Natural Flood Management

Protecting Communities through Peatland Restoration in Cumbria

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Cumbria Wildlife Trust

Contents

1. Summary

Peatlands provide a number of services to society, from storing carbon, providing clean drinking water and protection against flooding, to being fantastic wild places, beautiful to explore and home to a multitude of wild plants and animals.

The role of restored and well managed peatlands in natural flood management has previously been overlooked. Appropriately managed peatlands can help to prevent flooding by slowing down the speed with which water reaches rivers and streams in times of high rainfall. Conversely, in periods of dry weather, peatlands provide a much needed slow release of water to rivers and streams helping to prevent these from drying up. Maintaining natural peatland vegetation cover is crucial to reducing the flow of flood water during high rainfall events.

Many of the peatlands in Cumbria are in a degraded condition. A recent survey by Cumbria Wildlife Trust found that 97% of wetlands were in poor management condition[1]

In response to this the Environment Agency working with Cumbria Wildlife Trust commissioned Penny Anderson Associates Ltd (PAA) and JBA Consulting (JBA) to prepare a map of the upland peat resource in the Lake District National Park (LDNP), collate a wide range of data relating to its condition, including causes of degradation or damage, and record the work that is currently being undertaken by organisations in the area that directly or indirectly affects the peatland[2]. It was intended that this information will be used to prepare restoration plans, a range of actions and a business plan for taking the work forward.

Using this data we have defined potential areas of work within three priority catchments, the Kent, Eden and Derwent. Further analysis has categorised the sites into either *priority* or *potential* restoration sites. *Potential* sites are those in which remote mapping has suggested that work may be viable. *Priority* sites are those that detailed local knowledge and work undertaken by the Cumbria Peat Partnership means that work can be undertaken. Experience of similar restoration enables costs to be estimated. Work is scheduled over a five year period starting 2017.

Potential restoration sites cover a total of 1911 hectares costing an estimated 2.6 million pounds. Priority restoration sites cover 635 hectares and their restoration is costed at just under 1 million.

Peatland restoration will reduce the likelihood of flooding for those 5,668 properties downstream that flooded in December 2015.

[1] Cumbria Wetland Wildlife Site Management Condition Assessment: Findings of the Wetland Wildlife Sites Project: February 2012

[2] Cumbria Wildlife Trust Cumbria Peat Mapping Report, Penny Anderson Associates, May 2013

1. Protecting flooded properties.

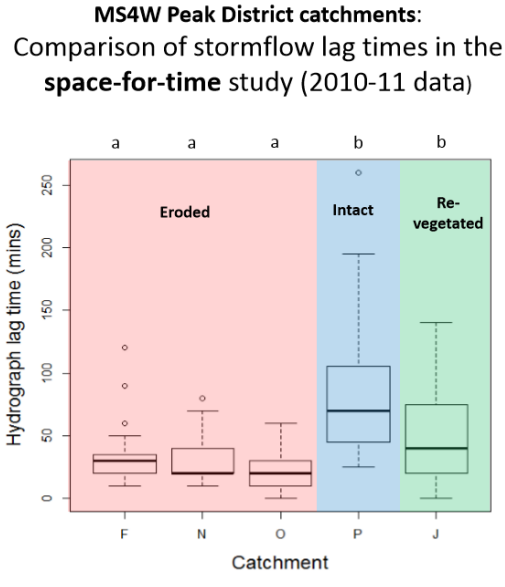
Areas of bare peat are unstable – subject to wind and water erosion as well as poaching by livestock. Eroded peat is usually washed into watercourses along with silt from any mineral base material that has become exposed as the peat is removed. This has implication for water quality on catchments as well as adding to the debris that can increase flood events.

Bare peat also has very little ability to slow water runoff due to its low surface roughness. This increases the speed that water falling in the uplands reaches towns and villages downstream. This is exacerbated in peatlands where drainage ditches, or grips, have been cut. All of this can have serious consequences on flood peak levels for communities downstream.

A number of studies have been undertaken that show that restoring peatlands by re-vegetating bare peat, blocking drainage channels and increasing the amount of Sphagnum in the uplands can have real flood alleviation benefits.

For instance, The Making Space for Water Project managed by Moors for the Future and funded by DEFRA identified the following headlines:

1. Peat restoration in upland blanket peat systems reduces storm flow in headwaters and can contribute to the reduction of downstream flood risk
2. Restoration of bare and gullied peat significantly alters storm flow release from headwater micro-catchments, reducing peak flows by 30% and increasing lag times by c.20 minutes
3. Model upscaling suggests that re-vegetation across 12% of a 9 km2 catchment would reduce flood peaks of severe storms by upto 5% and, with additional gully blocking, by upto 8%



Leeds University have developed a model to predict the effect of vegetation land cover change on flood attenuation. Modelling has suggested that obtaining 10% Sphagnum cover in a catchment could reduce flood peaks by between 5.1 and 7.4% during a 20mm/hr rainfall event.

Restoring these degraded peatlands can therefore make a significant contribution to reducing runoff by:

1. Changing the amount of water which flows off the hills
2. Changing the timing and reducing peak runoff by slowing the rate of flow and / or by storing water

Three catchments have been identified as being of priority as a result of these floods, the Eden, Derwent and the Kent. Figure 1 shows the number of properties flooded in the December 2015 floods in relation to degraded peatlands upstream. This project will seek to reduce the flood risk to these properties through restoring targeted peatlands by:

- Re-vegetating bare peat
- Blocking drainage ditches and grips
- Increasing the cover of Sphagnum

In addition this project will seek to supplement these practised methods by creating temporary storage in the uplands through the creation of a series of bunds.

As well as the flood attenuation benefits of restoring peatlands there are numerous other ecosystem services. These include conservation interest in terms of the plants and animals and the species that blanket bog supports. Peat is also the largest store of carbon on the planet and carbon is lost from damaged peat bogs. At the very least degraded blanket bog will lose the capacity to store significant quantities of carbon.

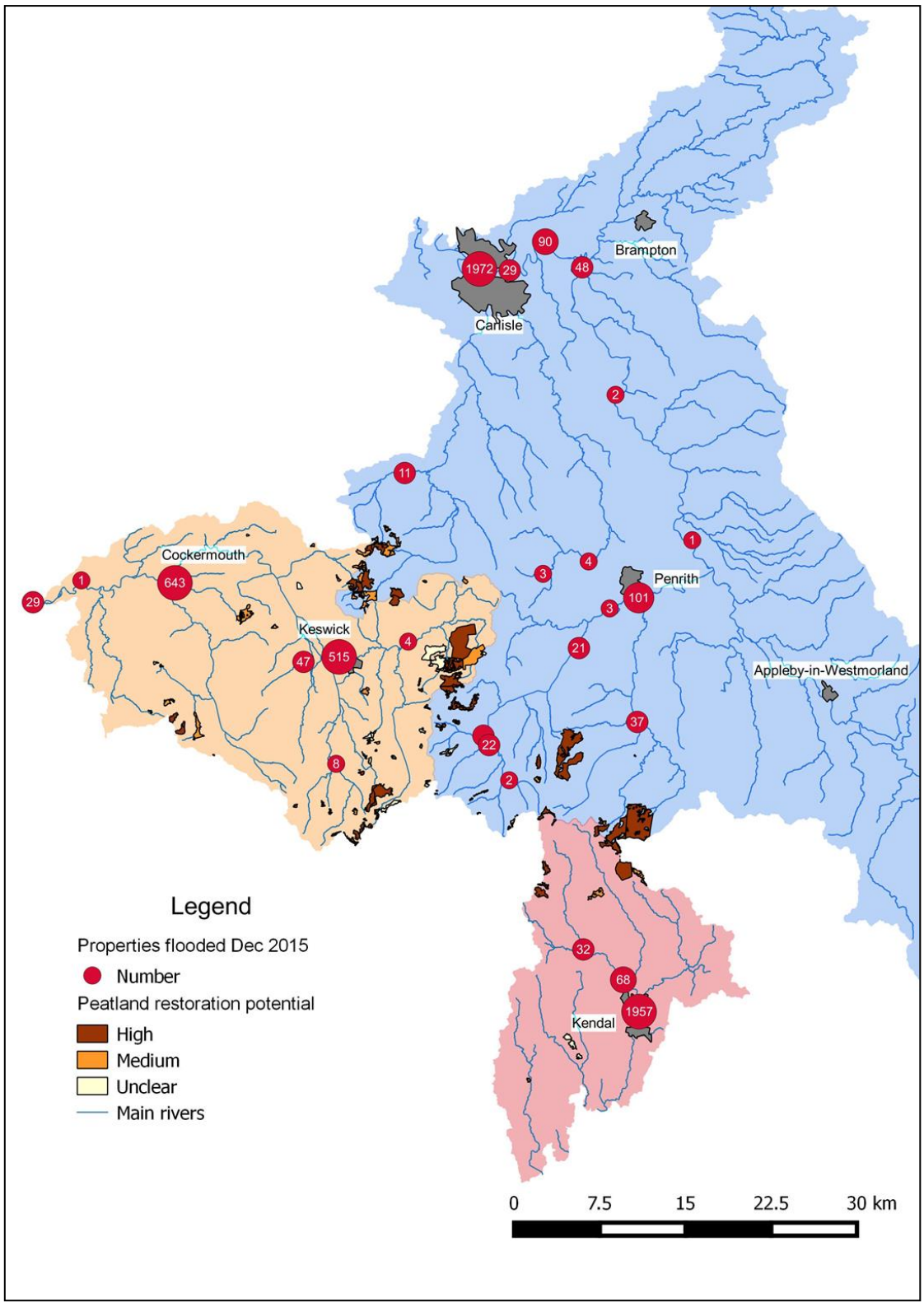


Figure 1: Properties flooded in the December 2015 floods.

2. Overview of peat resource.

Figure 2 shows the total peatland resource within the three identified catchments as identified in the Cumbria Peat Mapping Report.

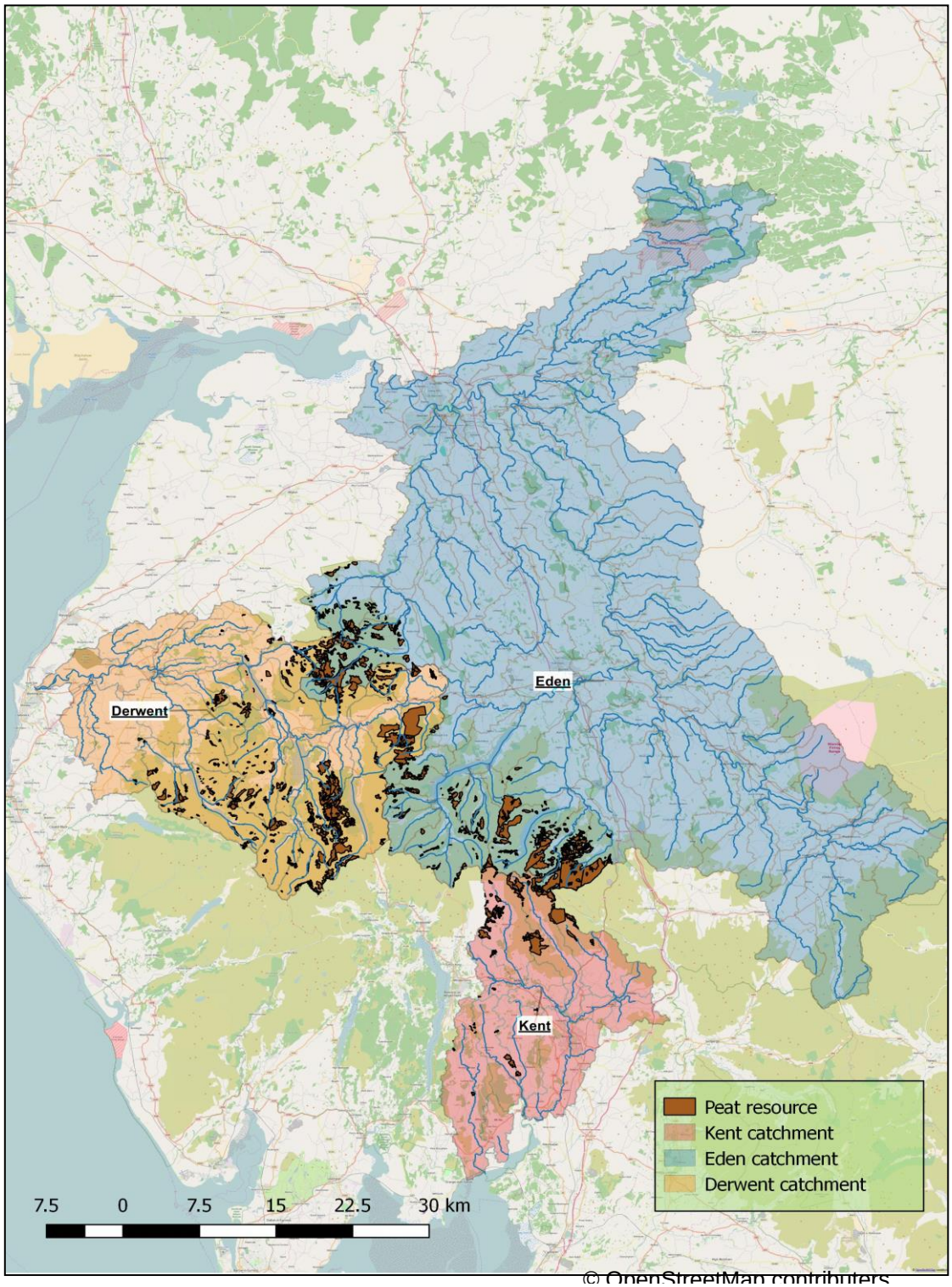


Figure 2: Peatland resource in the identified catchments

This peat extent and potential occurrence map was used as a starting point for the work and provided a constrained area to search for peat habitats.

The presence of peat habitat was determined on a combination of:

- Aerial imagery interpretation;
- Phase 1 Habitat Survey mapping of Cumbria and
- UKBAP inventories polygons.

These information sources were used to define the detailed peat habitat layer that forms the primary output from this project, defined as the Cumbria Peat Mapping Project (CPMP) Peat Habitat Layer.

Restoration potential was based on subjective assessment of the density of potential restoration features within a polygon, and primarily addressed the potential to physically restore the peat mantle. This process did not explicitly take into account any adjustments in livestock numbers that could be required to ensure success of restoration or prevent further damage. Areas were defined as:

- High - High density of features and large extent of peat habitat at the fell-scale;
- Med - Moderate density of features and large extent of peat habitat at the fell-scale;
- Low - Low density of features within polygon;
- Unclear - Restoration features may be present but potential is not obvious from aerial imagery. Isolated but badly damaged areas are included here; and
- None - No obvious restoration features and none suspected to be present.

Peat status features were recorded under the following categories:

- Intact\active;
- Hagged
- Gullied;
- Gripped;
- Drained;
- Eroded;
- Bare;
- Burnt;
- Cut; and
- Wooded.

For the purposes of this analysis we will examine those peat sites with a restoration potential of High, Med and Unclear.

3. Peatland restoration

Cumbria Wildlife Trust and the Cumbria Peat Partnership have been undertaking upland peatland restoration for over 5 years and have a wealth of experience in managing peatland restoration. The following work stages and 'costings' are based upon that experience and reflect the true costs of restoring peatlands in the uplands.

Each site will be designated a Work Category on the basis on the amount of human resource required to deliver restoration. In addition the capital resource required to deliver restoration will be estimated. Work Stages are identified that will work from an initial desk study through to the drawing up and delivery of detailed restoration plans.

3.1. Work stages

Work stage	Description of work	Cost
1 Desk study	Utilising up to date aerial photographs identify and map erosion features to identify whether site has the potential for delivering natural flood management gains.	£300
2 Site survey	If potential identified in stage 1. Contact landowner and undertake basic survey to ground truth erosion features. Produce report.	£300 + £20 / ha
3 Management plan	For those sites that pass stage 2 a detailed management plan will be written to deliver the required peatland restoration. This stage requires extensive communication with Statutory agencies and includes consents for work, planning etc.	£3000 + £30 / ha
4 Let restoration contract	The management plan will seek tenders from local contractors to deliver the management plan and restoration is delivered	£3000 = £450/ha + £1000 / ha

3.2. Work assumptions for costings

In order to provide indicative costs for a large scale peatland restoration project in the identified catchment certain assumptions have been made. These assumptions are based upon our experiences to date in restoring peatlands in the uplands. This involves not just the delivery of actual works but also time needed to build relationships with landowners and liaise with them throughout the works.

Revenue costings for work stream 1 2 and 3 are the costs of work undertaken by skilled restoration ecologists. This is based upon a full cost recovery of £300 per ecologist per day.

Work stream 2 is based upon the size of the site being surveyed plus a basic fee of £300 for arranging access.

Work stream 3 is based upon the size of the site being surveyed plus a basic fee of £3000 for drawing up the management plan and undertaking statutory requirements.

Work stream 4 is based upon capital costs of £1000 per hectare for capital works[3] plus £450 per hectare for staff time with a mobilisation fee of £3000.

3.3. Priority Sites

The analysis of sites undertaken identifies sites that we feel are feasible to deliver peatland restoration upon within the next five years. However for the majority of these sites the final decision will rest with the relevant statutory agencies and landowners.

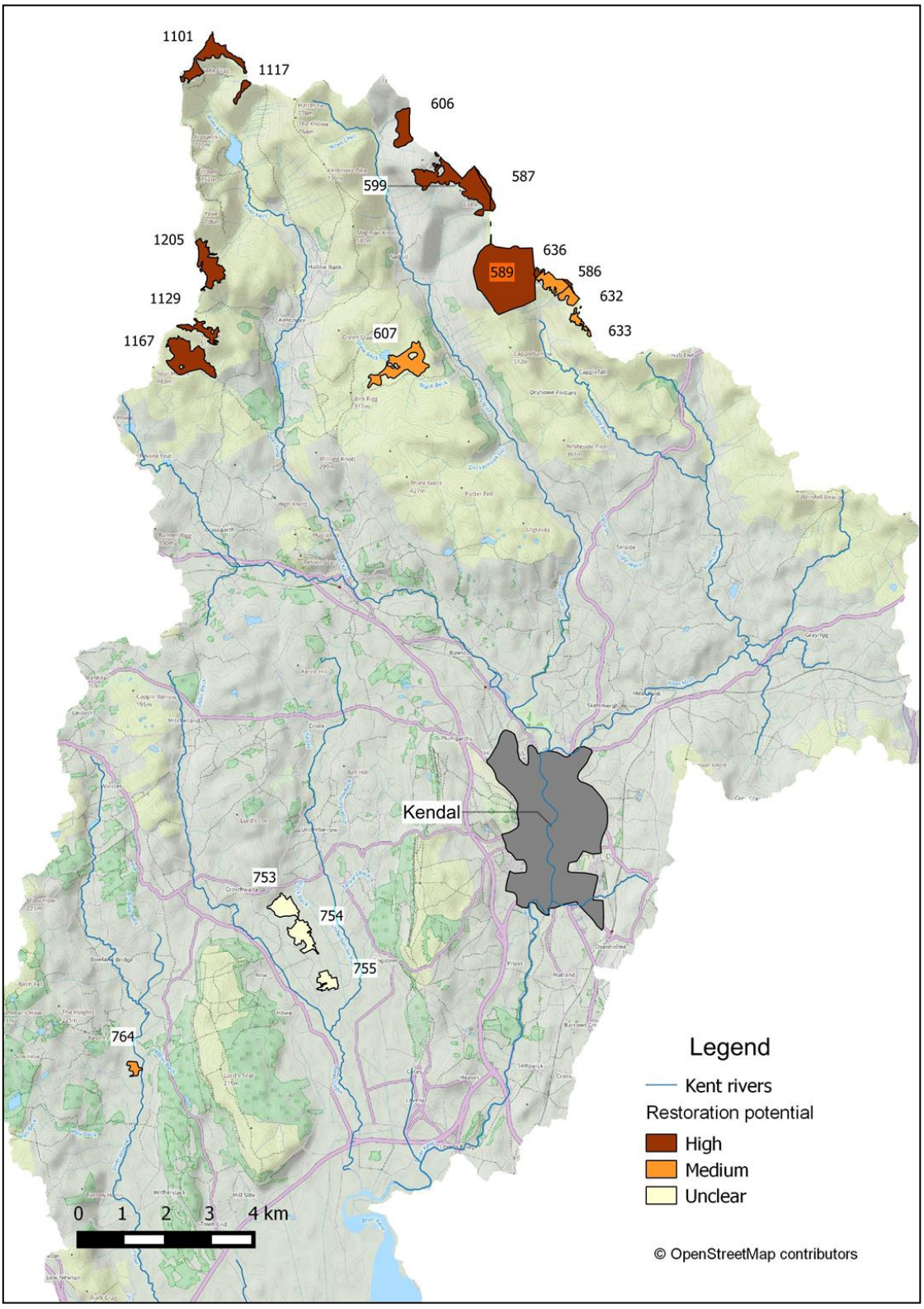
There are a number of sites where we already have landowner and statutory agency agreement in place. There are also sites in which the restoration will offer significant benefit to natural flood management.

These sites are marked as *Priority Sites* P

[3] Based on Yorkshire Peat Partnership figures

4. Kent catchment

The Kent catchment has already been surveyed by Cumbria Peat Partnership utilising funds provided by the Environment Agency. As a result this catchment is the best understood catchment out of the three. A total of 2057 properties flooded in this catchment in December 2015.



4.1

	Hectares	Site no.	Site name	Notes	Work stage
	1.82	*586*	*Bannisdale Fell (east)*	*Deep peat and blanket bog vegetation present, occurring as a mosaic with acid grassland in places.*	*No work required*
	6.92	587	Borrowdale Moss, Harrop Pike & High House Fell	Majority of peatland in adjacent catchment. Work already completed	No work required
P	177.26	589	Bannisdale Fell (central)	Area of deeply gripped blanket bog. Surveyed in 2015 and large potential for restoration to deliver natural flood management benefits.	3 / 4
	75.42	599	Sleddale Fell & Harrop Pike	Site received ground survey in 2015. No restoration potential.	No work required
	25.15	606	n/a	Part of larger site in adjacent catchment. Site surveyed 2015 and no restoration potential.	No work required
	16.32	1129	Sallows & Kentmere Park	Area mapped as acid grassland in the Phase 1, site surveyed 2015 and limited restoration potential	No work required
	56.72	1167	Wardless	Large area of flush/mire target noted in Phase 1 survey, site surveyed in 2015 and low potential for restoration.	No work required
P	35.94	1205	Buck Crag	Polygon contains areas of acid grassland and wet heath alongside blanket bog. Site surveyed 2015 and good potential for restoration	3 / 4
P	5.80	1101	Lingmell End	Surveyed 2015. Significant erosion features present that require re-profiling.	3 / 4
P	37.7	1117	Bleathwaite Crag	Surveyed 2015. Significant erosion features present.	3 / 4

4.2. Medium restoration potential

Hectares	Site no	Site name	Notes	Work category
50.20	607	Skeggles Water	Area also includes wet heath on shallower peats. Site partially restored. Potential for further restoration on south of site to be undertaken	2
17.62	632	White Howe	Habitat mosaic comprising remnant blanket bog and acid grassland. Surveyed 2015, no restoration potential	No work required
0.89	633	White Howe	Habitat mosaic comprising remnant blanket bog, and heath. Site surveyed 2015. No restoration potential	No work required
19.51	636	Bannisdale Fell (east)	Deep peat and blanket bog vegetation present. Site surveyed 2015, no erosion features present.	No work required
6.55	764	Stock Moss	Lowland raised bog. Peat surface largely wooded. No restoration potential	No work required
94.78				

4.3. Unclear restoration potential

Hectares	Site no	Site name	Notes	Work category
22.97	753	Blakebank Moss	Modified/succession habitats dominant. Work already underway	No work required
26.31	754	Cock Moss	Woodland present over much of the peat surface. Work already underway	No work required
14.13	755	Heslington and Savinhill Mosses	Modified/succession habitats dominant. Work already underway.	No work required
63.41				

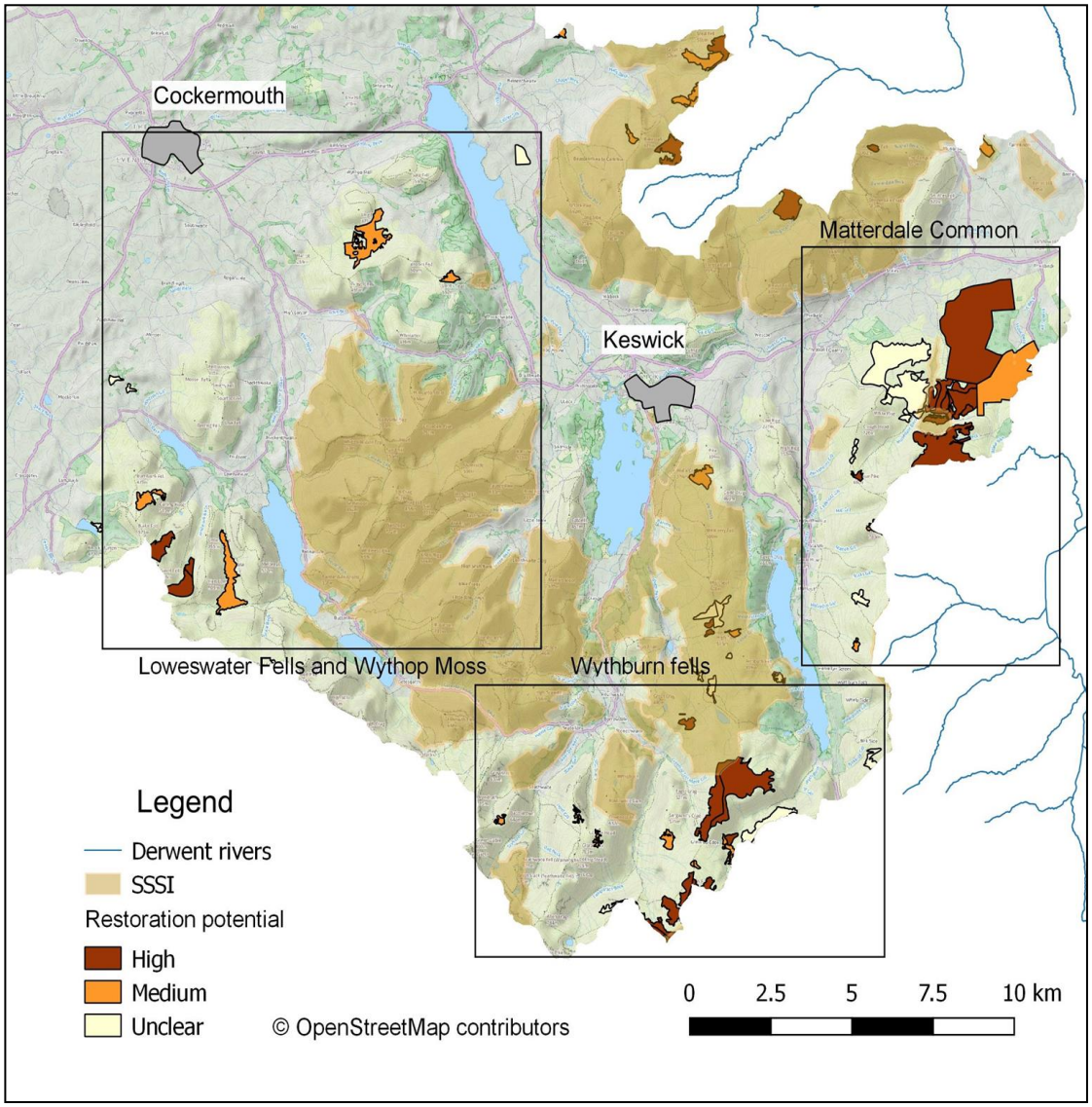
4.4. Kent restoration costs

Based upon remote mapping and site surveys the following sites are considered suitable for taking forward for peatland restoration. A total of 2057 properties flooded in December would benefit from restoration of these sites.

	Sub Catchment	Ha	Site no.	Work Stage				TOTAL
				1	2	3	4	
P	**Kent**	177.26	589			£8,318	£260,027	£268,345
P		35.94	1205			£4,078	£55,113	£59,191
P		5.8	1101			£3,174	£11,410	£14,584
P		37.7	1117			£4,131	£57,665	£61,796
		50.2	607		£1,304		£75,790	£77,094
	Sub total	**306.9**			**£1,304**	**£19,701**	**£460,005**	**£481,010**

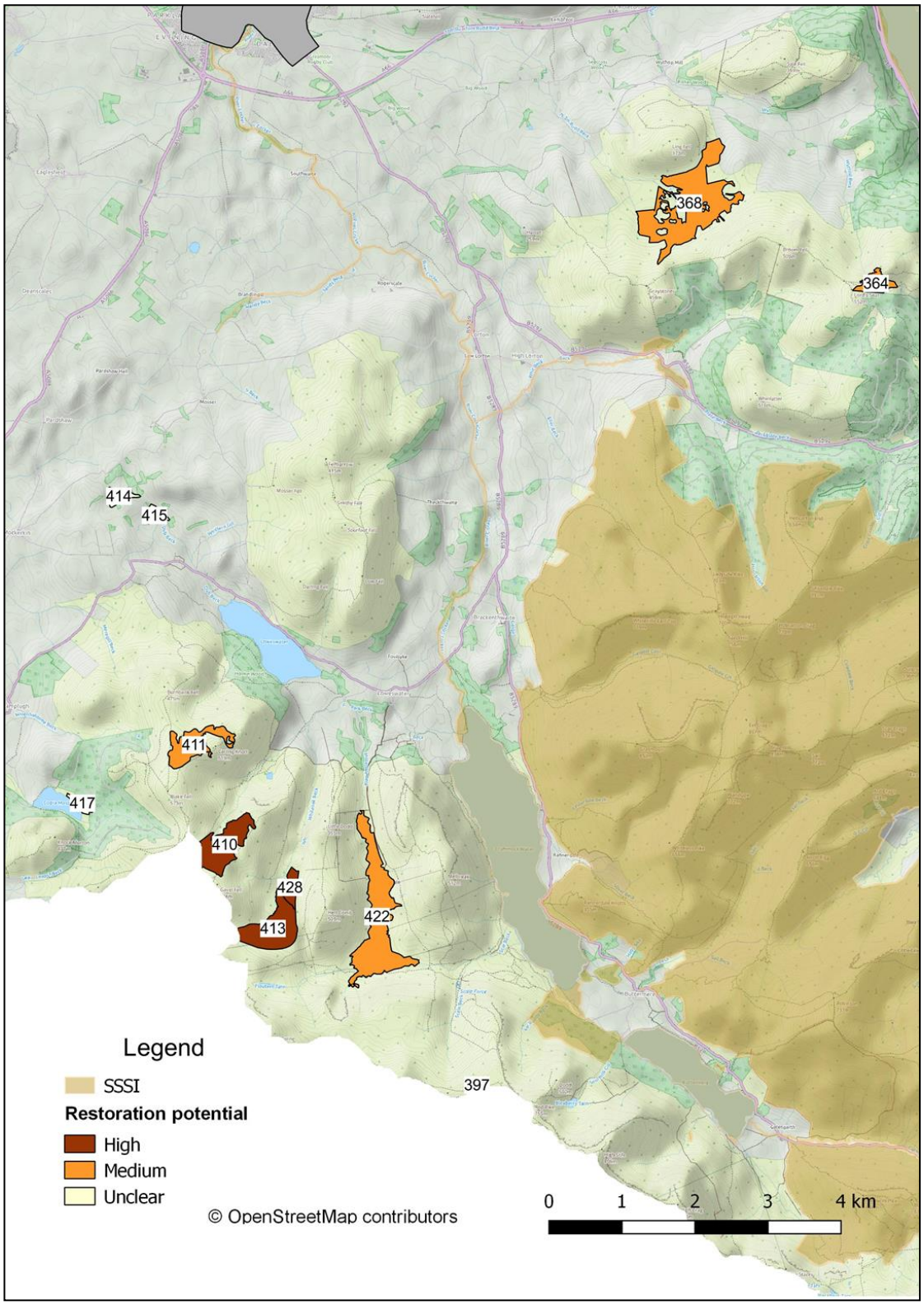
5. Derwent catchment

A large catchment with high levels of potential restoration. A total of 1247 properties flooded in this catchment in December 2015



5.1. Loweswater Fells and Wythop Moss

Peatlands that drain into Cockermouth, several of these peatlands have received detailed ground mapping and are ready to undertake restoration (landowner permitting).



5.1.1 High restoration potential

	Hectares	Site no	Site name	Notes	Work category
	30.77	410	Black crag	Peat largely removed by erosion in places. Less heavily grazed than surrounding fells.	3 / 4
P	**34.30**	413	Whiteoak Moss	Restoration agreed, awaiting capital funds to deliver	3 / 4
P	**8.44**	428	Whiteoak Moss	Restoration agreed, awaiting capital funds to deliver	3 / 4

5.1.2. Medium restoration potential

Hectares	Site no	Site name	Notes	Work category
9.85	364	The Barf	Probably Blanket Bog, eroded.	1
84.74	368	Whythop Moss	A widely drained area. CWT undertaken detailed surveys. Area mapped as whole and areas without peat removed	3 / 4
24.33	411	Carling Knott	Appears to be blanket bog, erosion features present	2
69.31	422	Mosedale	Valley Mire. Part of Mosedale valley mire. Mapped from 1984 Ph1	2

5.1.3. Unclear restoration potential

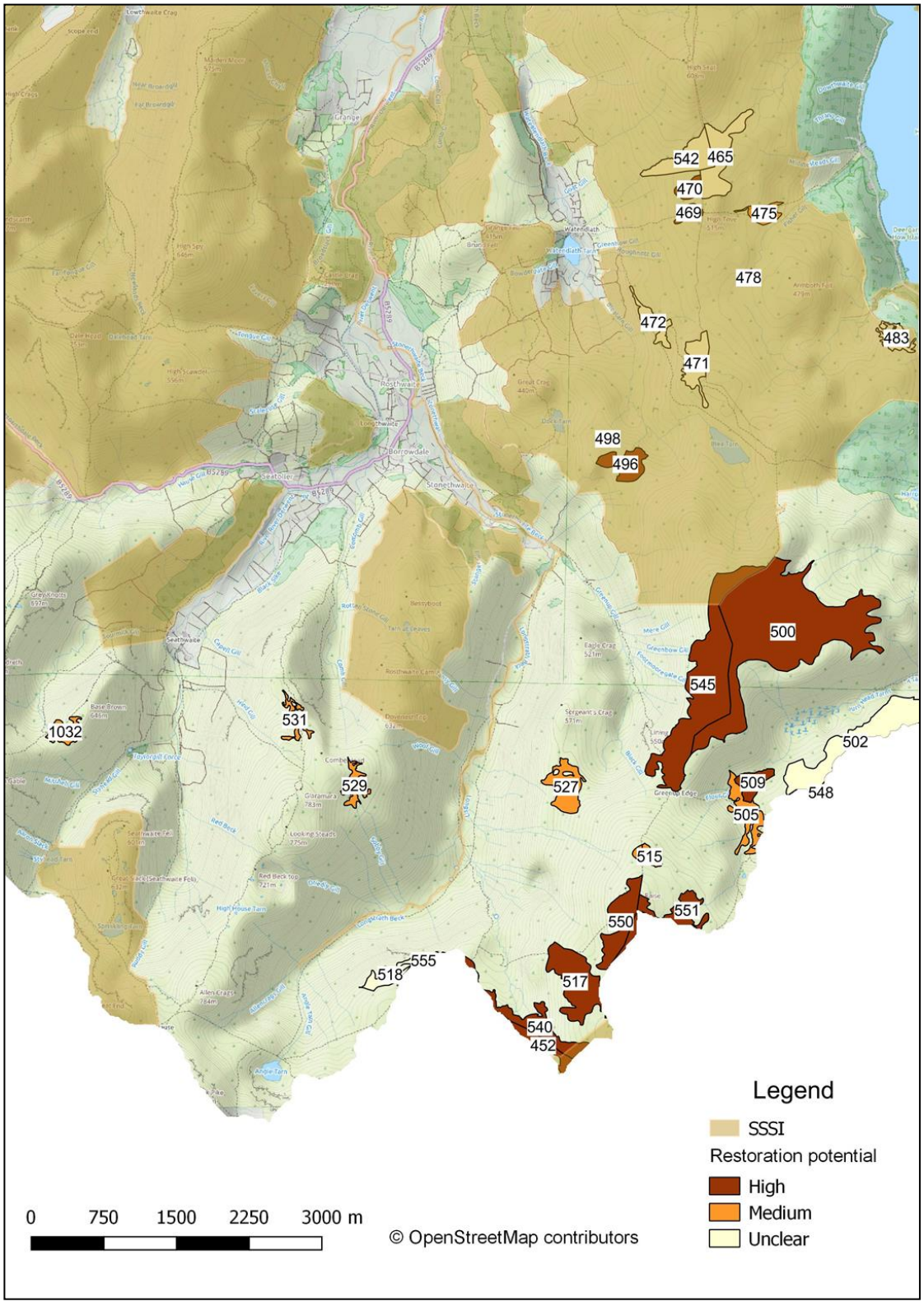
Hectares	Site no	Site name	Notes	Work category
5.59	414	Leady Moss	Relict basin mire? Assume intact peat. Planted with confiers	1
3.51	415	Leady Moss	Possible afforested basin mire	1
4.02	417	Cogra Moss	BGS 50k suggests peat more extensive than PH1 habitats	1

5.1.4. Loweswater Fells and Wythop Moss costs

	Sub Catchment	Ha	Site no.	Work Stage 1	2	3	4	TOTAL
P	**Loweswater**	34.3	413			£4,029	£52,735	£56,764
P		8.44	428			£3,253	£15,238	£18,491
		84.74	368			£5,542	£125,873	£131,415
	Sub total	**127.48**				**£12,824**	**£193,846**	**£206,670**

5.2. Wythburn Fells

No groundwork has been undertaken in this area so all sites will require ground-truthing. Restoration costs are based on three of these sites being viable for restoration.



5.2.1. High restoration potential

Hectares	Site no	Site name	Notes	Work category
129.49	500	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Restoration options unclear due to uncertainty on depth of peat. Features distributed throughout. United Utilities land	1
6.93	509	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Severe hagging, some minor gully formation. United Utilities land	1
25.46	517	Langstrath and Coomb Fells in Borrowdale	Much erosion along footpaths and probably also due to sheep and exacerbated by subsequent weathering..	1
15.01	540	Langstrath and Coomb Fells in Borrowdale	Much erosion along footpaths and probably also due to sheep and exacerbated by subsequent weathering. A fragile area of peat of varying depth on steep slopes.	1
70.47	545	Langstrath and Coombe Fells	Restoration options unclear due to uncertainty on depth of peat. Features distributed throughout	1
17.58	550	Langstrath and Coomb Fells in Borrowdale	Most features associated with footpaths. Peat definitely removed as a result of run-off from footpath.	1
10.63	551	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Most features associated with footpaths. Eroding edges of peat body also require restoration. United Utilities land.	1

5.2.2. Medium restoration potential

Hectares	Site no	Site name	Notes	Work category
10.98	505	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Scattered hagging. Some possible evidence of peat cutting to SE	1
2.27	515	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Erosion associated with foot path and some to SE also.	1
13.23	527	Langstrath and Coomb Fells in Borrowdale	Erosion by stock and subsequent weathering?	1
5.10	529	Langstrath and Coomb Fells in Borrowdale	Erosion by walkers. Potential for bunding at narrow end?	1
4.42	531	Langstrath and Coomb Fells in Borrowdale	Erosion along footpaths and possibly also by stock along edges of mire. Potential for bunding at narrow end	1
1.19	552	Langstrath and Coomb Fells in Borrowdale	Erosion associated with foot path and some to SE also.	1
5.04	1032	n/a	Erosion of peat along watershed footpath	1

5.2.3. Unknown restoration potential

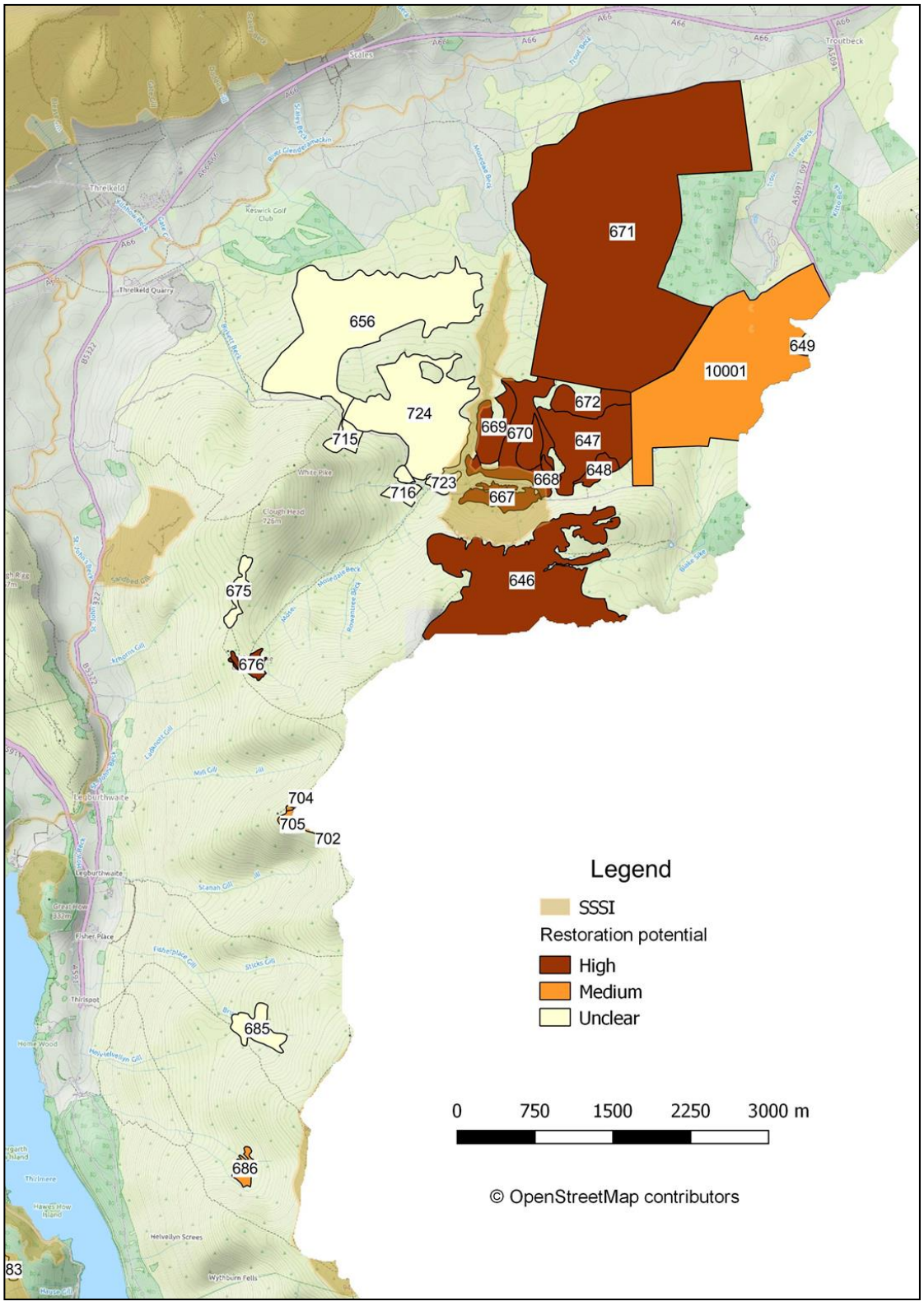
Hectares	Site no	Site name	Notes	Work category
39.89	502	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Some areas. Erosion features to NE possibly on shallower peat - c.0.5m	1
6.62	518	Langstrath and Coomb Fells in Borrowdale	Numerous erosion features, though uncertain if all are on peat.	1
1.37	548	Grasmere Common (Westmorland)	Some areas. Erosion features to NE possibly on shallower peat - c.0.5m	1
0.62	555	Great Langdale Common (Westmorland)	Numerous erosion features, though uncertain if all are on peat.	1
13.07	693	Whelpside, Steel End, West Head Armboth and Bleaberry Fells	Peat layer appears to be thin and discontinuous	1

5.2.4 Wythburn Fells restoration costs

Sub Catchment	Ha	Site no.	Work Stage				TOTAL
			1	2	3	4	
Wythburn		20sites	£6,000				£6,000
	25.46	517		£809	£3,764	£39,917	£44,490
	15.01	540		£600	£3,450	£24,765	£28,815
	70.47	545		£1,709	£5,114	£105,182	£112,005
Sub total	**110.94**	**1602**	**6000**	**3118.8**	**12328.2**	**£169,863**	**£191,310**

5.3. Matterdale Common

Surveys have been carried out on one part of Matterdale Common and



5.3.1. High restoration potential

	Hectares	Site no	Site name	Notes	Work category
	135.80	646	Matterdale Common	Thinner peats on the steeper western slope have eroded and their edges re-vegetated. Eroding edges of the deeper peat mantle require attention. Crosses into Eden catchment	2
	44.16	647	Matterdale Common	Vegetation restoration may be possible. Further peat-depth investigations would recommended	1
P	**6.15**	648	Matterdale Common	hagging ground with a large extent of bare peat. Restoration agreed with Commoners	3 / 4
	12.54	667	Matterdale Common	None	
P	**4.90**	668	Matterdale Common	Largely bare peat. Restoration agreed with Commoners	3 / 4
	16.07	669	Matterdale Common	Vegetation restoration may be possible however	1
	31.07	670	Matterdale Common	Some erosion of grip edges taking place	1
	427.70	671	n/a	Area apparently drained for forestry, but not planted? Restoration options unclear until extent of peat determined	2
	13.15	672	Matterdale Common	Some erosion along grips. Some hagged areas re-vegetated	2
	8.42	673	Matterdale Common	Vegetation restoration may be possible	1
	4.98	676	Matterdale Common	A relatively small and isolated area. Hagging associated with footpath occuring on watershed with severe erosion of peat taking place on slope below, possibly related to high sheep numbers	1

5.3.2. Medium restoration potential

Hectares	Site no	Site name	Notes	Work category
4.67	686	St. John's Common	None	1
0.07	702	St. John's Common	Erosion and hagging along line of footpath	1
0.39	704	St. John's Common	Erosion and hagging along line of footpath	1
1.82	705	St. John's Common	Erosion and hagging along line of footpath	1
	10001		Forestry Commission plantation on peat. Restoration potential worth investigating.	1

5.3.3. Unclear restoration potential

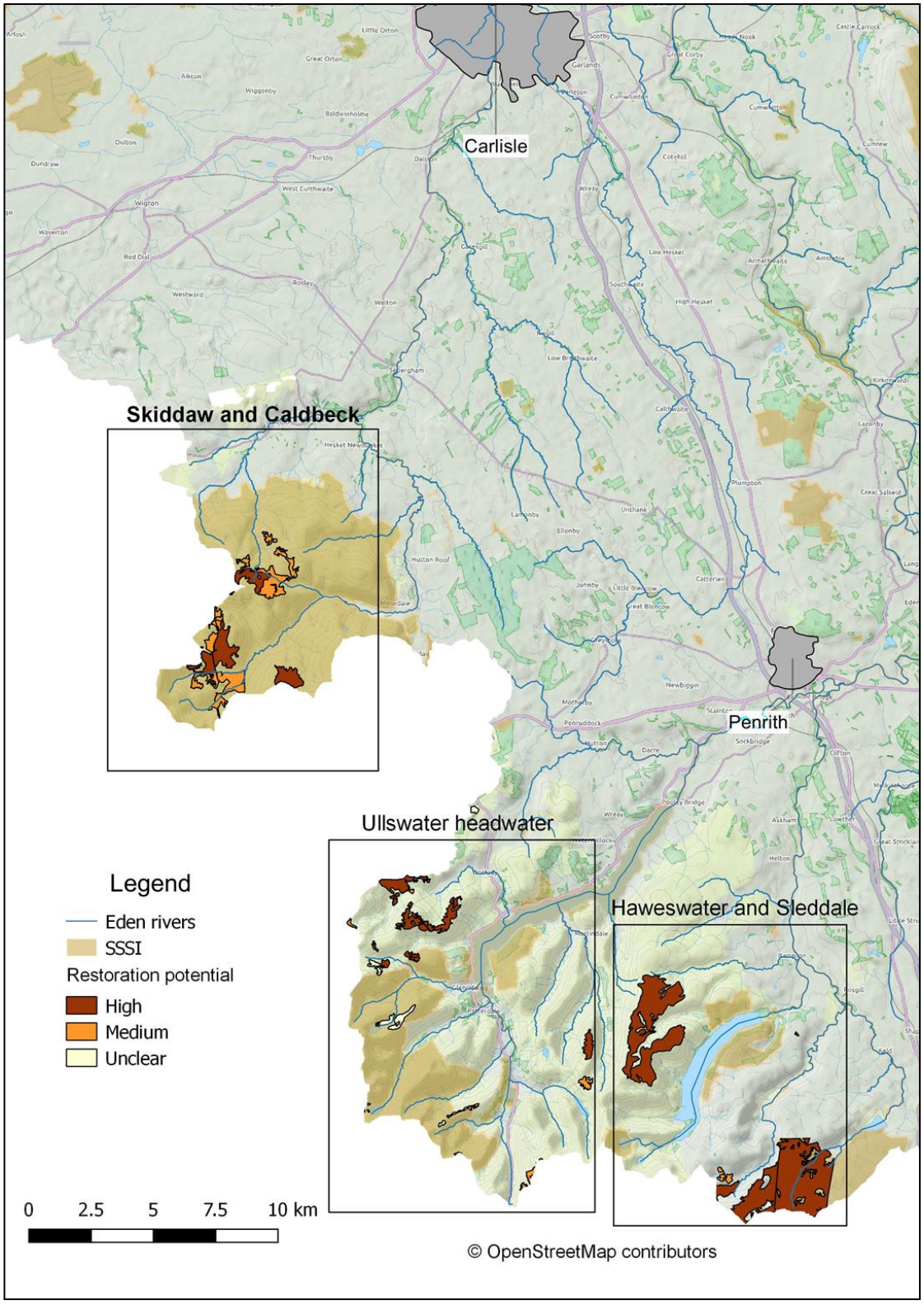
Hectares	Site no	Site name	Notes	Work category
137.27	656	Threlkeld Common	Impossible to assess peat restoration potential. Vegetation restoration likely to be difficult	2
6.40	675	St. John's Common	Hagging of remaining peat along watershed. Southern area may be restorable, but apparently very little peat remains to N	2
11.98	685	St. John's Common	Peat possibly to badly eroded to restore	2
8.33	715	St. John's Common	Restoration options unlcear	2
4.73	716	St. John's Common	Restoration options unlcear	2
4.22	723	Matterdale Common	Restoration options unlcear	2
84.81	724	Threlkeld Common	Restoration options unlcear	2

5.3.4. Matterdale Common restoration costs

	Sub Catchment	Ha	Site no.	Work stage 1	2	3	4	TOTAL
P	Matterdale	6.15	648			£3,185	£11,918	£15,102
P		4.9	668			£3,147	£10,105	£13,252
		427.7	671		£8,854	£15,831	£623,165	£647,850
		13.15	672		£563	£3,395	£22,068	£26,025
	Sub total	**451.9**		**£0**	**£9,417**	**£25,557**	**£667,255**	**£702,229**

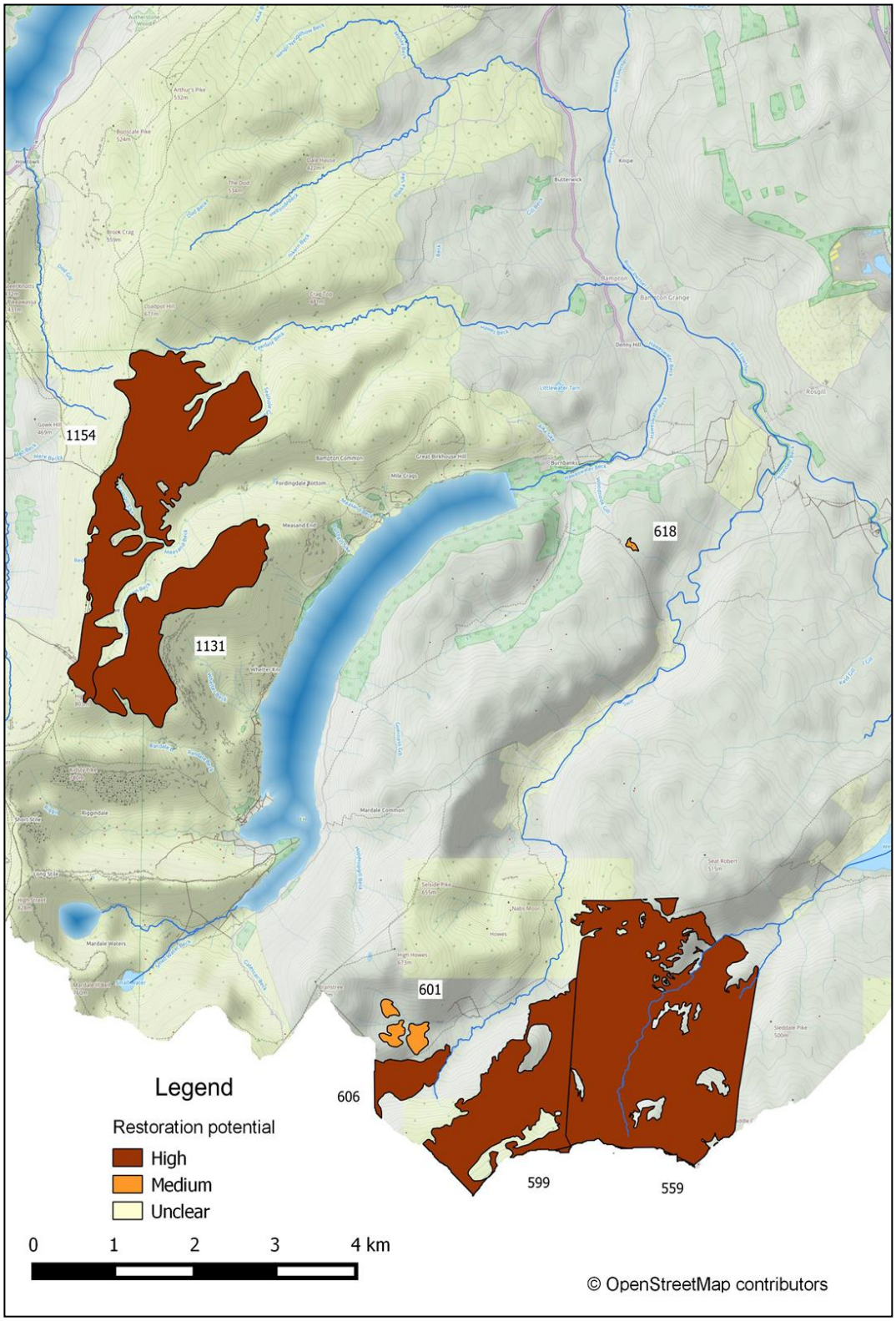
6. Eden catchment

A large catchment with the majority of the peat resource within this analysis falling in the south west of the catchment. There is also significant peat resource in the North Pennines not covered by this report. Skiddaw & caldbeck sub catchment is all within Skiddaw Group SSSI.



6.1. Haweswater and Sleddale

The catchment of two reservoirs Haweswater and Wet Sleddale. All of the land in this area is owned by United Utilities. Site 1154 flows directly into the River Eden



6.1.1. High Restoration Potential

Hectares	Site no	Site name	Notes	Work category
169.91	1131	Low Raise	Bare Eroded Hagged. Already Mapped	3 / 4
325.26	1154	Wether Hill	Hagged Bare Gullied Eroded. Already mapped	3 / 4
534.83	559	Shap Fells SSSI	Restoration already undertaken, SSSI	No work required
181.81	599	Sleddale Fell & Harrop Pike	Restoration already undertaken, SSSI	No work required
34.96	606	n/a	Restoration already undertaken, SSSI	No work required

6.1.2. Medium Restoration Potential

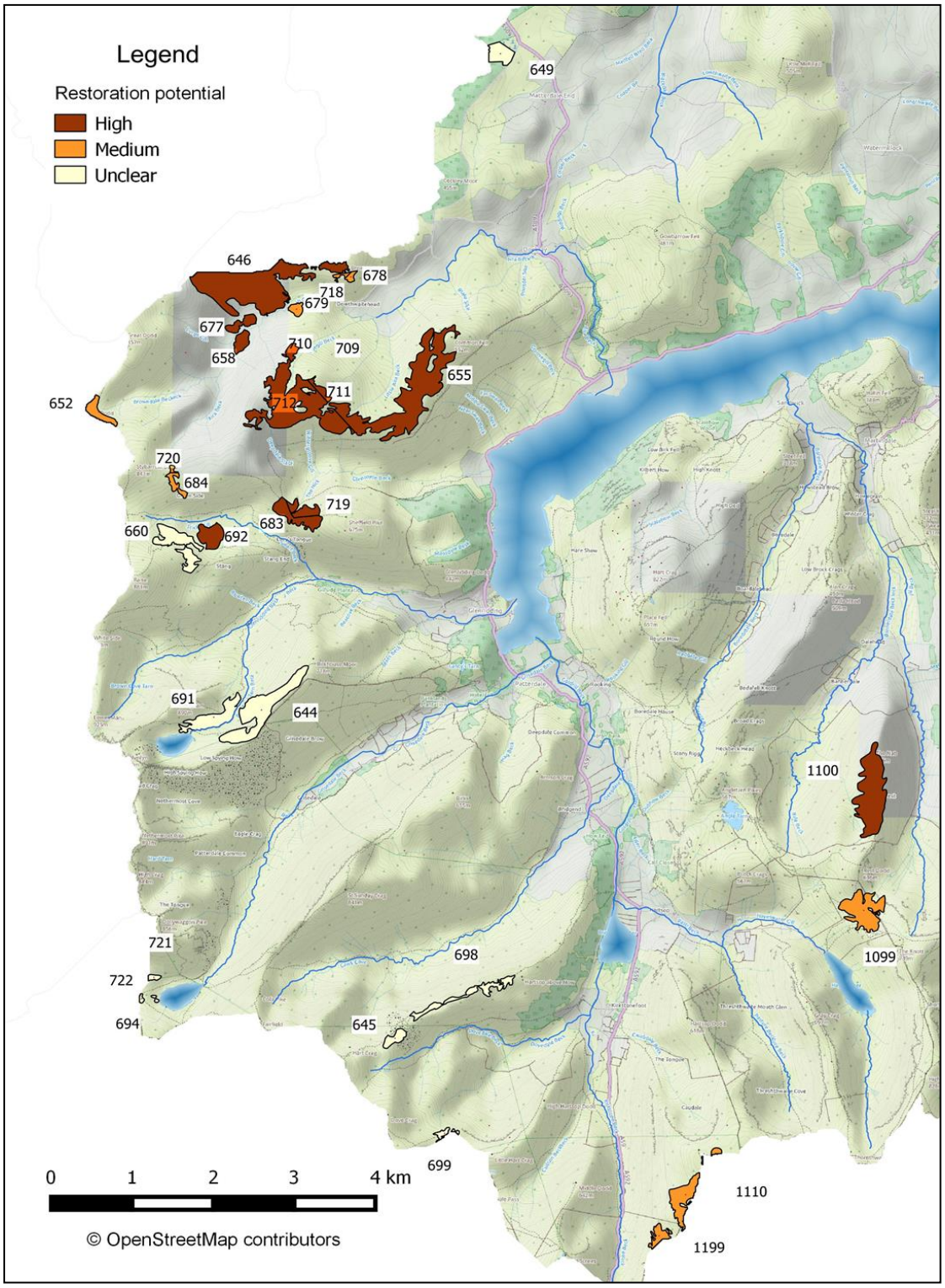
Hectares	Site no	Site name	Notes	Work category
16.11	601	Great Grain Gill, Mosedale	Hagged Bare	No work required
1.05	618	Scalebarrow	Gripped	No work required

6.1.3 Restoration costs

Sub Catchment	Ha	Site no.	Work Stage 1	2	3	4	TOTAL
Haweswater	169.91	1131			£8,097	£249,370	£257,467
	325.26	1154			£12,758	£474,627	£487,385
Sub total	**495.17**				**£20,855**	**£723,997**	**£744,852**

6.2. Ullswater headwaters

The degraded peatlands within these sub-catchments flow into Ullswater, via Glenridding and therin into the river Eamont through Pooley Bridge. No groundwork has been undertaken in this area so all sites will require groundtruthing. Restoration costs are based on three of these sites being viable for restoration.



6.2.1 High Restoration Potential

Hectares	Site no	Site name	Notes	Work category
56.53	646	Matterdale Common	Eroding edges of the deeper peat mantle require attention.	1
56.88	655	Watermillock Common	Whole area included under high potential as it would likely be restored as a unit.	2
3.81	658	n/a	None	2
4.02	677	Matterdale Common	None	2
8.72	683	Glenridding Common (Westmorland)	Eroding edges of peat mantle and a few potential gullies. SSSI	1
7.79	692	Glenridding Common (Westmorland)	None	1
2.24	710	Watermillock Common	Whole area included under high potential as it would likely be restored as a unit	2
2.28	711	Watermillock Common	Whole area included under high potential as it would likely be restored as a unit.	1
46.24	712	n/a	Whole area included under high potential as it would likely be restored as a unit.	2
5.06	719	n/a	Eroding edges of peat mantle and a few potential gullies. SSSI	1
30.01	1100	Deer Forest	Extensive bare peat visible, with erosion down to the mineral layer along many of the gullies.	1

6.2.2. Medium Restoration Potential

Hectares	Site no	Site name	Notes	Work category
4.74	652	Matterdale Common	Erosion and hagging along line of footpath	2
1.11	678	n/a	Edges of path possibly at risk of erosion	2
2.19	679	Watermillock Common	Erosion of NW edge	1
2.83	684	Glenridding Common (Westmorland)	Hagging and erosion associated with paths	1
0.85	718	Matterdale Common	Edges of path possibly at risk of erosion	2
0.51	720	n/a	Hagging and erosion associated with paths	2
17.29	1099	n/a	Bare peat becoming frequent on the slopes down to Sulphury Gill.	1

6.2.3. Unknown restoration potential

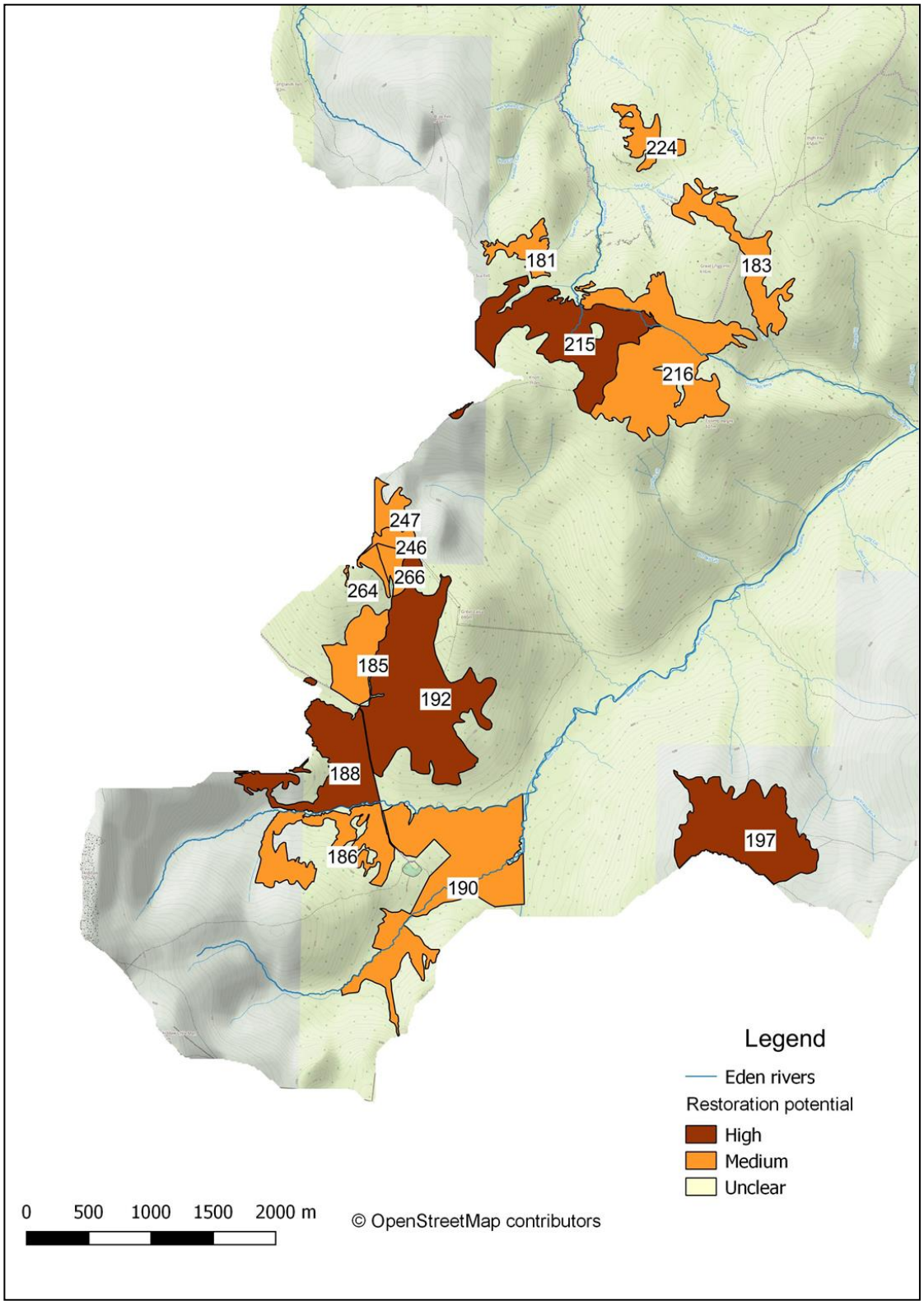
Hectares	Site no	Site name	Notes	Work category
13.39	660	Glenridding Common (Westmorland)	Peat in patches, may not be feasible to restore	No work required
3.52	645	n/a	May be too small an area/badly damaged to restore effectively. SSSI	No work required
8.72	698	Deepdale Common (Westmorland)	Erosion due to run-off and direct damage to footpath. Peat may be too discontinuous/damaged to fully restore. SSSI	No work required
1.56	699	n/a	Discontinuous BB hagging and eroding at edges, may not be feasible to restore. SSSI	No work required
6.67	649	Binks Moss	Possibly some bare peat edges to W - could be re-profiled?	No work required

6.2.4 Restoration costs

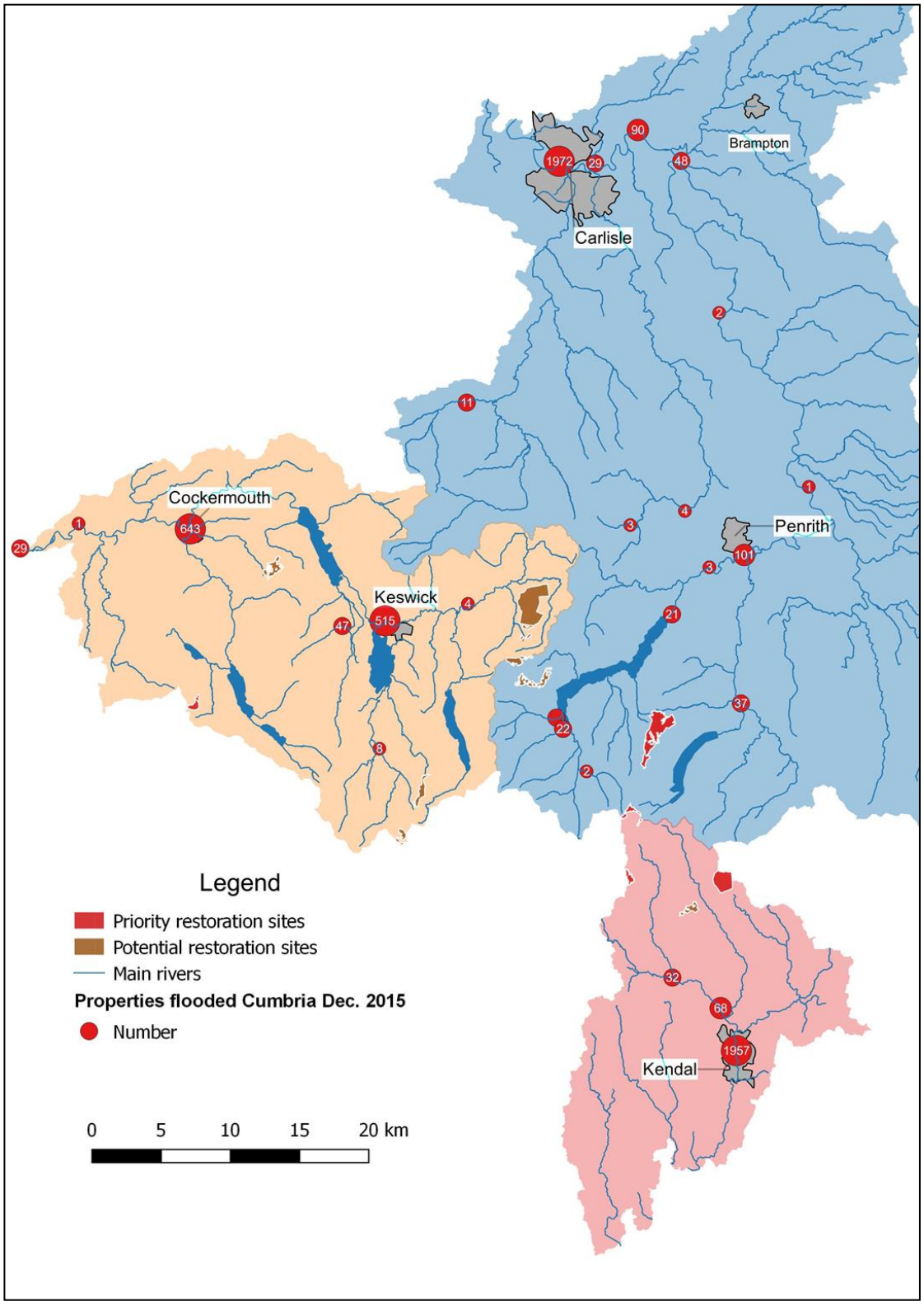
Sub Catchment	Ha	Site no.	Work Stage				TOTAL
			1	2	3	4	
Ullswater	258.99	16 sites	£4,800				£4,800
	50	TBC		£1,300	£4,500	£75,500	£81,300
	50	TBC		£1,300	£4,500	£75,500	£81,300
	50	TBC		£1,300	£4,500	£75,500	£81,300
Sub total	**408.99**		**£4,800**	**£3,900**	**£13,500**	**£226,500**	**£248,700**

6.3. Skiddaw and Caldbeck

The sites identified within this sub-catchment are all within the Skiddaw Group Site of Special scientific Interest. The area has already undergone restoration by Natural England. Discussion with Natural England suggest that no further work is required other than checking the status if the current work and re-instating any failed dams.



7. Priority sites restoration costs



Sub Catchment	Hectares	Site no.	Work Stage	Work Stage 1	2	3	4	TOTAL
Kent	177.26	589	3/4			£8,318	£260,027	£268,345
	35.94	1205	3/4			£4,078	£55,113	£59,191
	5.8	1101	3/4			£3,174	£11,410	£14,584
	37.7	1117	3/4			£4,131	£57,665	£61,796
Loweswater	34.3	413	3/4			£4,029	£52,735	£56,764
	8.44	428	3/4			£3,253	£15,238	£18,491
Matterdale	6.15	648	3/4			£3,185	£11,918	£15,102
	4.9	668	3/4			£3,147	£10,105	£13,252
Haweswater	325.26	1154	3/4			£12,758	£474,627	£487,385
TOTALS	**635.75**					**£46,073**	**£948,838**	**£994,910**

8. Priority sites timescales

Year (quarter)	2017				2018				2019				2020				2021			
Kent	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
589																				
1205																				
1101																				
1117																				
Loweswater	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
413																				
428																				
Matterdale	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
648																				
668																				
Haweswater	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1154																				

Work stage
1 - Desk study
2 - Site survey
3 - Management Plan
4 - Let contract & deliver restoration

9. Total restoration costs

	Sub Catchment	Hectares	Site no.	Work Stage 1	2	3	4	TOTAL
P	Kent	177.26	589			£8,318	£260,027	£268,345
P		35.94	1205			£4,078	£55,113	£59,191
P		5.8	1101			£3,174	£11,410	£14,584
P		37.7	1117			£4,131	£57,665	£61,796
		50.2	607		£1,304		£75,790	£77,094
	Sub total	306.9			£1,304	£19,701	£460,005	£481,010
P	Loweswater	34.3	413			£4,029	£52,735	£56,764
P		8.44	428			£3,253	£15,238	£18,491
		84.74	368			£5,542	£125,873	£131,415
	Sub total	127.48				£12,824	£193,846	£206,670
	Wythburn		20sites	£6,000				£6,000
		25.46	517		£809	£3,764	£39,917	£44,490
		15.01	540		£600	£3,450	£24,765	£28,815
		70.47	545		£1,709	£5,114	£105,182	£112,005
	Sub total	110.94	1602	6000	3118.8	12328.2	£169,863	£191,310
P	Matterdale	6.15	648			£3,185	£11,918	£15,102
P		4.9	668			£3,147	£10,105	£13,252
		427.7	671		£8,854	£15,831	£623,165	£647,850
		13.15	672		£563	£3,395	£22,068	£26,025
	Sub total	451.9		£0	£9,417	£25,557	£667,255	£702,229
	Haweswater	169.91	1131			£8,097	£249,370	£257,467
P		325.26	1154			£12,758	£474,627	£487,385
	Sub total	495.17				£20,855	£723,997	£744,852
	Ullswater	258.99	16 sites	£4,800				£4,800
		56.53	646		£1,431	£4,696	£84,969	£91,096
		56.88	655		£1,300	£4,500	£85,476	£91,620
		46.24	712		£1,300	£4,500	£75,500	£75,660
	Sub total	418.64		£4,800	£4,093	£13,790	£240,493	£263,176
	TOTALS	**1911.03**		**£10,800**	**£17,933**	**£105,055**	**£2,455,459**	**£2,589,247**

10 Timescales

	Year (quarter)	2017				2018				2019				2020				2021			
	Kent	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
P	589																				
P	1205																				
P	1101																				
P	1117																				
	607																				
	Loweswater																				
P	413																				
P	428																				
	368																				

	Year (quarter)	2017				2018				2019				2020				2021			
	Wythburn	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	20sites																				
	517																				
	540																				
	545																				
	Matterdale																				
P	648																				
P	668																				
	671																				
	672																				

	Year (quarter)	2017				2018				2019				2020				2021			
	Haweswater	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	1131																				
P	1154																				
	Ullswater																				
	16 sites																				
	TBC																				
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	TBC																				

Cumbria Wildlife Trust