



Haddo Estate – Proposed Forest Development Types

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FDT 1.1.1 Sitka spruce

Principle Design Concept: Timber production

Compartments 18a, 19, 27g, 29c,g,f, 31, 32e, 39, 41b, 45c,f, 66, 68, 69, 76 ~ includes existing and/or future stands of SS.

Structure and dynamics:

Single-storeyed SS stands with category A minor species, including remnants of nurse crops such as SP and LA.

Species distribution: SS 90 – 100% minor species: < 10%

Management Objectives:

Economic:

SS – sawlogs / pulp / chip in 40 – 60yrs

Environmental and Social:

Minor species elements where present may increase habitat diversity and improve landscape value as well as stability and resilience with regard to risk factors over pure SS stands.

General Management Principles:

This FDT encompasses a wide range of options, including scenarios with limited or no thinning interventions, short rotation biomass production and scenarios which may result in LIMA or even CCF management. However, stands will largely be managed under clear-fell-and-restock regime generating a more predictable final crop economic return at the end of the desired rotation. Impact of wind may be a determining factor in determining rotation length.

FDT 1.2.1 Norway spruce

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments 12, 39, 54, 63 ~ includes existing and/or future stands of NS.

Structure and dynamics:

Single-storeyed NS stands with category A minor species.

Species distribution: NS 90 – 100% minor species: < 10%

Management Objectives:

Economic:

NS – sawlogs / pulp / chip in 70 – 120yrs

Environmental and Social:

NS is one of the main habitat species for red squirrels. Minor species elements increase habitat diversity and improve amenity aspects as well as stability and resilience with regard to risk factors over pure NS stands.

General Management Principles:

This FDT should be used where clear-fell-and-restock scenarios with NS are envisaged, either because this suits the site-specific management objectives or because sufficient natural regeneration of NS cannot be expected. Management of young stands should aim to achieve canopy cover and maintain even and rapid growth of all stand components. Developing good tree stability is also important if the stand is to be thinned. A no thinning approach is possible but will limit management options and achievable target DBH. NS will respond well to thinning throughout its lifetime but in order to maintain good tree stability thinning must not be unduly delayed. Thinning should start at around 10 – 12m top height, generally as crown thinning. Thinning at later stages should aim to maintain an even canopy cover; with thinning type changing to low.

FDT 2.1.1 Scots pine

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments 13l, 20d, 29a, 45d ~ includes existing and/or future stands of SP.

Structure and dynamics:

Single-storeyed SP stand with category B minor species (mainly SBI and ROW).

Species distribution: SP 80 – 100% minor species: < 20%

Management Objectives:

Economic:

SP – sawlogs, target DBH > 40cm in 100 – 140yrs

Environmental and Social:

Woodland of natural appearance, providing habitats for light demanding species.

Presence of veteran trees and deadwood. With increasing age the relatively open structure will contribute to the conservation and amenity value of these forests.

General Management Principles:

This FDT is for even-aged stands of SP growing on lower fertility sites where SP can deliver management objectives. Stands should be established at higher density than 2500 trees/ha if timber production is an important objective, to provide scope for stem selection during the rotation. Management of young stands should aim to achieve timber quality and maintain even and rapid growth. Developing good tree stability is also important if the stand is to be thinned. A no thinning approach is possible but will limit management options and achievable target DBH. Timber quality in SP is more variable than in other conifers, and quality selection during respacing and thinning therefore more important. The growth response of SP to thinning interventions peaks early in life and diminishes rapidly thereafter; thinning must therefore not be unduly delayed and should focus on pole and small timber

stage. Thinning should start at 10 – 14m top height, generally as crown thinning. Thinning at later stages should aim to maintain an even canopy cover and steady growth. Clear-fell-and-restock is the main management scenario envisaged, however, long lived, stable stands of SP may present opportunity for LTR which will contribute to amenity, biodiversity and landscape qualities across the estate.

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FDT 2.4.1 Larch

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments 43 ~ includes existing stands of HL.

Structure and dynamics:

Single-storied stands of LA (mostly HL), some with a component of SP or DF. Mixture type ranges from intimate to small areas.

Species distribution: LA 60 – 90% SP 10 – 40% minor species: < 10%

Management Objectives:

Economic:

LA – sawlogs, target DBH > 40cm in 80 – 120yrs

Environmental and Social:

Bright and visually attractive stands which provide autumn colour and a good environment for recreation and amenity.

General Management Principles:

Management of young stands should aim to develop tree stability, timber quality and achieve even and rapid growth. LA will respond strongly to thinning interventions early in life and diminishing rapidly thereafter; thinning must therefore not be unduly delayed and should focus on pole and small timber stage. Thinning should start at 10 – 12m top height, generally as crown thinning. Where secondary species i.e. SP exist, regular monitoring and corrective action should be taken quickly should one species outgrow and dominate the other. Thinning at later stages must aim to maintain tree

stability, target species composition and steady growth. Clear-fell-and-restock as well as simple LIMA / CCF methods such as strip, seed tree and fast shelterwood systems provide options for final harvesting / restocking.

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FDT 3.1.1 Douglas fir

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments 15, 27, 63 ~ includes existing and/or future stands of DF.

Structure and dynamics:

Single-storeyed DF stands.

Species distribution: DF 90 – 100% minor species: < 10%

Management Objectives:

Economic:

DF – sawlogs, target DBH > 60cm in 60 – 100yrs

Environmental and Social:

Mature stands are attractive and popular for amenity and recreation. Minor species elements increase habitat diversity and improve soil quality.

General Management Principles:

This FDT should be used where clear-fell-and-restock scenarios with DF are envisaged, either because this suits the site-specific management objectives or because sufficient natural regeneration of DF cannot be expected. Management of young stands must aim to develop vigour and stability of individual trees in order to allow flexible management of stand structure later on. DF will respond well to thinning throughout its lifetime but in order to maintain good tree stability thinning must not be unduly delayed. Thinning should start at around 10 – 12m top height,

generally as crown thinning. Crown thinning should be used as long as necessary to develop good individual tree stability, however the thinning type may eventually shift towards low thinning, particularly in more exposed areas. DF can regenerate well under its own canopy if conditions are right and therefore LIMA / CCF methods could be considered for final harvesting / restocking on suitable sites. During the rotation there may be opportunities for species diversification through enrichment underplanting or natural regeneration.



FDT 1.1.3 Sitka spruce and Douglas fir

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments 14, 15, 16, 25, 57, 67, 71 ~ includes existing and/or future stands of mixed SS and DF, and/or current younger crops of SS with potential for transformation through enrichment planting with DF.

Structure and dynamics:

Mixed stands of SS with DF as compatible secondary species. Stands may be even aged and single storied or develop into complex structure. Species are mixed intimately, in small or large groups, or in patches.

Species distribution: SS 60-80% DF 20-40% Minor species:<10%

Management Objectives:

Economic:

SS – sawlogs, target DBH > 50cm in 60-100 years

DF – sawlogs, target DBH > 70cm in 80-100 years

Environmental and Social:

Increased habitat diversity and better maintenance of soil quality compared to pure stands. The mixed species and potentially diverse age structure of the stand is likely to be attractive and popular for amenity and recreation.

General Management Principles:

This FDT should be used where SS is planted on better soils and DF is a desirable species. SS and DF have similar shade tolerance and growth rate and are compatible to grow in mixture. Management of young stands should aim to secure DF if there is profuse natural regeneration of SS; this may require (repeated) respacing. Both species will respond well to thinning throughout their lifetime, however thinning must not be unduly delayed in order to achieve good tree stability. Thinning regimes should generally start at around 10 – 12m top height and use crown thinning as long as necessary to develop good individual tree quality and stability. LIMA / CCF methods should be the preferable option for final harvesting / restocking on sites conducive to natural regeneration.



FDT 1.1.5 Sitka spruce and shade tolerant conifers (XCST)

Principle Design Concept: Policy Woodland

Secondary Design Concepts: Amenity, Landscape and Timber production

Compartment 37 ~ initiated at restocking.

Structure and dynamics:

Mixed stands of SS and one or several shade tolerant species, likely to include WH, firs, WRC and others. Stands may be even aged and single storied or develop into a complex structure. Species may be mixed intimately, in small or large groups, or in patches.

Species distribution: SS 60 – 80% XCST 20 – 40% minor species: < 10%

Proposal: SS 60%, ESF 10%, WRC 10%, DF 10%, SOK 5%, BE 5%

Management Objectives:

Economic:

SS – sawlogs, target DBH > 40cm in 60 – 100yrs

XCST – sawlogs, target DBH > 40cm in 60 – 100yrs

Environmental and Social:

Increased habitat diversity, stand stability and maintenance of soil quality compared to pure stands. The mixed-species and potentially diverse age structure of the stand is likely to be attractive and popular for amenity and recreation. Offers opportunities to introduce emerging species.

General Management Principles:

This FDT is appropriate where objectives require the presence of a shade tolerant secondary species. Mixtures are generally compatible with the fast growth rate of SS being compensated by the greater shade tolerance of XCST. Management of young stands should be similar to that of pure SS but must aim to secure XCST if there is profuse natural regeneration of SS, possibly requiring (repeated) respacing. All species involved will respond well to thinning throughout their lifetime, however thinning must not be unduly delayed in order to achieve good tree stability. Thinning regimes should generally start at around 10 – 12m top height and use crown thinning as long as necessary to develop good individual tree quality and stability. LIMA / CCF methods should be the preferable option for final harvesting / restocking.



FDT 2.1.4 Scots pine and light demanding conifers (XCLD)

Principle Design Concept: Timber production

Secondary Design Concepts: Amenity and Landscape

Compartments: 11, 13, 14, 20, 51 ~ initiated at restocking

Structure and dynamics:

Single-storied SP stand with a component of XCLD (larches or other pines) and category B minor species (mainly BI and ROW). Mixture can be intimate, in small or large groups, or in patches.

Species distribution: SP 60 – 90% XCLD 10 – 40% minor species: < 10%

Proposal: SP 60-80%, HL/EL 10-20%, SBI 10-20%

Management Objectives:

Economic: SP – sawlogs, target DBH > 50cm in 100 – 140yrs

XCLD – sawlogs, target DBH > 50cm in 60 – 120yrs

Environmental and social:

The XCLD component provides increased stand diversity and a wider range of habitats. Stands will be visually attractive due to the mix of species and autumn colours, providing a good environment for recreation and amenity. The proposed compartments are highly visible both internally from within the Country Park and Garden, and externally from public roads.

General Management Principles:

This FDT is for productive stands on better sites than for pure crops of SP where establishment in mixture with larches will provide added productivity. SP is compatible to grow in mixtures with larches although the larger final crown diameter of larch should be considered. SP and larch follow a similar pattern with growth responding strongly to thinning interventions early in life and diminishing rapidly thereafter; thinning must therefore not be unduly delayed and should focus on pole and small timber stage. SP should be established and managed similar to that of a pure stand. Despite the general similarity in growth pattern between SP and larch regular monitoring is essential for taking corrective action in time should one species outgrow and dominate others. Clear-fell as well as simple LIMA / CCF methods such as strip and seed tree systems provide options for final harvesting / restocking.



FDT 3.1.3 Douglas fir and shade tolerant conifers (XCST)

Principle Design Concept: Policy Woodland

Secondary Design Concepts: Amenity, Landscape and Timber production

Compartments: 47, 48, 68, 69, 70 ~ initiated at restocking

Structure and dynamics:

Mixed stand of DF and one or several shade tolerant species, likely to include SS, WH, firs, WRC and others. Stands may be even aged and single storied or may develop into a complex structure. Mixture can be intimate, in small or large groups, or in patches.

Species distribution: DF 60 – 80% XCST 20 – 40% minor species: < 10%

Proposal: DF 60%, ESF 15%, SS 15%, NM 5%, ASP 5% (may also include WRC)

Management Objectives:

Economic:

DF – joinery grade, target DBH > 80cm in 80 – 140yrs

DF – sawlogs, target DBH > 60cm in 60 – 100yrs

XCST – optional, sawlogs, target DBH > 50cm in 80 – 140yrs

Environmental and Social:

Increased habitat diversity, stand stability and maintenance of soil quality. The mixed-species and potentially diverse age structure of the stand is likely to be attractive and popular for amenity and recreation. Inclusion of Norway maple and Aspen along the main south entrance drive will provide added autumnal colour and texture.

General Management Principles:

This FDT is 'DF with added diversity', the latter being provided by generally compatible shade tolerant conifers, preferably managed using LIMA / CCF methods.

Management of young stands must aim to develop vigour and stability of individual trees in order to allow flexible management of stand structure later on. All species should respond well to thinning throughout their lifetime; however, thinning must not be unduly delayed in order to achieve good tree stability. Thinning regimes should generally start at around 10 – 12m top height and use crown thinning as long as necessary to develop good individual tree quality and stability. Complex CCF systems are a realistic option for this FDT.

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FDT 3.1.4 Douglas fir and long-lived broadleaves (XBLL)

Principle Design Concept: Policy Woodland

Secondary Design Concepts: Amenity, Landscape and Timber production

Compartments: 70 ~ initiated at restocking

Structure and dynamics:

Single to multiple-storeyed DF stands interspersed with small to large groups of XBLL including BE, SY, SC, LI and others, plus category A minor species.

Species distribution: DF 70 – 90% XBLL 10 – 30% minor species: < 10%

Proposal: DF 70%, SC 10%, SLL 10%, NM 5%, ASP 5%

Management Objectives:

Economic:

DF – joinery grade, target DBH > 80cm in 80 – 140yrs

DF – sawlogs, target DBH > 60cm in 60 – 100yrs

Environmental and Social:

Uneven-aged forest structure provides habitats for a range of species and lends itself to low-impact management. Structural and species diversity maintain soil fertility better and improve stability with regard to risk factors compared to pure DF stands. Attractive to visitors because of its diverse structure, broadleaved component and autumn colours. Location adjacent to main south entrance forest drive.

General Management Principles:

Compatibility of the FDT components varies with XBLL species. The fast growth rate and taller final height of DF should therefore be compensated by the positioning of XBLL in groups, which will also benefit timber quality. Management of young stands must aim to develop vigour (XBLL) and stability (DF) of individual trees. DF will respond well to thinning throughout its lifetime but in order to maintain good tree stability thinning must not be unduly delayed and should start at around 10 – 12m top height, generally as crown thinning. Thinning of XBLL must aim to develop and maintain large crowns early on, aiming to produce vigorous and stable trees which are able to maintain their position within a DF dominated canopy. LIMA / CCF methods are the preferable option for final harvesting / restocking.

FDT 2.4.4 Larch and Sessile Oak

Principle Design Concept: Amenity and High-Quality Timber Production

Secondary Design Concepts: Biodiversity and Landscape

Compartments: 37e (Knockorthie Wood)

Structure and dynamics:

Mosaic of single-storeyed large groups or patches of LA and OK (preferably SOK) of variable age, with individual trees or small groups of category B minor species.

Species distribution: LA 50 – 70% OK: 20 – 40% minor species: 10 – 20%

Proposal: Cmppt 37e ~ LA 60%, SOK 20%, WCH 10%, SBI 5%, NMBL 5%

Management Objectives:

Economic:

LA – sawlogs, target DBH > 60cm in 80 – 120yrs

OK – sawlogs, target DBH > 60cm in 140 – 180yrs

Environmental and social: A good option for sites where timber productivity and biodiversity are both important objectives. OK increases biodiversity and improves soil quality. Attractive stands with a diverse structure, interesting mix of species and autumn colour, providing a good environment for recreation and amenity. This structure should provide a pleasant backdrop to the family cemetery, where the wild cherry dominated native broadleaf closest to the cemetery will give spring blossom and autumn colour.

General Management Principles:

LA and OK are not that compatible (CS = 3) to grow in mixture, so attention to mixture design is required – the faster growth rate of LA must be compensated by deploying the OK in groups or rows. This FDT therefore aims to create a small scale mosaic of more or less even-aged cohorts of LA and OK. Whilst the early peak of growth rate in LA requires early and heavy interventions, timber quality in OK benefits from high initial stocking density and requires careful quality selection during respacing and

thinning. Thinning in LA should start at around 10 – 12m top height and focus on pole and small timber stage, thinning in OK may start slightly later once a clean bole of > 6m has been achieved through self-pruning. For both species crown thinning should be applied throughout. Thinning at later stages must aim to maintain tree stability and steady growth. LIMA / CCF methods should be used to introduce and maintain the desired horizontal and vertical stand structure.

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FDT 5.3.2 Sessile oak and long-lived broadleaves (XBLL)

Principle Design Concept: Amenity and High-Quality Timber Production

Secondary Design Concepts: Biodiversity and Landscape

Compartments: 16, 54

Structure and dynamics:

Multi-storeyed stand of dominating OK with AH, SY, LI, and others in single tree to small group mixture. BE, HBM, HAZ and FM are also present and occupy mainly the middle and understorey. Light demanding category C minor species such as BI, WCH, and others occupy gaps and edges.

Species distribution: OK 50 – 70% XBLL 30 – 50% minor species: < 30%

Proposal: Cmp 54 ~ SOK 60%, BE 20%, SLL 5%, HBM 5%, SBI 5%, NMBL 5%

Cmp 16 ~ SOK 50%, NM 10%, SLL 10%, WCH 10%, ASP 10%, BE 10%

Management Objectives:

Economic:

OK – optional, veneer / planking grade, target DBH > 70cm in 120 – 160yrs

OK – sawlogs, target DBH > 60cm in 100 – 140yrs

XBLL – sawlogs / pulp / fuel

Environmental and Social:

Very diverse woodland of natural appearance and high conservation value. XBLL serve to add productivity, improve timber quality and control ground vegetation.

Attractive to visitors due to its diverse structure and tree size. Location adjacent to north entrance forest drive and Keithfield Lake amenity area.

General Management Principles:

This FDT aims to produce high quality timber in a multiple storey stand structure. OK and light demanding secondary species should dominate the overstorey whereas shade tolerant species are mostly kept in the middle and understorey. Mixture compatibility between OK and XBLL will vary depending on species; less competitive species require more support by interventions and will generally benefit from being established in groups rather than intimate mixture. Careful selection of FC trees for timber quality is essential. Interventions will have to be small scale and selective in nature, leading to a self-sustaining complex CCF system.

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FDT 5.3.1 Sessile oak and Beech

Principle Design Concept: Landscape

Secondary Design Concepts: Biodiversity and High-Quality Timber production

Compartment: 44 (other opportunities may present in the future in other similar 'parkland' like settings)

Structure and dynamics:

Two- or multi-storeyed stand of dominating OK with BE in single tree to small group mixture. BE occupies mainly the middle and understorey, some groups in overstorey are possible. Interspersed with single trees or small groups of category C minor species like HBM, SY, SLI, BI, ASP, ROW, HAZ and others.

Species distribution: OK 60 – 80% BE 20 – 40% minor species: < 10%

Proposal: SOK 60%, BE 20%, SLL 5%, HBM 5%, SBI 5%, MNBL 5%

Management Objectives:

Economic:

OK – optional, veneer / planking grade, target DBH > 70cm in 120 – 180yrs

OK – sawlogs, target DBH > 60cm in 100 – 160yrs

BE – sawlogs, target DBH > 50cm in 80 – 140yrs

Environmental and Social:

Diverse woodland of natural appearance providing a range of habitats and high conservation value. BE element serves to add productivity, improve timber quality and control ground vegetation. Attractive to visitors because of its diverse structure and tree size.

General Management Principles:

This FDT aims to produce high quality timber in a two-storey stand structure. OK as the more light demanding primary species must always dominate the overstorey. Careful selection of final crop trees for timber quality is essential. Due to the good self-pruning ability, weak apical dominance and phototropic growth behaviour of OK management by Q/D approach is advised, achieving timber quality first and ensuring FC trees can grow into large dimensions later. Thinning should start when the majority of FC trees have achieved the desired length of clean bole, usually at 16 – 18m top height and generally as crown thinning. OK and BE are very compatible to grow in mixture and both species respond well to thinning interventions throughout their lifetime. Thinning at later stages must maintain a two-storey stand structure and not let BE encroach into the OK canopy. Rotation length is driven by target DBH. LIMA / CCF methods should be the preferable option for final harvesting / restocking, diversifying the stand structure further.

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FDT 8.3.2 Sycamore and long-lived broadleaves (XBLL)

Principle Design Concept: Amenity and High-Quality Timber Production

Secondary Design Concepts: Biodiversity and Landscape

Compartments: 37e (Knockorthie Wood)

Structure and dynamics:

Multiple storeyed mixed stand of mainly SY, AH, EM, LI, OK, SC and WCH in small groups to patches. BE and HBM are present throughout the stand in middle and

understorey, other category B minor species will be found mostly in gaps according to site conditions.

Species distribution: SY 50 – 70% XBLL 30 – 50% minor species: 20 – 40%

Proposal: Cmppt 37a Premier Wood (W) ~ SY 60%, SOK 20%, SLL 10%, SC 5%, WCH 5%

Management Objectives:

Economic (SY GYC > 8):

SY – veneer / joinery grade / sawlogs, target DBH > 60cm in 80 – 100yrs

XBLL – veneer / joinery grade / logs / pulp / biomass

Environmental and social: Complex forest structure and species diversity provide habitats for a range of species and lend themselves to low-impact management.

Presence of veteran trees and deadwood. Attractive to visitors because of its diverse structure, spring aspect and autumn colours. Extensive sycamore natural regeneration already present combined with enrichment planting of other XBLL.

General Management Principles:

This FDT aims to produce high quality timber in a multiple-storey stand structure, however the presence of grey squirrels may restrict this. Mixture compatibility between SY and XBLL will vary depending on species (CS = 2 for AH / LI, CS = 3 for OK / WCH / BE / HBM). SY and light demanding XBLL should dominate the overstorey whereas shade tolerant XBLL are mostly confined to the middle and understorey. Careful selection of FC trees for timber quality is essential. Timber quality in all species involved will generally benefit from being established in robust groups rather than intimate mixture, particularly in less competitive species. Depending on tree species and spacing, clean boles in FC trees may be achieved by the Q/D approach or artificial pruning. Growth response to thinning interventions in SY is strong at a young age but diminishes quickly later; crowns of FC trees in SY and fast growing species such as AH must therefore be fully developed at an age of about 40yrs. Interventions will have to be small scale and selective in nature, leading to a complex CCF system.