Contents

Figures 3
Tables 3
1 - Introduction 4
1.1 - A site overview 4
1.2 - Ilston Cwm – Site background 8
1.3 - Ilston cwm - The Habitat 10
1.4 - The Gower Ash Woods Core Management Plan (CMP) - 2011 12
1.4.1 - The CMP, 2011 conservation objectives 15
2 - Phase 1 Habitat survey findings – Ilston Cwm 17
3 - Analysis of the existing Habitat management plan 23
4 - A 10-year habitat management plan for Ilston Cwm 31
5 - Conclusion 59
Appendices 62
Appendix 1 62
Appendix 2 63
References 64

Figures

Figure 1 - Map showing the location of Ilston Cwm (qGIS, 2022). 4
Figure 2 - Map showing the Gower Ash Woods SAC. 5
Figure 3- Dry riverbed after the sinkhole. 8
Figure 4 - Location of two main sinkholes and the Trinity well rising (qGIS maps 2022). 9
Figure 5 - Map showing the core management plan area that covers Ilston cwm as well as the connected areas of the Pennard valley management unit, and the Parkmill woodlands management unit. 13
Figure 6 - Vision for the site. 14
Figure 7 - A definition of a 'Favourable conservation status' 15
Figure 8 - Map showing Phase 1 survey results, using standard JNCC classification codes (qGIS maps 2022) 22
Figure 9 - Locations of adjacent South Wales wildlife trust managed nature reserves. (qGIS maps/Google UK) 33
Figure 10 - A fortified path through Kilvrough woods nature reserve. 34
Figure 11 - Channelling of the river as it flows under the A4118 at Parkmill. (R Carter, 2022). 36
Figure 12 - Graph showing the distribution of species across light classes in three ecological categories: ancient woodland indicators, Specialists and Generalists. 54
Figure 13- Image showing the extent of tree root exposure and damage by human trampling on unofficial path. 54
Figure 14 - Image showing soil erosion on footpath. (R Carter, 2022) 55
Figure 15 - Muddy section leads to creation of alternative paths (R Carter, 2022). 55
Figure 16 - Map showing the public right of way and the unofficial paths created and compounded by human activity (qGIS maps/Google satellite UK). 56
Figure 17 - Image showing Plantain growing on footpath (R Carter, 2022) 56
Figure 18 - Maps showing the proposed of 2 new entrance interpretation boards. 57
Figure 19 - Image showing the proposed location of the new wooden steps and interpretation board at the Gower inn car park. 57
Figure 20 - Image showing the regeneration of woodland species after clearance of bracken and bramble at Pennard burrows. 58
Figure 21 - Map showing Management plan outcomes for Lower Ilston cwm. (qGIS maps) 61
Figure 22 - Map showing Management plan outcomes for Upper Ilston cwm. (qGIS maps) 61

Tables

Table 1 - Threats and Positive Impacts. 11
Table 2 - Phase 1 habitat survey 17
Table 3 - Analysis of the existing habitat management plan. 23
Table 4 - Proposed 10 year management plan 2022 - 2032. 38

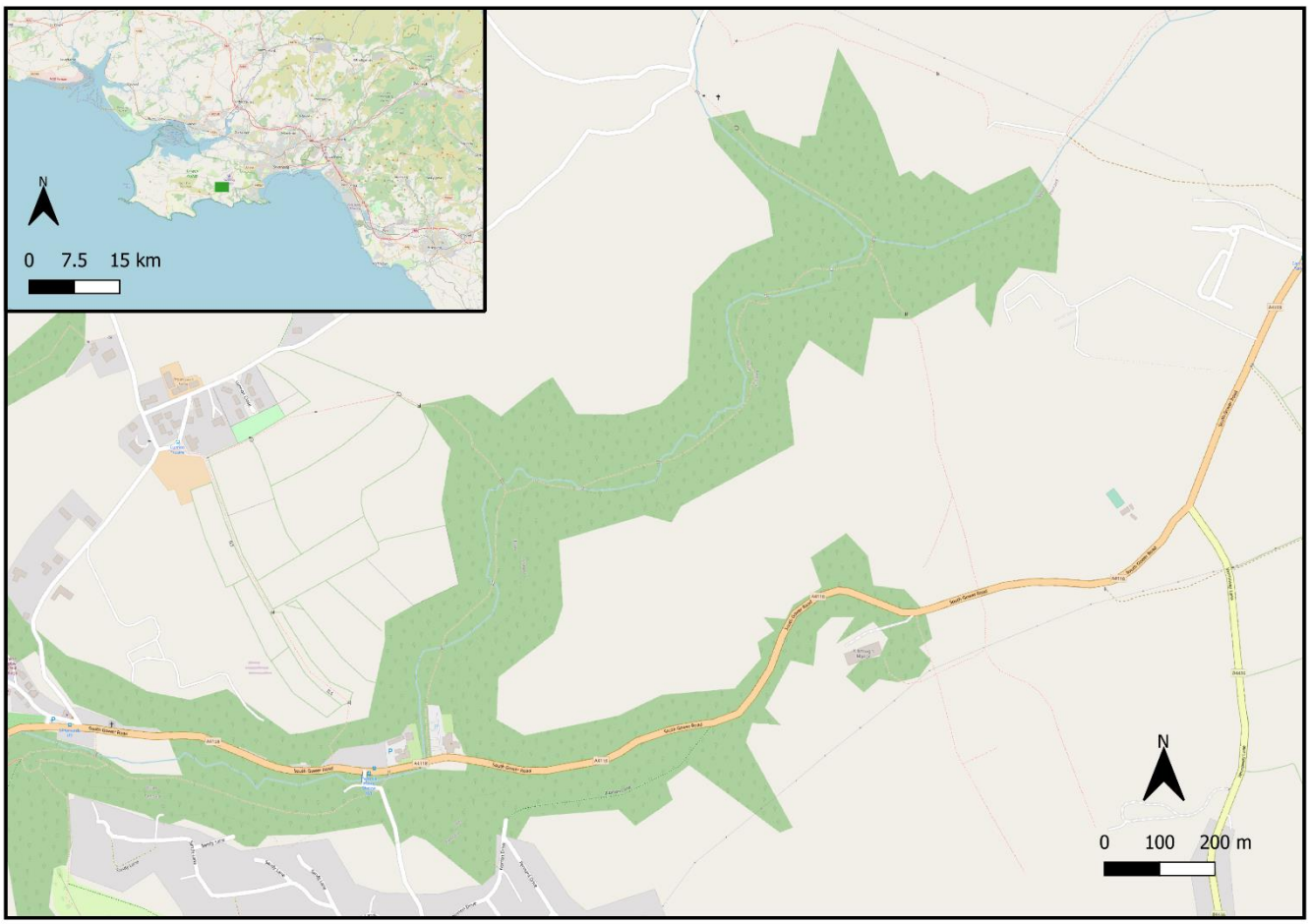
1 - Introduction

1.1 - A site overview

Ilston cwm is part of the wider Gower Ash woods Special Area of Conservation (SAC) and is a designated Site of Special Scientific Interest (SSSI). OS reference SS5589.

It is a steep sided river valley covered with woodland, dominated by Ash with a river fed by springs from Fairwood common, which itself is also a SAC managed by grazing by sheep and cows. Its location is shown in Figure 1 below.

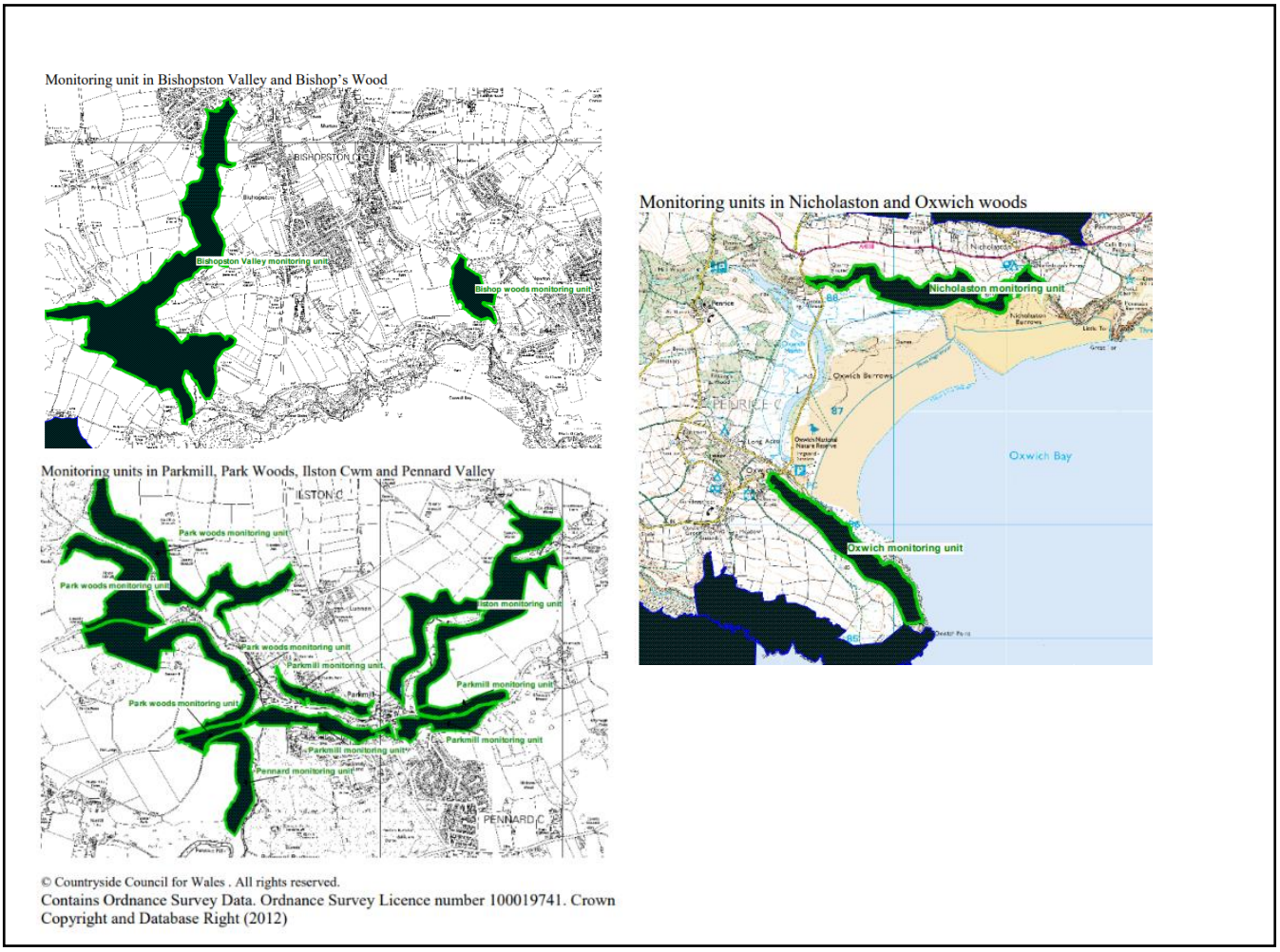
Figure 1 - Map showing the location of Ilston Cwm (qGIS, 2022).



Data sourced from Open Street map, (2022)

It is located to the west of Swansea on the Gower peninsula, in a designated Area of Outstanding Natural Beauty (AONB). The Ilston cwm site is one area of the larger Pennard valley component shown on the map in Figure 2.

Figure 2 - Map showing the Gower Ash Woods SAC.



Core management plan - Gower Ash Woods SAC
Countryside council for Wales, (2011)

This component is one of six management units that make up the Gower Ash Woods SAC, Natura 2000 site. The area has been selected as a SAC due to the extensive area of woodland which is largely connected and forms a more sustainable unit. Plants and

animals can move and survive better due to this large area of connected habitat (CCW, 2011).

The Ilston cwm site contains 2 main features within the SAC:

- *Tilio-Acerion* forests of slope, screes and ravines (Code:9180 – Natura 2000).
- Alluvial forests with *Alnus glutinosa* and *fraxinus excelsior (Alno-Padion, Alnion incane, Salicion albae)*

The SAC features of Ash woodland, Alluvial woodland and the SSSI feature of semi-natural woodland are all identified as Key Habitats (KH) and are the main drivers for conservation in the Core management plan (CMP). The Gower ash woods are considered one of the best areas of ash woodland in the UK (CCW, 2011).

The existing CMP (Appendix 1) was published by the Countryside Council for Wales (CCW) on 15th March 2011. The CCW was amalgamated into the National Resources Wales (NRW) portfolio on its establishment by Welsh Government in 2013.

A Tilio-acerion feature is described as:

> ***Tilio-Acerion*** *ravine forests are woods of ash Fraxinus excelsior, wych elm Ulmus glabra and lime (mainly small-leaved lime Tilia cordata but more rarely large-leaved lime T. platyphyllos). Introduced sycamore Acer pseudoplatanus is often present and is a common part of the community in mainland Europe, where it is native. The habitat type typically occurs on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Therefore, it is found on calcareous substrates associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact. It often occurs as a series of scattered patches grading into other types of woodland on level valley floors and on slopes above, or as narrow strips along stream-sides. More extensive stands occur on limestone and other base-rich rocks.*
>
> **www.sac.jncc.gov.uk/habitat/H9180**

The Alluvial forests feature is described as:

> ***Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*** *comprises woods dominated by alder Alnus glutinosa and willow Salix spp. on flood plains in a range of situations from islands in river channels to low-lying wetlands alongside the channels. The habitat typically occurs on moderately base-rich, eutrophic soils subject to periodic inundation.*
>
> **www.sac.jncc.gov.uk/habitat/H91E0**

1.2 - Ilston Cwm – Site background

Ilston cwm is a steep sided river valley stretching from the hamlet of Ilston on the Gower peninsula. The geology is of limestone, with sinkholes a prominent and important feature. The small river runs through the valley from its source on Fairwood common and runs through the Pennard valley SAC/SSSI forming part of a salt marsh before flowing into the Bristol Channel at Three Cliffs Bay.

The steep sides are covered in semi-natural ancient woodland, and a rich variety of woodland flora of bluebells, ramsons, anemone and hart's tongue fern cover the forest floor in Spring. In summer ferns, brambles, and non-native species such as Japanese knotweed, feature alongside saplings of Sycamore and Beech. Historically the site has been planted with Beech for coppicing, and conifers such as cedar and larch.

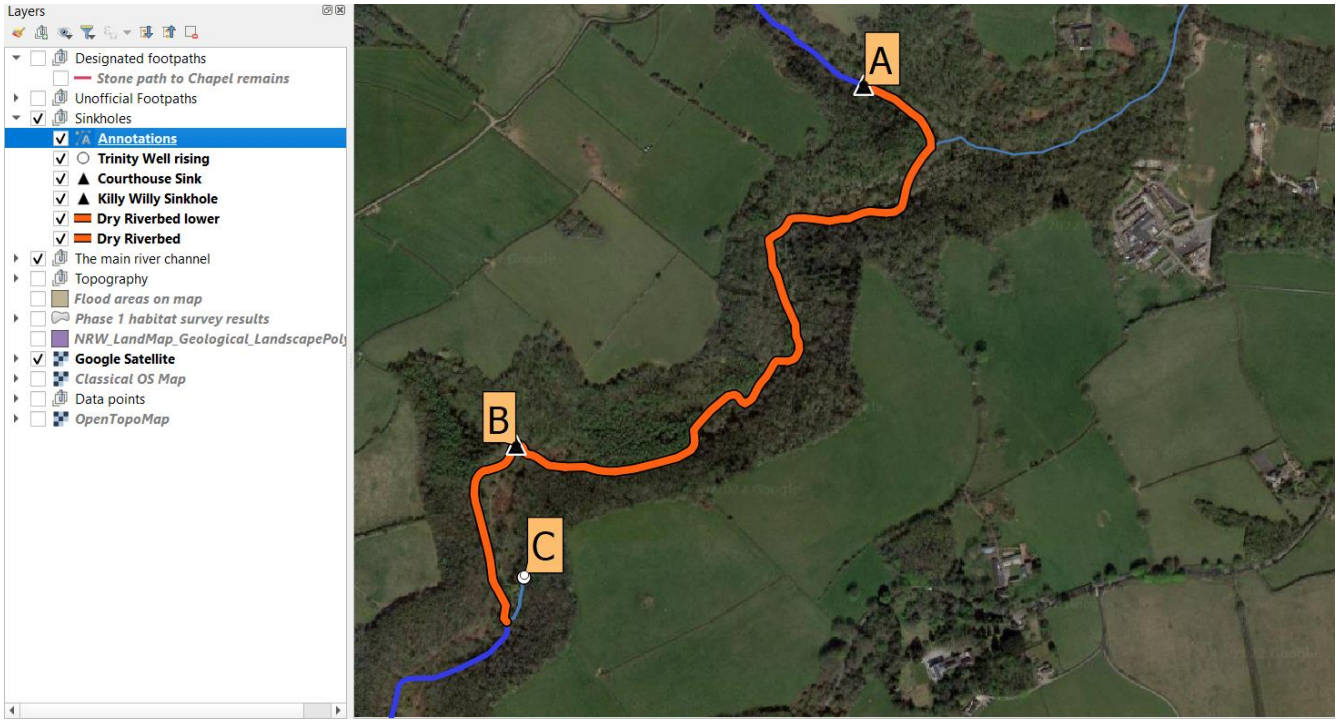
The river flows into limestone sinkholes and water risings lower down the valley, this creates a long stretch of dry riverbed when rainfall is low – see Figure 3. The river rises on Fairwood above the village of Ilston and flows into the Courthouse sink shown at point A on figure 4. Following heavy rainfall this sinkhole reaches capacity and water flows beyond the sinkhole to the Killy Willy sinkhole shown at point B.

Figure 3- Dry riverbed after the sinkhole.

R Carter. 2020

Water rises at the Trinity well shown at Point C and re-joins the main river channel. Tests have been carried out to gather data on the hydrological flow but have proved inconclusive with little data to support the hypothesis that the water that flows into the sinkholes is the same flow that rises at Trinity well (*ogof.co.uk*). The valley is prone to flash floods during periods of heavy rainfall creating a rich alluvial woodland.

Figure 4 - Location of two main sinkholes and the Trinity well rising (qGIS maps 2022)



There is a scheduled monument on the site at Trinity well. This includes the remains of a 17th century chapel of historical significance and marks the site of the medieval chapel of St. Cenydd. Both sites are of national cultural importance.

There is a natural surface footpath and public right of way through the flat valley floor, with a series of concrete bridges. This links the main road, public house and the village

of Parkmill at the southern end to St Illtyd's church in the village of Ilston at the northern end. The area is popular with tourists and dog walkers and is served by the Pub car park and local bus service. It is also used by the adjacent Girl Guide centre and local forest school facilities.

1.3 - Ilston cwm - The Habitat

The Natura 2000 site classification of #9180 - Tilio-acerion Forest of slopes, scree and ravines, is listed as a priority habitat at the time of the CMP in 2011 and should include the following features:

- Ash, Wych elm and Lime woodland
- Shaded and wet
- Base rich rocks
- Ramson, Herb Robert and Hart's tongue fern.

According to the JNCC submission to Natura 2000 on 12/2004 the following threats and positive impacts were noted:

Table 1 - Threats and Positive Impacts

Site	Threats to habitat			Positive impacts on habitat		
	Level	Code	Details	Level	Code	Details
Gower Ash Woods	High	H04	Air pollution	Medium	B02	Forest management
	High	I01	INNS	Medium	D05	Improved access
	High	K04	Interspecific floral relations			
	Medium	B01	Forest planting on open ground			
	Medium	A04	Grazing			
	Medium	B02	Forest management			
	Low	G01	Outdoor sports			
	Low	H05	Soil pollution and waste			

These threats apply to the whole site covered by the 2004 CMP but are relevant to the Ilston Cwm area.

It was also noted that there may be the presence of both Lesser and Greater Horseshoe bats but there was deficient data. These are 2 species protected by Schedule 2 and 4 of the EPS which forbids reckless killing, injury, or disturbance of breeding or resting places.

The local Development plan (LDP) from Swansea council advising that any development must consider the impact that any development in the nearby area would have on air pollution in the SAC (DTA Ecology, 2018). The SAC is adjacent to the main Gower Road and any development along this route including increased holiday accommodation or

tourist attractions could possibly result in increased air pollution as road traffic increases.

The devastating impact of Ash dieback (Hymenoscyphus fraxineus) a fungal disease which has affects Ash tree was not realised at the time the CMP was devised. It is evident from satellite imagery and field observations that the population of ash trees in the Gower ash woods have been decimated. In my field observations for the phase 1 survey, I did not record a single ash tree. Future management plans will need to address the regeneration of the forest with other species, and plan for the potential future reintroduction of Ash population to the area.

1.4 - The Gower Ash Woods Core Management Plan (CMP) - 2011

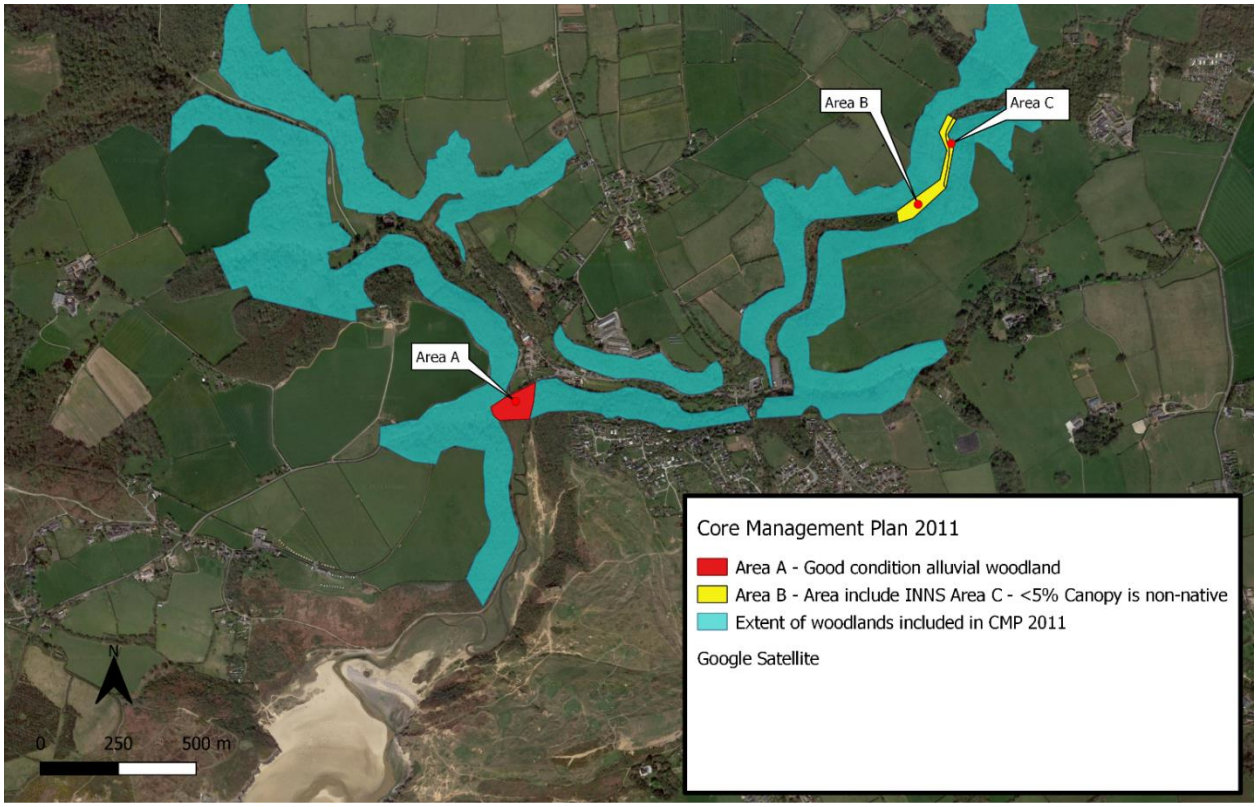
The map in shows the area of Ilston Cwm and the adjacent connected woodlands covered under the existing CMP. There were three significant areas marked in the plan for special consideartion A, B and C

Area A - Alluvial woodland in favourable condition

Area B - Presence of non-native species

Area C - Plantations of non-native conifers. (>5%)

Figure 5 - Map showing the core management plan area that covers Ilston cwm as well as the connected areas of the Pennard valley management unit, and the Parkmill woodlands management unit.



CMP area. (Google satellite images. qGIS 2022)

Any disturbance or management at Ilston cwm could affect the favourable condition and status of the SSSI at Area A and the Pennard valley management unit.

Given the site's SAC and SSSI status with priority habitats, key habitats and key species present the following vision shown in figure 5 was presented in the CMP and includes the conservation objections the success of which I will be discussing in this report.

Figure 6 - Vision for the site

The steep sided valleys found across most of the site will be covered with woodland dominated by ash. On rocky slopes, a rich ground flora of dog's mercury, hart's tongue fern and ramsons will be found amongst fallen trees left on the ground providing homes for invertebrates and fungi. The steep slopes prevent the canopy trees reaching full size. Amongst the canopy ash will dominate, with other species such as field maple, oak and sycamore also present. A shrub layer of hazel, hawthorn, spindle and saplings of ash will fill the spaces between the ground flora and the canopy, while mosses and hart's tongue fern cover limestone boulders that pepper the ground.

The ground flora on the slopes and on the flatter ground will continue to be full of colour in the spring, with bluebells and ransoms providing a haze of blue and white. As the leaves of the trees in the canopy and shrub layer emerge, the colours of the ground flora change as the bluebells and ransom leaves turn yellow and wilt.

There will be mature rotting trees, standing and fallen. Young trees will grow in the ground flora and shrub layer ready to take the place of a fallen tree.

Some uncommon vascular plants can be found in the woods these include herb Paris, purple gromwell, butcher's broom and spurge laurel. The varied structure will sustain populations of mammals and birds.

On the flatter areas fallen planted conifers support mosses and ferns and ash trees will grow between the fallen trees. Old conifer and beech plantations support developing ash woodland.

Along side the Pennard Pill and the Ilston stream alluvial woodland will continue to thrive in the silts from the river, dominated by alder but hazel and elder also grow here, with creeping buttercup, nettles and meadowsweet dominating the ground flora. There will be no signs of disturbance such as over-grazing or fly-tipping and no non-native species grow in these areas.

Countryside council for Wales, CMP, 2011

The CMP refers to current management at Ilston cwm - "*At Pennard valley the woodland has not been actively managed in recent years, this is the most 'natural' of component woodlands.*" (CCW, 2011). The CMP's main focus was the ash woods and stated that other features such as geological features did not require more than

occasional intervention management. Areas of alluvial woodland were stated as possible requiring some occasional management.

1.4.1 - The CMP, 2011 conservation objectives

In accordance with the 1992 habitats directive (92/43/EEC), conservation objectives were stated to maintain, and restore, if necessary, the favourable conservation status of the habitats and species for which the SAC was designated (CCW, 2011).

Figure 7 - A definition of a 'Favourable conservation status'

Box 1
Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- Its natural range and areas it covers within that range are stable or increasing, and
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- The conservation status of its typical species is favourable.

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."

Countryside council for Wales, CMP, 2011

The CMP recognises that achieving these objectives will require appropriate management and control of factors that may cause deterioration of habitats or significant disturbance to species. They break down the conservation objectives into 2 elements:

- Vision for the feature
- Performance indicators

These are shown in Table 2 alongside analysis and evaluation of each objective for 2022, eleven years after the CMP was created. I will also set out my own habitat management plan objectives to meet the conservation objectives to restore and retain a 'favourable conservation status'.

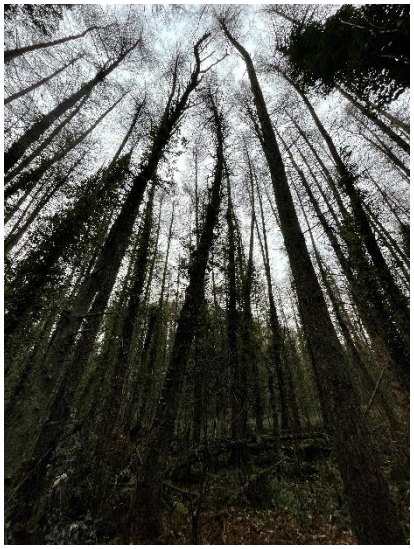
As the CMP's focus is the Ash woodlands it has not included the flatter river valley floor and open spaces. I will be discussing potential solutions for this habitat that will complement and support the conservation objectives of both the class 9180 and class 91EO Habitats.

2 - Phase 1 Habitat survey findings – Ilston Cwm

I carried out a phase 1 habitat survey at Ilston Cwm on April 16th, 2022. The survey provided an analysis of the current condition of the habitats and evaluation of the conservation's objections 12 years after the CMP was published. Table 2 shows a summary of findings.

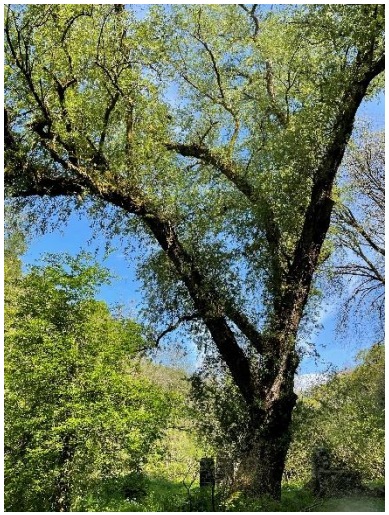
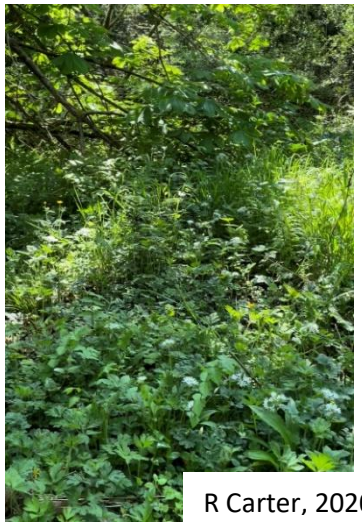
Table 2 - Phase 1 habitat survey

Phase 1 Code	Habitat type	Dominant plant species	Habitat description	Target notes	Photos
A1.1.1	Broadleaved woodland semi natural	♣ Ash ♣ Beech ♣ Sycamore	Woodland dominated by trees of more than 5m high. <5% of trees are broadleaf species Steep sided ravines of mature broadleaf trees limit their height.	Understory of diverse and abundant flora included indicator species for Tilio-Acerion habitats such as: ♣ Ramsons ♣ Bluebell ♣ Harts tongue ferns. The topography of the sites means that it is not easy to survey the majority of the woodlands so	 R Carter, 2020

				observations were carried out using binoculars.	
A1.2.2	Coniferous plantation woodland	♣ Popular ♣ Larch	Woodland dominated by conifers with <5% Broadleaved species, mainly Sycamore. Soil is covered in layer of pine needles. Low diversity and abundance of understorey where light is low.	Densely planted non-native conifers. This area has lower light levels with limited flora visible. Vegetation observed: ♣ Bramble ♣ Fern ♣ Bryophytes on fallen wood ♣ Sycamore saplings Sycamore saplings are able to grow where light penetrates the canopy due to Conifers are densely planted ~ 6 trees per 10 metres.	 R Carter, 2020

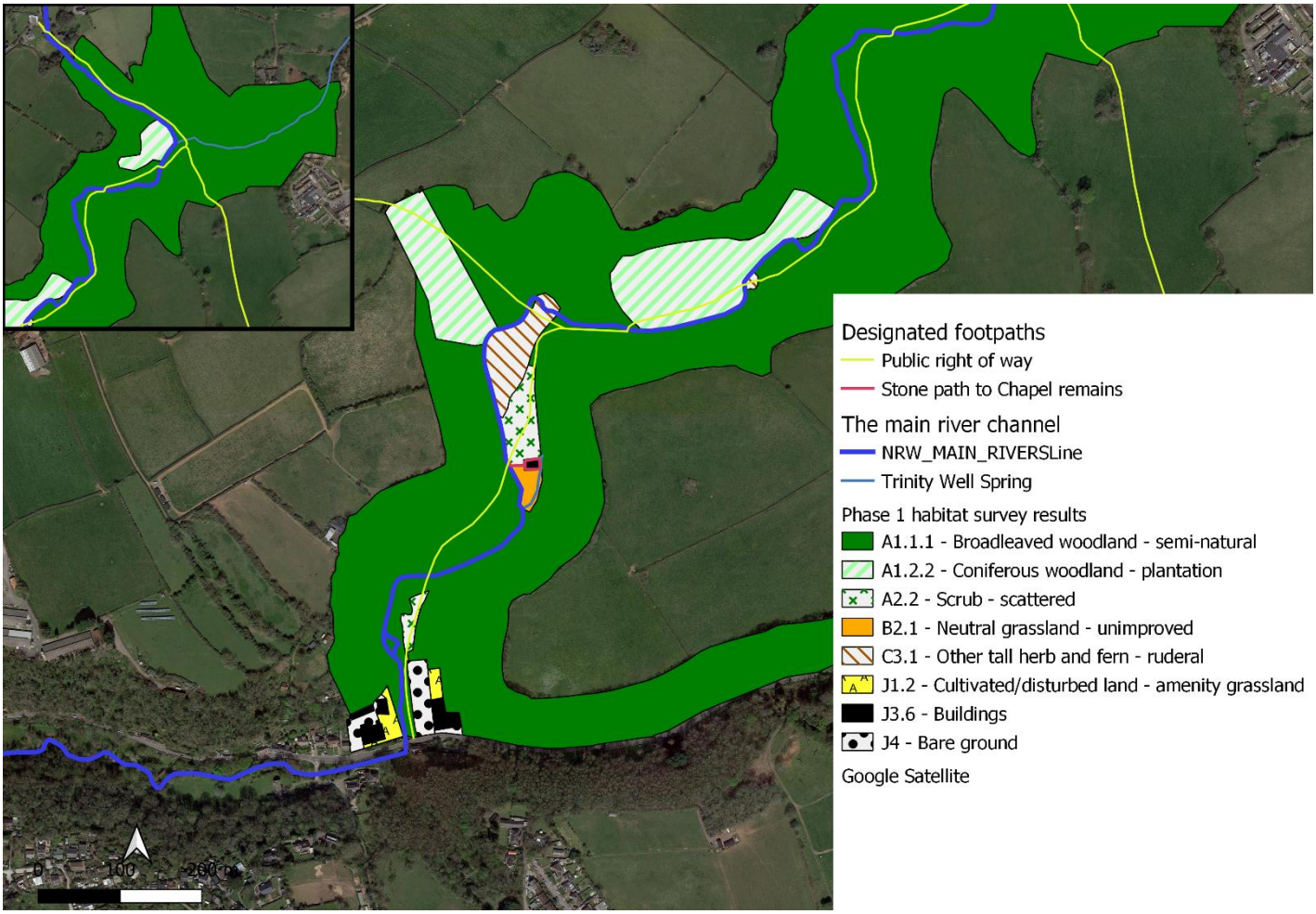
A2.2	Dense/ continuous scrub	♣ Bramble ♣ Fern ♣ Cuckoo pint ♣ Privet ♣ Hawthorn ♣ Ransoms ♣ Celandine ♣ Willowherb	Flat clearing with very few trees below 3m in height. Vegetation dominated by Bramble and abundant and diverse ground flora. Shoots of Bracken evident throughout.	A large open clearing with scattered small trees of Beech, hazel and Hawthorn. A large specimen of Horse chestnut. Ground flora is diverse and abundant however shoots of bracken were sighted throughout the habitat and possible C2 classification could be made if surveyed in Summer. Some evidence of fly tipping and possible clearance with machinery?	 R Carter, 2020
C3.1	Other tall herb and fern – Tall ruderal	Reynoutaria Japonica – Japanese knotweed	Area dominated by Japanese knotweed shoots.	Evidence of extensive growth of Japanese knotweed in previous season. Shoots of new growth evident in majority of area. Speedwell, bramble, lords and ladies, 1 Elm tree with fruits observed.	

				To the south of this C3.1 area is a Scheduled monument with stone path perimeter which connects to main path and bridge. Non-native introduced species observed at monument. • Polygonatum / Solomon's seal • Rosa chinensis • Symphoricarpos orbiculatus Between the monument and the area of Japanese knotweed a non-native specimen of Symphoricarpos orbiculatus – Indian current was recorded. Other species observed include: • Jack in the bush • Cuckoo pint • Dock • Wild mustard	 R Carter, 2020

				♣ Plantain	
B2	Neutral grassland – Alluvial meadow	Festuca pratensis Carex species Urtica dioica Herb Robert Ramsons	Grassland with waterlogged areas, inundated periodically after high rainfall.	An area of woodland around the Trinity well spring between its source and where it joins the main river. The ground is wet and soft underfoot. Vegetation observed: Festuca pratensis indicating neutral soil. 1 Large specimen of Salix Alba. Understorey of large population of Urtica dioica / Stinging nettle Number of Privet shrubs Periwinkle Sycamore saplings 1 beech sapling Further survey restricted by boggy ground.	  R Carter, 2020

The complete results of the Phase 1 habitat survey are shown in figure 8 below: The vegetation of the flat valley floor has been observed and classified according to the presence of dominant vegetation and the areas of non-native species can be clearly seen. I was able to ground truth the available data for footpaths and river flow with field observations and analysis of satellite imagery within the boundaries of the available resources.

Figure 8 - Map showing Phase 1 survey results, using standard JNCC classification codes (qGIS maps 2022)



3 - Analysis of the existing Habitat management plan

Table 3 sets out the existing habitat management aims and vision of the site from 2011. The current status, according to observations and phase 1 survey carried out on 16th April 2022 is included in column 5. I have also included proposed actions in brief. These proposals will be discussed in more detail in the next table.

Table 3 - Analysis of the existing habitat management plan

	Conservation area	2011 management plan objective	Performance indicators	Current status as observed	Proposed action
Feature 1 Tilio acerion forest of slopes, screes and ravines	Gower ash woods area	Steep sided valleys covered with woodland dominated by Fraxinus excelsior (Ash)	No permanent loss of Tilio-acerion habitat within management area.	Observations show this has been achieved with some loss of Ash due to Ash die-back. Exact data not available	A full tree survey to be carried out to establish impact of Ash dieback
		Rocky slopes covered in rich flora to include: ◦ Dog's mercury ◦ Hart's tongue fern ◦ Ransoms	Hart's tongue fern presents in any 10m radius	Achieved in majority of site especially on the slopes.	A phase 2 NVC survey to be carried out
		Fallen trees left on ground to provide habitat for invertebrates and fungi	Average of at least 5 deadwood stems per 50m^2 block	Achieved based on observations	Periodic felling of non-native conifers and Sycamore to provide path demarcation and habitat.
		Shrub layer of Hazel, Hawthorn, Spindle and Ash will fill the spaces between the ground flora and canopy.	Shrub layer will cover between 20% and 80% of woodland.	Unable to verify due to difficulties surveying steep slopes. On lower slopes no Ash was recorded, no Spindle	Possible intervention dependent on results of NVC and tree survey results.

				and only small numbers of Hawthorn and Hazel. Large numbers of Sycamore observed.	
		Ash will be dominant tree species with Field maple, Oak and Sycamore present.	At least 95% canopy cover made up of native species inc Sycamore Sycamore = <20% canopy cover	Achieved for overall site. Some areas remain dominated by non-native conifers and Beech. Ash is not the dominant species on lower slopes.	Ash introduced if possible (Ash dieback dependent) some thinning of Sycamore saplings and mature trees.
		Ground flora will be full of colour in Spring dominated by the blue and white of Bluebells and Ransoms	None set	Achieved (as shown in Table 1)	no action needed however control of Japanese knotweed essential alongside reduction of human impact ie trampling and erosion. Hybrid and Spanish bluebell present in some areas. control may be necessary to prevent reduction in population of distinct native English bluebell. Volunteering opportunities
		Mature rotting trees will be left standing or fallen.	Average of at least 5 deadwood stems per $50m^2$ block	Achieved on steep slopes and in area B and C.	Reuse fallen and felled trees to form paths and way markers to reduce human impact and soil erosion
		Young trees will grow in the understorey ready to replace fallen trees.	At least 20 viable Ash saplings are present in at least 60% of $50m^2$ units and at least 2 Ash saplings present in 50%+ of canopy gaps. (>150cm in height)	Unable to assess. Ash dieback may have affected this outcome.	Action dependent on results of Phase 2 NVC and tree survey.
		Presence of Uncommon vascular plants such as: ◦ Herb paris ◦ Purple gromwell ◦ Butcher's broom ◦ Spurge laurel	None set	Herb Paris observed	Action dependent of results of NVC survey. Some planting may be necessary to increase populations.

		Fallen conifers will support mosses and ferns and Ash trees will grow in the spaces created.	At least 20 viable Ash saplings are present in at least 60% of 50m^2 units and at least 2 Ash saplings present in 50%+ of canopy gaps.	No Ash saplings recorded at lower levels	Action may be need to replace Ash trees diseased with Ash dieback. Action taken on results of tree survey.
		All other factors under control	None set	Human impact and disease have affected the outcomes of the plan.	A full assessment of the effect of Ash dieback is needed. Human impact has not been controlled. Numerous paths have been created by erosion due to high levels of human activity, increase in dog ownership exacerbated by the Covid pandemic 2020-2022
Feature 2. Alluvial forests with Alnus glutinosa (Alder) and Fraxinus excelsior (Ash)	Alluvial forests	Alongside Ilston stream alluvial woodland will grow in the silts from the river.	Flat valley bottom covered in Alluvial Forest. Evidence of periodic flooding in 75% of samples (area B shown in Figure 4) <5% non-native trees including Beech.	Very few Alder and Willow species observed, Ground was very dry on day of survey. Evidence of periodic flooding found at Area B.	Overgrowth of brambles and fern may be reducing river flow to some areas and impacting on the natural development of Alluvial woodlands. Control of bracken and fern needed to allow a clearer flood plain and growth of water meadow and indicator species.
		Alder will dominate with Hazel and Elder present.	Himalayan balsam and Japanese knotweed occur in <5% of samples (Area B) <5% of canopy forming trees are non-native in Area c	Not achieved Japanese Knotweed present in area B and in other areas surrounding area b and in a new area lower down the valley. (see figure 7)	Begin the process of eliminating Japanese knotweed over a number of years using trained volunteers. Japanese knotweed has the potential to spread down stream to the SSSI site at Pennard valley and onto the Saltmarsh establishing a population in the identified Alluvial woodland of favourable condition (Site A on map shown in figure 1)
		Creeping buttercup, Nettles and meadowsweet dominates ground flora.	Excessive poaching absent: <50% bare ground observed.	<50% bare ground observed No indicator species recorded on date of survey.	Intervention to remove dominant populations of Bramble, fern and Japanese

			Within any 1m radius the following will be observed: ◦ Marsh marigold ◦ Bittersweet ◦ Yellow iris ◦ Meadowsweet ◦ Marsh horsetail ◦ Purple loosestrife	Some nettles recorded.	knotweed will allowing more frequent flooding where conditions are right and wetter soil. If conditions are improved indicators species will be better supported.
		No signs of disturbance such as over grazing or fly tipping and no non-native species will be present.	No litter or signs of contamination	Very few pieces of litter present near car park. 2 pieces of dog faeces. Non native species present introduced at scheduled monument.	Use of volunteers to carry out regular litter picks. Working with stakeholders eg The Pub, community council and Guide centre. Removal of introduced species at scheduled monument.
		Young saplings of Alder and Hazel will be numerous.	None set	No Alder recorded Hazel present but not numerous.	Dependent of results of tree survey. Alder may natural re-populate as cleared areas re-wet. Some planting may be needed.
		All other factors under control	None set	Human impact and encroaching brambles may prevent alluvial species establishing themselves. Weather anomalies include long dry spring months with flash flooding periodically followed by long dry spells.	Human impact has at Ilston cwm has not been considered. Erosion of tree roots could affect tree health and canopy height. Human movement and dogs through areas of Japanese knotweed has the potential to spread seeds beyond the identified areas.

The existing plan identified 5 key factors leading to the unfavourable condition of the Ilston cwm site as a part of the whole block of Gower Ash woods.

- Lack of mature trees
- Lack of deadwood
- Lack of regeneration in gaps
- Over dominance of Sycamore
- Non-natives

The status of **Feature 1** – Tilio-acerion forests was deemed Unfavourable due to a lack of regeneration, too many canopy gaps, presence of non-native species and dominance of Sycamore.

Key issues were identified:

i. Lack of mature trees in too many units – this cannot be addressed through intervention. Trees approaching maturity must be identified and protected from removal.
ii. Lack of deadwood – where removal of sycamore or non-native canopy species is required, leaving cut material in-situ should be considered.
iii. Lack of regeneration in gaps – a better understanding of the processes affecting regeneration is required before any intervention can be attempted.
iv. Over dominance of sycamore – where sycamore in the canopy is exceeding the upper limit for this feature, intervention in the form of felling and removal is required.
v. Non-natives – too many woodlands have non-native species in the canopy and this needs to be managed by intervention.

Ilston Cwm was identified in the plan as being the most natural of the woodland blocks. It appears as if a 'hands off' and minimal approach has been taken to this habitat and as such the unfavourable condition has increased since the plan was revised in 2013.

Management requirements for Ilston cwm were identified by the 2011 plan.

My analysis of the existing management plan and my Phase 1 habitat survey have informed my recommendations for a 10-year habitat management plan. I have addressed their identified management requirements shown in blue italic below.

Feature 1 – Tilio-acerion forests

• Non-native species
"The site has a relatively large proportion of non-native species, mainly conifer species. Although these conifer species make up a large part of the site, there is still a good amount of regeneration of ash and little regeneration of the non-native species. This means that it is not a priority to remove the conifers and we could allow them to fall naturally and for ash woodland to return. This approach would mean that a 'good condition' woodland would not be seen for hundreds of years, but the site can be classed as unfavourable recovering for this attribute until this point is reached."
The absence of Ash and dominance of Sycamore and high numbers of conifers still standing in the habitat shows that this strategy has not achieved the objectives. Ash dieback may be a factor in the last half of the time period however no Ash dieback control has taken place in the area, so this is unlikely.

• Mature trees
"The lack of mature trees in woodland cannot be addressed through intervention; trees must be allowed to become mature. Coppicing or felling requirements should take this into account and avoid removing trees of an almost mature size."
No evidence of coppicing seen, trees continue to mature slowly however the density of trees in some areas may be having a negative impact on maturity of the canopy.

• **Dead Wood**
"Opportunities to create standing dead wood may be more in some areas of this woodland due to public safety. Where conditions allow, dead wood should be created or left in situ."
Dead wood and fallen trees have created abundant opportunities for mosses and ferns to grow and provides habitat for invertebrates, reptiles and small mammals

• **Sycamore**
"The upper limit for sycamore as a proportion of the canopy is exceeded. It was considered that ring barking of selected sycamore would both create standing deadwood and eliminate large sycamore from the canopy. However, observations from other woodlands suggest that the ring-barking of sycamore can lead to a final flush of seeds, thus promoting further regeneration of sycamore. As such, felling of sycamore needs to be considered. "
Sycamore now dominates the canopy and saplings are numerous. In spot samples over 80% of trees observed were Sycamore. No evidence of Sycamore felling to control this issue has been observed.

Feature 2 – Alluvial Forests

"At Ilston Cwm the alluvial woodland is threatened by non-native species. Both Japanese knotweed and Himalayan balsam grow in the area of alluvial woodland, this must be addressed as this species will spread and threaten habitat outside the SAC as well as features within the SAC. It is necessary to implement a programme of Japanese knotweed and Himalayan balsam removal. Until these species are under control the feature cannot be classed as unfavourable recovering. Also affecting feature condition at Ilston Cwm is the proportion of non-native poplar trees. But because they are not regenerating, they are not thought to be a problem at the moment. Pennard Valley At Pennard, the woodland requires control of non-native species. However, because Ilston Cwm is upstream of Pennard Valley and the likely source of these species, Ilston should be tackled first."

The presence of Japanese knotweed is still prevalent and presents a serious threat to the favourable status of Ilston cwm and downstream at the Pennard valley SAC and SSSI.

No evidence of any control of either INNS has been observed. The phase 1 habitat survey results showed that the area of Japanese Knotweed is now larger than in 2011 and examples were found on both sides of the river channel.

4 - A 10-year habitat management plan for Ilston Cwm

Main objectives:

- To retain classification as a Code 9180 habitat - *Tilio-acerion* forest of slopes, screes and ravine
- To retain classification of Code 91EO habitat - Alluvial woodland with Alnus glutinosa and Fraxinus excelsior.
- To retain status as a Special Area of Conservation (SAC)
- To retain status as one of the best examples of Ash woodlands in the UK
- To manage the site to protect habitat downstream at Pennard valley.
- To control and eliminate where possible invasive non-native species (INNS) including Japanese knotweed and Himalayan balsam.
- To reduce and remove all non-native conifers from the area.
- To reduce the negatives impact of public access.
- To mitigate the effects of air pollution.
- To return the woodland back to 'Favourable condition'

I have identified 5 key areas of the site that require active management as previously stated in Table 2. These areas are:

- **The absence of Ash, Wych elm and Lime trees in the Tilio-acerion habitat and the dominance of Sycamore.**

- **The presence of non-native conifers.**
- **The human impact on the woodland understorey.**
- **The presence of INNS – Japanese knotweed and other introduced species in the Alluvial forest habitat.**
- **Dominance of bramble and bracken in clearings**

Baseline data

Before any habitat management could be ratified, a full ecological survey is advised to include a tree survey. The difficulty of access is acknowledged and would need to be considered as part of a risk assessment prior to the survey. Following the survey results, decisions could be made on the actions points and assess whether they continue to be appropriate and the most effective method to reach the objectives set out. Drones and satellite imagery could be used to survey the canopy and identify Ash and incidences of Ash die-back.

The lack of active management in the previous plan has resulted in a habitat that is now even less favourable and further away from the goal of attaining 'Favourable' status. The habitat is at risk of losing its conservation status as a 9180 habitat and this could affect future funding opportunities.

Stakeholder engagement

Consultation on the future management by an external body such as the wildlife trust should be considered. The South Wales wildlife trust already manage two sites close to Ilston cwm. Locations are shown in Figure 9.

Figure 9 - Locations of adjacent South Wales wildlife trust managed nature reserves. (qGIS maps/Google UK)

Ilston quarry; officially known as the *Rowe and Elizabeth Harding Nature Reserve*. In addition to that they also manage a section of Gower Ash woods at the southern end – Kilvrough Woods Nature Reserve and Redden Hill, which is in the Park woods section of the SAC. In these two sites, the habitats are in more favourable condition with less or no non-native species remaining and reduced human impact. The image in Figure 10 shows the woodland flora and reinforced path in Kilvrough woods.

Figure 10 - A fortified path through Kilvrough woods nature reserve

R Carter, 2022

The Wildlife trust have a network of volunteers which could be trained to carry out tasks to help meet plan objectives.

Establishment of a volunteering group to engage in maintenance activities such as installing way markers, paths, removing Sycamore saplings and control of INNS, will ensure good public engagement and help achieve plan objectives such as building paths.

Citizen science programmes could be initialised to aid with monitoring and surveying.

An essential element of the management plan will be stakeholder engagement. The most important stakeholders have been identified as:

- National Resources Wales

- South Wales wildlife trust
- Swansea Council
- Ilston community council
- The Gower inn
- The Guide centre
- Local residents
- Local walkers/dog walkers

Before any work is enacted it will be vital to engage with these stakeholders to get their support for the plan and to ensure that all stakeholders are working together to the same objective. Public meetings and social media are effective tools for sharing information and gaining valuable feedback.

Flood risk management

There is no current flood risk to property at the site. The site is a natural flood area which eases flooding further downstream in Parkmill. There are potentially 3 properties downstream that could be subject to flooding, but they are not currently identified as a flood risk. It is important that the river channel and flood plains at Ilston are maintained in a favourable condition and eroding of riverbanks and tree roots is mitigated to preserve this

vital ecosystem service. A balance between removing deposition in the upper valley to allow reduced flooding and erosion and slowing down the flash flooding characteristic of the site is needed and should be kept under review.

Figure 11 - Channelling of the river as it flows under the A4118 at Parkmill. (R Carter, 2022)

Air quality

Air pollution is an issue in the local area, any tree planting and increased flora will mitigate local air pollution issues as far as possible. The section of A4118 adjacent to the south end of the site has recently been reduced to 20mph which should have an impact of air quality.

Any developments further down the A4118 should consider the impact on this SAC and others within the AONB, this could include housing, tourist attractions and increase campsite capacity. This is monitored regularly by The Gower Society.

Table 4 - Proposed 10 year management plan 2022 - 2032

Issue identified	Action to be taken	Timescale	Performance indicator	Evidence to support action	Objective met
The absence of Ash, Wych elm and Lime trees in the Tilio-acerion habitat	Monitor situation of Ash dieback and reassess viability of an Ash replanting strategy. Ash trees in adjacent sites absent or removed during Ash dieback control means there is limited opportunity for natural regrowth. Introduction of Wych elm and Lime seedlings/saplings.	Ongoing monitoring using GIS and drone surveillance	Interim survey after 5 years shows establishment of saplings. NVC survey in 2032 shows increased population of Ash, Wych elm and Lime Retained status as 9180 habitat or equivalent. Increased populations and variation of tree species.	*The devastating effect of Ash dieback introduced into Great Britain in 2011 from mainland Europe and other pathogens that could affect even resistant phenotypes.* (Woodward and Boa, 2013) At present planting of Ash is therefore not advised but should be kept under review. A 2014 report by the JNCC – 'The Potential Ecological Impact of Ash Dieback' made a study of 1058 plants and animals that live on or around ash. 1058 species have been identified but only 44 of these species are obligate to Ash and their	To retain classification as a Code 9180 habitat - *Tilio-acerion* forest of slopes, screes and ravine. To retain status as a Special Area of Conservation (SAC) To retain status as one of the

				fate will be linked to the success of Ash replanting in the future if they are not lost entirely. Further research found that planting a combination of 11 species could mitigate the ecological impact of losing Ash. 798 out of the 1058 species supported by ash could be provided with alternative hosts. Planting the right tree in the right place may allow the woods to recover and provide a diverse and more resilient ecosystem. (Mitchell et al, 2014) The most effective method is to observe which species are growing in the area and plant those species in	best examples of Ash woodlands in the UK To mitigate the effects of air pollution.

				gaps. In Ilston this would be Hazel, field maple, hawthorn, oak, small leaved lime, and goat willow. Local provenance Wych elm could also be planted in gaps left by felled conifers or thinned Sycamore saplings. These saplings at lower levels would provide a seed bank for natural re-population on the steep slopes, characteristic of the site. Case study – The Ash project, Kent Downs A 1-year project that planted 1,150 trees along JNCC guidelines to replace lost Ash trees. Community engagement and art projects also featured to compile a social history	

				and public awareness of the heritage of Ash trees. See Appendix 2	
The over dominance of Sycamore.	Thin out saplings	2 year removal programme. 5 year interim review to assess presence of other saplings. Full review after 10 years.	Walkover surveys show reduce cover by Sycamore. NVC survey completed in 2032 shows Drone , satellite imagery and aerial surveillance show Sycamore well below the upper limit of 20% of canopy cover.	Sycamore is a naturalised non-native species with similar ecological requirements to Ash. Hence why it has been so successful in Ash woodlands post- Ash dieback. It can also support a larger number of Ash dependent species. (Mitchell et al, 2014) It is therefore considered as a potential replacement species in ash woodlands, it. Sycamore can provide habitat for a wide range of lichen and aphid species, providing an important part in the ecosystem. Sycamore is seen as an	To return the woodland back to 'Favourable condition'

				invasive species as it thrives in areas of disturbance however its own regeneration is limited by its dense canopy so will not dominant the canopy for long. (Future trees trust, 2021) Removal of Sycamore saplings will prevent it dominating the understorey and prevent even short-term dominance of the canopy whilst other species re-establish. Any larger Sycamore removed will have some financial value as it has the highest yield class of all British broadleaves and can attain the same price as Oak timber.	

				The timber could be used for path creation or wooden sculptures.	
The presence of non-native conifers.	Gradual removal	Review of the effect on understorey after 5 years. 10 years to complete.	Winter aerial survey and GIS used to assess outcomes of felling.	Research recommends a gradual removal of Non-native conifers to allow light levels to gradually increase and allow both light and shade dependent species to grow in the understorey. Sudden removal by clear-felling or removing too many trees at once can encourage the growth of bracken and Brambles as the dominant species. The graph in Figure 12 shows the optimal light level for maximum growth of ancient woodland indicator (AWI) species such as Dog's mercury, Ransoms and Bluebells.	To reduce and remove all non-native conifers from the area. To return the woodland back to 'Favourable condition'

				A gradual removal of conifers is needed to control light level changes and should be carries out over a long period in Plantation on Ancient Woodlands (PAWS) like Ilston cwm. Brown et al, (2021), Ellenberg et al, (1991)	
The human impact on the woodland understorey.	Install wooden way markers at designated public rights of way. Close off unofficial pathways with vegetation planting or wooden rail. Create clear pathways using felled conifer timbers and wood chips. All materials to be sourced within the site. These dead timbers will slowly rot and	2 -5 years	Reduced areas of poaching (bare ground) No exposed tree roots and tree health improved. Increased floral cover in understorey. Reduced muddy areas in Area B and C (Conifer plantation)	NRW identify sympathetic management of ancient woodlands could include: Rerouting footpaths to avoid damage to ancient woodland flora and disturbance to wildlife. Damage can be caused by: Loss of soil micro-organisms, affecting nutrient cycling Damaging roots and understorey	To retain classification of Code 91EO habitat - Alluvial woodland with Alnus glutinosa and Fraxinus excelsior.

	provide habitat whilst protected the woodland vegetation and saplings. Create a new entrance at pub car park with timber steps to public right of way. Engagement with visitors and introduce citizen science programmes and volunteer groups to ensure the site remains important in local culture.		One main path through the site of no more than 2 metres wide. Entrance to site through main gate off A4118 or at rear of car park (figures 9 and 10) with reduced soil erosion. Entrance at St Illtyd's church, Ilston unaffected.	Damaging or compacting soil around the tree roots. As shown in figure 13 there is significant evidence of tree root exposure and damage where paths have deviated from the public right of way as shown in Figure 14 this has led to a loss of soil, increased erosion and damage to tree health which could lead to tree loss. The number of Woodland species will increase with increasing distance form a path and bare soil and cobblestones support the highest percentage of plants. Soil compaction however is high with cobblestones. (Godefroid & Koedam, 2003).	To retain status as a Special Area of Conservation (SAC) To retain status as one of the best examples of Ash woodlands in the UK To manage the site to protect habitat

				A bare soil or wood chip path will support woodland species and prevent mud and soil erosion during periods of high rainfall or flood. Case study – Foxglove covert nature reserve, N.Yorkshire. As shown in figures 13 and 15 visitors have been creating alternative paths when path is muddy. And figure 14 show damage to path alongside riverbank. These unofficial paths have been mapped and are shown in red on the GIS map in figure 16. In figure 17 shows species such as plantain grow wherever trampling is reduced.	downstream at Pennard valley. To control and eliminate where possible invasive non-native species (INNS) including Japanese knotweed and Himalayan balsam. To reduce and remove all non-native conifers from the area.

				Clear signposting will allow visitors to stick to the one public right of way and reduce the negative impacts. Interpretation boards at the entrances to the site (shown on the map in figure 18) will explain the importance of the site and engage the public in the protection of the ancient woodland species. Figure 19 shows the soil erosion at car park edge by human activity. New wooden steps to compliment the interpretation board are proposed here. The increased signage and awareness may result in an increase in visitor numbers so this will need to be	To reduce the negatives impact of public access. To return the woodland back to 'Favourable condition'

				balanced against the outcome of taking no action.	
The presence of INNS – Japanese knotweed and other introduced or non-native species in the habitat.	Gradual removal of Japanese knotweed plants by controlled application of appropriate herbicide	3 years	NVC survey identifies reduced numbers of Japanese knotweed.	According to the UK government 's publication There are four main types of long-term management: Large scale eradication Containment Control Mitigation However, it does state that in some instances no action may be appropriate. *Japanese Knotweed is estimated to cost the economy £165.6 million per annum (Williams et al. 2010)* Knotweed spreads through: direct rhizome (root) growth or	To control and eliminate where possible invasive non-native species (INNS) including Japanese knotweed and Himalayan balsam. To manage the site to protect habitat

				new plant growth from the parent plant's stem and rhizome fragments – a new plant can grow from pieces of rhizome as small as 1cm. (The Great Britain invasive non-native species strategy, 2015) NRW recommends: Japanese knotweed is best controlled by the application of a suitable herbicide. Glyphosate-based herbicides are commonly used to treat Japanese knotweed. If glyphosate is applied correctly, at the appropriate time of year, it is possible to eradicate it, although it can take two to three years of repeated treatment.	downstream at Pennard valley.

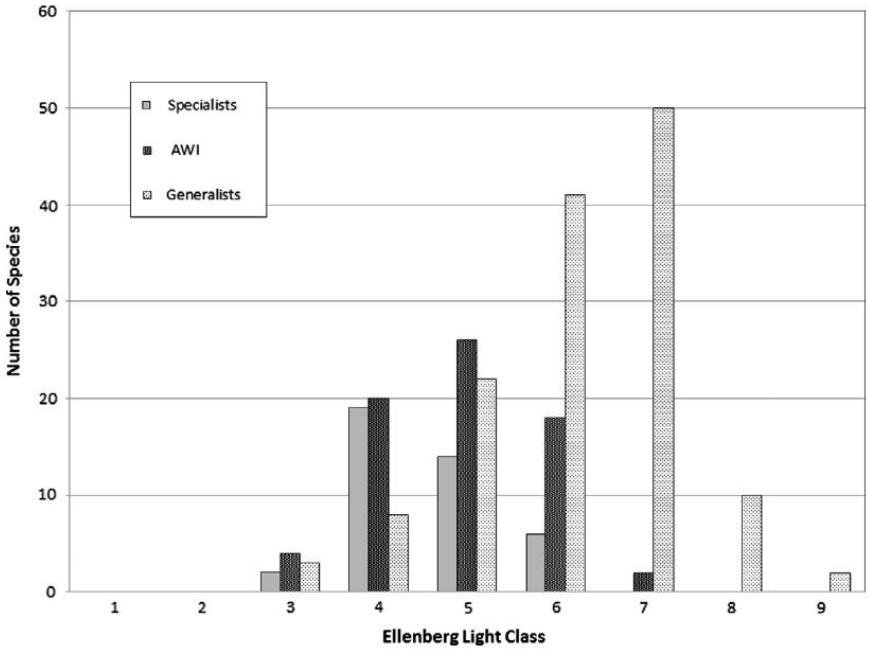
				NRW (2022). Removal or cutting is not advised. Direct spraying or injection of Glyphosate in late summer/autumn to maximise the effect of seasonal translocation. (Jones et al, 2018 In the absence of glyphosate, the only effective alternative for Japanese knotweed control would be complete physical excavation and disposal which would be significantly more expensive and arguably more environmentally harmful due to increased associated CO2 emissions and the risk of further spread. Jones & Eastwood (2019)	

	Removal of introduced species at ancient monument site: Solomon's seal, Garden rose and the large specimens of Symphoricarpos orbiculatus.			"it is evident that alien Hyacinthoides taxa pose a significant potential risk to native H. non-scripta" Kohn et al, (2008) Volunteer action to monitor the population of all three taxa of bluebell through citizen science and trained volunteering schemes to remove bulbs entirely could help to control the spread of Spanish and hybrid bluebells within the habitat. This would protect the native bluebell population and reduce hybridisation. Plant life, (2022)	

Dominance of bramble and bracken in clearings	Gradual and moderate clearance of bramble and bracken to allow better control of INNS removal. The reduction of human trampling by rerouting path and increased light exposure from clearing brambles and INNS will encourage typical vegetation of woodland margins to establish populations. Natural re-population of White willow, Alder and Hazel in the clearing increasing tree cover.	1-2 years Annual management	The 2 clearings will be dominated by woodland flora. Willow, hazel and Alder grow in scattered form. Species such as Ransoms, bluebell, harts tongue fern and celandine are the dominant species. Reclassification from C3.1 to A2.2	To increase biodiversity, it is important top have a variety of sward heights and canopy heights and light levels in the woodland. Removal of some areas of Bracken and bramble and controlling its growth annually a greater diversity of species will grow and support invertebrates, reptiles, and amphibians. Some bracken and bramble will remain as an important habitat for small mammals and birds and also as a food source for Bats and Swallows. Figure 20 shows the growth in a woodland clearing following removal of dense bramble and bracken during the winter. This was carried out at a woodland within a 3 mile radius.	

				More open clearings will reduce bare ground and allow growth of species in wetter areas such as: Bittersweet Yellow iris Meadowsweet Marsh horsetail Purple loosestrife	

Figure 12 - Graph showing the distribution of species across light classes in three ecological categories: ancient woodland indicators, Specialists and Generalists



Brown et al, (2021), Ellenberg et al, (1991)

Figure 13- Image showing the extent of tree root exposure and damage by human trampling on unofficial path.

R Carter, 2022

Figure 14 - Image showing soil erosion on footpath. (R Carter, 2022)

Figure 15 - Muddy section leads to creation of alternative paths (R Carter, 2022)

Figure 16 - Map showing the public right of way and the unofficial paths created and compounded by human activity (qGIS maps/Google satellite UK)

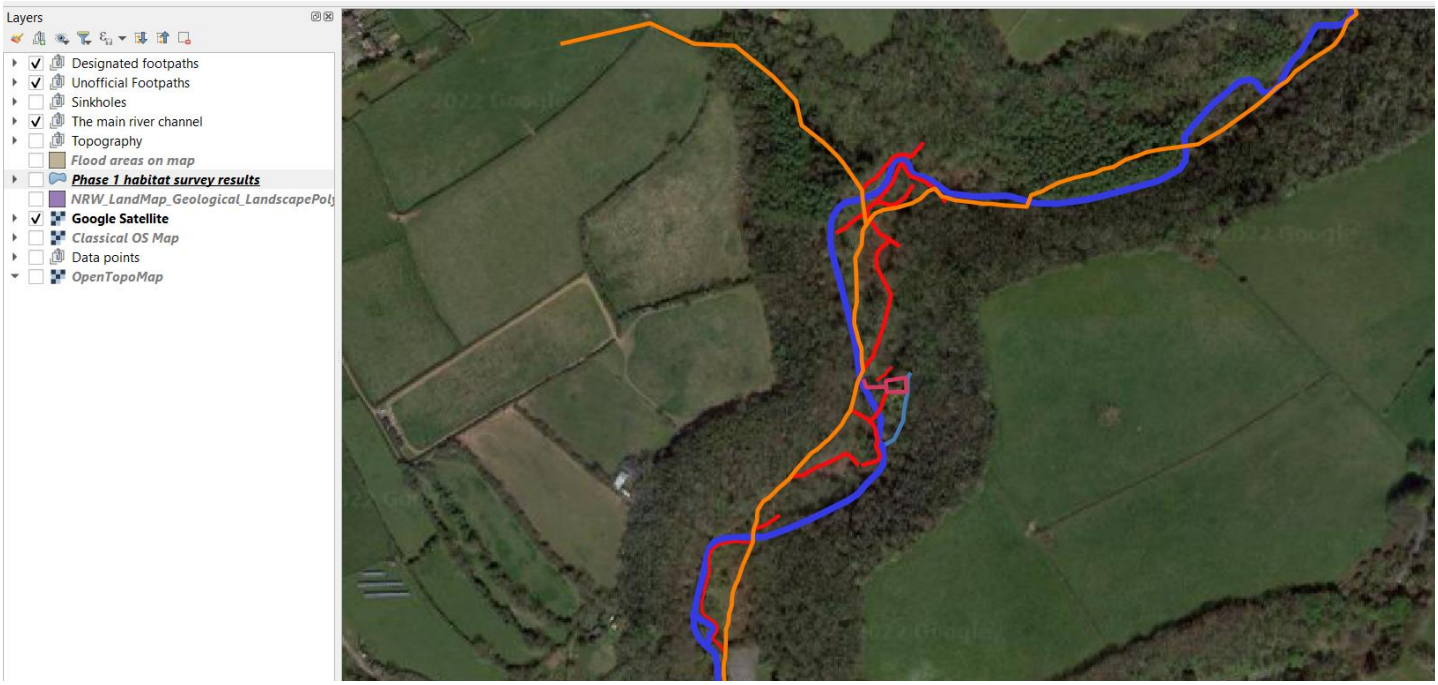


Figure 17 - Image showing Plantain growing on footpath (R Carter, 2022)

Figure 18 - Maps showing the proposed of 2 new entrance interpretation boards

Figure 19 - Image showing the proposed location of the new wooden steps and interpretation board at the Gower inn car park

Figure 20 - Image showing the regeneration of woodland species after clearance of bracken and bramble at Pennard burrows.

5 - Conclusion

Ilston cwm is a vitally important habitat within the Gower Ash woods SAC, the Gower AONB and in the UK as an exceptional example of Ash woodlands and ancient woodland. The site is classed as a 9180 and 91EO habitat, a special area of conservation and forms part of a larger connected woodland. The health and condition of the valley is integral to the health of the other connected woodlands.

As a Plantation on Ancient Woodlands (PAWS), it is crucial to actively manage the woodland to ensure the health of the woodland species and prevent any detrimental effects by non-native invasion and human impact.

The 2011 core management plan indicated that Ilston was the 'most natural of the woodland units' and as such needed minimal management. It did recognise the threat of INNS and planned action to be taken. In 2022 it is evident that if any action has taken place, it has not been effective. The presence of Japanese knotweed is pervasive across the open woodland clearing and requires immediate action to retard spread and growth.

The plan to allow the non-native conifers to fall naturally has resulted in still large numbers of conifers remaining, where they have fallen new habitats have been created and Sycamore has grown in the gap created. This has led to a dominance of Sycamore above the upper limit of 20%. Immediate action will be needed to gradually remove the conifers, reduce the Sycamore, and allow native and locally abundant species to grow in the gaps created.

To increase biodiversity and variety of habitat, the 2 woodland clearings should be maintained with limited tree planting to ensure a variety of sward height to create maximum opportunity for different ground flora, shrubs, sapling, and trees to thrive.

The impact of human footsteps is marked and is having a detrimental effect on tree health through soil erosion and root damage. The ground flora is limited and, in some areas, damaged. By clearly demarcated the official public right of way with felled conifer timber and wood chipping from wind fallen and felled trees, resources will remain on site and erosion and areas of poaching reduced. Public engagement with the major stakeholders will ensure that the local community will understand and appreciate the objectives of the plan and fully support its aims.

Where lack of management is due to funds, staffing or priorities being elsewhere, consideration should be given to establishing a volunteering group which could work with NRW, access funding and active volunteers to help achieve plan objectives. This ties in with the installation of way markers and interpretation boards to inform and educate the public as to the issues and pressures on this delicate habitat.

My vision for the site is to achieve an unspoilt and semi natural ancient woodland restored. A rich woodland flora throughout the year with different types of habitats and a clear way marked path leading visitors through form Parkmill to Ilston. Visitors will be informed and engaged with the different habitats and be able to recognise key species and understand their importance. Local businesses will value the habitat and be engaged in the management plan's progress.

After 10 years surveys will show abundant and divers woodland flora, no non-native species and eradicated or non-visible INNS throughout the site. Reptile amphibians and small mammals such as bats, voles, stout and weasel will be recorded along with butterflies, bees and other invertebrates.

My vison is outlined in the maps shown in figures 21 & 22.

Figure 21 - Map showing Management plan outcomes for Lower Ilston cwm. (qGIS maps)

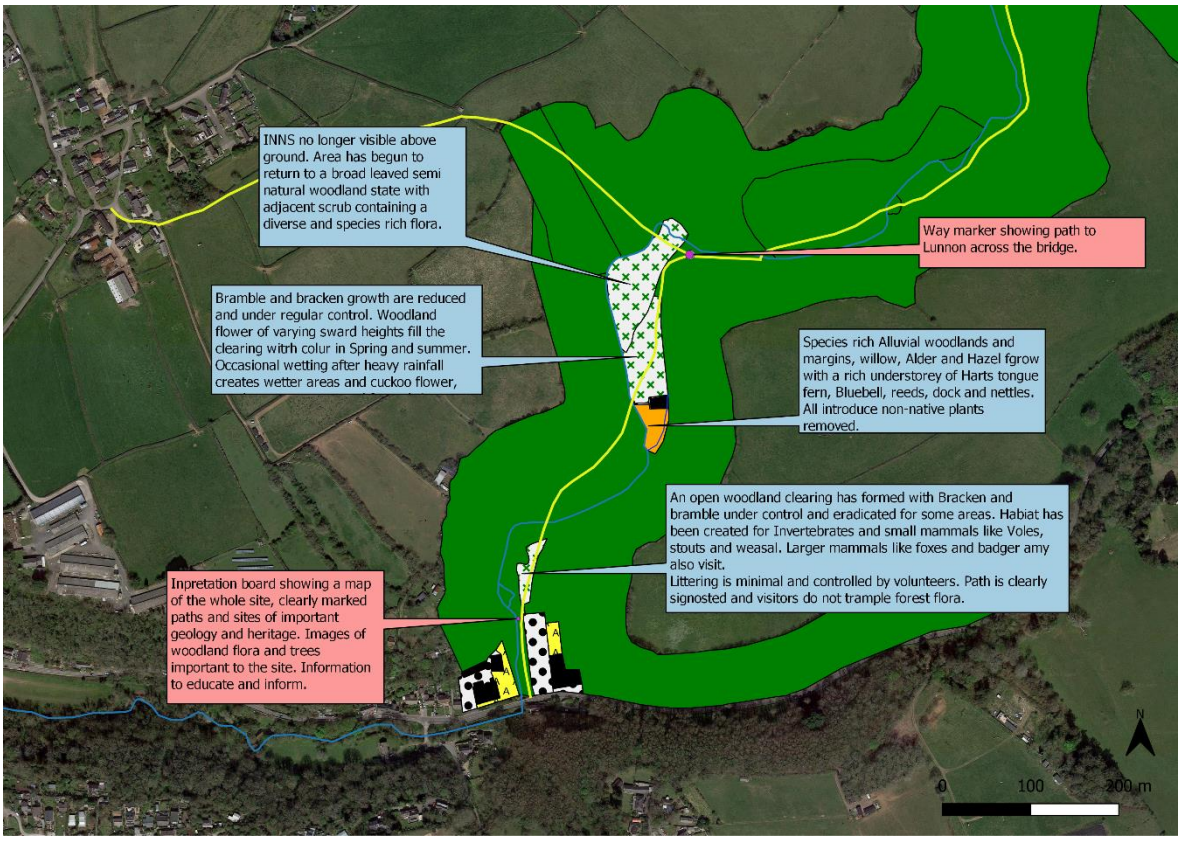
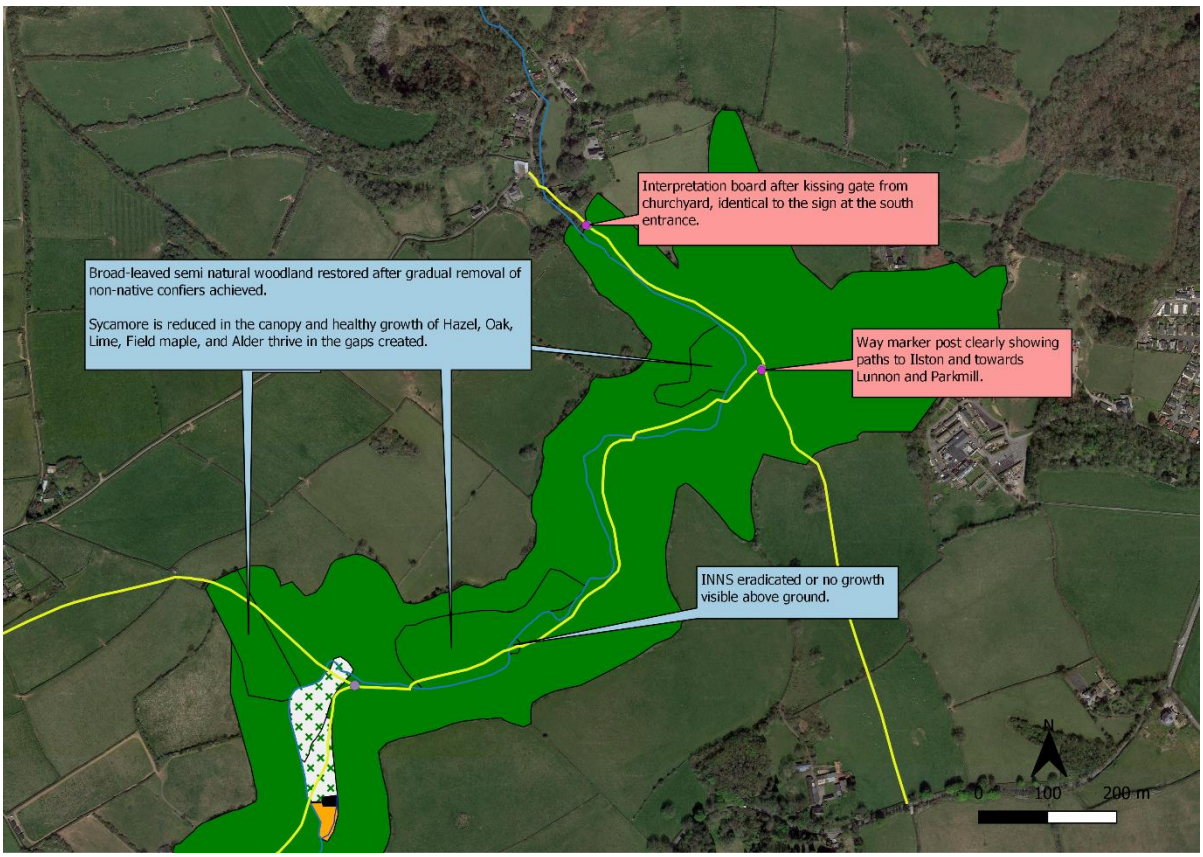


Figure 22 - Map showing Management plan outcomes for Upper Ilston cwm. (qGIS maps)



Appendices

Appendix 1

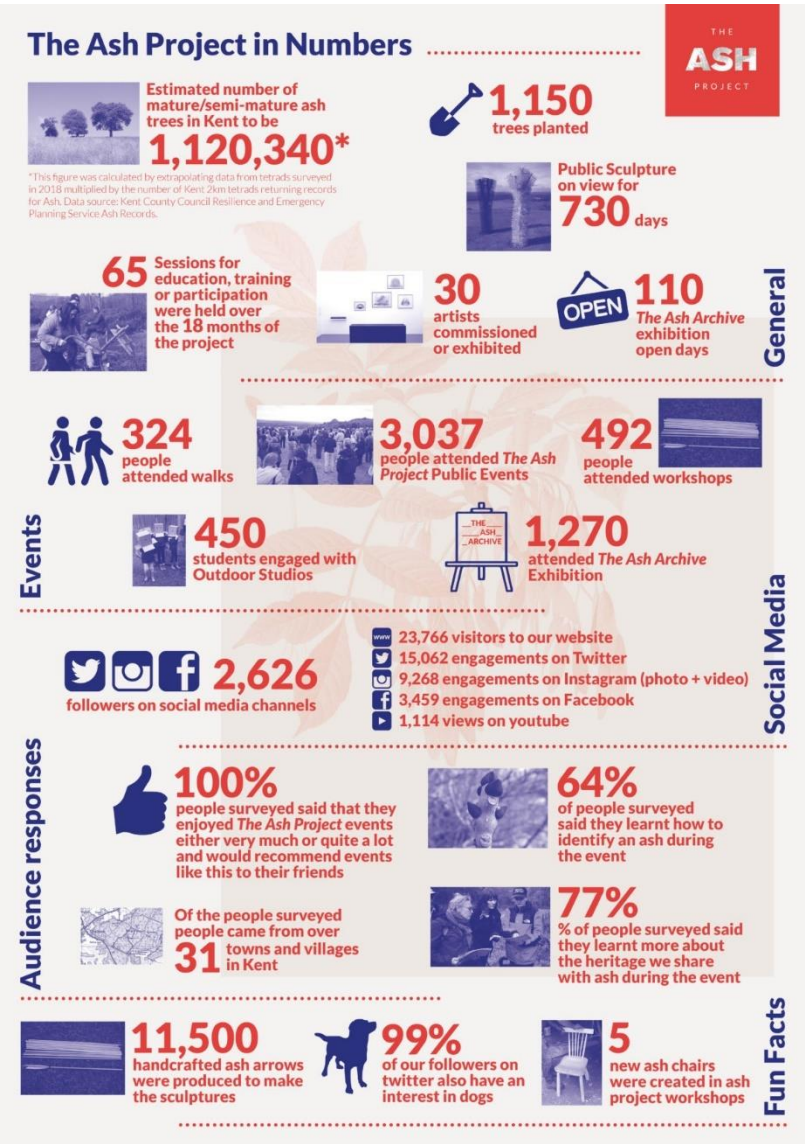
The Core management plan for Gower ash woods SAC, 15 March 2011:

2013 02 05 Gower Ash Woods Coedydd Ynn Gwyr SAC management plan _Eng_ v16 Mar 2011

(naturalresources.wales)

Appendix 2

The Ash project, Kent: An infographic summarising the project outcomes and main objectives.



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