Strathbogie Shire Council

Rural Green Infrastructure Review

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URBAN FOREST CONSULTING

Rural Green Infrastructure Review

Client

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Rural Green Infrastructure in Strathbogie Shire

Strathbogie Shire as a rural municipality sits in the crossover of agricultural and native vegetated landscapes both of which economically, socially and environmentally support many aspects of the shire. Climate change is already taking its toll on many agricultural businesses, with lack of water, fire risk and pests leading to de-stocking and support business hardship. Alternative non-traditional options to add value to the agricultural community have seen Council reviewing eco-tourism based around our forests, and plantation timber harvesting/carbon farming as potential alternative options.

A 2016 study completed by Australian National University's Fenner School of Environment and Society identified that Victoria's Central Highlands forests (though not in Strathbogie but are very close) are currently worth $12 million in native timber production each year. In comparison though, their permanence in situ is also worth:

- $310 million for clean water supply
- $312 million for agriculture
- $260 million for tourism and
- potentially $49 million for carbon storage alone.

Therefore, any potential loss in economic return derived from forestry is easily offset just by the value of carbon storage alone. Added to this, are the recognition of significant biodiversity values held within these forests, which each year grows as more species become threatened. (Keith et al, 2017).

So, whilst there is clear value in retaining native forests in Strathbogie, they are not controlled or managed by Council. Instead there is significant opportunity in considering the role that rural land has to play in assisting with the transition away from native forestry of remnant forests and towards more sustainable solutions that also support eco-tourism.

To this end, Strathbogie Shire Council has requested a broad analysis of rural green infrastructure to identify potential opportunities for alternative or complementary activities on farming land that could better equip the region to adapt to climate change and/or with potential for economic returns within the region.

Several clear and pertinent opportunities beyond the traditionally-employed agricultural practices of the region for Strathbogie rural land have been identified through an analysis of baseline data that is currently freely and publicly available. These opportunities are:

1. Protection of remnant native vegetation on freehold rural land using on-title agreements such as a Conservation Covenant (Trust for Nature), and the potential for this enhanced protection to provide access to State and Commonwealth funding to support conservation activities
2. First party offset creation with remnant native vegetation for landholders undertaking approved native vegetation clearance work on their property
3. Biodiversity (habitat) offsets through market mechanisms by registration of remnant native vegetation on the Native Vegetation Credit Register through schemes such as Bushbroker
4. Carbon credits from above and below ground carbon on agricultural land issued through the Emissions Reduction Fund
5. The establishment of agroforestry land uses, which allows for the sustainable and selective harvesting of hardwoods grown on rural land, potentially coupled with carbon credits, and the continued grazing of such sites.

It is noted that economic returns from tourism within Strathbogie Shire are growing and therefore any analysis of opportunities for rural green infrastructure must support tourism opportunities.

In framing this discussion, it is important to note that 87% of the rural land area in Strathbogie is privately owned. Council own and control only 5%, with the state or Crown owning the remainder.

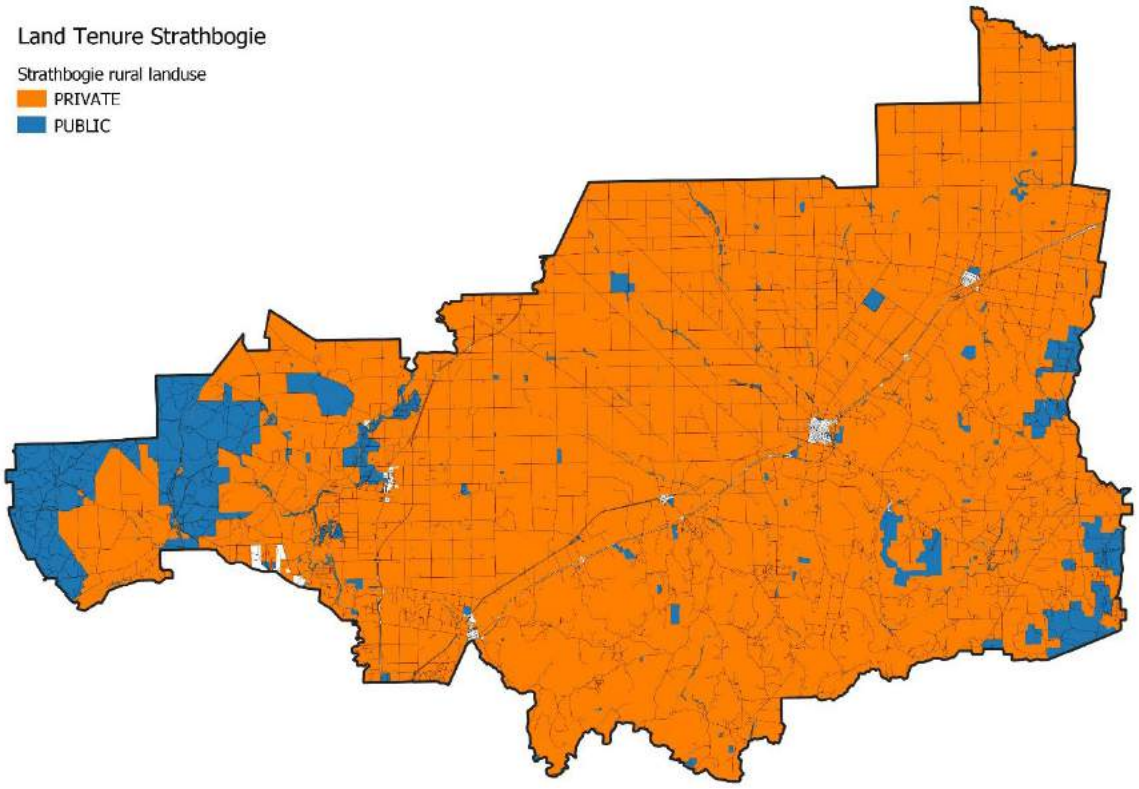

Image 1: Rural land tenure showing public vs private across Strathbogie Shire. Townships are excluded.

Public land across Strathbogie is categorised as below. There are a range of management agencies involved in these public areas e.g. Department of Environment, Land, Water and Planning (State Forest) Parks Victoria (National Parks), VicForests (Plantations), the Goulburn Broken Catchment Management Authority (Waterways – Other) and Strathbogie Shire Council.

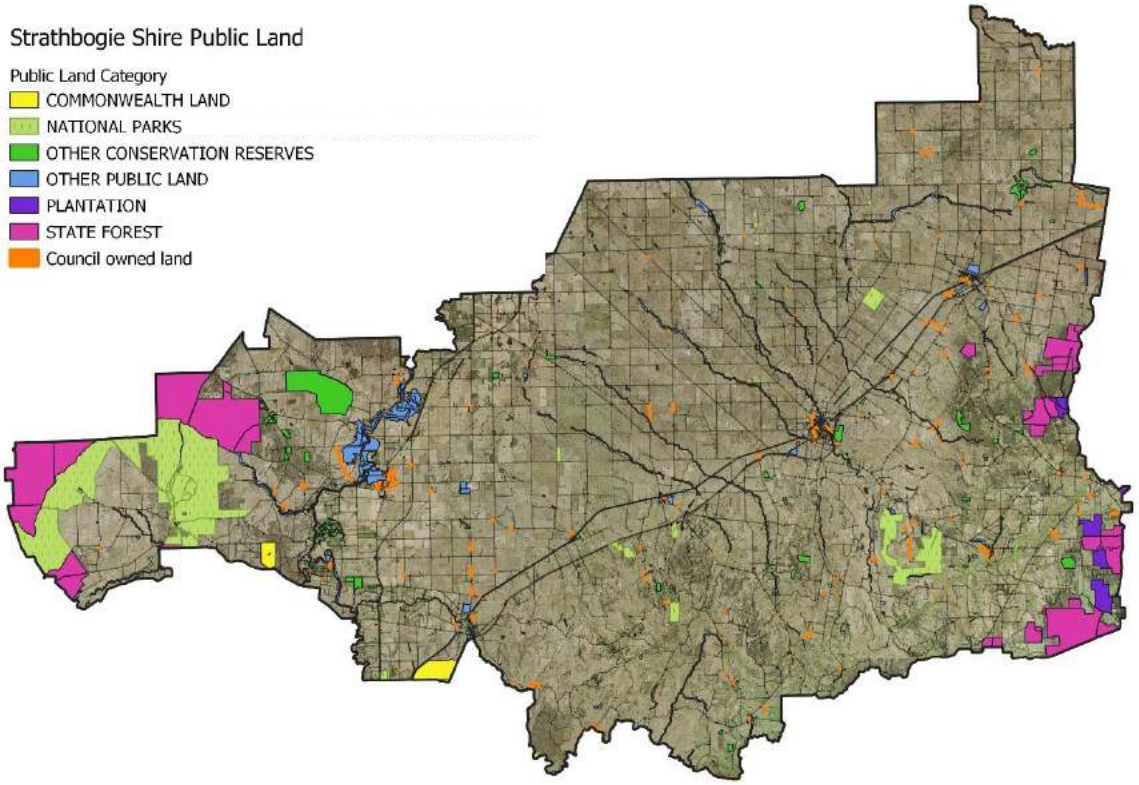

Image 2: Public land management types across Strathbogie (Source: DELWP PM25)

The forests that sit within these public lands (and some on private land) contain different vegetation communities and dominant tree species. The various forest types are shown below for areas greater than 500ha. Council does not own or manage any of the land where these forests are located. The forests are either management by a State Agency or fall on private land. Councils role, however, is that of advocacy with these agencies and landholders to improve outcomes for not only the existing forests but local ecosystems and economies.

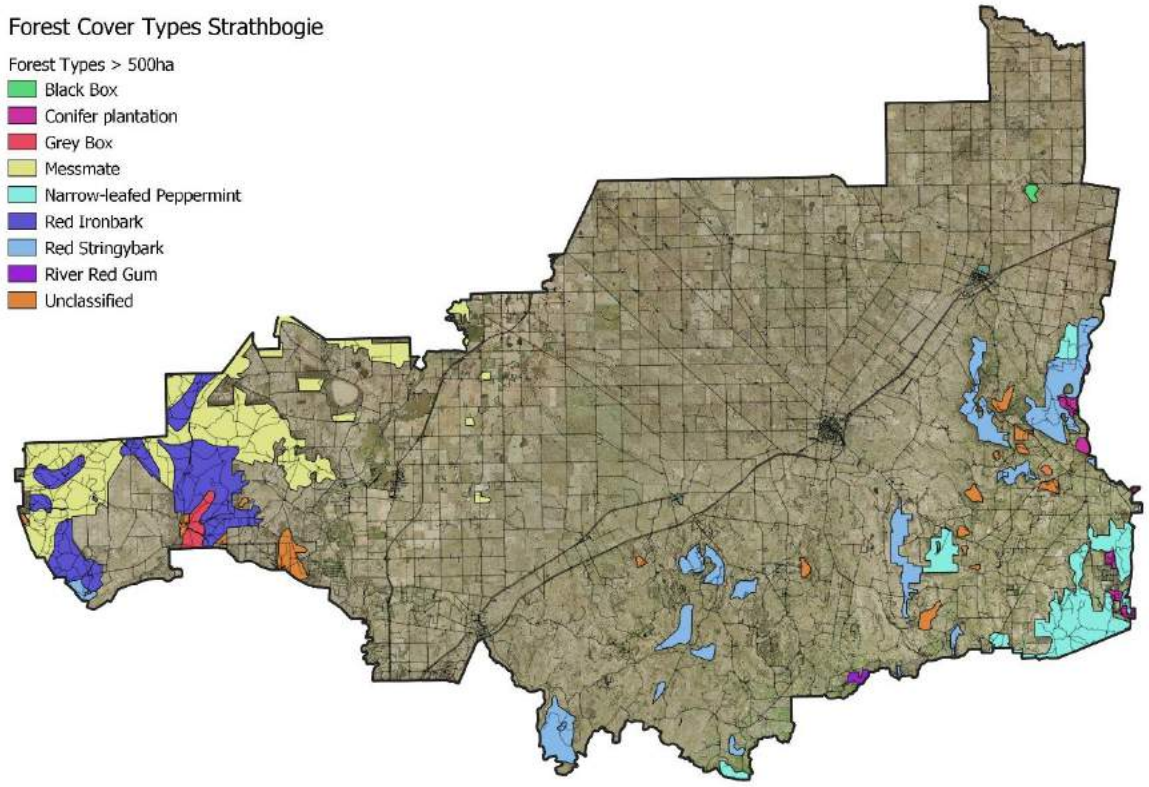

Image 3: Forest types across Strathbogie (Source: DELWP FORTYP 500)

1. Biodiversity and Vegetation

1.1 Baseline

Existing datasets to measure baseline vegetation community distribution and status in a regional context for use in the determination of native vegetation clearance extent and value, and the commensurate offsetting for these losses include NV2005 EVC and Natureprint 4.0.

NV2005 EVC which measures ***"Bioregional Conservation Status" or BCS***
Categories of Ecological Vegetation Classes (EVCs) as at 2005: rare, endangered, vulnerable, depleted and least concern.

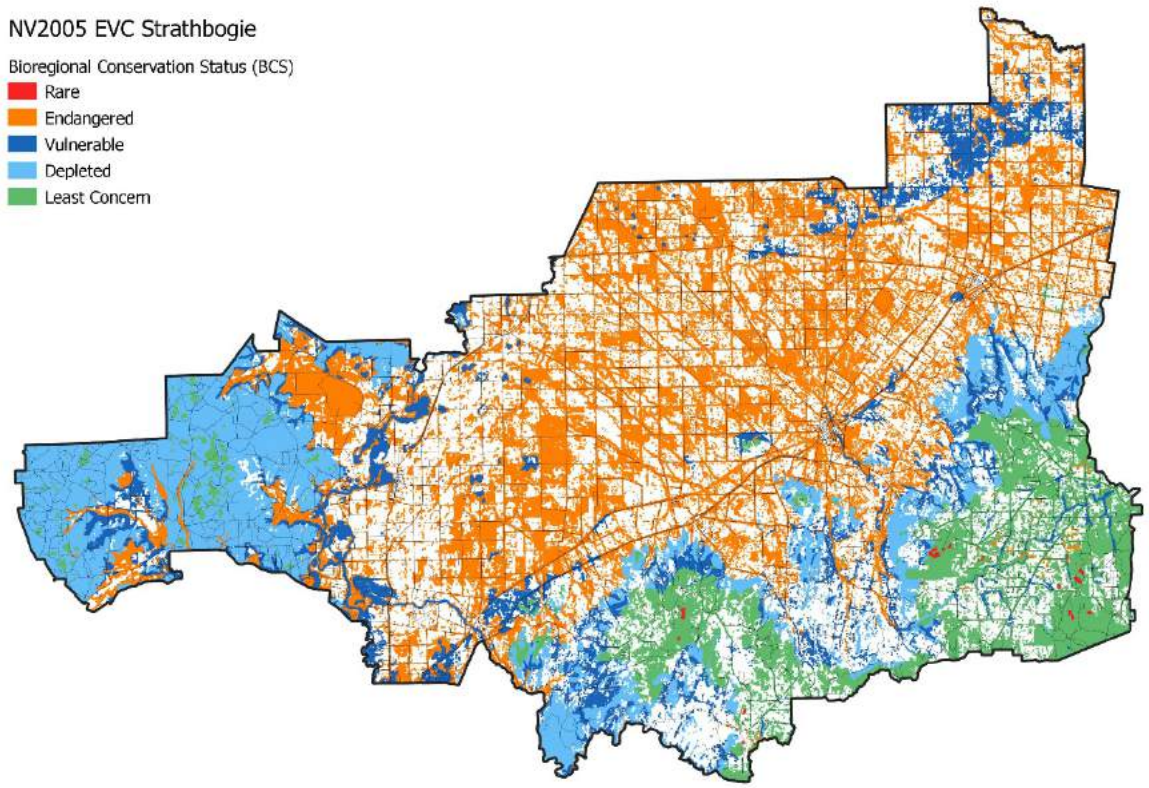

Image 4: Distribution of bioregional conservation status of Ecological Vegetation Communities in Strathbogie Shire as at 2005.

Land Area Statistics:

EVC BCS	**% of total land area**
Rare	0.5%
Endangered	14%
Vulnerable	6%
Depleted	24%
Least Concern	11%

Table 1: Percentage of total land area in Strathbogie Shire that houses certain Ecological Vegetation Communities

Areas with EVC's with a Bioregional Conservation Status of "Least Concern" or "Depleted" predominantly sit on publicly owned land and are protected to the degree of existing legislation within national and state parks. The Strathbogie Ranges themselves are almost entirely categorised

as “Least Concern” apart from a number of isolated spots that contain “Rare” EVC’s (coloured in red on map).
Most of the “Endangered” EVC’s exist on the plains which is predominantly either private land or roadsides. They are categorised as endangered because there have been historically low protections or are not found in large contiguous patches anymore. It is noted that a report to Council in 2018 has addressed the need to review and update certain aspects of Council’s Roadside Management Plan and Municipal Fire Management Plan to better protect these “Endangered” EVC’s along roadsides (Biodiversity Services, 2018)

Natureprint 4.0 which measures ***Strategic Biodiversity Value (SBV)***

Strategic Biodiversity Value (SBV) ranks all remnant native vegetation in Victoria in value from 0-1 (or 1-100). It uses the Bioregional Conservation Status (BCS) from EVC mapping of communities, flora and fauna species habitat distribution and habitat importance models, and modelled data on habitat quality (site condition) to determine a value. An SBV score demonstrates the importance and value of any mapped native vegetation on a Statewide basis, with a higher score indicating higher value.

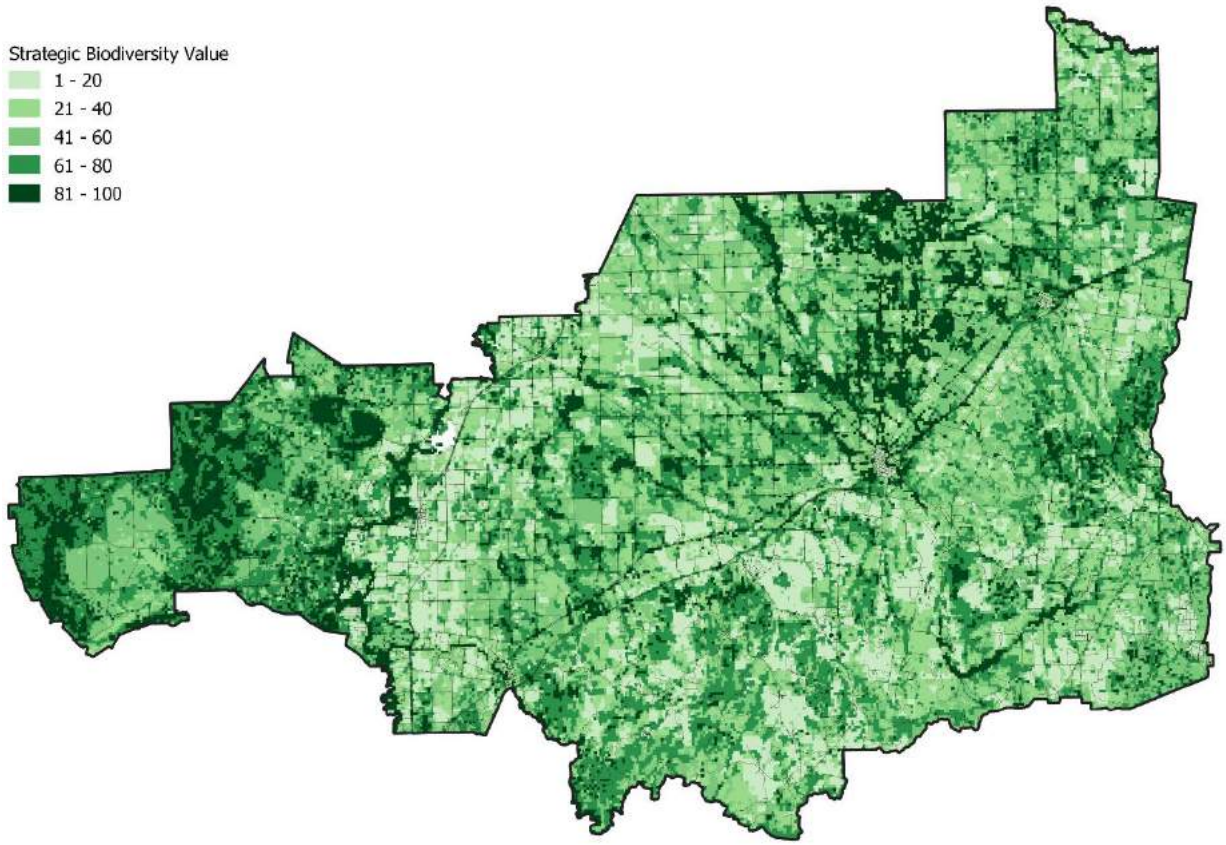

Image 5: Distribution of Strategic Biodiversity Values across Strathbogie Shire derived from Natureprint 4.0

Given the above definition of SBV's, it is therefore not surprising then that EVC's with a BCS of rare, endangered, vulnerable or depleted match almost completely with areas registering high Strategic Biodiversity Values (i.e. scores between 60-100). These areas of SBVs between 60 and 100 have been mapped below.

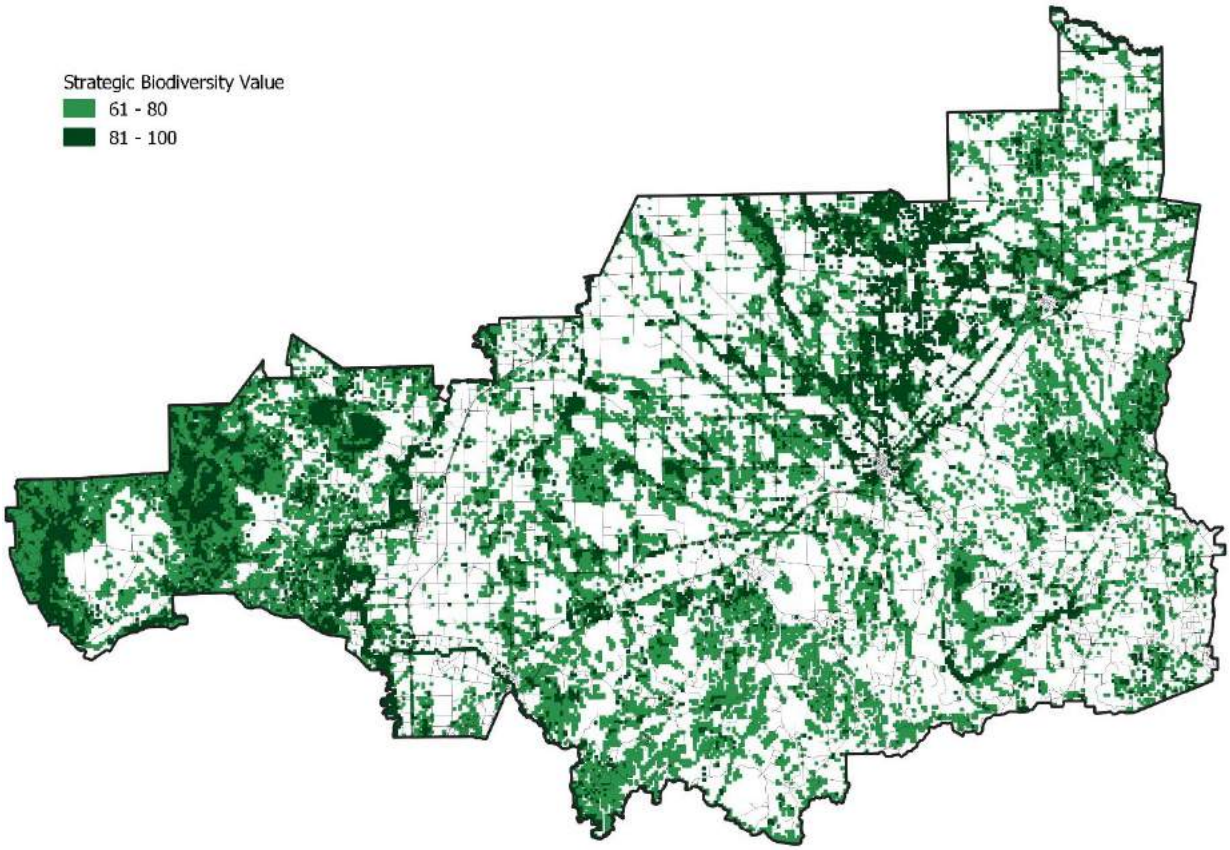

Image 6: Distribution of Strategic Biodiversity Values of 60-100 across Strathbogie Shire derived from Natureprint 4.0

A minimum SBV for the offset site required for any native vegetation clearing is specified based on the SBV of the native vegetation cleared – the offset site must have an SBV of at least 80 % of the clearance site. As many sites proposed for clearance have at least a mid-range SBV (e.g. 30-50), only offset sites with a suitably high SBV are eligible to be used as offsets. Therefore, in a market situation, it is better for potential offset sites to be as high in SBV value as possible, so that they can be utilised on a higher proportion of proposed clearances.

Given that the EVCs of value of offsets or improvement for offsets (depleted) match almost entirely with Strategic Biodiversity Values of 60 or higher, the SBV has been used to further analyse the opportunities for registering and deriving income for biodiversity offsets.

EVCs, SBVs and threatened species records are just some of the features that can be determined for any area of the State through the NatureKit portal. NatureKit is DELWP's biodiversity web mapping and reporting tool that displays information on Victoria's:

- Biodiversity values
- Investment prospects

- Flora and fauna distribution
- Native vegetation
- Marine bathymetry and habitat
- Disturbance
- Land administration and classification

NatureKit can be accessed from: http://maps.biodiversity.vic.gov.au/viewer/?viewer=NatureKit

Detailed records for flora and fauna – including threatened species – can be derived from the Victorian Biodiversity Atlas (VBA). The VBA species observations are a foundation dataset that feeds into some of the many biodiversity tools used in DELWPs everyday decision making (including NatureKit) - showing where wildlife is now and how this has changed over time. It is a dynamic list with new records being constantly added, and there are currently seven million records of species distribution and abundance collated from many different data providers. This makes the VBA a core input to the majority of the governments processes and programs that impact native species.

The VBA is used in conservation status assessments, Habitat Distribution Models (HDMs) that feed into the Strategic Management Prospects, *Native Vegetation Removal Regulations* and into public land management, research activities and State of the Environment reporting.

The VBA can be accessed from: https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas

1.2 Baseline Biodiversity and land tenure

Private Land

36% of all private rural land in Strathbogie houses vegetation with a strategic biodiversity value of 60-100. This is considered very high and poses significant opportunity for considering private biodiversity offsets, particularly in the central and northern regions of the municipality where "Endangered" EVC's are prevalent.

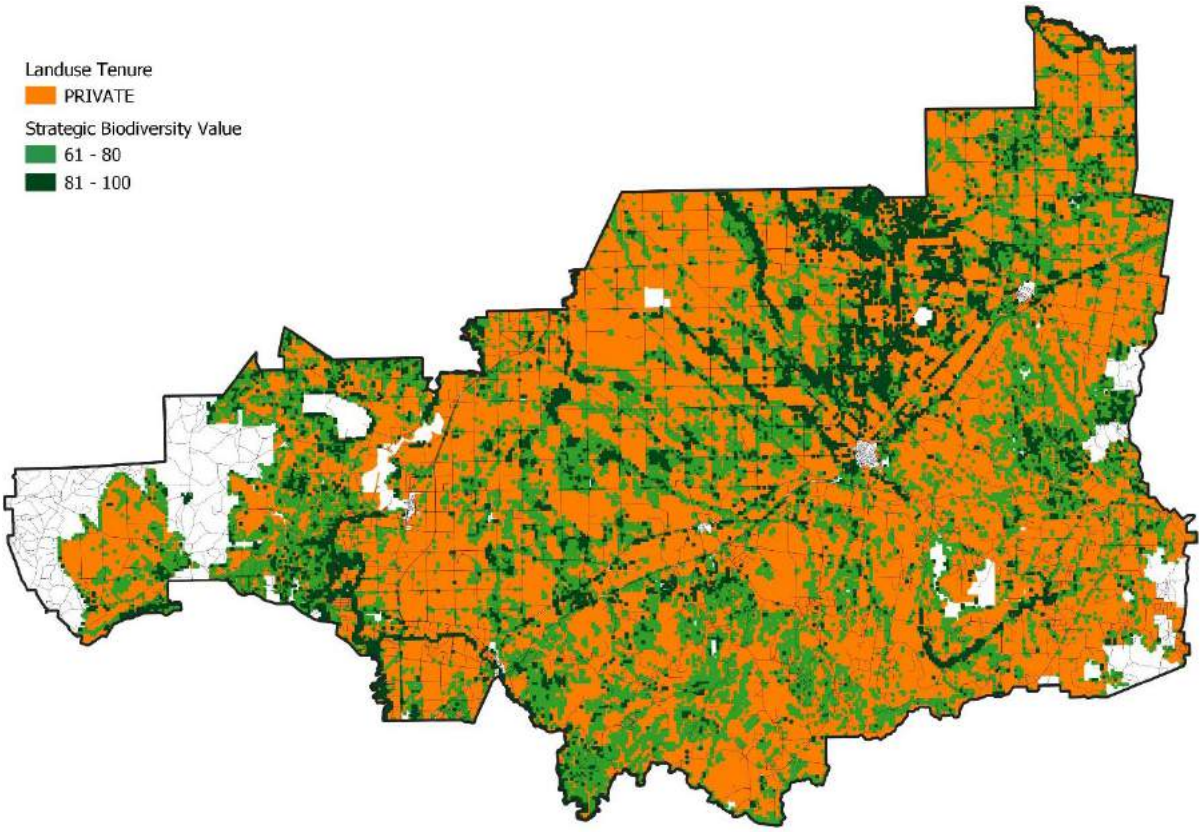

Image 7: Distribution of SBV's of 60-100 across privately-owned rural land in Strathbogie Shire

Roadsides

SBV's along roadways are also an opportunity for Council to consider owned biodiversity offsets and have been extracted out in the below map.

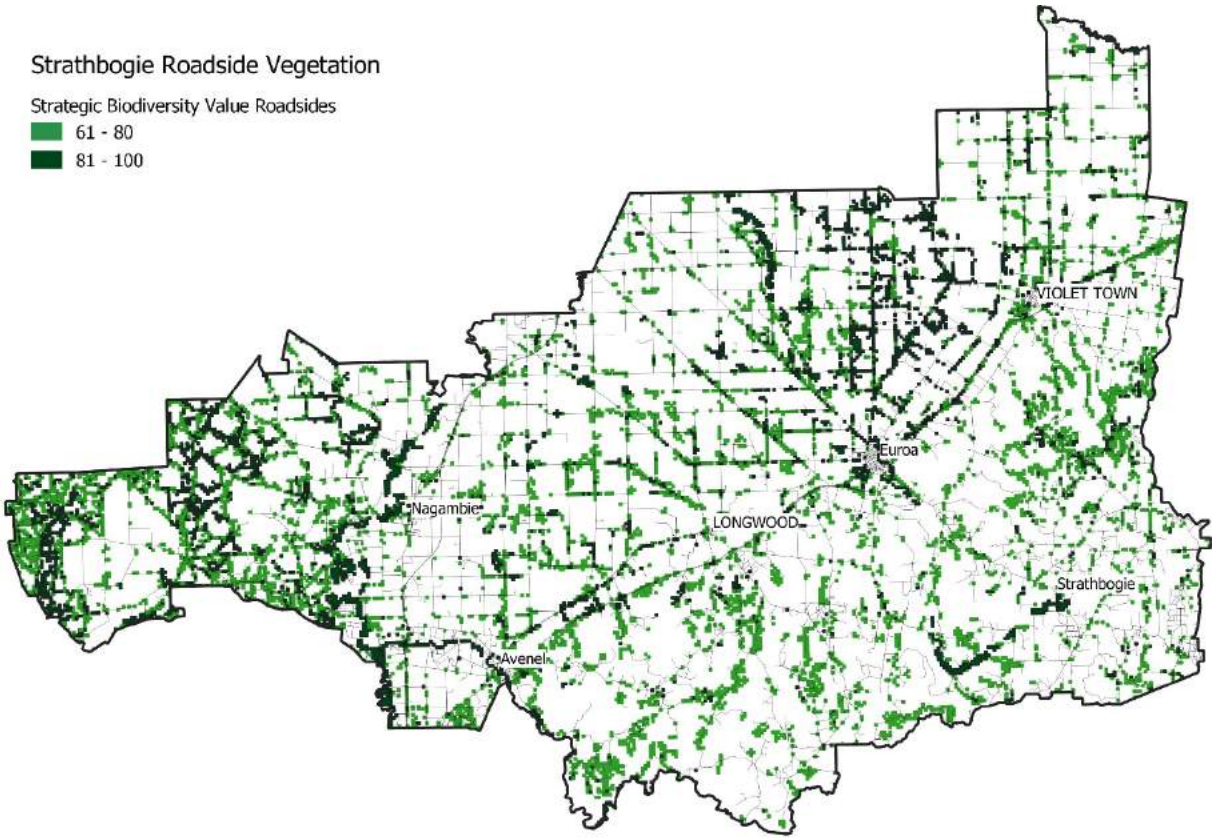

Image 8: Distribution of SBV's of 60-100 along roadsides

Many roads, particularly those radiating out of townships, those in the western ranges and those north of Euroa contain high value vegetation which could be considered for better protection and management but also possible vegetation offset value.

Council Roadside Conservation Value Assessment

Further to the above, Council undertook a roadside assessment for conservation values in 2018. A total road length of 2,105 km was assessed. Two hundred and seventy-two roads were assessed, containing 1,344 separate management zones with resulting hierarchy of values from very high conservation value to low conservation value. (Biodiversity Services, 2018)

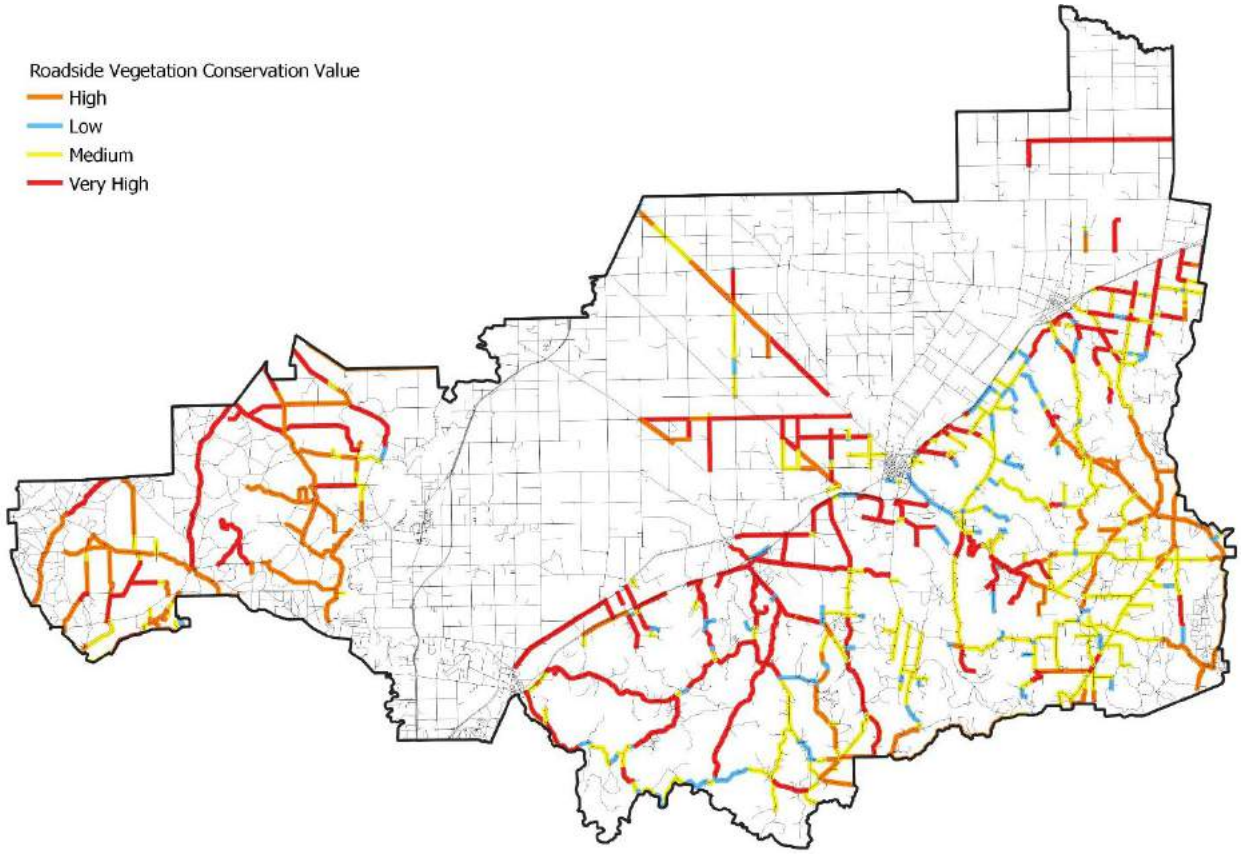

Image 9: Roadside conservation value assessment for Strathbogie's roads completed in 2018. Data source: Biodiversity Services Pty Ltd.

Overlaid with high SBV values, the conservation value assessment can be further prioritised.

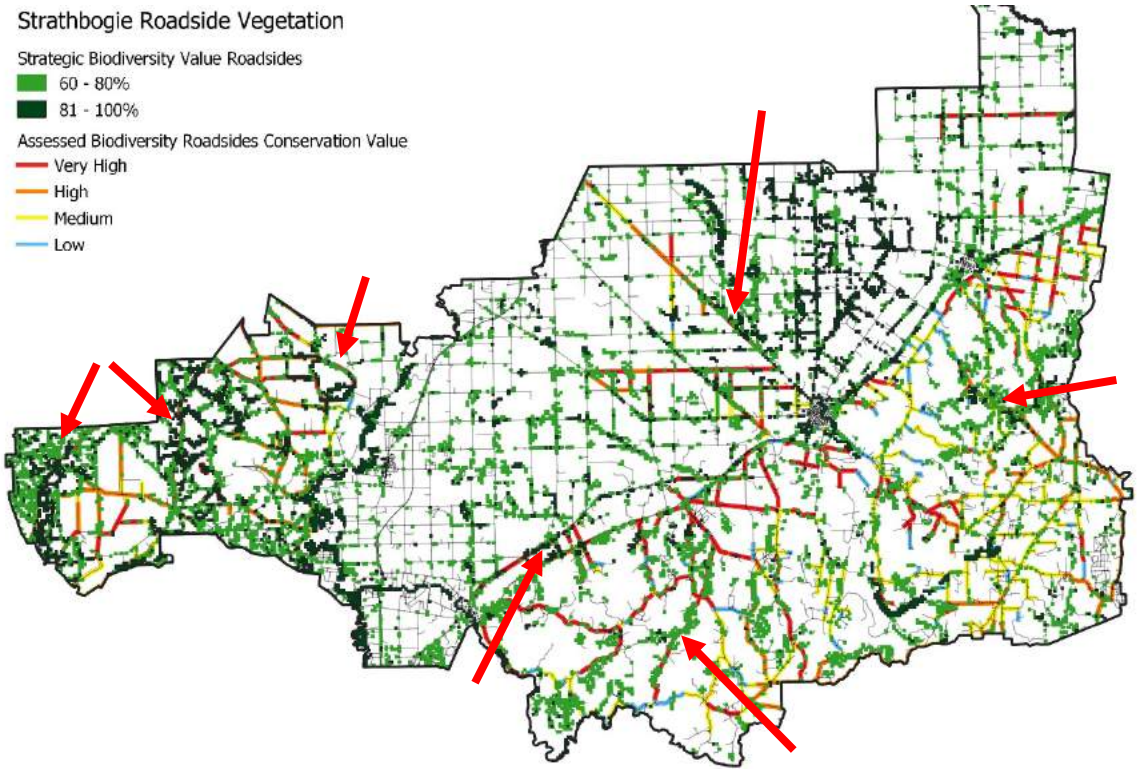

Image 10: Distribution of SBV's of 60-100 along roadsides coupled with a prioritised Roadside conservation value assessment. Arrows indicate high conservation value and high SBV value.

The red arrows above point to roadside locations in Strathbogie where very high conservation values (coloured red) intersect with a density of high SBV values. These locations warrant further on-ground analysis to determine applicability for better protections, management and potential offset value.

Council owned land (other than roadsides)

Council has around 200 various parcels of land that occur within areas of high Strategic Biodiversity Values of 60-100. In area, they total 1.6 km^2 of land area that could potentially be of high offset value.

Image 11: A parcel of Council owned land that registers high strategic biodiversity values south-east of Euroa

Image 12: A parcel of Council owned land that registers high strategic biodiversity values on Moormbool Rd

1.3 Biodiversity Offset Market and trading

Native Vegetation Clearance in Victoria

Under the *Native Vegetation Removal Regulations 2017*, all native vegetation cleared must be offset.

The magnitude of this offset is determined by:

- The extent of clearing proposed;
- A Location Category rating for the proposed clearance. The determination of an area as Location 1, 2 or 3 is as follows: Location 3 – where removal of < 0.5 ha could have a significant impact on a rare or threatened species in that location, Location 2 – includes locations that are mapped as an endangered Ecological Vegetation Class (EVC) and/or sensitive wetland not included in Location 3, and Location 1 – all remaining areas. DELWP maintain Location Category, pre-1750 and 2005 EVC mapping layers for the whole State;
- The Habitat Score (quality) of the native vegetation to be cleared. There is modelled data for Habitat Score (referred to as site condition), or it can be quantified by an accredited assessor;
- The intrinsic value of the native vegetation to be cleared relative to all other native vegetation in the State. The parameter applied is referred to as the Strategic Biodiversity Value (SBV) of the native vegetation, and is a DELWP mapped dataset. The SBV ranks all remnant native vegetation in Victoria from 0-1 (or 1-100). It uses the Bioregional Conservation Status (BCS) modelling of communities, flora and fauna species habitat distribution and habitat importance models, and modelled data on habitat quality (site condition) to determine a value. An SBV score demonstrates the importance and value of any mapped native vegetation on a Statewide basis, with a higher score indicating higher value.
- The diameter of any trees that are to be cleared. Large Tree diameter at chest height is specified in the EVC benchmark statement(s) for the proposed clearing. For every Large Tree cleared, a Large Tree must be protected in the designated offset (1:1 ratio).

An applicant wishing to clear native vegetation can determine the offset requirements of any proposed clearance either by plotting themselves the loss on-line on the Native Vegetation Information Management (NVIM), or utilising an ecologist to assess the native vegetation, map the site and estimate the condition score, and then submitting an ArcGIS mapping layer to the DELWP EnSym Native Vegetation Support Team. Both of these mechanisms with provide a Native Vegetation Removal Report, that will summarise offset requirements for the proposed clearance. The offset requirements in the NVR Reports will typically specify:

- The mapped extent of loss;
- The Location Category for the proposed areas of loss;
- The condition score of the proposed areas of loss;
- The General Habitat Units (GHU) generated by the loss that require offset;
- The number of Large Trees that are required in the designated offset;
- If critical threatened species or community habitat is to be cleared to a benchmark extent, then Species Habitat Units (SHU) are generated that will additionally require offset;
- The minimum SBV of the designated offset;
- The mandated location of the offset to an LGA of CMA area basis.

The characteristics of the proposed native vegetation clearance will see the proposal ranked as Basic, Intermediate and Detailed Assessment Pathways in the *Native Vegetation Removal Regulations 2017*, according to the table below.

Extent of native vegetation	Location category		
	Location 1	Location 2	Location 3
Less than 0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
Less than 0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
0.5 hectares or more	Detailed	Detailed	Detailed

Table 2: Risk-based pathways for Native Vegetation Removal Regulations 2017 (DELWP 2017).

Applicants for native vegetation clearance will be required to apply to the LGA with a Planning Permit Application to remove the native vegetation (Councils are the Responsible Authority in this instance), and at a minimum, especially in Basic Assessment Pathway proposals, will need to append the NVR Report to the application. If the proposed native vegetation loss is a Detailed Assessment Pathway, an accredited assessor will be required to provide more detailed reporting to Council on the matter.

Offsets in Victoria

If the Planning Permit for native vegetation removal is approved, then the applicant will be required to secure an offset through one of the options below:

- Utilising native vegetation that meets all offset requirements on their property for the purpose. This is called a First Party Offset;
- Using a credit broker to secure an offset site that meets all of the offset requirements from a Statewide register referred to as the Native Vegetation Credit Register (NVCR) that is managed by DELWP. This is referred to as a third party offset. The site utilised for such an offset is in fact a parcel of native vegetation generally found on freehold land that has been assessed by an accredited broker as part of the BushBroker scheme (DELWP), deemed a suitable offset site, and then registered on the NVCR. The landholder receives payment over a 10 year period from the inception of the offset arrangement, and is required to manage the site to an agreed offset management plan for perpetuity;
- A variant of a third party offset, an offset requirement can be met on the property of another landholder if the site is suitable, but the site is not registered on the NVCR. The landholders will need to go through the assessment and registration process through Bushbroker to get the site on the NVCR, and if approved and registered on the NVCR, utilise the site for the offset.

Offsets must have some form of on-title agreement that ensures the security and condition of the native vegetation being protected, and ensures that they are managed in accordance with an agreed management strategy.

In the case of a First Party offset, there are three on-title protection options:

- an agreement with a responsible authority (Council) under Section 173 of the *Planning and Environment Act 1987*;
- an agreement with the Secretary to DELWP under section 69 of the *Conservation, Forests and Lands Act 1987*;

- an agreement with Trust for Nature to register an offset covenant (conservation covenant) under the *Victorian Conservation Trust Act 1972*.

The Section 173 agreement is the simplest of these protections to establish, and generally requires only a simple legal document prepared by a solicitor that identifies the site and the management conditions, and is lodged with the pertinent Council. Costs of the preparation of such documents is variable depending on the solicitor used, but would generally be under $1,000.

DELWP mandate that Section 69 agreements are required for all BushBroker sites that are registered on the NVCR. The cost of this registration – whether undertaken for first or third party offset – will be around $13,000 to $16,000 to DELWP for fees to establish the site, as well as the cost of an accredited site assessor to assess the site, and then prepare the documentation and mapping for registration with DELWP, which will be between $5,000 and $10,000.

It should be noted that any transaction on an offset site on the NVCR will attract transaction fees from DELWP (up to $150 per transaction), and that credit brokers – if utilised for brokering a third party offset – will further charge brokering fees that may be up to $2,000 per transaction.

A Conservation Covenant can only be obtained on a potential offset property if Trust for Nature Victoria (TfN) – the community organisation that implements and enacts the *Victorian Conservation Trust Act 1972* – deem the site as a worthy site for conservation. The legal establishment of a covenant site attracts legal costs of > $30,000 per site, often which are borne by TfN, so such agreements are not loosely entered in to. TfN actually do offer many existing covenanted sites on freehold land for credit trading – all such sites have been registered on the NVCR and are traded in the same manner as any BushBroker site.

A First Party offset is clearly only an option if suitable land that meets the offset requirement is found on the same property (and the same landholder) where the clearance is to occur. Any eligible sites for offset must have a Site Condition score of > 30 as determined by an accredited assessor.

Generally, an accredited site assessor will need to assess the native vegetation proposed for offset, map the site and estimate the condition score, and then submitting an ArcGIS mapping layer to the DELWP EnSym Native Vegetation Support Team. DELWP will provide a Offset Report, that will summarise the offset characteristics of the site. The Offset Report will typically specify:

- The mapped extent of the site;
- The Location Category for the proposed offset area;
- The condition score of the proposed offset area;
- The General Habitat Units (GHU) generated by the proposed offset area;
- The number of Large Trees within the proposed offset area;
- The Species Habitat Units (SHU) that are generated in the proposed offset area;
- The SBV of the designated offset.

The establishment of a First Party offset requires the prescription of a Vegetation Offset Management Plan (VOMP) for the site that details the management that needs to be applied specifically to the site for the initial 10 year period, but then managed in the same manner for perpetuity. Some of the typical management conditions that apply to first party offset sites include:

- Retention of all living and dead standing dead trees and other native vegetation;
- On-site control of all grazing threats, including stock, rabbits and other pest herbivores, and other threats as identified, necessitating annual programs for control;

- Exclusion of stock, often necessitating new fencing, and ensuring that weed cover does not increase beyond current levels;
- Control or elimination of all high threat weeds (< 1 % cover), necessitating annual programs for control;
- Control of all high threats in addition to grazing threats, including inappropriate fire regimes and other identified threats;
- Retention of all logs, fallen timber and leaf litter;
- Annual reporting for the first 10 years of management to Council and/or DELWP.

The costs of annual management of a First Party Offset site are highly variable, depending on the initial condition of the site, and the level of management that is required to achieve "Net Gain" as specified in the VOMP. Therefore, costs are almost impossible to estimate in a generalist manner. Clearly, establishing fences to exclude stock grazing – if required – is a considerable initial expense, as is the eradication of woody weeds should such an infestation be present. In general, most sites must factor in, at a minimum, at least quarterly inspections of the site, regular checking of fence integrity, preparation of an annual management report to Council that addresses progress towards the agreed management targets, annual fox and/or rabbit baiting/hunting programs, and annual herbaceous weed control programs.

All landholders considering a First Party offset to satisfy offset requirements need to consider that the management of the site is for perpetuity, and that the annual and recurrent costs of management of a first party offset site over a 50 year period need to be assessed relative to the costs of a third party offset.

All of the offset scenarios discussed have centred on established mature remnant native vegetation. Revegetation can be utilised to meet the requirements of a First Party offset (although a significantly greater area is required to satisfy requirements compared to an establishment remnant block), IF there is no Large requirement; clearly Large Trees cannot be created. Note that Revegetation Offsets must be a minimum of 1 ha in area, and probably in extent as a solid block shape rather than a linear corridor.

The costs of establishing a revegetation offset site are also difficult to estimate, and also do depend on the initial condition of the site, and the actions required to mitigated potential influence of threats such as unwanted grazing (e.g. from rabbits, hares, deer, wallabies, etc.), waterlogging, flooding, heavy frosts, etc. DELWP have released standards for revegetation, which specifies that the species planted need to be in accordance with the EVC (or former EVC) benchmark species, and will further specify the density of species that must be initially planted according to life form groups (i.e. trees, medium shrub, small shrub, etc.) to ensure survival of the target number of plants per hectare after 10 years. Such a precise determination of the required density across a range of life form groups (some of which are difficult to propagate) does render direct seeding a less viable option in such revegetation establishment; tubestock planting is probably the preference in such circumstances.

As a general guide, it is not unusual for DELWP prescriptions to require up to 1,000 individual plants (across different life forms) to be planted per hectare of revegetation. The cost of the growing and planting of a tubestock plant can be up to $5/plant (e.g. therefore $5,000/ha at 1,000 plants/ha), depending on whether the plant requires staking and guarding, and the level of site preparation undertaken on-site before planting. The need to water plants over the late spring/summer period in

the event of a dry period in the first year after planting should also be factored in to the potential costs of revegetation establishment.

Offset market conditions

The third party offset market is a true market where costs of offsets are very strongly based on supply-and-demand; in the end, the market is based on the protection of existing mature remnant native vegetation, and new areas of these are not being created – it is a finite resource. Clearly, many areas of potential offsets on freehold have not been registered on the NVCR, and there is significant potential for new additions to the NVCR to improve supply.

Further to this, it is clear that as at March 2019, there is a rapidly diminishing supply of General Offset and Large Trees (with these effectively being a separate commodity for trade) across all 10 CMA areas across the State. Large Trees in particular are currently in very short supply in several catchment areas, and it is envisaged that Victoria may run out of Large Trees within the next 5 years, unless there is a significant addition of new Large Trees (and offset sites) on to the NVCR.

Colloquially, given that landholders who have offsets on the NVCR and who trade them can set their own price, under the circumstances that they must manage the site for perpetuity, it is very much a "sellers" market.

There are at least 12 credit brokers in Victoria; all of these brokers are effectively offering potential offsets from the same database (the NVCR), and have presumably negotiated the same selling price from the landholder as any other broker, the only major variable in price will be the credit brokers brokerage fees.

It is very difficult to provide a generic price for an offset per unit area of clearance (and the potential return of an offset site), because all offset requirements are predicated on the variables of Location Category, extent of clearance, site condition (Habitat Score) of the clearance, the SBV of the clearance, and potentially, the impingement of the extent of clearance on the threshold for a threatened species habitat. All offset requirements are uniquely different, and it truly is a case-by-case basis.

From experience, it would seem as if most small proposed clearances (< 0.25 ha in extent and GHU only) will cost < $20,000 to satisfy with a suitable third party offset. It is not unusual to see clearances of > 1-2 ha (again, GHU only) cost > $50,000 to satisfy with a suitable third party offset. Large Trees add significantly to the cost of an offset. As a general rule, it seems as if Large Trees (as a separate commodity) cost at least $400-500/tree, and up to $1,500/tree. As this document is written, available Large Trees for offsets are in extremely short supply in both the Goulburn Broken and North East catchment areas.

If Species Offsets have been triggered by a clearance proposal, it can be a very costly exercise for the proponent, and potentially a very lucrative return for the offset holder. Species Offsets can be satisfied by securing an offset anywhere in the State, not just in the LGA or CMA area. The nature of an offset requirement that includes Species Offsets is that the GHU, Large Trees and Species Offset requirements must all be met to satisfy the requirement. It is highly unusual in such circumstances if all three of these components can be satisfied on the one offset site (i.e. GHU and Large Trees at one site, but the offset site does not have the Species Offset required); more often than not, two or more sites are required, so that credit is having to be purchased at 2 or more offset sites.

In general, Species Offsets for many species are in very short supply, and so offset holders will place a high price on such offsets. In is not unusual for 1 SHU for a threatened species in an offset requirement to cost > $50,000 to satisfy.

Given that it is difficult to be specific on potential returns for offset holders, there are a few rules of thumb in regards to suitability of sites for registration on the NVCR.

- Bigger blocks of remnant vegetation are better, i.e. > 5 ha;
- DELWP will generally not consider long-narrow parcels of remnant vegetation for the NVCR (there are some exceptions depending on EVC rarity and Site Condition, and sometimes, Scattered Trees have been registered);
- High habitat quality (Site Condition) is better than degraded vegetation (i.e. tree cover only). Remember, sites registered on the NVCR must have a Site Condition of > 30 anyway, which does eliminate most degraded remnant vegetation. There are some advantages to a site that has been modified to an extent, but has great capacity to improve with better management, as such sites will experience better 'Net Gain', and this will improve their value;
- A good density of Large Trees (e.g. > 5 Large Trees/ha).

A site with a higher SBV is an advantage. A minimum SBV for the offset site required for any native vegetation clearing is specified based on the SBV of the native vegetation cleared – the offset site must have an SBV of at least 80 % of the clearance site. As many sites proposed for clearance have at least a mid-range SBV (e.g. 30-50), only offset sites with a suitably high SBV are eligible to be used as offsets. Therefore, in a market situation, it is better for potential offset sites to be as high in SBV value as possible, so that they can be utilised on a higher proportion of proposed clearances.

Information regarding how to set up a First Party offset guide:

https://www.environment.vic.gov.au/__data/assets/pdf_file/0029/329456/First-party-offset-guide.pdf

https://www.environment.vic.gov.au/native-vegetation/native-vegetation/offsets-for-the-removal-of-native-vegetation/i-need-to-secure-an-offset

1.4 Areas of Priority for offsets

Council has some opportunities to consider its own remnant vegetation for offsets. However, the greater opportunities are more likely to be in supporting landholders to consider the value of native vegetation occurring on their own land for potential offsets.

As discussed, the offset markets are relatively complicated and despite governments across Australia adopting offset policies, there are undetermined risks and challenges that still need to be answered before offsets can be seen as a value-add to the no net loss of biodiversity objective (Maron et al, 2016).

In order to progress these ideas forward, Council could look to develop a case study of both a Council owned land parcel with high conservation status and also a freehold patch of vegetation and undertake the required assessment to consider the value for the offset market. Council would need to employ the expertise of a credit broker to undertake this work.

2 Carbon Storage

2.1 Baseline Carbon

Above ground carbon

Public Land

In 2016, an advocacy group called Forests Alive commissioned a study of carbon stored in the Strathbogie Ranges. Using 2005EVC data, they estimated the following carbon stores in the Strathbogie Ranges alone:

Forest Type	Area (ha)	Tree Carbon Stock (tC)
Eucalyptus open forests	24,710	3,206,459
Eucalyptus Tall Open Forest	1,085	106,917
Eucalyptus woodland	39	3,874
Heath	168	30,292
Melaleuca Forest and Woodland	328	40,135
TOTAL	**26,331**	**3,387,560**

Table 3: Strathbogie Ranges Forest Types and estimated carbon content (Forests Alive, 2016)

The report modelled carbon potential carbon stores for a 100 year period under three scenarios: a 40 year timber harvest rotation, a one off harvest event in 2016 and no logging i.e. full protection of the forest.

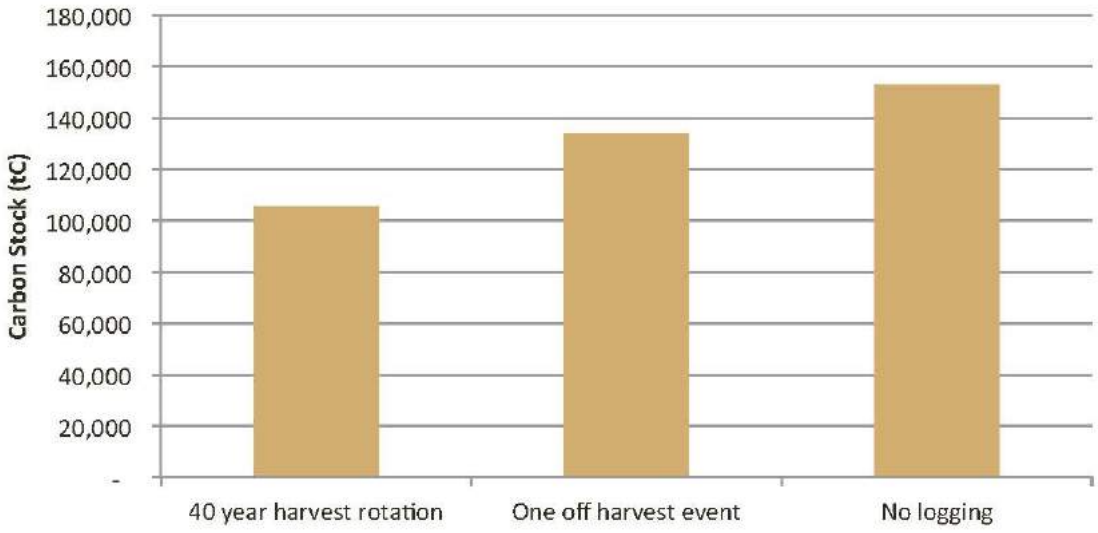

Image 13: average carbon stocks under 3 scenarios for Strathbogie Ranges forests

The modelling shows that average carbon stocks over a 100 year period are 20,000 tons higher for a no logging scenario than a one off harvest and almost 50,000 tons higher than a 40 year harvest rotation. Further results can be found in the report. (Forests Alive, 2016)

Reviewing the report today, the group formally conclude that the FullCAM model did undervalue both the carbon stored in the native vegetation but also the amount of carbon lost through logging and burning. Therefore the percentage differences are likely to be more pronounced between no logging and logging using the newly updated FullCAM model.

The Full Carbon Accounting Model (FullCAM) is the model used to construct Australia's national greenhouse gas emissions account for the land sector. FullCAM deals with both the biological and management processes which affect carbon pools and the transfers between pools in forest and agricultural systems. The exchanges of carbon, loss and uptake between the terrestrial biological system and the atmosphere are accounted for in the full/closed cycle mass balance model which includes all biomass, litter and soil pools.

In 2010, DELWP and Melbourne University attempted to measure the carbon stocks of Victoria's ***public land*** using the FullCAM (Full Carbon Accounting Method). The following map is the resulting information. It is noted that the work was not broken down per local government area.

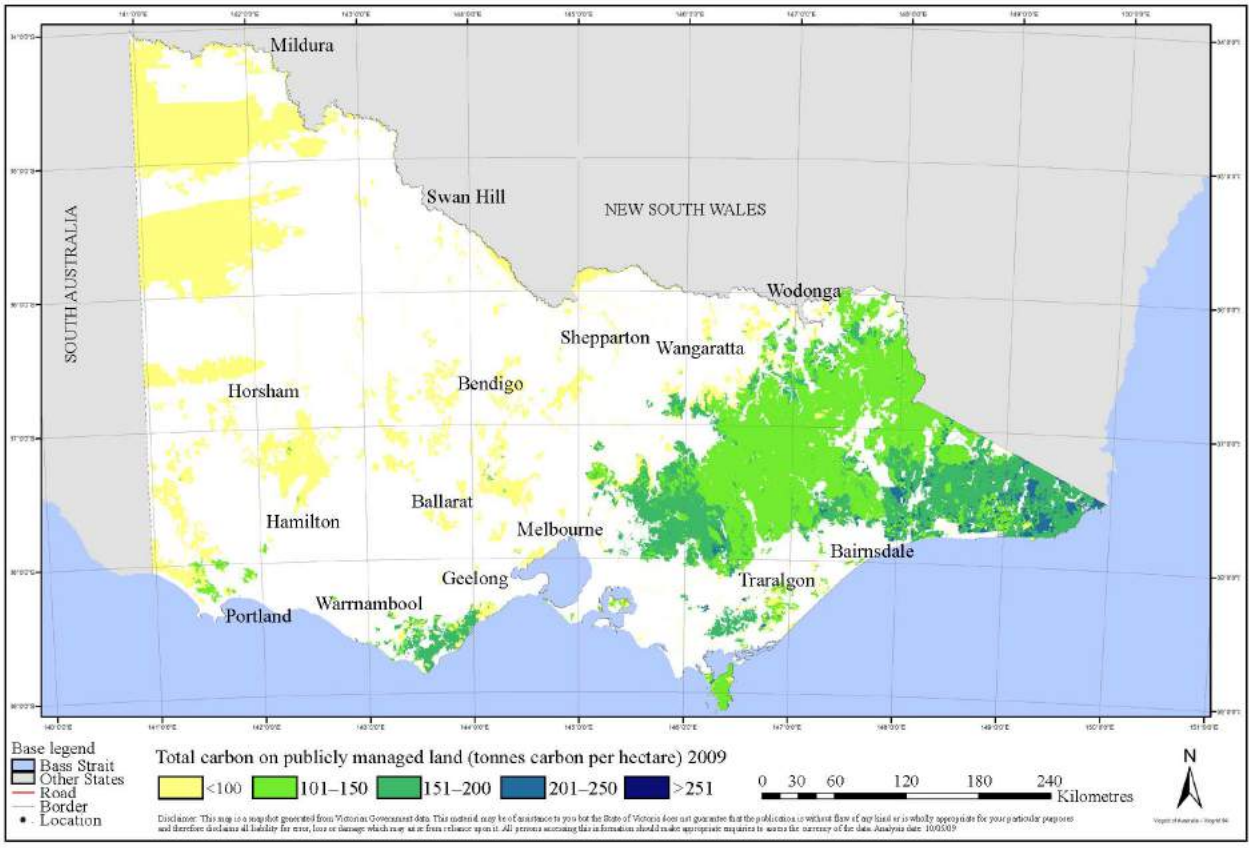

Image 14: Mapped values of carbon stored on public land across Victoria (Norris et al, 2010).

Clearly, however, the States carbon stock is centred around the ranges and includes important forest in Strathbogie Shire.

Referring back to Image 3 in the Biodiversity section, there are various types of forests in Strathbogie. These different types of forests have different rates of carbon storage. Of the types listed below, Strathbogie Shire houses at least 3 forest types: foothills mixed species, River red gum, blackbox woodland and their estimated rates of carbon storage.

Table 1. Average carbon stocks associated with major forest types found within publicly managed land in Victoria. Data derived from Grierson *et al*. (1991) and Kaye (2008).

Forest type	C (t ha^{-1})
Alpine ash	197–339
Mountain ash	246–372
Shining gum	235–374
Mountain mixed species	212–293
Foothills mixed species	239
Alpine mixed species	219–250
Coastal mixed species	190–192
Box–ironbark	75–119
River red gum	24–111
Cool temperate forest	209
Callitris woodland	20
Black box woodland	25
Scrub species	60
Mallee	18

Table 4: Estimated carbon stocks of Victoria's major forest types (Norris et al, 2010).

Again, as with the Forests Alive report, it is worth noting that in speaking with the authors of this DELWP/Melbourne University report, the field measurements taken for various forest types to validate the FullCAM modelling in 2010 suggested that more densely forested areas were being undervalued for carbon content using the model. They suggested that some of the forest types within the Strathbogie area may have been undervalued and in fact may store much higher quantities of carbon within forested areas. (Fairman, T. 2019)

Carbon mapping and modelling has not yet been updated since 2011 for the whole of Victoria. Instead, there is currently an Integrated Forest Ecosystem Research (IFER) project entitled "*Understanding and Managing Victoria's Forest Carbon"* that is still underway.

The project will:

- Develop a framework for modelling carbon to explore how the drivers and their interactions will influence the forest carbon stored into the future at landscape scales.
- Provide a stronger basis for estimating and monitoring the size of Victoria's forest carbon stores, including a comprehensive Forest Carbon Database.
- Estimate the comparative carbon losses associated with bushfires over a range of severities.
- Improved understanding of the rates of change in Victoria's forest carbon stores, including the influence of climate variations.
- Develop a Forest Carbon Modelling Framework to examine the influence of forest management scenarios on changes in forest carbon stores at landscape scales.

The outcomes of this work conducted by DEWLP will be available in the coming years and will provide the necessary information to determine more accurate measures of carbon in Strathbogie's forests and account for carbon lost and stored through the various management styles of the forests.

Private Land

Carbon credits, as earned under the current Emissions Reduction Fund, can also be earned through creating new stocks of carbon. Again, as with biodiversity, land use types in Strathbogie have significant potential for building carbon stocks that are able to earn such credits. Deriving an economic return from sequestering carbon on either private or Council owned land is not necessarily a simple process though. Carbon projects must meet certain scenarios. Of the potential methods for capturing carbon and earning carbon credits listed by the Emissions Reduction Fund (the governing body for carbon credit establishment and trading), the following are relevant for consideration within Strathbogie:

- Avoided clearing method (relevant more for the existing forests of Strathbogie)
- Human-induced regeneration
- Managed regrowth
- Farm forestry method
- Reforestation by environmental plantings.

Each have their own criteria for meeting the ERF guidelines and each have different methods for calculating the potential storage and therefore credits earned. Some of them require field assessments of vegetation over various timescales and some require the fatal harvesting of trees to properly measure carbon content over time. All of them however, require the use of FullCAM to measure carbon.

The Sequestration Tree in Appendix B details these requirements for each method.

2.2 Carbon Market (March 2019)

Emissions Reduction Fund

The Emissions Reduction Fund is a $2.55 billion fund to pay for carbon abatement projects. The fund is an auction that awards Australian Carbon Credit Units (ACCU's) to successful carbon projects. These units can then be sold to the Australian Government only through a carbon abatement contract. In February 20149, the Australian Government announced the Climate Solutions Fund which provides an additional $2billion to attempt to meet the emissions reductions targets by 2030.

The Carbon Farming Initiative which was started in 2011 and ran until 2014 is no longer running and projects have been absorbed in to the Emissions Reduction Fund.

The Clean Energy Regulator is the agency that administers the ERF. They assess all potential projects, they run the project auctions, issue the ACCU's and facilitate the appropriate compliance mechanisms.

Given the complexity of applying for and administering carbon abatement projects, many landholders seek the services of Carbon Service Providers, or those who manage the carbon contracts on behalf of landowners. It is important to know that landholders can run a carbon abatement project themselves directly through the ERF and Clean Energy Regulator or can employ the services of a professional agent. The Federal Government have put together information sheets to help landholders decide what is best for them:

http://www.environment.gov.au/system/files/resources/55d6f834-371b-42aa-9dad-35cb1a691ed8/files/working-carbon-service-providers-farmers-land-managers.pdf

Carbon Trading/Offsets

This is a voluntary carbon market that operates to assist businesses towards a journey of carbon neutrality by purchasing carbon offsets to mitigate the remaining carbon that they cannot eliminate.

Project types include reforestation, investing in renewable energy, reducing emissions through energy efficiency, and/or more efficient agricultural processes. In 2017, the Carbon Market Institute, the peak body for carbon trading in Australia created The *Carbon Marketplace* that assists businesses in navigating the voluntary carbon market, fostering connections between businesses operating in the carbon reduction space and providing information to individuals and organisations wishing to learn more about offsetting and carbon neutrality.

They also developed a comprehensive Carbon Project Registry that lists all current carbon offset programs in Australia to match up potential buyers and sellers:
http://marketplace.carbonmarketinstitute.org/registry/

Involvement in this market would require significant amounts of land dedicated purely to capturing carbon for trading. Cassinia Environmental, one such operator who owns carbon stores to trade for offsets, states that it is now not cost effective for small land owners to contribute to these projects. Rather, larger companies buy large tracts of land for conversion.

It is not proposed as part of this report for Strathbogie Shire to consider entering this market. Individual land holders or corporations looking to buy land in Strathbogie for those purposes are likely to be quite rare.

2.3 Modelling carbon opportunities for Strathbogie

Regrowth and regeneration opportunities

It is likely that there is opportunity to manage regrowth and regeneration along the interface between native forests and farmland and in recently cleared areas where a seedbank may still be present in the soil. The below map shows potential locations for such an estimated buffer zone along this interface. This zone sits around 300-500m from the boundary of spatially mapped forest sites and assumes that the Forest Types data is geographically correct. Most buffer zones sit within private agricultural land.

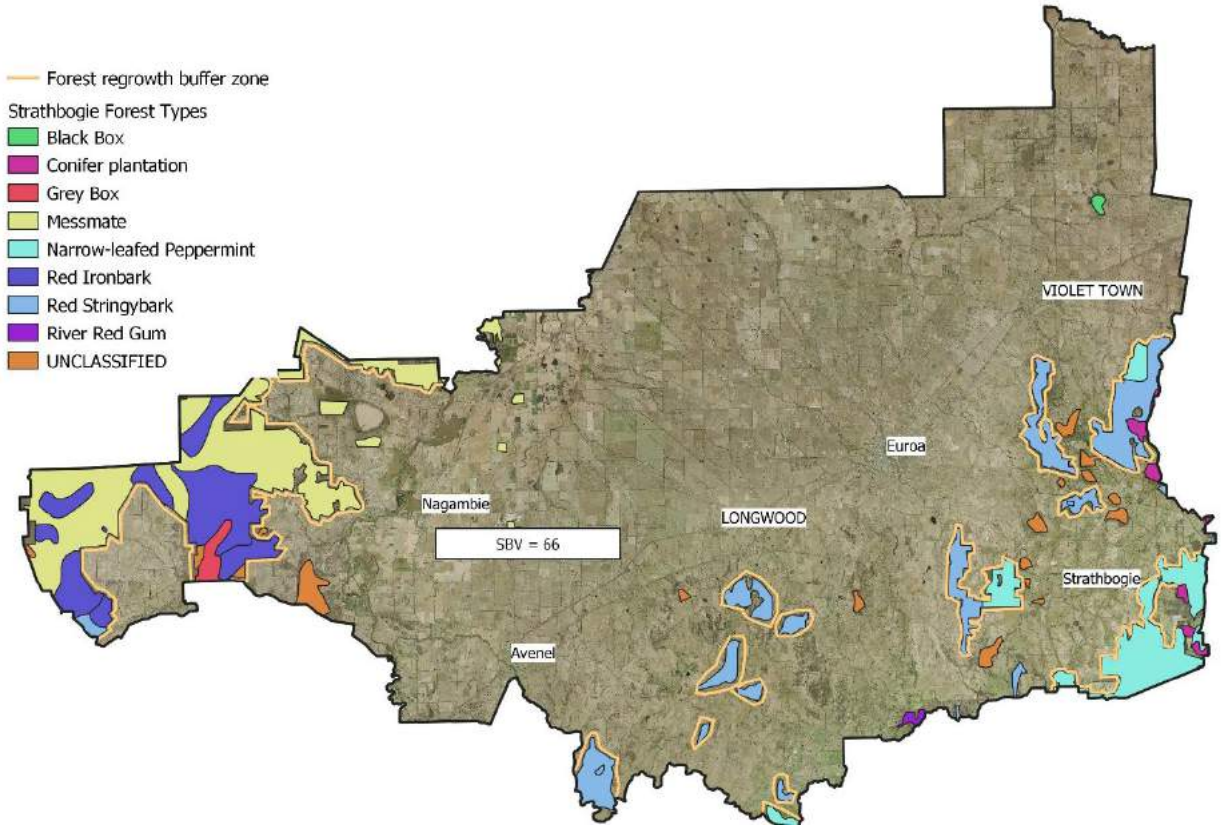

Image 15: Buffer zones around various forest types across Strathbogie identifying potential sites for carbon regrowth and regeneration opportunities

Human induced regeneration and reforestation by environmental plantings

The opportunity to explore opportunities for reforestation in permanence in Strathbogie would appear to the highest potential carbon yield purely from the amount of land base available for this. The available planting space on existing farmland is significant where reforestation is likely to benefit farmers along fencelines for protection of stock.

There are also opportunities along waterways, however the Goulburn Broken CMA are the land managers who already operate in this space. As at writing, the CMA currently has a Linking Landscapes and Community grant open to encourage landholders to revegetate, control pests and install fencing to keep stock out. https://www.gbcma.vic.gov.au/funding_opportunities

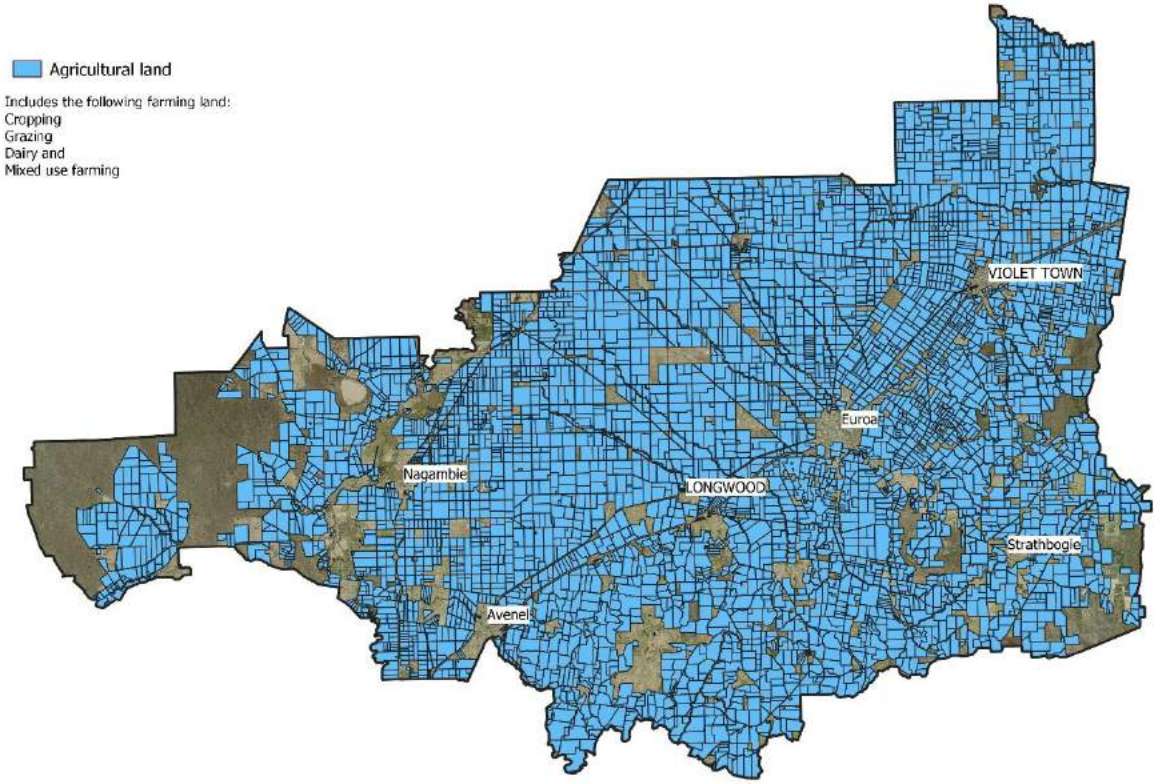

Image 16: Cropping, grazing or mixed-use farming land that has potential for carbon storage as an additional income source.

The total of the above property boundaries equals 15,672km. Boundary fenceline planting is only one option for reforestation opportunities and it is assumed that many property boundaries already contain vegetation. Paddock fencelines, tree patches within properties or whole paddock tree reforestation are also significant opportunities for carbon credits.

The Goulburn Broken CMA developed a Climate Change Adaptation Plan in 2016 in which they mapped areas of their catchment that would be suitable for carbon farming.

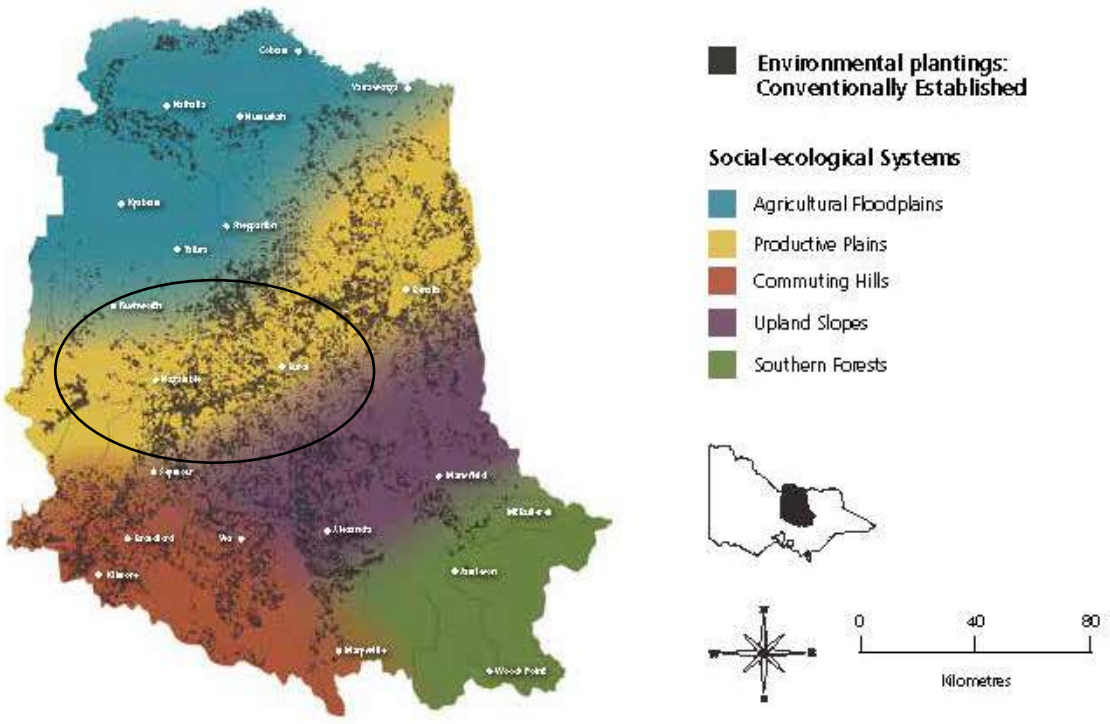

Image 17: Goulburn Broken CMA mapping of suitable locations for environmental plantings for carbon sequestration. (GBCMA, 2016) Black oval signifies Strathbogie Shire area.

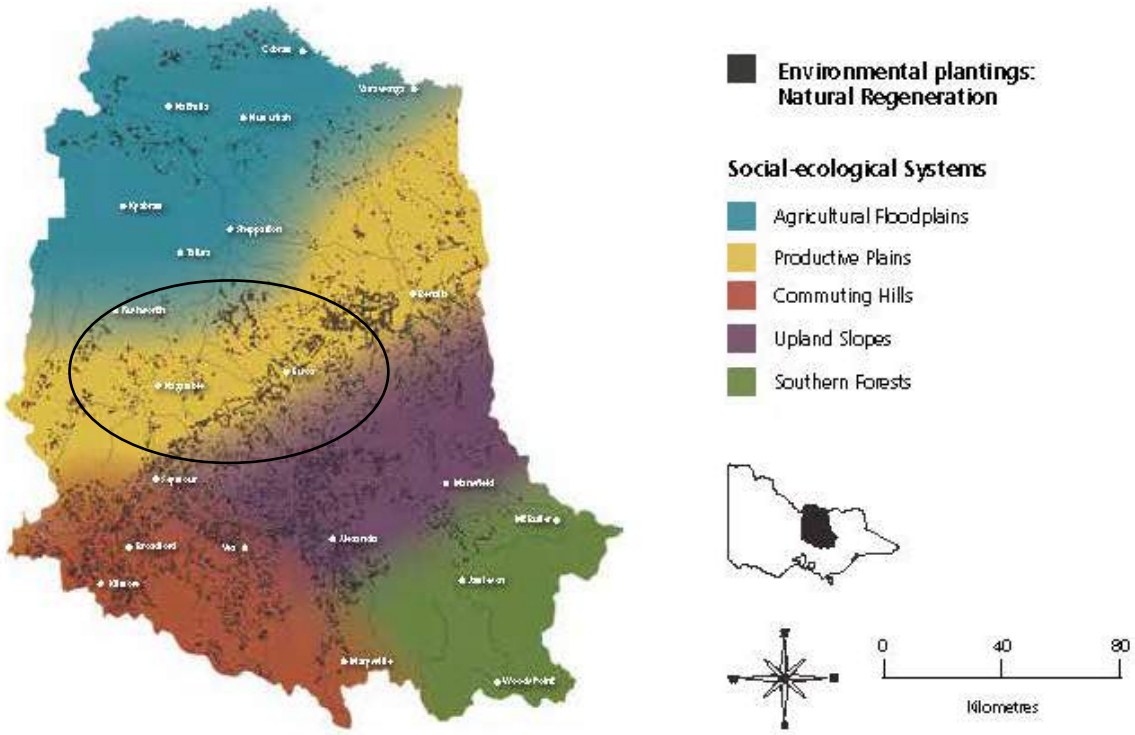

Image 18: Goulburn Broken CMA mapping of suitable locations for natural regeneration for carbon sequestration. (GBCMA, 2016) Black oval signifies Strathbogie Shire area.

As an extension to the Climate Change Adaptation Plan, the CMA partnered up with RMIT and CSIRO to engage with the community in the Strathbogie Ranges to explore further the opportunities for localised climate change adaptation techniques. The CMA see their role as more encouragement and education for landholders. The CMA have not undertaken any economic modelling, rather encouraged landholders to seek further expert advice themselves. (GBMCA, 2019)

In addition to the role of advocate, Council has other opportunities in could explore to encourage environmental plantings:

- economic development role around land use and business development; (not sure what this means..)
- organising party to bring landholders together
- incentives via rate base or other aspect
- auspicing body for grants and drought/disaster relief.

2.4 Soil Carbon

Soil carbon stocks must be estimated using specified soil sampling methods and samples must be measured for soil carbon content using specified laboratory techniques or calibrated in-field sensors. Otherwise, an appropriately qualified resource can be employed to develop a strategy of management actions that improve soil carbon content. One of the following 3 must be met in conjunction with permanence objectives (25 or 100 years in situ):

- Sustainable intensification - where new ways of productive land management are started with the aim to increase soil carbon content.
- Stubble retention - where crop residue that was previously removed by baling or burning is now retained in the field.
- Conversion to pasture - where cropped land is changed to permanent pasture

Specific management actions for measuring soil carbon storage can be found at on the Legislative Requirements page for the Carbon Farming Initiative:

https://www.legislation.gov.au/Details/F2018C00126

Given the above criteria, large cropping properties have been mapped to determine potential soil carbon opportunities. These farms combined are 44km2 in area. Whilst not all of this land will meet the criteria required for carbon credits, it is the best opportunity for exploring further.

Other farms that are listed as mixed-use farming may also have potential to improve crop pastures.

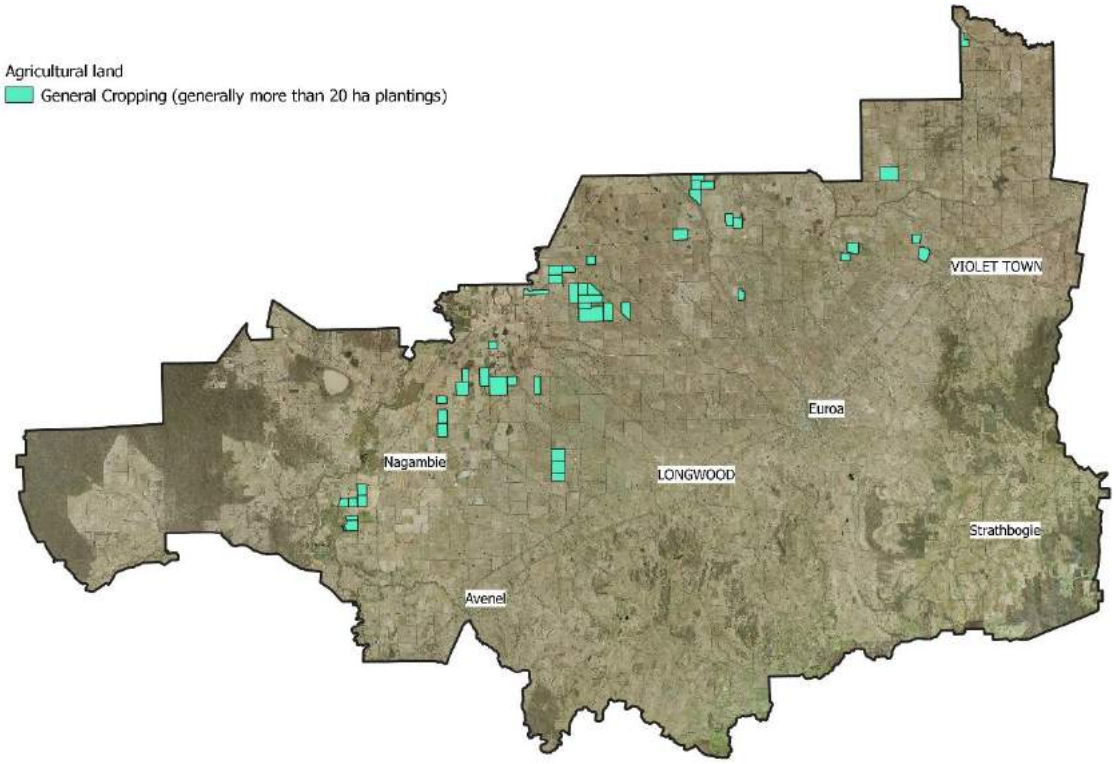

Image 19: Properties listed as cropping on more than 20ha as taken from State Govt land use zones descriptions

3 Farm Forestry

3.1 With carbon storage

Projects under New Farm Forestry Plantations can capture carbon by establishing trees as permanent plantings or rotational harvests on land previously clear of forest cover and used for agricultural purposes. This can be done on land up to 100ha.

Project proponents undertake field inventories to estimate the amount of carbon sequestered by the plantings. The method sets out requirements for designing a sampling plan, undertaking a forest inventory and determining the relationship between the in-field measurements and the carbon in the forest. Impacts of disturbances such as fires as also accounted for.

For projects featuring harvests, the Full Carbon Accounting Model (FullCAM) is also used to work out the long-term average carbon captured in the plantings taking into account harvest cycles. Landholders can earn credits from harvest projects up to the long-term average carbon estimated by FullCAM.

Projects are subject to permanence obligations. This means the project must be maintained for a nominated period of either 100 or 25 years.

3.2 Agroforestry

Sustainable and selectively harvested hardwood plantations on private rural land holdings have the potential to not only supply a growing market, but also provide a range of benefits such as biodiversity, shelter for stock, general amenity, improved water catchment outcomes and soil improvements. The ability to then harvest the tree for hardwood value in a burgeoning market allows the landowner to reap an economic benefit from revegetation. (Australian Agroforestry Foundation, 2018).

Rowan Reid, a pioneer of agroforestry in Victoria with a demonstration farm in the Otways, has undertaken a wealth of research into agroforestry and its multiple benefits such as shelter, conservation and profit. Both the Australian Agroforestry Foundation and Rowan's own webpage contain in depth research and information for farmers to consider when thinking about agroforestry on their own land. These sources should be used when communicating with landholders. Support for landholders interested in Agroforestry can look at The Master Tree Growers program.

In Strathbogie, as with carbon farming and vegetation offsets, there are a multitude of opportunities for both Council and private landholders to consider sustainable hardwood timber plantations for economic, environmental and also animal welfare benefits.

Some of the more intensive farming enterprises such as piggeries and chicken broiler farms have the capacity to utilise their wastewater to fertilise and irrigate potential plantations. These industries should be supported in Strathbogie as they provide real economic benefits to the region, as opposed to forestry. Added to this, in buffering these properties with vegetation that also couples as a harvestable asset, the amenity of local landscape improves, building on the attraction for tourism.

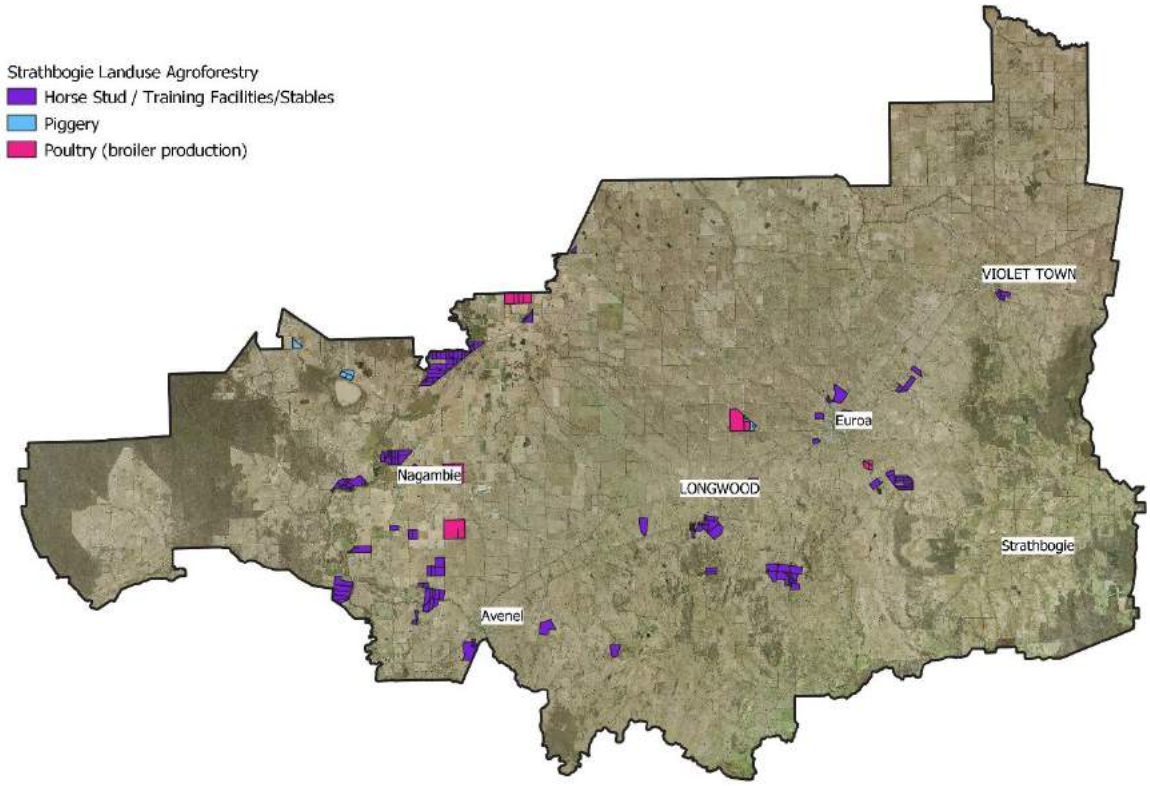

Image 20: Opportunity properties to combine agroforestry with wastewater utilisation and landscape amenity improvement: piggeries, broiler farms and horse studs

Species selection should allow most areas in the landscape across the shire to be utilised for some form of plantation or agroforestry purpose. It is far better if these areas are strategic recharge areas in the upper or mid catchment that have been cleared (i.e. for a dryland salinity control mechanism), and the vast majority of these sites are unimproved pasture/grazing. The areas where these plantings could occur can clearly also have a bioregional conservation benefit if they link isolated blocks of vegetation of riparian corridors (these comments apply to any plantings undertaken).

Finally, whilst timber harvesting for high values like hardwood for use in infrastructure or furniture is the higher value output, there is also value in sustainable timber harvesting for fire wood. Many people in the region of Strathbogie rely on firewood for heating over winter and this is likely to continue until policy prevents it. Rather than encouraging people to fossick through areas of high conservation value or status (roadsides or private remnant stands) or rely on old growth forests in the Ranges to provide firewood, quick growing plantations that are sustainably harvested could be utilised as an energy resource (VNPA, 2019).

4 Discussion

As at writing, a new alliance has formed to advocate for the very issues as outlined in this report. Climate Proofing Australia has been formed nationally to include Farmers for Climate Action, Greening Australia, The Red Meat Advisory Council and Australian Forest Products Association.

The cross-sector alliance advocates for a whole-of-landscape approach to tackle climate change aimed at integrating trees and improving soils across the landscape to store carbon, improving biodiversity, generating income for farmers and landholders, and moving towards carbon neutral farming and forestry supply chains by 2030. The group have formed 5 key principles:

1. The continuation and enhancement of the Carbon Farming Initiative – around which the Emissions Reduction Fund was built – to maximise biodiversity, and food and fibre production benefits alongside the scheme's carbon sequestration objectives.
2. The development of new mechanisms and incentives for carbon abatement on land projects that brings together institutional, private and public capital.
3. The need for new and improved national environmental datasets and mapping to guide best practice and whole-of-landscape policy making that integrates forestry, farming and conservation outcomes.
4. Improving the Australian landscape by balancing native biodiverse plantings with agricultural production and forestry.
5. Primary industries working towards carbon neutrality by 2030 (Greening Australia, 2019)

There are other examples of other agencies, namely CMA's, trying to work with landholders to provide climate adaptation and mitigation solutions. The Goulburn Broken CMA works with landholders in the Strathbogie Ranges to advocate for environmental outcomes, though since the project inception there has been little interest or take up from landholders. The Goulburn Murray CMA has declared 2019 the Year of the Paddock Tree to encourage landholders to protect and enhance their paddock trees.

Strathbogie Shire Council have a clear role in working alongside these other agencies and networks to support primary producers in understand the possibilities of their land in adapting and mitigating to climate change. Using existing information and networks, Council can play a joint role in educating the community about the value-added benefits of such options including improving water catchments, improving soil quality, enhancing animal welfare and increased landscape amenity, potentially influencing the tourist dollar. Whilst Council's capacity to make large inroads into biodiversity protection or carbon stored on their own land are not as large as privately held land, there are a multitude of pathways Council could consider to become more actively involved in this space.

5 Recommendations

This report has looked at the opportunities for Strathbogie Shire Council to explore alternative or complementary activities on farming land that could better equip the region to adapt to climate change and/or with potential for economic returns within the region. The options explored are

1. vegetation offsets
2. carbon credits (both above and below ground) and
3. agroforestry or sustainable timber harvesting

Given the groundswell of networks moving in this direction, Council can partner or collaborate with them in providing more transparent information and potential assistance to landholders who wish to pursue these options.

More specifically however, Council could explore some influential mechanisms to assist this transition towards more sustainable, climate adaptive and complementary rural land uses.

1. Council Policy
   For Council to move forward in this space, particularly as it is intending to influence changes on freehold land, Council could look at adopting a local policy that directly aims to improve biodiversity, vegetation cover, carbon stored, sustainable timber harvesting outcomes altogether or individually via specific policies. If endorsed, a local policy provides a robust platform on which to make effective decisions or embed change within existing Council frameworks such as the planning scheme, economic development masterplans and both strategic and operational programs.
   Recommendation: Explore the potential of introducing a policy that supports rural green infrastructure on both freehold and public land, specifically for biodiversity, carbon capture, agroforestry, and climate adaptation. The data explored within this report can be used as the baseline data to support this policy.

2. Land Use Planning
   The Strathbogie Shire Council planning scheme governs, to a certain degree, what happens on land across the Shire. As a result, informed by robust local policy, amendments to the planning scheme can be explored to better protect or improve biodiversity, carbon capture, vegetation cover and water outcomes on freehold land when development is occurring. It can also support strategic economic development in respect to agricultural production and forestry.
   Mechanisms within the planning scheme that could be considered for change are the use of specific overlays for protection, provisions in certain clauses, stronger permit conditions and a stronger Municipal Planning Strategy (Municipal Strategic Statement) with supporting documents and evidence. Whilst planning scheme amendments and updates can take time and significant funding particularly in a small rural Council, they can strengthen Council's ability to effect change on private land.
   Recommendation: Investigate the feasibility of planning scheme amendments to support better outcomes for biodiversity, carbon capture, vegetation cover and agroforestry across the Shire. This could be earmarked for the next planning scheme review or given the size

and nature of the project, could be considered a stand-alone piece of work with pre-approved funding.

3. Incentives
   As opposed to regulation, financial or reward-based incentives are proven to effect change by those willing to adopt. This mechanism also operates outside of the planning scheme and can effect change even when there is no current development taking place which requires planning permission. Landholders who adopt new practices that contribute towards a climate adaptation or mitigation local policy could be rewarded through mechanisms such as rate reductions, access to free advisory services, discounts for using local service providers or tubestock giveaways for planting
   Recommendation: Explore potential incentives that Council could make available to landholders to encourage transition towards better biodiversity, carbon, vegetation and agroforestry outcomes.

4. Council led Agroforestry network
   A regional network consisting of interested landholders, agroforestry experts and government decision makers would be a strong first step in exploring the role of agroforestry in Strathbogie region and beyond. As discussed, Council has a role in educating and advocating but also facilitating and bringing together the relevant stakeholders to come together and develop a vision and pathway for sustainable forestry in the region.
   Recommendation: Invite and facilitate a network of stakeholders to meet regularly to discuss the opportunities and pathways for agroforestry in the region. Key aims should be to establish a shared vision, objectives and pathways for action in establishing a boutique and sustainable agroforestry industry in Strathbogie Shire.

In assessing each recommendation and potential outcomes, other influencing factors should also be considered. Tourism and its growing presence in the region and the negative impacts of climate change namely changed rainfall patterns, drought, bushfire and extreme heat events should all be considered by Council in deciding the next steps to take in transitioning to a more sustainable and resilient rural lands future.

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Appendix A: Gain Calculator for Offsets

Use the gain calculator to determine potential gain from site:

Property details	**Property address / location**	
	Unique project ID	
	Property size (ha)	
	Total extent of native vegetation on the property (ha)	
	Proposal type	Offset
	Current land tenure	Freehold land
	Current security arrangements	
	Proposed security arrangements	
Zone information	Save zone / **Site number**	
	Zone ID	
	Delete zone / Zone type	
	Size of zone (ha)	
	Open saved zone / Bioregion	
	EVC name	
	EVC standardiser	1
	Bioregional EVC code / conservation status	1 / 1
	Vegetation type (as per gain scoring manual)	1

Click

Are there any current land management restrictions (e.g. due to an overlay)?

1. Not permitted to graze with domestic stock ☐

2. Not permitted to remove trees ☐

3. Not permitted to remove dead vegetation ☐

4. Requirement for regular fuel reduction ☐

Management commitments

☐ Select all management actions

To generate gain the land manager must commit to all of the following:

User details

User name	
Organisation	
Contact phone	
Contact email	

Appendix B: Carbon Sequestration Tree Decision Tool