

Updated Summary of the Locations and Types of Watermills in 51 British River Catchments, April 2023

Synopsis

This is the latest update on our investigations of mills, mainly water powered, but also those driven by horse gins. Altogether, we have identified and located almost 9500 commercial and farm mills, (defined early in the document), which operated after 1750; the majority processed corn, but others performed a wide range of functions, from making and conditioning textiles to manufacturing gunpowder. Geographically, the mills were distributed countrywide along 51 rivers, and many tributaries and other streams in their catchments. We have built an extensive and unique database of the locations and functions of commercial and farm water mills across the UK. Efforts have been made to explain different facets of the mill population, with considerable success, but many factors had influence and not all of them are well understood. In particular, we have identified some specific unanswered questions, and will continue our investigations in the hope of addressing them, though the time elapsed since most mills shut down, and the complexity of the situation may, on occasion, defeat our best efforts.

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1. Introduction

This document is an update to the pamphlet '**INVESTIGATIONS INTO WATERMILL LOCATIONS AND TYPES ON 34 RIVER CATCHMENTS – ISBN 978-1-7399648-1-8**', issued in November 2021, and an update, **UPDATED SUMMARY OF THE LOCATIONS AND TYPES OF WATERMILLS IN BRITISH RIVER CATCHMENTS**, placed on the website, <https://historicaljourneysalongbritishrivers.com/>, in July 1922 and amended in August 2022. We have looked at additional river catchments, bringing the total number investigated up to 51, and we have filled in gaps by listing farm mills in some catchments, in which previously, we had investigated only commercial watermills. (** a commercial watermill is paid by customers to process raw materials like grain or wool, a farm mill is a machine located on a farm, which operates at the behest of the farmer, normally without money changing hands.*)

We have built an extensive and unique database of the locations and functions of commercial and farm water mills across the UK. It now contains almost 3,700 commercial mills and over 4,700 farm watermills from 51 river catchments. We have also identified horse gins on over 1,000 farms. In addition to watermills, our discussion considers very briefly the proportions of windmills and watermills in different areas of the country, and explores the possibility of discriminating by desk studies between farm threshing mills and farm gorse mills in the areas of the UK, where the latter were common.

Our new work has enabled us to gain a far greater understanding of the strengths and limitations of our data set. However, it is fair to say that we have supplied some support for the aphorism that “the more you know, the more you realise that you don't know” and some of our conclusions have been amended accordingly.

In the updated Summary of the Locations and Types of Watermills in British River Catchments (the “Update”) the ratio of farm mills to water-powered cornmills was used as an indicator of the relative use of water and horse-powered farm mills (horse gins) in different geographical areas. In general, the ratio of farm mills to cornmills was lower in England than in Scotland. There are limitations in this approach but the ratios in the Update were a strong qualitative indication that farm mills were relatively less common in England than in Scotland.

In Scottish river catchments, the great majority of commercial mills were water-powered, rather than wind-powered. Any conclusions we have drawn about numbers and distributions from the numbers of Scottish commercial watermills, therefore, relate closely to the overall picture for milling operations. When we looked at Welsh river catchments, the picture seemed broadly similar. However, when we considered more English river catchments, it became clear that the role of wind-powered mills as regards milling of corn was far greater, especially in drier, flatter areas towards the east coast. In particular, there were many wind-powered cornmills in Lincolnshire and East Anglia. Nevertheless, the ratios of farm mills to water-powered cornmills in these counties were lower than ratios encountered in Scotland, even before considering the proportion of corn ground by windmills. We believe that this pattern, therefore, is further qualitative evidence of the lower take up of water and horse powered threshing mills in England.

In the following sections of the document, we first itemise the river catchments, which have been investigated, with the aid of Alastair Robertson's sketch map. He then describes the refined methodology, which is now used

to identify and locate watermills, both commercial and farm, and to determine their types, i. e., cornmills, textile mills, gunpowder mills, etc. The next section is the heart of the document, in which Tables summarising the results, expressed in much more detail on the website, <https://historicaljourneysalongbritishrivers.com/>, are presented along with fairly extensive explanatory notes. An overview follows, which includes information seeking to clarify some of the points made in the Introduction, and to generalise, where now thought possible. The document ends formally with some brief account of questions raised, and thoughts on further work which might answer some of them; a bibliography is attached.

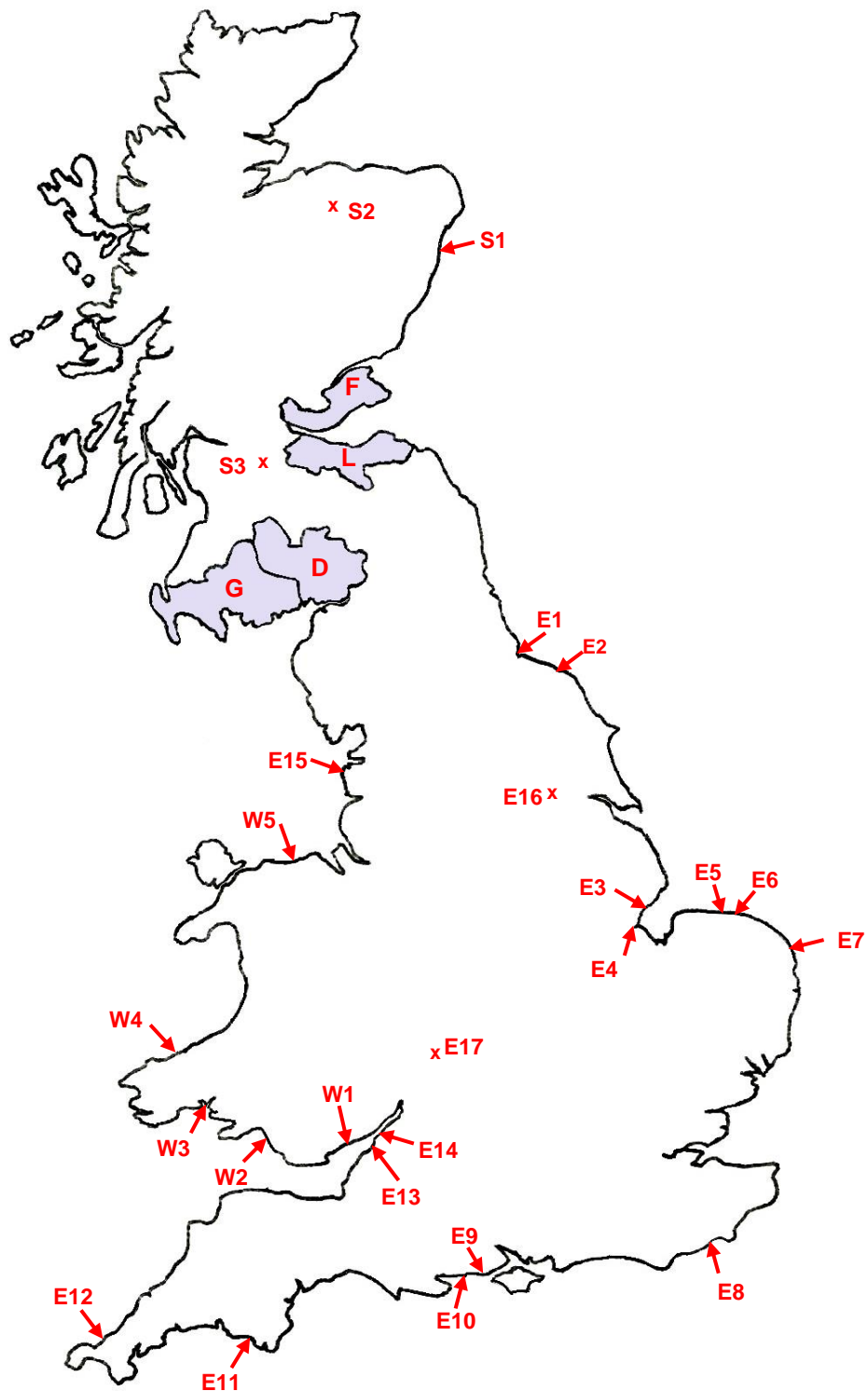
2. The Geographical Scope of the Project

The contents of this document have developed from a project intended originally to produce accounts of journeys along rivers, a genre well populated in the literature, but strongly biased towards famous and/or picturesque rivers, like the Thames, Warwickshire Avon, and Wye. We were interested in the surroundings of many rivers of lower profile, considered from a mainly historical viewpoint, and we developed a template for describing virtual journeys along the rivers, firstly in areas we knew best, namely in the Lothians and Fife. We did not track on foot along the whole lengths of most of the rivers in question. Instead, we have identified features of interest in each river catchment, many already visited by us, but some investigated on the ground, as part of the project. All have been tied into accounts of journeys, with links based on some visits, but mainly on desktop studies, making use of the internet, and other published work. We have maintained a convention that journeys proceed from source to mouth, and when a significant tributary has been encountered, it also has been tracked from source to mouth. The project grew to consider other rivers, known to us through periods of residence and holidays, and latterly simple interest, so that the list of virtual journeys includes 51 rivers, with their main tributaries and many other feeder streams, spread throughout Great Britain. The locations of the rivers are on the map, Figure 1, overleaf, which shows, that we have achieved reasonable country-wide coverage.

Many accounts of British rivers have been written and some of the best, benefit from an intimate connection with the river in question, obtained from making an actual journey, mainly on foot, or living nearby. Our versions are less intimate than some, and deal with broad patterns of landscape influenced by geology, historical man-made artefacts, people of note with strong local associations, and commercial and transportation developments. Limited knowledge, length constraints, and desires to maintain coherence, have meant that our treatment of the natural world, the plant and animal life in the river valleys, has been somewhat cursory, as has been our consideration of leisure pursuits, from boating to fishing. We recognised at the outset that two riverside constructs were special in the closeness of their associations with the rivers, namely old bridges and watermills. The former have their place in the accounts, and more detailed descriptions of many, erected before 1700, are presented on the website <https://historicbridgesofbritain.com/>. Watermills also had an important place in the accounts, and it was soon decided to highlight them by presenting the locations and functions of every watermill built after 1750, in an Appendices attached to all the river accounts. The date limit was unavoidable; although many thousands of medieval watermills have been recorded in Great Britain, information concerning them was in general, too patchy, to allow any kind of comprehensive overview. It can also be argued that we were focussing on the 'great age of watermills' as precursors of the Industrial Revolution. Nonetheless, there is much about medieval watermills in the body of the accounts of river journeys, but it is not systematic. The methodology, which was developed, utilised a range of sources, and is described in the next section.

Figure 1: Sketch Map showing the Locations of the Catchments Studied

River codes are given in the table below the map, and on the next page



Key:

- Marks where the main river enters sea
- x Used where a river investigated was a tributary of another and marks the location of the confluence
- Labels are: **S**; Scotland, **E**; England, **W**; Wales
- Areas in Scotland where all rivers were investigated
- F** Fife and Clackmannan; **L** Lothians; **D** Dumfriesshire; **G** Galloway

(a) Areas in Scotland where all Catchments were investigated

Area	Main Rivers*
Fife and Clackmannan	River Eden River Leven River Devon
Lothians	River Tyne River Esk Water of Leith River Almond River Avon
Dumfriesshire	River Esk River Sark Kirtle Water River Annan Lochar Water River Nith
Galloway	Water of Urr River Dee Water of Fleet River Cree River Bladnoch Water of Luce Piltanton Burn

* All catchments of lesser rivers were investigated in each of the above areas.

(b) Other Catchments

Country	Code	Catchment
Scotland	S1	Aberdeenshire River Don
	S2	Moray River Avon
	S3	Lanarkshire Avon Water
England	E1	River Tees
	E2	Whitby River Esk
	E3	River Welland
	E4	River Witham
	E5	River Stiffkey
	E6	River Glaven
	E7	River Yare River Wensum River Bure River Waveney
	E8	Eastern River Rother
	E9	Hampshire Avon Water
	E10	Hampshire River Avon
	E11	Devon River Avon
	E12	River Camel
	E13	Bristol River Avon
	E14	Little Avon
	E15	River Wyre
	E16	Yorkshire River Don
	E17	Warwickshire River Avon
Wales	W1	River Usk
	W2	River Afan
	W3	River Towy
	W4	River Teifi
	W5	River Clwyd

3. Methodology

For categorisation, we have assumed that commercial watermills were paid, either in cash or in kind, by customers to process raw materials like grain or wool, whereas farm mills were machines located on a farm, operating at the behest of the farmer, normally without money changing hands. Across the UK as a whole, the

great majority of farm mills during the period in question (post-1750) were threshing mills, separating grain from stocks (straw) but in some areas gorse (or whin) mills were common.

Commercial mills and farm mills were initially identified from first edition, six inches to the mile Ordnance Survey maps (6 inch OS maps). The surveys for the relevant 6 inch OS maps were undertaken between the mid-1840s and the late 1880s. These maps are available on the National Library of Scotland Map Images website (<https://maps.nls.uk>). The methods for commercial mills and farm mills diverged at this point

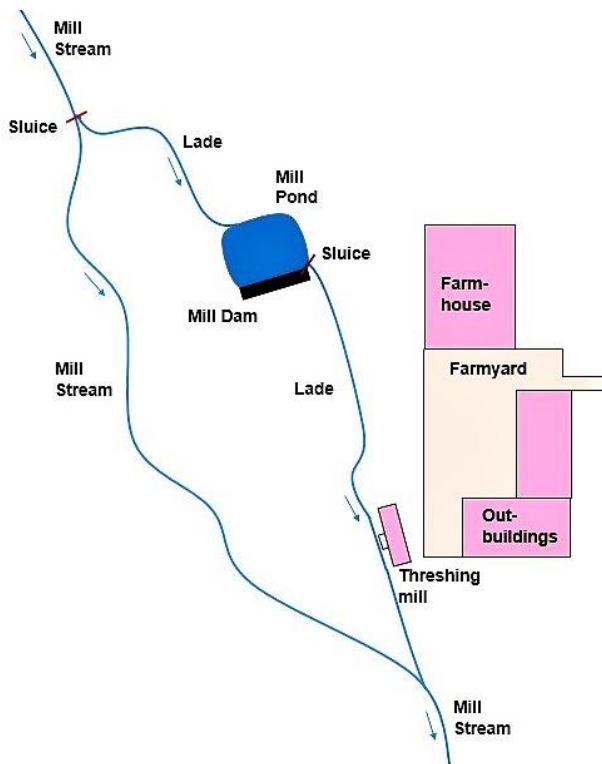
For commercial mills, additional information was obtained from:

1. The Ordnance Survey "Old Series" of 1 inch to the mile maps for England and Wales were also checked for commercial watermills. These maps were published between 1805 and 1844. The maps are available online on the Archiuk site and through the Charles Close Society (at, respectively, https://www.archiuk.com/archi/archi_old_maps.htm and <https://www.charlesclosesociety.org/oldseries>).
2. Regional information such as the Norfolk Mills website (www.norfolk Mills.co.uk), the NLS From Water to Steam project ([From Water to Steam - Scottish Mills Project - National Library of Scotland \(nls.uk\)](http://From Water to Steam - Scottish Mills Project - National Library of Scotland (nls.uk))) and Coflein (Coflein - The online catalogue of archaeological sites, historic buildings, industrial and maritime heritage in Wales). Specific details for each catchment are given in the river descriptions.
3. The Mills Archive (The Mills Archive – We preserve & protect records of our milling history)
4. Google searching for water mills at specific locations.

The procedure for farm mills was a little different. Water-powered farm mills that operated after 1790 were recorded using the following procedure

1. Threshing mills were marked on 1st edition 6 inch OS maps in the 1840s and early 1850s and these mills were recorded. Threshing machines were also marked on these early maps and in many instances, these had all the features of water mills and they also were recorded as threshing mills.
2. Threshing mills were not systematically recorded on 6 inch OS maps surveyed after the early 1850s. Farms, where there were at least two features of water mills (ponds, leads, sluices etc) and where the ponds were higher than farm buildings, were deemed to have farm mills. A schematic diagram of these features is shown on the next page in Figure 2.
3. In Norfolk catchments where there were many ponds beside farms, a farm mill was only deemed present if the pond was at least 2m above the farm buildings (this was done using the "height feature" on NLS zoomable OS maps).
4. Ordnance Survey Name Books, available at Scotland's Places (ScotlandsPlaces), were used to gain additional information for farms in Scottish catchments. No equivalent source of information on farm mills has been found for English and Welsh catchments.

Figure 2: Sketch diagram of the water supply arrangements for a threshing mill



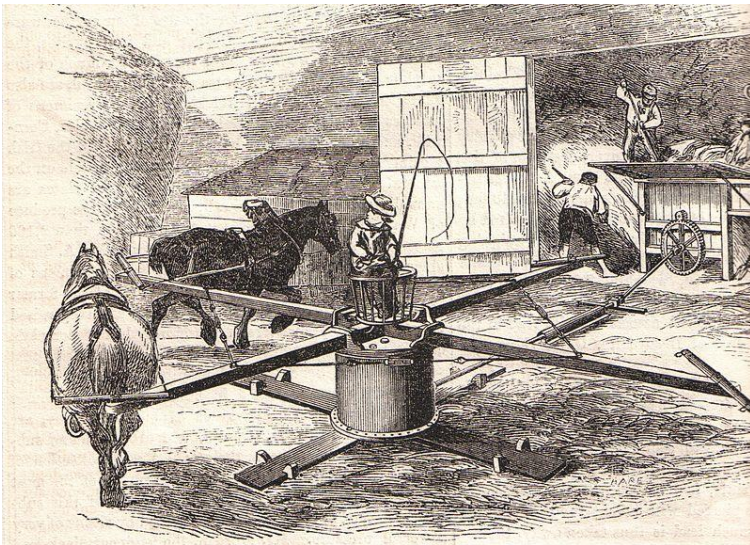
Farm mills were also powered by horse gins. Horses or ponies, often 4 in number, attached to the shaft were led in circles inside the walls of a 'round' house or outdoors. Cogwheels took the movement, by way of drive shafts and gears, to the rotating drum of the threshing machine. Figure 3 shows typical examples of indoor and outdoor horse gins on farms.

Figure 3: Farm horse gins

(a) Indoor horse gin in roundhouse preserved at the Beamish Museum in County Durham



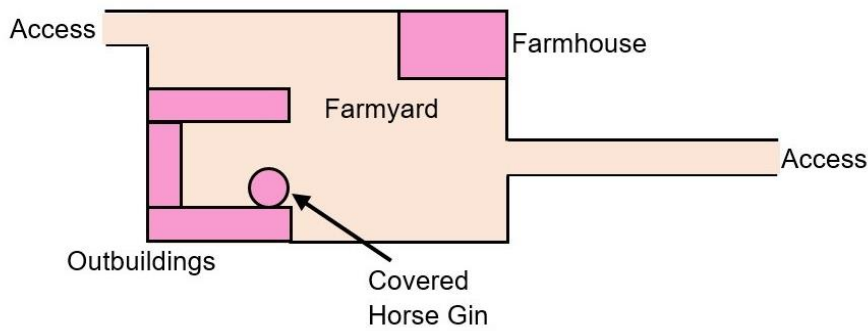
(b) Outdoor horse gin (Roger Griffith, Public domain, via Wikimedia Commons)



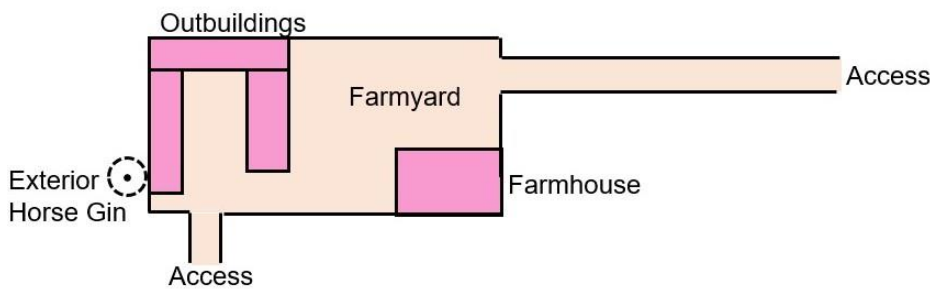
We recorded the numbers of horse gins in 34 river catchments from first Edition OS maps, using methods pointed out to us by the late Professor Paul Bishop. Indoor horse gins were identified by the presence of small roundhouses on farms (these were an intrinsic part of indoor horse gins) (Figure 4a). Dotted line circles with the centre marked were taken as indicating the presence of outdoor horse gins on farms (Figure 4b). Note we have concerns as to whether outdoor horse gins were systematically marked on the later 6 inch OS maps.

Figure 4: Features of farm horse gins on 1st edition OS Maps

(a) Indoor horse gin



(b) Outdoor horse gin



4. Results – Tabulations of Data Extracted from the Appendices Associated with Each River Journey

The information for 51 river catchments is presented using a similar format, with notes pointing to local features.

Table 1: Frequencies of Occurrence of Watermill Types on Lothian Rivers

Watermill Type	Numbers of Watermills in Catchment						
	Avon (31km)	Almond (45km)	Water of Leith (29km)	Esk (64km)*	Tyne (48km)	Smaller Streams	All Catchments
Food, Drink and Beverages							
Corn	20	23	40	18	29	28	158
Farina						1	1
Brewing/ Distilling	2	1					3
Dairy				1			1
Textiles, Leather							
Textile	11	4	13	14	14	6	62
Leather			2	1	5		8
Metals, Construction							
Saw	3	9	9	5	9	7	42
Clay/Brick	2						2
Metal industry	1	2					3
Chemicals, Fertiliser							
Glue			2				2
Paper, Printing	3	5	13	15	2	1	39
Special							
Flint						5	5
Gunpowder				3			3
Snuff/Tobacco	1		3	1			5
Unknown	5	7		2	4	7	25
All Commercial Watermills	46	48	68	53	52	53	320
Farm							
Farm Watermills	38	62	30	43	58	67	298
Horse Gins		123					
<i>OS Map Dates</i>	<i>1854 -60</i>	<i>1852- 59</i>	<i>1852 -53</i>	<i>1852 -53</i>	<i>1852 -53</i>	<i>1850- 60</i>	<i>1850- 60</i>

* The length given for the River Esk is the sum of the lengths of the rivers Esk, North Esk and South Esk.

Notes;

1. There were 158 corn mills, well distributed between the catchments, though the Water of Leith had more than its share, presumably feeding Edinburgh's population. Textile and saw mills were evenly distributed, but paper mills were concentrated along the Water of Leith, and the Rivers Esk.

2. There were 295 water powered farm mills, fairly evenly spread amongst the catchments. There were also 123 horse gins in the River Almond catchment. Almost all the farm mills were threshing mills though there were 6 churns with water-powered paddles. The ratio of threshing mills to commercial corn mills in the River Almond catchment was c7.8.

3. The OS maps, from which information has come were mainly prepared in the 1850s, so it is expected that most farm mill installations were still detectable.

Table 2: Frequencies of Occurrence of Watermill Types on Fife and Clackmannan Rivers

Watermill Type	Numbers of Watermills in Catchment				
	Devon (54km)	Leven (26km)	Eden (48km)	Smaller Streams	All Catchments
Commercial					
Food, Drink and Beverages					
Corn	3	43	46	59	151
Starch			2		2
Brewing/ distilling	1	1	2	4	8
Coffee			1		1
Textiles, Leather					
Textile	29	41	28	28	126
Metals, Construction					
Saw	5	20	12	15	52
Metal industry		2		5	7
Chemicals, Fertiliser					
Bone				1	1
Paper, printing	2	4	1		7
Special					
Flint		1			1
Pencil		1			1
Snuff/Tobacco		1	1	1	3
Unknown		2	10	12	24
All Commercial	39	111	94	124	368
Farm					
Threshing	12	37	50	47	146
Horse gins			179		
<i>Map dates</i>	<i>1852-55</i>	<i>1854-55</i>	<i>1859-62</i>	<i>1852-62</i>	<i>1852-62</i>

Notes;

1. There were 151 corn mills, distributed between the catchments, though the River Devon had very few. Textile and saw mills were more evenly distributed, though again there was a paucity on the River Devon. Textile mills produced woollen goods on the River Devon, and linen goods elsewhere.
2. There were 146 water powered farm mills, fairly evenly spread amongst the catchments except for that of the River Devon. There were also 179 horse gins in the River Eden catchment. As far as we know, all the farm mills were threshing mills. The ratio of threshing mills to commercial corn mills in the River Eden catchment was c5.0.
3. The OS maps, from which information has come were mainly prepared in the 1850s, and early 1860s, so it is expected that most farm mill installations were still detectable.

Table 3: Frequencies of Occurrence of Watermill Types on Dumfriesshire Rivers

Watermill Type	Numbers of Watermills in Catchment							All Dumfriesshire Catchments
	Nith (101km)	Lochar (34km)	Annan (90km)	Kirtle (29km)	Sark (22km)	Esk (77km)	Smaller Streams	
Commercial								
Food, Drink and Beverages								
Corn	31	4	29	5	2	20	3	94
Brewing/ distilling			1			2		3
Textiles, Leather								
Textile	14		10	1		6		31
Leather	3		1			1		
Metals, Construction								
Saw	25	4	25	4	1	8	2	69
Limeworks							1	1
Metal industry	4		1	1	1			7
Chemicals, Fertiliser								
Bone	1		1		1			3
Mining	1	2						3
Unknown		2	4					6
All Commercial	79	10	65	11	5	37	6	213
Farms								
Watermills	239	29	76	5	6	20	5	380
Horse gins		71		29	12			
<i>OS Map Dates</i>	<i>1854-58</i>	<i>1854-58</i>	<i>1854-58</i>	<i>1854-58</i>	<i>1854-63</i>	<i>1854-67</i>	<i>1854-58</i>	<i>1854-58</i>

Notes;

1. There were 94 corn mills, distributed between the catchments, concentrated on the Rivers Nith, Annan, and Esk. Textile and saw mills followed the same pattern.

2. There were 380 water powered farm mills, with large numbers on the River Annan, and even greater numbers on the River Nith. There were also 71 horse gins in the River Lochar catchment, 29 in the Kirtle catchment, and 12 in the Sark catchment. The great majority of the farm mills were threshing mills. The composite ratio of farm mills to commercial corn mills in these 3 catchments was c13.8, an extraordinarily high value, which we think must be close to saturation, although we did see farms with no mill installations.

3. The OS maps, from which information has come were mainly prepared in the 1850s, and early 1860s, so it is expected that most farm mill installations were still detectable.

Table 4: Frequencies of Occurrence of Watermill Types on Galloway Rivers

Watermill Type	Numbers of Watermills								
	Piltanton (20km)	Luce (29km)	Bladnoch (40km)	Cree (52km)	Fleet (26km)	Dee (89km)*	Urr (46km)	Smaller Streams	All Catchments
Commercial									
Food, Drink, Beverages									
Corn	1	3	9	7	6	26	17	29	98
Farina	1		1	2	1			1	6
Starch			1					2	3
Brewing/ distilling			1	1	1				3
Textiles, Leather									
Textile		3	3	6	5	5	5	9	36
Leather		2		2	2	1			7
Metals, Construction									
Saw	1		6	5	3	10	9	13	47
Quarrying							1		1
Limeworks								1	1
Metal industry			1				2	1	4
Chemicals, Fertiliser									
Bone						1			1
Manure							1		1
Mining				1		1			2
Paper/ printing						1	1		2
Special									
Snuff/Tobacco				2		1			3
Unknown		1	2	1	2	3	3	4	16
All Commercial	3	8	24	23	19	48	36	54	215
Farms									
Watermills	22	17	37	52	32	118	99	196	573
Horse gins	13	0					37		
OS map date	1846	1846-56	1846-51	1846-57	1848-50	1848-57	1848-55	1846-51	1846-62

Notes;

1. There were 98 corn mills, distributed between the catchments, with most on the Rivers Dee and Urr. Textile mills were more evenly distributed, and saw mills were mainly on the Rivers Dee and Urr.
2. There were 573 water powered farm mills, with concentrations on the Rivers Dee and Urr. There were also 37 horse gins in the River Urr catchment, and 13 along the River Piltanton. As far as we know, all farm mills were threshing mills. The ratio of threshing mills to commercial corn mills in the 2 catchments was 8.3, a high value.
3. The OS maps, from which information has come were mainly prepared in the 1840s, and early 1850s, so it is expected that most farm mill installations were still detectable.

Table 5. Frequencies of Occurrence of Watermill Types in 3 More Scottish River Catchments

Watermill Type	Numbers of Watermills in Catchment		
	Moray Avon (64km)	Aberdeenshire Don (131km)	Lanarkshire Avon (39km)
Commercial			
<i>Food, Drink and Beverages</i>			
Corn	7	102	14
Brewing/ distilling	2	4	
<i>Textiles, Leather</i>			
Textile	1	23	6
Leather		1	
<i>Metals, Construction</i>			
Saw	1	38	4
Metal industry		7	
<i>Mining</i>	1		
<i>Paper/ printing</i>		6	1
<i>Unknown</i>	2	25	1
All Commercial	13	199	24
Farm			
Watermills	51	566	14
Horse gins	0	429	32
OS map dates	1866-69	1860s	1856-59

Notes;

1. There were 123 corn mills, distributed between the catchments; it would be expected that most would have been in the catchment of the Aberdeenshire River Don, much the longest river, but its share was much greater than would be expected on that basis alone. Significant numbers of textile and saw mills were also found, though few in the Moray Avon catchment.

2. Farm mills were found in substantial numbers on the Moray Avon, though there were no horse gins. However, it is right to concentrate on the remarkable results obtained for the Aberdeenshire River Don. There were 566 water powered farm mills, and 429 horse gins in the catchment. The ratio of farm mills to commercial corn mills in the River Don catchment was c9.75, a high value, but fairly meaningless as a measure of threshing mill penetration, in this case.

This is because we know that there were large numbers of gorse mills, which crushed gorse shoots to prepare them for use as animal feedstock. We know, where some of these farm mills were, and we have found areas of 'cultivated' gorse near to farm mills, but we cannot make realistic estimates of the numbers of gorse mills or the numbers of threshing mills, which operated in the River Don catchment.

3. The OS maps, from which information for the Moray Avon and Aberdeenshire Don has come, were mainly prepared in the 1860s and more farm mill installations may have been undetectable, compared with other catchments in Scotland.

Table 6. Frequencies of Occurrence of Watermill Types in seven River Catchments in the North and Midlands of England

Watermill Type	Numbers of Watermills in Catchment						
	Tees (135km)	Yorks Esk (46km)	Yorks Don (114km)	River Wyre (58km)	Warks Avon (136km)	Bristol Avon (134km)	Little Avon (15km)
Commercial							
Food, Drink, Beverages							
Corn	76	18	108	18	195	196	32
Bean							
Brewing/ distilling			3		1	7	2
Textiles, Leather							
Textile	20	6	45	14	27	89	40
Leather				1	2	7	
Metals, Construction							
Saw	4	1	5	1	5	11	1
Quarrying							
Stone cutting			1				
Metal industry	3		153	4	4	27	2
Needle					17		
Chemicals, Fertiliser							
Chemicals			5			2	
Glue			1			1	
Bone			1	3	1		1
Mining	18						
Paper/printing	4	1	19	4	9	15	2
Special							
Pencil	1						
Glass grinding			1				
Gunpowder						4	
Ropeworks							
Snuff/ Tobacco			5			6	
Engine			1				
Rubber						2	
Pottery						2	
Unknown	4		9	1	42	15	
All Commercial	118	24	332	35	284	334	54
Farm							
Watermills	19	12	18	36	67 ¹	232	34
Horse Gins	108	6	9	3	0	5	0
OS Map Dates	<i>1850s</i>	<i>1848-54</i>	<i>1850s Y² 1870s D³</i>	<i>Mid 1840s</i>	<i>1880s</i>	<i>1880-1886</i>	<i>1879-1881</i>

¹ Partial coverage only: see note 7 for an explanation of the number of Warwickshire Avon threshing mills.

² Y is Yorkshire, ³ D is Derbyshire

Notes; see over

1. These results are grouped for convenience only, and cover a large part of England, so commonalities were not expected; the notes begin with consideration of commercial mills.
2. On each river, except the River Don, and the Little River Avon, the number of watermills, under the umbrella term, cornmill, (essentially all those processing cereal grains) considerably exceeds the number performing all other tasks.
3. The picture for the Yorkshire River Don is completely different from those for all the other rivers in Great Britain, which have been investigated, thanks to the very large number of metal processing watermills, which existed in and around Sheffield. The only other major metal-related industries of note on these catchments were needle manufacture in the middle reaches of the Warwickshire River Avon, foundries beside the lower Bristol River Avon, and lead mining beside the upper River Tees. Steelmaking near the mouth of the River Tees was a late 19th century development, in the age of steam, unlike the Sheffield Iron and Steel industry which grew up more than a century earlier. It should be noted that there were also many cornmills along the Yorkshire River Don, and its tributaries, mainly higher in the catchment; this is unsurprising given the large regional population to be fed.
4. As regards textile mills, the large sheep population in the Cotswolds explains the many woollen mills in the catchments of the Bristol River Avon and the Little River Avon, while the number of woollen mills in the Yorkshire River Don catchment reflects the one-time importance of the Yorkshire wool industry. Textile mills are a feature associated with the other rivers, an indication of the importance of wool especially, in much of England, from medieval times up to the fairly recent past.
5. The Yorkshire River Don passes through the Sheffield/Rotherham conurbation, the Bristol River Avon passes through Bath and Bristol, and the Warwickshire River Avon skirts the West Midlands conurbation, in all of which population centres, documents of many kinds were indispensable, and this explains the number of papermaking and printing mills in these catchments.
6. A puzzling feature is the scarcity of water-powered saw mills in these river catchments, except for the Bristol River Avon, in comparison with Scottish river catchments. Certainly, there are more forests on Scottish hills nowadays, but much of the planting was in the 20th century, so the difference remains unexplained.
7. As regards farm mills, it is likely that the great majority in these catchments were threshing mills. There were 2 types, water-powered and horse gins. The stand-out catchment for the former was the Bristol Avon, while there were few of the latter in any English catchment investigated except that of the River Tees. Comparisons between the catchments are saved for the overview. Note that we did not carry out a full investigation of farm mills in the Warwickshire River Avon catchment, but did so for a large sample including part of the river itself, and some tributaries, and then extrapolated.
8. Our mode of estimation of the penetration of threshing mills, as opposed to hand threshing with flails, into a catchment, is to consider the ratios of farm threshing mills to commercial corn mills; the ratios are tabulated in the overview.
9. The OS maps from which information was drawn, were dated between the 1840s and the 1880s. We expect that most of the farm mill structures would have still been in place at the time of the 1840s and 1850s surveys of the Tees, Yorkshire Esk, Wyre and Don catchments. The surveys of the Don catchment in Derbyshire and the Warwickshire Avon, Bristol Avon, and Little Avon catchments were much later when compared with the life-cycle of fixed threshing mill installations, so not all such mills will have survived to gain the attention of the map-makers.

Table 7: Frequencies of Occurrence of Watermill Types in five Southern English River Catchments

Watermill Type	Numbers of Watermills in Catchment				
	Camel (48km)	Devon Avon (41km)	Hants Avon (96km)	Hants Avon Water (14.5km)	Eastern Rother (48km)
Commercial					
Food, Drink, Beverages					
Corn	53	19	86	3	27
Bean			1		
Brewing/ distilling	1		1		1
Textiles, Leather					
Textile	3	4	19		
Leather	1	1			
Metals, Construction					
Saw	4		4		1
Quarrying	2				
Stone cutting					
Metal industry	1	1	2		3
Needle					
Chemicals, Fertiliser					
Chemicals					
Glue					
Bone	3		1		
Mining	2				
Paper/ printing		1	3		1
Special					
Gunpowder			1		2
Ropeworks	1				
Unknown	4	1	12	1	0
All Commercial	74	20	122	4	33
Farms					
Watermills	95	45	47	6	103
Horse Gins	8	4	3	0	10
<i>OS Map Dates</i>	<i>Early 1880s</i>	<i>1880s</i>	<i>1867-1887</i>	<i>1867-1871</i>	<i>1870-1874</i>

Notes;

1. Numbers of corn mills generally reflect the river lengths, a rough estimate of the catchment size.
2. The Hampshire Avon was noted for the practice of corn/sheep husbandry, aided by the creation of floating meadows. Hence the significant number of textile mills as well as corn mills in its catchment.
3. There are substantial numbers of water powered farm mills in all the catchments, though there are few horse gins. It is assumed that the great majority of farm mills were threshing mills, though resistance to their installation led to riots in some catchments and may have limited the numbers. This may be reflected in the ratios of farm mills to corn mills for all catchments (except the Eastern Rother) being 2 or less. There were many corn windmills in the Eastern Rother catchment. A count of the water-powered cornmills, therefore, does not reflect the corn milling capacity in the catchment at the time, resulting in an artificially high ratio.
4. The OS maps from which information was drawn, were dated between the 1860s and the 1880s, relatively late when compared with the life-cycle of fixed threshing mill installations, so not all such mills will have survived to gain the attention of the map-makers.

Table 8. Frequencies of Occurrence of Watermill Types in eight River Catchments in the East of England

Watermill Type	Numbers of Watermills in Catchment							
	River Witham (132km)	River Welland (104km)	River Stiffkey (29km)	River Glaven (21km)	River Yare (84km)	River Wensum (75km)	River Bure (95km)	River Waveney (80km)
Commercial								
Food, Drink, Beverages								
Corn	31	41	3	6	19	20	20	14
Bean								
Brewing/ distilling				1				
Mustard					1			
Textiles, Leather								
Textile	1				2	2	2	3
Leather						1		
Metals, Construction								
Saw	1	1			2	2	1	
Quarrying	1							
Stone cutting								
Metal industry		1						
Needle								
Chemicals, Fertiliser								
Chemicals								
Glue								
Bone	1					1	2	
Mining								
Paper/ printing	3				2	5	1	1
Special								
Pencil								
Glass grinding								
Gunpowder								
Ropeworks	1							
Snuff/ Tobacco								
Engine								
Rubber								
Pottery								
Unknown	6	6	0	0	0	0	0	0
All Commercial	41	49	3	6	21	22	24	14
Farms								
Watermills	21	21	3	6	67	29	22	35
Horse Gins	0	2	0	1	9	2	5	3
<i>OS Map Dates</i>	<i>1885-87</i>	<i>1880-87</i>	<i>1885-86</i>	<i>1885-86</i>	<i>Mid 1880s</i>	<i>Mid 1880s</i>	<i>Mid 1880s</i>	<i>Mid 1880s</i>

Notes;

1. Though there are significant numbers of commercial water powered corn mills in each catchment, those numbers are dwarfed by the number of windmills to be found. Thus, there are thought to have been over 900 windmills in Norfolk, between 500 and 800 in Lincolnshire, and more than 500 in Suffolk. Although it is thought that a typical watermill generated twice the power of a typical windmill, and so would grind significantly more corn, it remains true that the great majority of corn would have been ground in windmills, in these counties, and thus the catchments within them.

2. Apart from paper mills near to Norwich, there were no 'hotspots' for watermills of any other type.
3. Although we know of farm mills, which crushed woad plants to make dye, and apples to produce cider, the great majority of farm mills will have been threshing mills. Their numbers are relatively small, given the large total numbers of commercial corn mills powered by wind and water, though on the River Yare in particular, 67 farm water mills was quite a large number, in absolute terms. Horse gins were rare in all the catchments, continuing the picture seen in all the south and midlands of England. We think that there were farm windmills, but they performed the same function as commercial corn mills, and not threshing; their existence was perhaps a measure of the size of farms in Norfolk.
4. The OS maps for this region all date to the 1880s, late in the life cycle of fixed threshing mills. So, it is likely that evidence for some had vanished before the maps were drawn. On the other hand, there is such a profusion of ponds on farms in these catchments, that it is possible that we have wrongly associated some with watermills. We are confident that the numbers we present are real, but we would place a larger error band about them, than in other catchments.

Table 9: Frequencies of Occurrence of Watermill Types in five Welsh River Catchments

Watermill Type	Numbers of Watermills in Catchment				
	Clwyd (56km)	Teifi (120km)	Towy (121km)	Afan (18km)	Usk (130km)
Commercial					
Food, Drink, Beverages					
Corn	69	80	131	3	93
Brewing/ distilling					
Cider					2
Textiles, Leather					
Textile	16	97	74	2	16
Leather	1	2	4		2
Metals, Construction					
Saw	8	11	10	1	5
Metal industry	3	4	7	4	14
Cement/brick	1	1			1
Quarry	1		3		
Paper/ printing	2				3
Chemicals		1	1		
Unknown	4	16	30	1	20
All Commercial	101	212	253	10	141
Farms					
Water Mills	93	485	507	2	79
Horse gins	3	0	17	0	1
<i>OS Map Dates</i>	<i>1869-89</i>	<i>Late 1880s</i>	<i>Late 1880s</i>	<i>1875-77</i>	<i>1872-87</i>

Notes;

1. There were large numbers of commercial corn mills on each of the rivers, except for the short, industrialised River Afan.
2. The very large numbers of Textile mills, especially in the westernmost catchments, reflect the importance of the woollen industry from 1750 onwards in west Wales. Sawmills were relatively common, and other numbers reflect the burgeoning steel industry on the downriver, right bank tributaries of the River Usk in the 19th century.
3. As regards farm mills, it is clear that horse gins were as uncommon in Wales as in the south and midlands of England.
4. The numbers of water powered farm mills were unexceptional along the Rivers Clwyd and Usk, in north and east Wales, and it is likely that the majority were threshing mills. However, the numbers in the Teifi, and Towy catchments are very large, c500. The explanation lies in the fact that there were large numbers of gorse mills in the catchments, a conclusion backed by a number of published papers. We have attempted to quantify the split between threshing mills and gorse mills, but have been unable to do so in credible fashion, though we have confirmed that the combination of a farm mill, and a near-at-hand field of gorse seems to be common. Our best guess, but no more than that, would be that there are at least twice as many gorse mills as threshing mills, which would place the number of threshing mills in the catchments in the mainstream for other English and Welsh rivers.
5. The OS maps used are dated in the range 1869 to 1880s, late in the life cycle of threshing mills, though perhaps not so much so, for gorse mills. It may also be the case that developments were generally later in Wales, so traces of abandoned farm mills might survive until later.

5. Overview

The tabulations presented in the Results section, identify almost 3,700 commercial watermills and over 4,700 farm watermills from 51 river catchments. We have also found evidence of horse gins on over 1,000 farms. (*A commercial watermill is paid in cash or kind, by customers to process raw materials like grain or wool, a farm mill is a machine located on a farm, which operates at the behest of the farmer, normally without money changing hands.*) The tabulations are of course, backed by more detailed information about locations and types of the commercial and farm mills, which is presented in the Appendices at the end of each account of a virtual river journey on the website, <https://historicaljourneysalongbritishrivers.com/>. It is our view that these accounts are themselves, a fairly unique set of documents, which expand the literature on rivers, far beyond those well known, like the River Thames. However, the purpose of this document is to focus on watermills.

As regards commercial watermills, the information obtained has increased in two main aspects. Firstly, we have looked at locations and types of commercial watermills in many more river catchments. We do not seek to draw conclusions by making comparisons between them, but present the information as confirming or otherwise, what are best called specialities on the rivers in question. To obtain a complete picture of commercial milling operations, it would be necessary to consider watermills, windmills and steam powered mills together. The first type have been central to our investigations, but the others have not. It is our impression, that within the period, which we consider, namely post-1750, the balance between watermills and windmills, was strongly tilted towards the former in most parts of Scotland, England, and Wales, save in the strip of eastern England, including Lincolnshire, East Anglia, and Kent/East Sussex. There were windmills elsewhere, and it is possible, that as well as hot spots, which might have been anywhere, depending on local factors, their numbers may have tapered with movement west from eastern England, rather than reducing abruptly; we have not investigated this matter. It is also worth remembering, that windmills do not generally seem to have carried out functions other than grinding corn, unlike watermills, and in the latter operation, with a typical power output said to be only half that generated by watermills, their throughputs would have been correspondingly lower. We may be able to say more in the future, but for the moment, we are limited to expressing the view, that where windmills were common, our data does not allow full comparisons between milling arrangements in different catchments.

As regards steam powered mills, the first few decades of our post-1750 period saw the technological advances associated with James Watt, which made steam power, a viable method of driving mills, amongst many other applications. Although there were exceptions, as for example in the ironmaking industry, there was no large scale replacement of commercial watermills, which at the beginning of the 19th century, were mainly located by riversides in areas, close to sources of raw materials, including corn, wool, timber, and metal ores. Instead, steam engines were often fitted to boost available power in existing watermills, either to enable them to cope with low water flows, or simply to increase their capabilities. For the first half of the 19th century, watermills, perhaps boosted by steam, still dominated milling in most of England, Scotland and Wales.

Considering cornmills specifically, by the middle of the 19th century, restrictions on imports of corn were entirely lifted, and it was being unloaded in large quantities, at major ports, and steam-powered corn mills were being built there, to produce flour. The railways, which penetrated rural areas to a remarkable extent from the middle of the 19th century, made transport of corn and flour easy and relatively cheap. It had ceased to be economic to grow corn on marginal land to feed local populations, and watermills in such areas became redundant. Instead,

large steam-powered mills in population centres produced flour from corn sourced from distance, if necessary, and the flour was distributed countrywide by means of the railways. As a result, the majority of watermills, which ground corn, closed in the later 19th and early 20th centuries, though numbers fell slowly, and evidence of their past existences survived, not least because many became up-market homes. Similar life histories applied to watermills, which had carried out other functions, like weaving, spinning, and conditioning textiles, albeit for different reasons, and the end point was much the same, namely the vanishing of such watermills along rivers. In this and our previous documents, we have not been concerned with the timelines for watermills, we have identified the locations of watermills of different types, post-1750, though that may not be far from giving a snapshot picture of the distribution in c1880, before closures began to accelerate.

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Investigations since we produced our previous review in the summer of 2022, have mainly focused on farm mills, and in Table 10, we summarise the results which have been obtained. For many catchments we give numbers of farm mills which were powered by waterwheels, and corresponding numbers for those powered by horse gins. However, there are gaps, because the time-consuming task of identifying and counting large numbers of horse gins has been completed only for a sizeable sample of catchments in Scotland, though coverage is near complete in England and Wales. Taking the Scottish results first, it is clear that the numbers of farm mills, which were driven by waterwheels, and those driven by horse gins, were generally of the same order, though as can be seen from column 3 of Table 10, there were considerable variations between catchments. We started with an assumption that in flatter, drier catchments in the east of the country, horse gins might be favoured, and ratios of 2.0 and 3.6 for the numbers of horse gins to the numbers of water powered farm mills in the River Almond and River Eden catchments seemed to lend support. However, although we found ratios less than 1 for some catchments in wetter, hillier, catchments further west, we also found some high values, like 5.8 (in the Kirtle Water catchment). Clearly other factors like costs and localised topography decided which type would be installed, and we had to discard any idea we might be able to predict on the basis of broad area landscape or rainfall. So, the picture for Scotland was that there were many farm mills driven by each method, waterwheels and horse gins, and that the choices made by farmers were not easily predicted.

The picture presented by column 3, in Table 10, is completely different for England and Wales, though there is one anomaly. The River Tees is the northernmost English catchment, which we have looked at, and here the aforementioned ratio has the value of 5.7, indicating that there were many more horse gins in this catchment than farm watermills. In every catchment investigated in the remainder of England and Wales, the ratio is substantially less than 1, and in the south of England very few horse gins appear on the NLS 6 inch OS maps, which are our main tool for finding the farm mills. However, we need to qualify that statement. The map surveys for these catchments were almost all undertaken in the 1870s and 1880s, much later than those for the Tees and the Scottish catchments, and well after the introduction of portable farm steam units, which would not appear on the maps.

In addition, we knew that horse gins could be housed indoors or outdoors, and we needed to distinguish between these situations, when considering the likelihood of their appearance on maps. Indoor horse gins were housed in very distinctive buildings, (an example is shown as Figure 3a, in Section 3, dealing with methodology) that were clearly marked in first and second edition OS maps of Scotland. It is possible, but highly unlikely, that the

map-makers in England did not mark these buildings, and certainly, more could have disappeared before later maps were produced. However, the simplest and best explanation, for their not appearing on the maps, is that there were few indoor horse gins in England south of the River Tees and in Wales. We have no idea why this should have been the case. Outdoor horse gins, with drive shafts transferring power into adjacent barns, constituted a substantial proportion of farm horse gins, (an example is shown as Figure 3b in Section 3, dealing with methodology). These outdoor horse gins involved much less permanent structural work and appear to have been relatively simple to dismantle. It is possible therefore, that they many were removed by the time of the later map surveys. However, the Yorkshire Esk, much of the Yorkshire Don and the Wyre were surveyed in the 1840s and 50s and few horse gins were found in these catchments. The best explanation may simply be that there were not many outdoor horse gins, either, south of the River Tees in England or in Wales.

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The other part of Table 10, focusses on the ratio of the number of farm mills to the number of commercial corn mills in the catchments, as presented in column 6. Our starting point for this work was again in Scotland, and we soon understood that the great majority of the farm mills, both water powered and driven by horse gins, in the catchments, which we looked at initially, were threshing mills. We thought that we could take the ratio of the number of farm mills to commercial corn mills in a catchment, as a measure of the penetration of threshing mill technology. Threshing mills were invented by Andrew Meikle in East Lothian, in the 1790s, and the technology spread out across Scotland, and into England and Wales. In the catchments where both water-powered mills and horse gins were counted, ratios approaching 10 are common, albeit with a few larger outliers, and we thought that they signified substantial penetration, though not saturation, since we were able to find similar numbers of farms, without farm mills, in every catchment looked at.

When we figuratively crossed the border into England, the picture changed. We had thought that we might find a gradation, with highest values in the north, and lower values further south. In fact, we found that with two groups of exceptions, the values of the ratio of farm mill to commercial corn mills numbers, were in a range less than 2.5, implying less penetration of threshing mill technology. The exceptions were in the counties of Norfolk and Sussex, where we had considered only commercial watermills, and did not include the much larger number of windmills, which ground corn, so we got misleadingly high values of the ratio, up to more than 4. There were other possible contributing factors, like the later dates of the OS maps, but, in general, we thought that outside the eastern strip, the picture in England was real, and considered possible explanations for relatively low uptake of threshing mill technology, including the possibility, that riots against the introduction of threshing mills, had discouraged installation in some counties.

However, we found relatively high ratios for west Wales, in the catchments of the Rivers Towy and Teifi, with values of 4, and 6.1. We had known that gorse mills were used in this region to crush and soften plant shoots for use as animal feedstock, and we had information that there had been large numbers of such mills. Sheep, horses and cattle were given prepared gorse, which had been found to be nutritious. It was an extra feedstock, which could be used out of the growing season, so reducing the amount of straw, and imported food, required to bridge the winter gap, and allowing a farm to carry more livestock through the winter. Although, we had information about specific installations, and had references that indicated large numbers, we had no quantitative information as to how many gorse mills there had been after 1750. We attempted to plug the knowledge gap in

various ways, including by estimating how many farm mills were near areas of gorse shown on historic OS maps. However, these efforts proved unavailing, and the most we can say is that if we assume a threshing mill to corn mill ratio of 1.5 in these catchments, putting them roughly in line with others in the south, the split would be 328 gorse mills and 196 threshing mills in the River Towy catchment, and 365 gorse mills and 120 threshing mills in the River Teifi catchment. In truth, these are little better than educated guesses.

While investigating gorse mills in Wales, we became aware that there were reputed to be large numbers in Aberdeenshire. Again, the problem for our type of analysis, lay in the facts that there was published work dealing with specific installations, and there were statements that they were common, but no way of quantifying the number of installations. When we looked at the catchment of the Aberdeenshire River Don, we found almost 1,000 farm mills, roughly half water and half horse powered. We were, however, unable to estimate separate numbers of threshing mills and gorse mills. We were not even able to make an educated guess of the split between gorse mills and threshing mills in the River Don catchment because the spread of numbers of threshing mills found in other Scottish catchments, is larger than in England. We are left with questions as to why they are largely confined to two widely separated parts of Great Britain (and Ireland and New Zealand). It would seem that a readily available, nutritious extra feedstock would be useful everywhere, but farmers appear unconvinced in most of the country, and used expensive installations like floating meadows, to achieve what seem to have been similar results.

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Our additional work has undoubtedly enabled us to obtain a far greater of understanding of the use of farm mills across the UK. It has given further strong evidence of differences between the adoption of farm mills in general and horse gins in particular between Scotland and England. Quantitative understanding has, however, been elusive. There are no simple explanations for the relative numbers of horse gins and water powered farm mills which operated in different parts of Great Britain. If there was any relationship between the numbers of farm mills and cornmills in a catchment, it was clearly complex. We are certainly clear that there were many gorse mills in Wales and in Aberdeenshire, but we do not yet know the relative proportions of gorse and threshing mills in Wales and Aberdeenshire. As we continued with these investigations, it became clear that there has been an element of 'the more you know, the more you know, that you don't know', but it is also true that starting from a detailed investigation of a domain of knowledge, i.e., watermills, you eventually butt against the boundaries of that domain, finding a need to know more about other mill types, to complete the picture as regards the targeted mills. There are some gaps in our knowledge, which we can hope to resolve, by doing further work as indicated in the next section. However, there are others which seem to be of a different order, and it is difficult to see how we might resolve some of our dilemmas in realistic timescales. For example, we can foresee a need for field work, investigating records of farm sales, looking at local newspapers & magazines, and as a forlorn hope, trying to find surviving equipment. It would be good to see such work being undertaken but it cannot be by us, and we must satisfy ourselves with having accumulated, and made available, a unique collection of data, which might point the way for others.

Table 10, see over

Table 10: Summary of numbers of Farm Mills and Corn Mills

Catchment	Farm Mills				Corn Mills	
	Water Mills	Horse Gins	Horse Gins/ Water Mills	All Farm Mills	Corn Mills	Farm Mills/ Corn Mills
Scotland						
<i>Lothians</i>						
West Lothian River Avon	38	nc	nc	38	20	1.9 ¹
River Almond	61	123	2.0	184	23	8.0
Water of Leith	30	nc	nc	30	40	0.8 ¹
Midlothian River Esk	43	nc	nc	43	18	2.4 ¹
River Tyne	58	nc	nc	58	29	2.0 ¹
Smaller Lothian Streams	67	nc	nc	67	28	2.4 ¹
<i>Fife and Clackmannan</i>						
River Devon	12	nc	nc	12	3	4.0 ¹
River Leven	37	nc	nc	37	43	0.9 ¹
River Eden	50	179	3.6	229	47	4.9
Smaller Fife Streams	47	nc	nc	47	59	0.8 ¹
<i>Dumfriesshire</i>						
River Nith	239	nc	nc	239	31	7.7 ¹
Lochar Water	29	71	2.5	100	4	25.0
River Annan	76	nc	nc	76	29	2.6 ¹
Kirtle Water	5	29	5.8	34	5	6.8
River Sark	6	12	2.0	18	2	9.0
Dumfriesshire River Esk	20	nc	nc	20	20	1.0 ¹
Smaller Dumfriesshire Streams	5	nc	nc	5	3	1.7 ¹
<i>Galloway</i>						
Piltanton Burn	22	13	0.6	35	1	35.0
Water of Luce	17	0	0.0	17	3	5.7
River Bladnoch	37	nc	nc	37	9	4.1 ¹
River Cree	52	nc	nc	52	7	7.4 ¹
Water of Fleet	32	nc	nc	32	6	5.3 ¹
River Dee	118	nc	nc	118	26	4.5 ¹
Water of Urr	99	37	0.4	136	17	8.0
Smaller Galloway Streams	196	nc	nc	196	29	6.8 ¹
Moray River Avon	51	0	0.0	51	7	7.3
River Don ²	566	429	0.8	995	102	9.8
Lanarkshire Avon Water	14	32	2.3	46	14	3.3

Table continued over the page

Catchment	Farm Mills				Corn Mills	
	Water Mills	Horse Gins	Horse Gins/ Water Mills	All Farm Mills	Corn Mills	Farm Mills/ Corn Mills
England						1.7
River Tees	19	108	5.7	127	76	1.0
Yorkshire River Esk	12	6	0.5	18	18	0.3
Yorkshire River Don	18	9	0.5	27	108	2.2
River Wyre	36	3	0.1	39	18	1.0 ³
Warks River Avon ³	67	0	<0.1	67	67 ³	1.2
Bristol River Avon	232	5	<0.1	237	196	1.1
Little Avon	34	0	<0.1	34	32	2.0
River Camel	95	8	0.1	103	53	2.6
Devon River Avon	45	4	0.1	49	19	0.6
Hampshire River Avon	47	3	0.1	50	86	2.0
Hampshire Avon Water	6	0	<0.1	6	3	4.2
Eastern River Rother ⁴	103	10	0.1	113	27	0.7 ⁴
River Witham ⁴	21	0	<0.1	21	31	0.6 ⁴
River Welland ⁴	21	2	0.1	23	41	1.0 ⁴
River Stiffkey ⁴	3	0	<0.1	3	3	1.2 ⁴
River Glaven ⁴	6	1	0.2	7	6	4.0 ⁴
River Yare ⁴	67	9	0.1	76	19	1.6 ⁴
River Wensum ⁴	29	2	0.1	31	20	1.4
River Bure ⁴	22	5	0.2	27	20	2.7 ⁴
River Waveney ⁴	35	3	0.1	38	14	1.7

Wales						
River Clwyd ²	93	3	<0.1	96	69	1.4
River Teifi ²	485	0	<0.1	485	80	6.1
River Towy ²	507	17	<0.1	524	131	4.0
River Afan	2	0	<0.1	2	3	0.7
River Usk	79	1	<0.1	80	93	0.9

Notes

nc = horse gins not counted

¹ ratio of farm to corn mills based on water-powered farm mills only

² a substantial proportion of farm mills in these catchments may have been gorse mills

³ farm mills identified in some stretches of the catchment, the numbers of corn mills and the ratio of farm mills to corn mills refer to those stretches

⁴ these figures do not refer to the substantial numbers of wind-powered corn mills in the catchment

6. Questions Raised and Possible Future Work

6.1 The general point has been made that a decision to focus on a particular domain, often leads to issues at the edge of the domain, which suggest a need to stray across the boundaries. In this case, focussing on watermills has given a limited picture of milling operations in areas where windmills dominate. Some work should be done to get a better qualitative understanding of the relative numbers in different areas of the country. In a similar vein, some additional information should be sought on the use of steam power for milling, both as a boost to watermills and as separate installations.

6.2 We have the impression that windmills were almost always used to grind corn, rather than for the multiplicity of tasks performed by watermills. It would be useful to know why.

- 6.3 Why was the use of threshing mill technology so much lower in England and Wales than in Scotland, and why were horse gins far scarcer in England and Wales, and rare south of the River Tees?
- 6.4 Our evidence suggests that processed gorse shoots were an important animal feedstock in Wales and Aberdeenshire, potentially enabling farms to carry more animals at little extra cost. Why was the practice not employed more widely?
- 6.5 Again, there seem to be many more powered sawmills in Scottish river catchments than in those in England and Wales. It is important not to make judgements based on present-day tree cover, because extensive forests were planted in the 20th century, and this continues, but there were forests in the 18th and 19th century.
- 6.6 Apart from looking specifically at the questions raised, we think light will be shed on the matters concerned, by looking at a few more river catchments. So, we intend to consider the following;
- (i) River Deveron
 - (ii) River Till
 - (iii) River Irwell
 - (iv) River Lea

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