Natural England Commissioned Report NECR140

New Forest SSSI Geomorphological Survey Overview

Annex K: Spring Wood Riverine Woodland Restoration Plan - SSSI Unit 371

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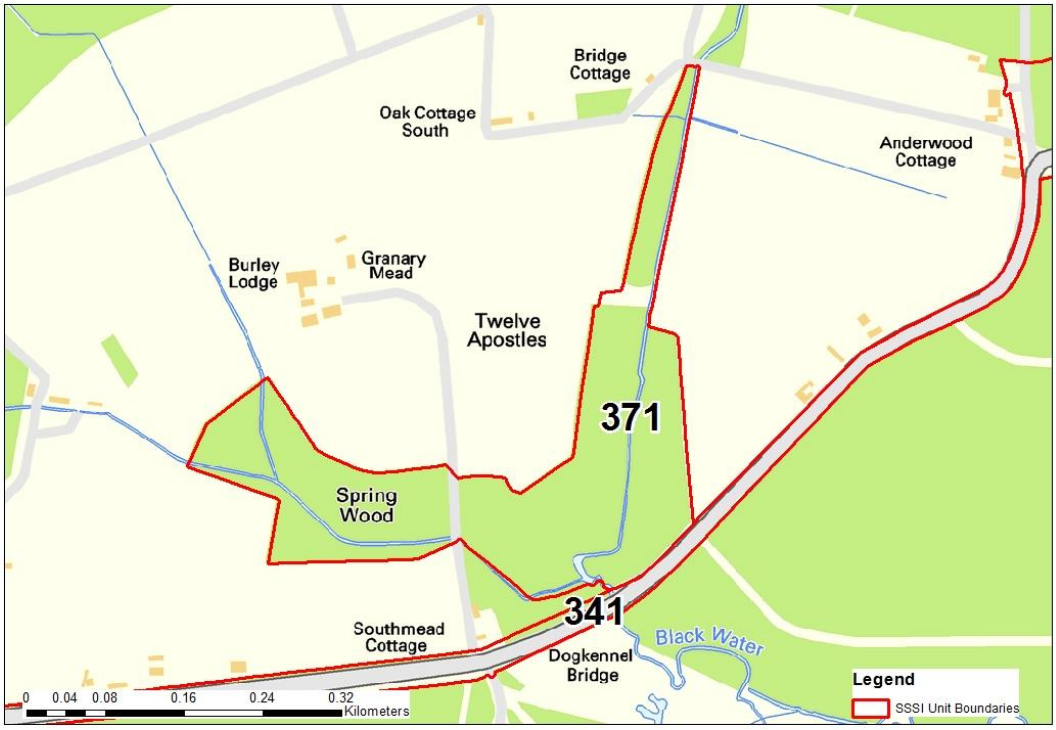
1 Spring Wood Riverine Woodland Restoration Plan - SSSI Unit 371

1.1 Introduction

Spring wood Riverine Woodland (Unit 371) incorporates the upper reaches of the River Blackwater (Figure 1-1) which then flows into Units 363 and 364. The SSSI unit is considered to be in an unfavourable recovering condition. It is approximately 7.37ha in size.

The unit consists of predominantly broadleaved woodland and the western section of the unit is dominated by grass and bracken.

Figure 1-1: SSSI Unit 371 location (flow direction is west to east)



1.2 Current hydromorphic conditions and issues

A summary of the hydromorphic conditions for unit 371 is given in Table 1-1.

Table 1-1: Summary of hydromorphic conditions for unit 371

Geomorphological Assessment Area		Spring wood Riverine Woodland
Site Name		Spring wood Riverine Woodland
Size (ha)		7.5
SSSI Unit(s)		371
Channel Condition	River Type (s)	Weak lowland anastomosed; active meandering
	Responsiveness	Moderate gradient, straightening, moderate gravel supply
	Sediment delivery, type and mobility	Moderate upstream gravel sources, local bank sources, minor local storage, few fines.
	Main Source of water	Upstream sources are Blackensford Brook to the east and two unnamed headwater streams to the west which join at Dogkennel Bridge

	Aquatic vegetation	The channel is dominated by fine and medium gravels and at the time of survey no aquatic vegetation was evident
	Drainage Damage	Drains straight and enter channel steeply
	Morphology	Pool, riffle, gravel shoal, plane bed, debris jams, bifurcated channel
	Incision	Yes - impacting local groundwater levels and flood regime. Steep tributary channel confluences
	Engineering	Channel straightening. Dredging. Adjacent spoil
	Bank activity	Moderate, some lateral activity. Some bank collapse
	Flow type (s)	Flood peaks concentrated in incised channel reaches.
Floodplain Condition	Valley Type	Narrow wooded floodplain
	Main Source of water	Drains / overland flow
	NVC communities	W10, W6
	Key Habitat Types	Broadleaved woodland with grass and Bracken understorey
	Drainage	Natural and drains
	Scrub/Tree Encroachment Damage	Wooded floodplain
	Palaeo features	Yes - palaeo channels evident and in some cases reoccupied
	Floodplain connectivity	Moderate - good
	Poaching and Grazing Pressures	V low
Generic restoration options		Reinstate palaeo channels. Debris jams to manage incision.
Additional Comments		Engineered structure close to Dogkennel Bridge

The tributaries of the River Blackwater within SSSI Unit 371 vary between:

- a weakly lowland anastomosed system, particularly in the lower reaches where debris jams have created better connectivity, activating a multi-thread system at higher flows (Figure 1-2);
- an active single thread channel, with some lateral activity (Figure 1-3);
- an engineered, straightened single thread reach (Figure 1-4).

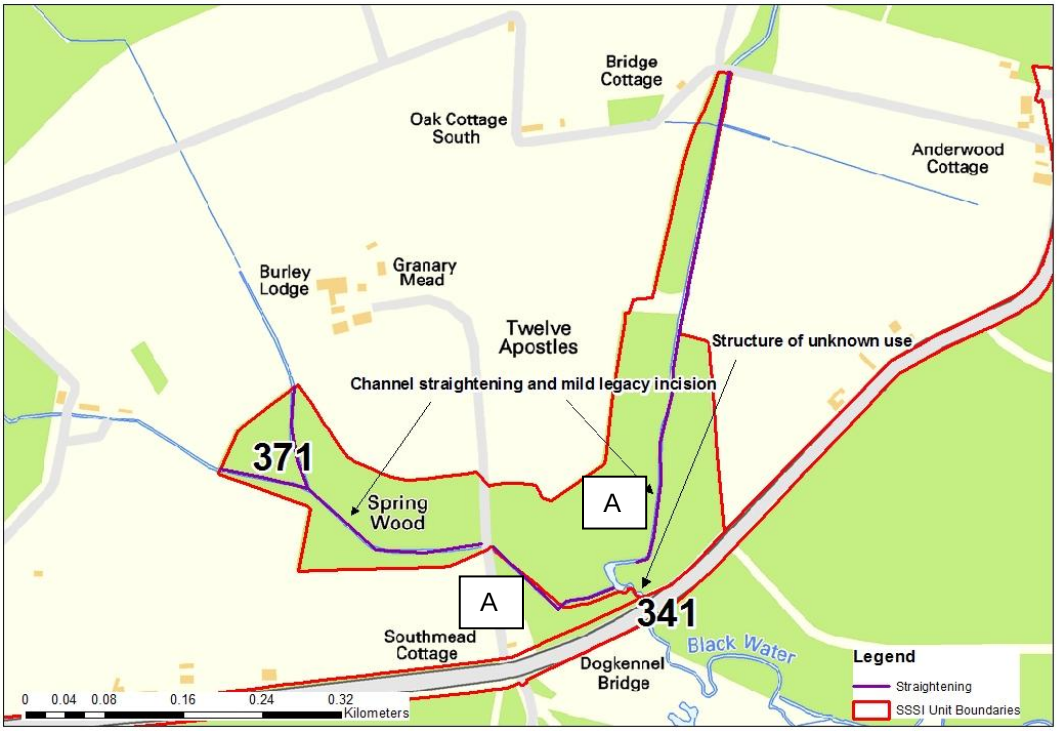
Figure 1-2: Weak anastomosed channel network

Figure 1-3: Active single thread channel

Figure 1-4: Straightened artificial channel

The source of the River Blackwater is from Blackensford Brook to the east and two unnamed headwater streams to the west which join at Dogkennel Bridge. This unit is supplied with fine and medium gravels from upstream and actively transports this sediment through to the main River Blackwater. An engineered structure of unknown use is present close to Dogkennel Bridge and should be considered for removal. Figure 1-5 summarises the existing hydromorphology and pressures impacting Unit 371.

Figure 1-5: Current hydromorphic conditions and pressures



The gradient of the watercourses through unit 371 is moderate promoting an anastomosed system where engineered channels have not concentrated flows. Many floodplain palaeo channels are present, albeit currently disconnected. It is clear that significant channel straightening has been undertaken (from maps and LIDAR) in the past, particularly along the lower reach (Figure 1-5 - A). Straightening of the watercourse has had a significant effect on the nature and functioning of the river. The length of watercourse will have been shortened leading to a steepening of the system and the associated dredging will have over-deepened the channel. This in combination will have increased flood shear stress levels promoting erosion. The initial impact of straightening would have been incision along significant lengths of the wooded watercourse (Figure 1-6) and localised widening. This incision episode appears to have been mild and no knick points were seen on the tributary / drain systems (Figure 1-7). Ditching along the reach will have impacted slightly on the flood flow regime of the watercourse. Groundwater levels have been altered slightly as a result of post engineering channel incision, but the impact is considered minor. The degree of artificial drain creation is shown in Appendix A.

Gravel supply appears moderate and coarse sediment storage in the reach is minimal with few shoals apparent (Figure 1-8).

Figure 1-6: Local channel incision

Figure 1-7: Stable local drainage

Figure 1-8: Local gravel shoaling

Where riparian woody vegetation is dense enough to provide a coherent resistant root mat erosive energy will have been directed at vertical incision leading to a slightly over-deepened channel. Floodplain connectivity is improved where woody debris dams pond water upstream creating a multi-thread anastomosed channel network. Restoration should look to increase the frequency of wetting of these channels. Natural woody debris features are relatively common along the channel (Figure 1-9) and in places have blocked the straightened reaches causing flow to partially reoccupy the original channel course increasing hydromorphic diversity locally.

Figure 1-9: Natural woody debris jams

1.3 Probable channel development

The process of adjustment to the channel straightening, dredging and increased drainage is continuing despite the historic nature of many of the changes. The river can also be said to be recovering to a degree in the sense that it has now created a diverse hydromorphology consisting of locally sinuous channels through what were straightened single thread reaches with an associated mix gravel based morphology and significant woody debris induced features. The nature and distribution of these features is likely to alter significantly over the next decades as the erosion, transport and deposition patterns change.

Drainage into the SSSI is stable and management of the drains themselves will not be required if they are retained. Drainage channel infilling is recommended.

1.4 Current Ecological Condition

Unit 371 is a varied area of broadleaved woodland, the western arm of which is dominated by a grass and Bracken *Pteridium aquilinum* understorey with Oak *Quercus robur* woodland forming the canopy (Figure 1-10). This woodland is fenced-off and there does not appear to be much grazing taking place at the present time (Figure 1-11). However, the lack of a developed ground flora and the presence of grasses, mainly Tufted Hair-grass *Deschampsia cespitosa* and Rough Meadowgrass *Poa trivialis*, indicate that it is likely this woodland was heavily grazed in the recent past.

Figure 1-10: Phase 1 Habitat Map of Unit 371 (Spring Wood)

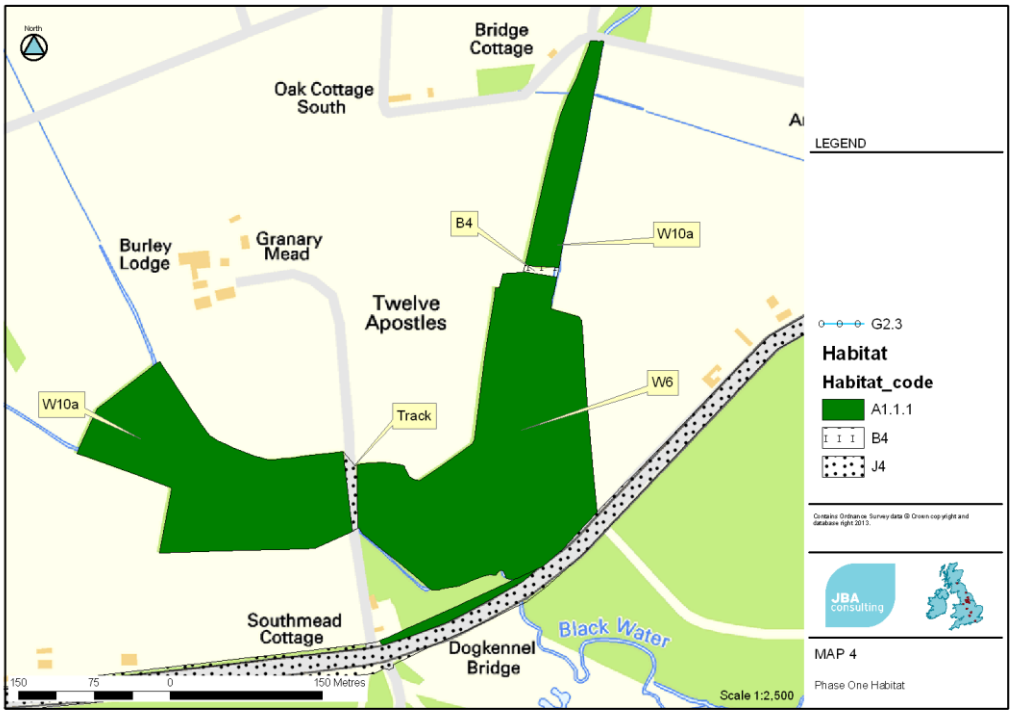


Figure 1-11: Spring Wood: East of Burley Lodge Lane (left) and West (right)

To the east of the lane to Burley Lodge, the woodland character is very different (Figure 1-10). Here the woodland floor is criss-crossed with drains which are now incised and flowing freely. The ground flora is more varied and the area is fenced-off from both people and livestock: indeed it is clear that the former are discouraged from entering the wood. The ground is very uneven and this leads to differential levels of waterlogging and all this has led to a greater variety in the ground flora here than upstream. Wood spurge *Euphorbia amygdaloides* is common here, especially near the Lyndhurst Road. Within this compartment the stream from Spring Wood (Black Water) is confined within a large drainage channel and eventually joins the Blackensford Brook channel (which is also straight) after it cuts its way along the designation boundary to its confluence with the Blackensford Brook at Dogkennel Bridge. In this area Alder *Alnus glutinosa* is the dominant woodland tree and there are a few palaeochannels as well as a large lawned area, separating two sections of woodland upstream on the Blackensford Brook.

1.5 Restoration plan proposals

A summary of the current pressures, unmitigated impacts and restoration proposals is given in Table 1-2 and shown in Figure 1-12.

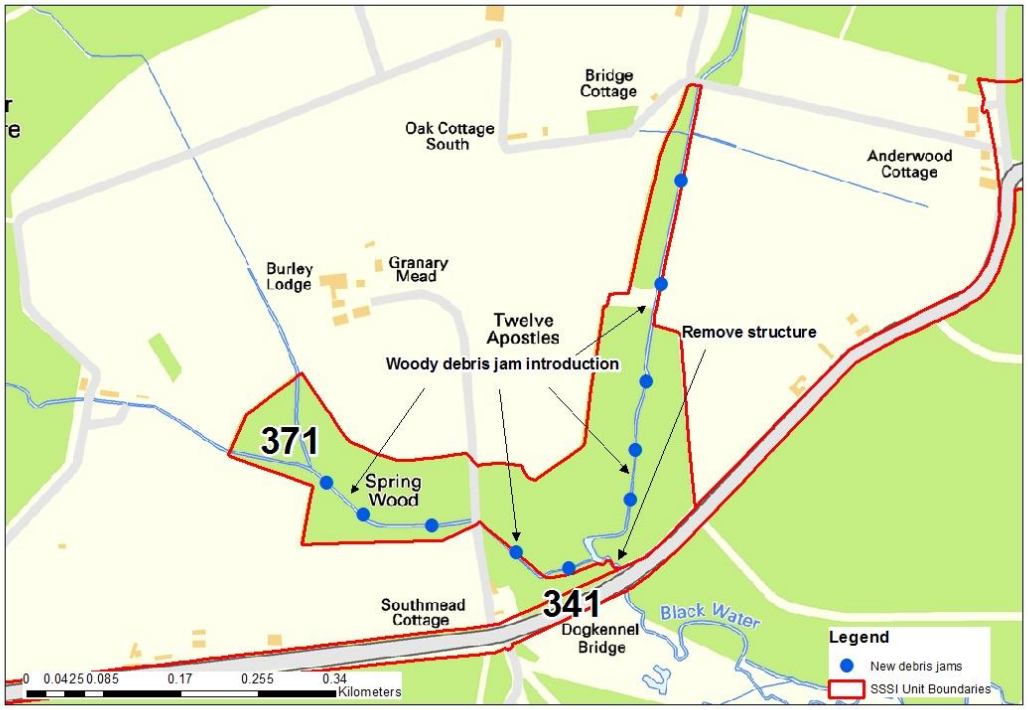
The key hydromorphological and ecological gains associated to the proposed restoration measures are:

- Improved anastomosed channel network development, through using woody debris jams to improve floodplain connectivity, will improve hydromorphological diversity;
- Better floodplain connection through water level raising and artificial drain restoration;
- Improved in-channel habitat.

Table 1-2: SSSI Unit 371 proposed restoration measures

Pressure	Impact	Restoration proposal	Hydromorphic improvement	Ecological improvement	Constraints / issues
Straightening & historic dredging	Long term river response, cut and fill activity. Slightly enhanced in-channel energy levels. Disconnected sub-channels. Loss of in-channel features.	Palaeo channel reconnection. Infill / install woody debris. Restore in-channel morphology. Restore connectivity.	Reinstate some channel length lost through straightening - helping to reduce incision. Encourages anastomosing channel development. Slows gravel movement. Stabilises in-channel features.	Anastomosed channel development will increase the diversity of the riparian strip. Small bar features in the stream will vegetate over.	None. Promote natural processes.
Artificial drainage	High flows impacted. Water table lowered locally.	Drain infilling	Restore a natural flow regime, reducing incision in the drain and channel network. Reduces flood peaks. Reduces fine sediment inputs. Slows gravel movement. Stabilises in-channel features.	Encouraging stream to become multi-threaded increases the diversity of the habitat mix mo the woodland floor and encourages the further growth of Alder which, in turn, will stabilise the existing channels whilst at the same time promoting a spread of flows across the woodland floor at times of peak flow.	May require import of material and associated risk of introducing invasive species. Cost
Engineered structure	Local hydromorphic alteration	Removal	Reinstate anastomosed reach	Improve diversity of in-channel habitats and improve conditions for invertebrates.	None. Promote natural processes.

Figure 1-12: Proposed restoration measures for SSSI Unit 371



1.6 Design considerations

The channel is unlikely to completely stabilise as a result of re-routing the watercourse back through a palaeo channel that was once occupied, probably at a time when channel and catchment processes and pressures would have been very different from today. However, retaining the dynamism of the channel should be an objective of the restoration plan.

Palaeo-channel entrance and exit elevations must be carefully considered to avoid instigating uncontrolled instability.

Retaining and improving the currently disconnected anastomosed network in the upper section should be a target of the restoration plan.

The major straightened / modified drainage channels are identified in Figure 1-12. Other minor modifications could be considered for infilling and Appendix A should be used for reference.

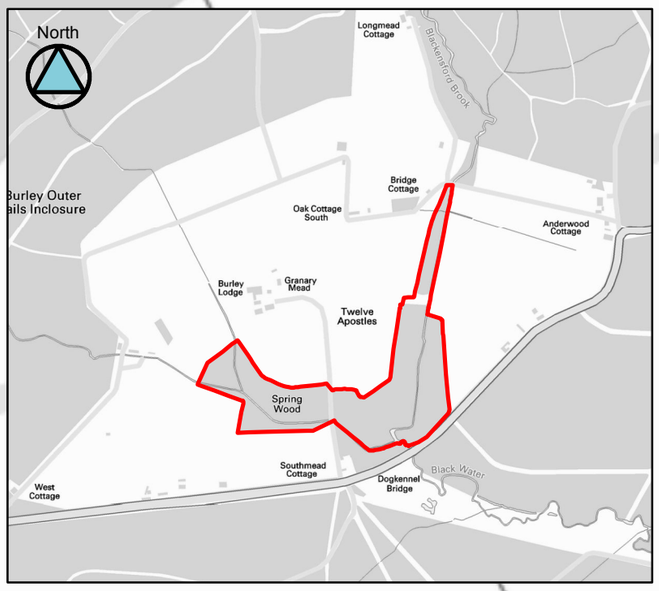
1.7 Restored channel and monitoring requirements

It is anticipated that the proposed restoration works will create a dynamic, sinuous channel with some anastomosed sections and improved floodplain connectivity, with frequent overbank flooding and a heightened potential for local channel switching in response to natural debris blocking. This pattern of development is difficult to document accurately due to the complex nature of the river network and the difficult surveying conditions. As such a qualitative monitoring approach is recommended with automated time lapse photography employed at key restoration points to record daily images of flow types, morphology and vegetation character. This could be undertaken alongside two-yearly reconnaissance audits to determine hydromorphological change over the entire reach, which fixed point photography will not cover. The daily photographic records should be analysed to estimate and record the parameters detailed in Table 1-3.

Table 1-3: Monitoring parameters, frequency and suggested approaches for the Unit 371.

Parameter	Approach	Frequency	Approximate cost
Morphologic unit change	Time lapse camera / audit	Daily (Annual statistical summary)	Capital 4 x £200 Half yearly downloading £200 Annual summary £300 Two - yearly reconnaissance audit £500
Flow change	Time lapse camera / audit	Daily (Annual statistical summary)	
Sedimentology	Time lapse camera / audit	Daily (Annual statistical summary)	
Vegetation change	Fixed point camera survey	Biennially	
	Fixed point quadrat survey	Biennially	Survey £350 Analysis £500
	Fixed point aquatic macrophyte survey		
NB. Costs assume downloading and site visits as part of wider field campaign.			

Appendix A - Artificial drains and flow lines - SSSI Unit 371



SSSI 371: Spring Wood

Bridge Cottage

Oak Cottage South

Burley Lodge

Granary Mead

Twelve Apostles

Spring Wood

0 50 100 Metres