and two or more additional trees with potential to become emergent habitat trees where feasible and practicable;
b. enhance the protection of retained trees through aggregation in forest patches and connectivity with existing areas of reserved trees wherever feasible and practical; and

c. reduce reliance on the use of high-intensity controlled burns for regeneration of the site, through further development of alternative systems for effective regeneration, including use of ‘cool burns’ as well as mechanical disturbance across sites or in specific areas.

5. Further develop the implementation of variable retention harvest systems, with the expectation they will become the primary system for harvesting and regeneration across its operations; indicatively, accounting for more than 75% of the total area harvested across regions on an annual basis, by 2020; and

6. Further develop and implement selection harvest systems for all designated coupe areas within a licensed bee site; and ensure the design for these harvest operations incorporates direct engagement with apiarist stakeholders, as well as other community stakeholders, with a specific interest in these bee forage site areas.

4.1.3 Evaluate management effectiveness

VicForests will evaluate the management effectiveness of its variable retention harvesting systems through a substantial increase in its monitoring program, encompassing both pre- and post-harvest operations.

Internal performance monitoring

VicForests has established a range of research projects aimed at continuous improvement of its forest management practices and harvesting systems, with a focus on effectiveness in terms of biodiversity conservation and sustainable forest management. These projects are managed by VicForests’ Environmental Performance team and specialists in Biodiversity Conservation and Research.

In this context, VicForests has identified a range of evaluation sites, which comprise designated coupe areas in which assessments of forest conditions can be assessed at two or more stages of the harvesting and regeneration cycle:

(i) pre-harvest condition
(ii) post-harvest condition, prior to regeneration
(iii) post-regeneration treatments.

VicForests has also established sets of monitoring procedures that relate to silvicultural outcomes and biodiversity conservation. These procedures are incorporated in the company’s Operating Procedures and in its management systems for managing HCVs. In accordance with these systems, a monitoring plan will be set up for monitoring the effectiveness of adaptive silviculture and its application across the footprint of VicForests’ operations. The monitoring plan will incorporate a program that is expected to include:

- Mapping sequences over time, using GIS and remote sensing technologies
- Field based assessments and remeasures of habitat trees across multiple HCV categories.

Monitoring and evaluation of evaluation sites will be supported by operational feedback from other coupe sites and incorporated into regular feedback loops for VicForests’ management to continue developing its program of adaptive silviculture and HCV retention and protection.
In summary, VicForests’ performance monitoring will comprise the following:

- Increased focus on monitoring of tree retention levels and fauna values, through the routine collection of data including:
  - the location and number of habitat trees, by category, forest type and condition;
  - the location and number of trees to be retained for recruitment of habitat trees.
- Making use of new technologies for more efficient and extensive coverage, e.g. use of drones, specialised cameras and acoustic tests to identify hollows using more reliable, effective and safe surveying systems and techniques;
- Conducting frequent post-harvest surveys of retained trees as part of systematic regeneration surveys, such that the condition of habitat trees and recruitment trees are routinely assessed and reported over time; and
- Calculating tree retention as a proportion of net harvest area across all operations by region, so VicForests can monitor, evaluate and routinely report on the proportion of tree retention and the condition of retained trees within areas of its operations.

**Compliance monitoring**

The performance monitoring program outlined above is additional to compliance auditing, conducted by external auditors. VicForests’ operations are regularly inspected and scrutinised, through extensive internal and external certification processes, and regulatory audits taking place each year. Under its Responsible Wood certification for forest management, VicForests is subject to independent evaluation audits on a regular basis and surveillance audits every 9 months.

Furthermore, DELWP conducts regular audits of VicForests’ operations as part of its Forest Audit Program. These audits assess VicForests compliance with the regulations which govern native timber harvesting in Victoria and are performed each year along with VicForests’ own internal auditing. VicForests is also subject to periodic audits by the Victorian Auditor General’s Office (VAGO), as and when required.

4.1.4 Report findings and recommendations of evaluations

In addition to all regulatory requirements, VicForests commits to an annual review of key performance metrics on its harvesting and regeneration operations, for internal evaluation and regular reporting to its stakeholders.

This annual review will incorporate key findings from its internal performance monitoring and external compliance monitoring, subject to the availability of external audit findings and limitations on sharing data and reports prepared by third parties.

VicForests will review these key performance metrics, on an annual basis, with a view to ongoing refinement (continuous improvement) of its selection of harvesting and regeneration systems for its tactical planning processes and annual works program, as well as the operational application of specific prescriptions for each of the systems.

4.1.5 Review the overall management program

Beyond the ongoing monitoring and annual review of key performance data, VicForests commits to a periodic review of the overall management program, at least every three years.
This will be a substantial review of all aspects of VicForests’ harvesting and regeneration systems and may comprise an independent review with specialist technical expertise.

This period review will encompass a review of current research and development on harvesting systems and regeneration systems, specifically oriented towards enhancing protection for HCVs and a broad range of forest values. It will be used to recalibrate the existing silvicultural prescriptions, or make substantive changes required to address VicForests’ management objectives and desired outcomes (refer section 4.1.1), as part of the cycle of adaptive management.
5 Occupational Safety Considerations

VicForests aims for zero harm in all that it does and, as an organisation, is committed to supporting a culture of leadership that embraces health and safety.

As an example of this, both the People, Safety and Culture Committee and the Environment and Stakeholders Committee of the VicForests' Board of Directors, are responsible for monitoring the effectiveness of VicForests' practices to manage occupational health, safety and environmental risks. To do this the Committees monitor the effectiveness of critical systems and review significant incident investigations and corrective actions. This is achieved by reviewing incident statistics, statements from management, audit reports, changes in regulation and case law at regular committee meetings.

VicForests has identified that its adaptive silviculture approach, and an increasing focus on retaining habitat trees – including old dead stags as well as living trees and recruitment trees – presents some heightened safety risks to consider. While VicForests has incorporated retained vegetation into its coupe designs as part of standard practise, it is now increasing its focus on variable retention within and across the harvesting areas. Compared to clear-felling, seed tree retention, and the RRH system, the increasing focus on variable retention and single tree selection will mean that field operations, including coupe marking, harvesting, post-harvest surveys and regeneration operations will all need to be conducted with increased proximity to standing trees, including older senescing trees or damaged trees that will be more prone to dropping limbs or branches, or carrying 'hang ups'.

While VicForests is committed to ensuring protection for HCVs, it is also fully committed to ensuring a safe workplace for its personnel and contractors. In this context, VicForests will:

- ensure the selection of appropriate systems incorporates consideration of safety;
- ensure specific focus on safety in all phases of planning and coupe design, including aggregation and buffers for retained trees, and the placement of roads and landings; and
- continue to develop and deploy technologies to minimise risks associated with personnel operating under or close to retained trees, e.g. drone mapping and mechanised harvesting.
Clearfalling/seed tree operations
• Most suited to uniform stands of tall wet eucalypt forests, i.e. Ash regrowth forests, which require a receptive seedbed and substantial gap sizes for effective regeneration.
• Increasing retention of seed trees and recruitment of future habitat trees within the coupe area; indicatively 5-10 trees per hectare across harvest area.
• Primary focus for retention is surrounding forests and connectivity through existing or new corridors.

Variable retention 1 system
• Using retention harvesting to ensure older forest elements are retained and recruited in areas available for timber harvesting.
• May comprise aggregated retention (forest patches) or more dispersed retention to support multi-cohort stand development.
• Retention of existing habitat trees and recruitment tree; indicatively 10+ trees per hectare across harvest area.

Variable retention 2 system
• Well suited to a range of forest types, including mixed species (comprising low elevation and high elevation mixed species forests), where there are hollow bearing trees to be retained to provide for habitat or other values.
• Higher levels of aggregated and dispersed retention across coupe; indicatively retaining 20+ trees per hectare across harvest area.
• Encompasses thinning operations, in terms of harvesting operations in which up to 50% is harvested to release further growth of new cohorts.

Selection harvest system
• Comprises group selection and single tree selection systems, recognising varying levels of selection from single trees to small patches.
• System represents a low intensity method of harvesting where individual or small groups of trees are selected and removed; hence the focus is on selection for high quality sawlogs rather than retention of remaining trees.
• Ideal system for co-existence of selective sawlog harvesting and the sustainable harvesting of apiary products from floral resources.
Clear-felling and seed tree operations

**Broad description:**

Silvicultural system 1 is based on systems known as clear-felling and (improved) seed-tree operations.

These types of systems have been the most commonly employed harvesting methods since the 1960s, principally because it has demonstrably been the most reliable method for achieving successful forest regrowth after harvesting and is the safest harvesting system for forest workers in tall Ash forests.

**Primary forest types:**

This system is designed primarily for relatively uniform regrowth Ash forests, which require a receptive seedbed and substantial gap sizes for effective regeneration. In these forests, there are typically very few if any hollow bearing trees, and coupes are marked out to ensure any HCVs are retained and protected outside the net coupe area.

For the near future, clear-felling systems will remain an important part of VicForests operations, predominantly in tall Ash forests. However, as a key part of its focus on developing a broader suite of harvest systems, VicForests is working to:

- restrict use of clear-felling to the uniform regrowth Ash forests, and
- reduce the use of high intensity regeneration burns
- protect and enhance uneven-aged forest elements.

**Guidelines for Ash forests:**

- About 30% (by area) of retained tree cover across gross coupe area (this may not be achieved for every coupe).
- For category 1 habitat trees, retain $\geq 4$ additional habitat trees (category 2 or 3 as they exist) per hectare.

**Guidelines for Mixed species:**

- About 30% (by area) of retained tree cover across gross coupe area (this may not be achieved for every coupe).
- For category 1 habitat trees, retain $\geq 4$ habitat trees (category 2 or 3 as they exist) per hectare.
- Clearfall and seed tree units will incorporate additional retention for every hectare of harvest area.
- Ensure gaps between retained vegetation do not exceed 150 metres, as required by the Code.
- Clearfall and seed tree units will incorporate additional retention for every hectare of harvest area.
- 20 metres is the minimum width of vegetation to be retained between coupe aggregates that have both been harvested within the last five years, as required by the Code.
- Additional retention in ratio of 1 ha harvest area, 0.05 ha of vegetation will be retained. Placement will consider the best ecological and safety outcomes.
- Utilise the 2 – 1 habitat tree retention method to maintain and enhance habitat elements within the harvest areas.
- Use of regeneration burns, where required or otherwise most prudent, in conformance with VicForests guidelines for managing HCVs.

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<tr>
<th>Evaluation sites:</th>
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Variable retention system 1

**Broad description:**

Variable retention system 1 is based on the principles of VicForests’ Regrowth Retention Harvesting (RRH) system, in which regrowth trees are retained principally in patches within the net coupe area. However, the variable retention system 1 is intended to have broader application, across Ash forests and Mixed species; and provides scope for dispersed retention to complement patches.

Retention harvesting is an alternative to traditional clear-fell harvesting methods and aims to mimic natural disturbances as well as protect biodiversity values. From above the retained areas may often look like islands and they are retained to help ensure older forest develops in areas available for timber harvesting.

**Primary forest types:**

This system is primarily suited to Ash or mixed species forest types where there are approximately 3–6 hollow-bearing trees per hectare to be retained to provide for habitat or other values. VicForests is using retention harvesting to ensure older forest elements are retained and recruited in areas available for timber harvesting.

To meet these aims, this system typically involves the retention of all type 1 habitat trees and recruitment of additional future habitat elements. Limits on gap size, recruiting additional retained vegetation and ensuring ecological outcomes are key objectives. Variable retention 1 can also incorporate dispersed retention to complement aggregations.

**HCV considerations:**

This new method is based on extensive research as part of VicForests’ collaborative Retention Harvesting Project, community and expert feedback and strong support and advice from other forest management organisations, such as Sustainable Timber Tasmania (formerly Forestry Tasmania).

VicForests will use this harvesting system within the range of the Leadbeater’s Possum to assist in the possum’s recovery and persistence, by providing increased connectivity of habitat, and the re-colonisation of areas following harvesting.

**Guidelines for Ash forests:**

- Where 3–6 category 1 habitat trees per hectare are present, retain between 6–12 habitat trees per hectare across the active harvest area.
- Ensure gaps between retained vegetation (aggregated retention) do not exceed 150 metres, as required by the Code.

**Guidelines for Mixed species:**

- Where 3–6 category 1 habitat trees per hectare are present, retain between 6–12 habitat trees per hectare across the active harvest area.
- Utilise the 2–1 habitat tree retention method for category 1 habitat trees to maintain and enhance habitat elements within the harvest areas.
• Utilise the 2 – 1 habitat tree retention method for category 1 habitat trees to maintain and enhance habitat elements within the harvest areas.

• Use of regeneration burns, where required or otherwise most prudent, in conformance with VicForests guidelines for managing HCVs.

• Increasing preference for cooler burns for regeneration.

<table>
<thead>
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<th>Evaluation sites:</th>
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<tbody>
<tr>
<td>• Skinny Jim (2016)</td>
<td>• Puerile (2018)</td>
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</tbody>
</table>
Variable retention system 2

**Broad description:**
Variable retention system 2 is based on the principles of *variable retention* and *aggregated retention*. The retention of trees is principally in patches and corridors but can also incorporate dispersed retention. It builds upon the variable retention system 1, and is designed for areas with high levels of existing habitat trees.

Variable retention system 2 represents a step up in the reduction in harvest intensity and the use of high intensity regeneration burns, compared to system 1. System 2 is used where there is a higher density of habitat trees or other values that warrant additional protection through these measures.

**Primary forest types:**
Variable retention system 2 is well suited to a range of forest types, most notably *Low Elevation Mixed Species* (LEMS) and *High Elevation Mixed Species* (HEMS), where there are hollow bearing trees to be retained for habitat and/or other values.

Typically, there will be an increasing density of habitat trees, with younger or smaller trees representing recruitment candidates for the next cycle. VicForests is using retention harvesting to ensure older forest elements are retained in areas available for timber harvesting, as part of an increasing shift towards multi-cohort forest management.

**Guidelines for Ash forests:**
- Where 7 – 9 category 1 habitat trees per hectare are present, retain at least 10 additional habitat trees and 10 recruitment trees across the gross coupe area.
- Ensure gap between retained vegetation (aggregated retention) does not exceed 150 metres, as required by the Code.

**Guidelines for Mixed species:**
- Where 7 – 9 category 1 habitat trees per hectare are present, retain at least 10 additional habitat trees and 10 recruitment trees across the gross coupe area.
- Utilise the 2 – 1 habitat tree retention method balancing habitat trees with production values to maintain and enhance habitat elements within the harvest areas.
• Utilise the 2 – 1 habitat tree retention method balancing habitat trees with production values to maintain and enhance habitat elements within the harvest areas.

• Use of regeneration burns, where required or otherwise most prudent, in conformance with VicForests guidelines for managing HCVs.

• Increasing preference for cooler burns for regeneration.

• Use of cool burns for regeneration and an increasing use of mechanical treatment options to minimise or replace burning.

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<th>Evaluation sites:</th>
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Selection harvest systems

**Broad description:**

VicForests’ selection harvest system is based on the principles of group selection and single tree selection; noting both these descriptors represent low intensity methods of harvesting where individual or small groups of trees are selected and removed within an area planned for timber harvesting. Using a selection harvest system, VicForests looks for areas of forest that contains a mix of different age classes ranging from young regrowth trees to mid/late mature trees that may already be forming natural hollows.

The trees are selected based on diameter and condition, with smaller and younger trees retained to grow on to the next harvest and the older trees left for future species habitat. By selecting from the remaining competing trees, the retained trees are provided access to more light, moisture and nutrients to grow on further.

**Primary forest types:**

The selection harvest system is used when the forest consists of an uneven aged stand, generally mixed species, ranging from young regrowth trees to individual, large old habitat trees. This method seeks to maintain this uneven age class structure, for forest biodiversity, other values including bee forage ranges, and the potential for ongoing selection of high quality sawlogs over time. These harvesting operations comprise low intensity extraction of trees with high quality sawlogs as well as some other trees of low habitat value and economic value that can be removed to enhance the stand dynamics. When patches of trees are harvested during this process, the mechanical disturbance within gaps allows a seedbed for new seedlings to naturally establish and regenerate the site.

**Guidelines for Ash forests:**

- **Note:** *This system is predominantly for Mixed species forests in Victoria.*

  To the extent it could be applied in Victorian Ash forests, the prescriptions would be aligned with those for Mixed species (refer opposite).

**Guidelines for Mixed species:**

- Selection harvesting is used where more than 10 habitat trees per hectare are identified.
- Maintain average of at least 50% of retained tree cover, evenly dispersed, across the forest block (excepting areas designated for landings).
- Predominant use of mechanical disturbance for any regeneration requirements and use of cool burns if required for fuel management.

**Evaluation sites:**

<table>
<thead>
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</thead>
<tbody>
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