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Harnham Water Meadows

A pasture productive system in traditional
English agriculture

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Figure 1 Water Meadows during irrigation

Project XX - Harnham Water Meadows
PXX

Context.

Location:	Harnham, Wessex, United Kingdom
Period:	17-19th Century A.D.
Function:	pasture irrigation, soil fertilizer, hay-agriculture
Area:	40 ha
Components:	hatches (sluices), stone structures, aqueducts, ridges, channels, bedworks.
Status:	Conservation

The Harnham Water Meadows are located inland in the South-Western part of England. The water catchment area of Harnham being a part of the county of Wiltshire. The rivers of this area are largely spring-fed and provide a stable flow throughout the year. Along the floodplains of these rivers a series of (abandoned) water meadows can be found.

Water meadows are part of a well known irrigation system in England. The chalk valley landscapes of Wessex are an important county for water meadows because of the topsoil texture and slightly alkaline water they provide, elements that are needed for grass sward development.

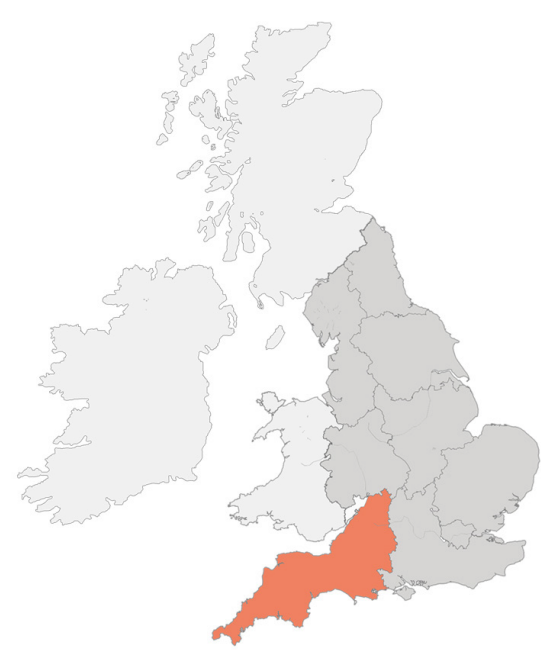


Figure 2
Country Scale

Region of South-West England. Including the provinces Cornwall and Wessex.

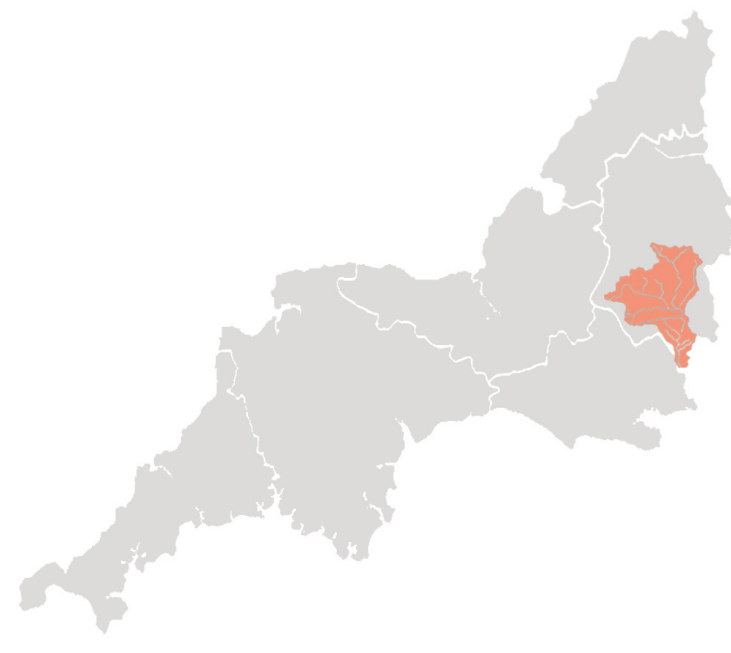


Figure 3
Provincial Scale

Water catchment area of Harnham and the Avon River within the county of Wiltshire, Wessex.



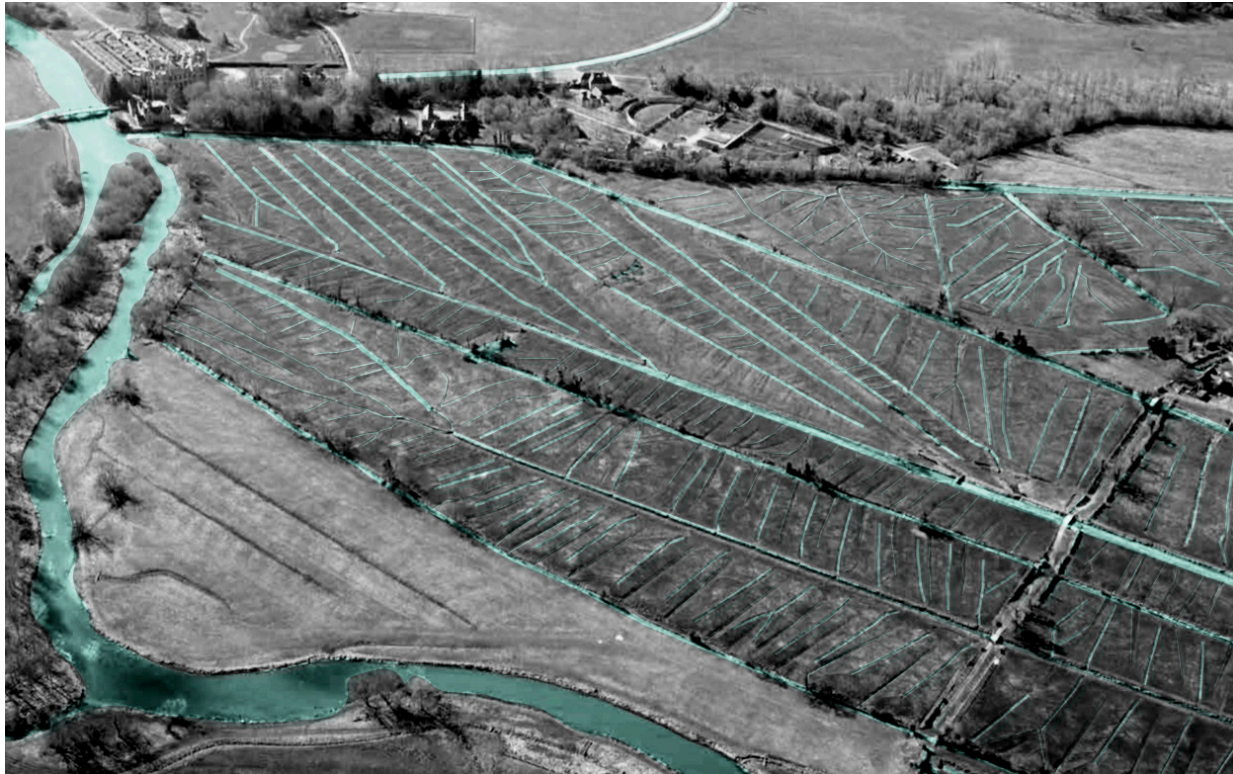
Figure 4
Regional Scale

Location of Harnham and Salisbury within the water catchment area of the Avon River.

Historical Photos.

The Harnham Water Meadows, as a remnant of the 17th century farming revolution, form an important part of the historical English landscape. These floodplain meadows are altered in such a way to control the flow of water in order to improve agricultural activities. Due to their common occurrence, water meadows are often regarded as semi-natural features in the landscape while in reality they are notably artificially constructed.

Figure 5
Farmer harvesting hay
Figure 6
Victorian aqueduct guiding the flow of water
Figure 7
Hatch gates used to let water in/out of the meadows
Figure 8
The specialized worker known as the 'drowner' of the meadows
Figure 9
Hatch pool or 'reservoir'
Figure 10
The water meadows lay-out, better known as bedworks



Climate.

Climate zone: **Temperate**
Sub-climate: Mild winter, warm summer, moderate rainfall

Climate & Weather Averages

- High t°: 22°C
- Low t°: 0.5°C
- Mean t°: 10°C
- Precipitation: 36.5mm
- Humidity: 81%
- Dew point: 7°C
- Wind: 16km/h
- Pressure: 1016mbar
- Visibility: 15km
- Hottest Month: July (23°C avg)
- Coldest Month: January (0°C avg)
- Wettest Month: December (77mm avg)
- Windyest Month: January (19km/h avg)
- Annual Rainfall: 743 mm per year

In Harnham the summers are short but comfortable and the winters are longer, more windy and mostly cloudy. The warm seasons lasts around 3 months from June to September. The hottest month usually being July. The colder seasons last 4 months from November until March, February being the coldest month.

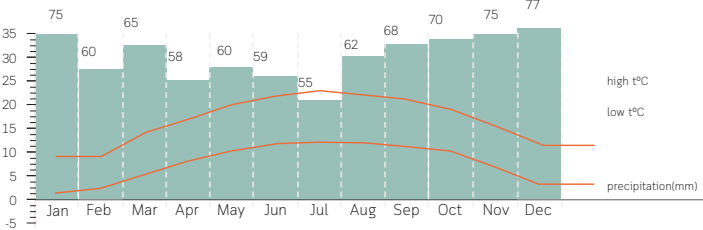


Figure 11
Climate

Figure 12a
Rainfall: annual average from 1981-2010

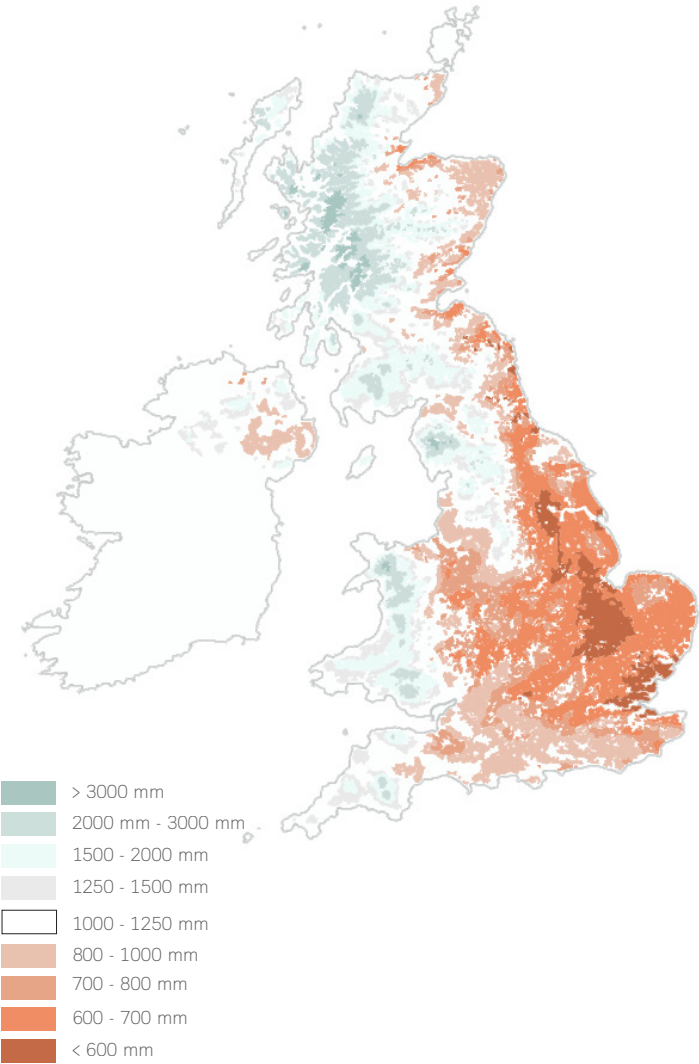
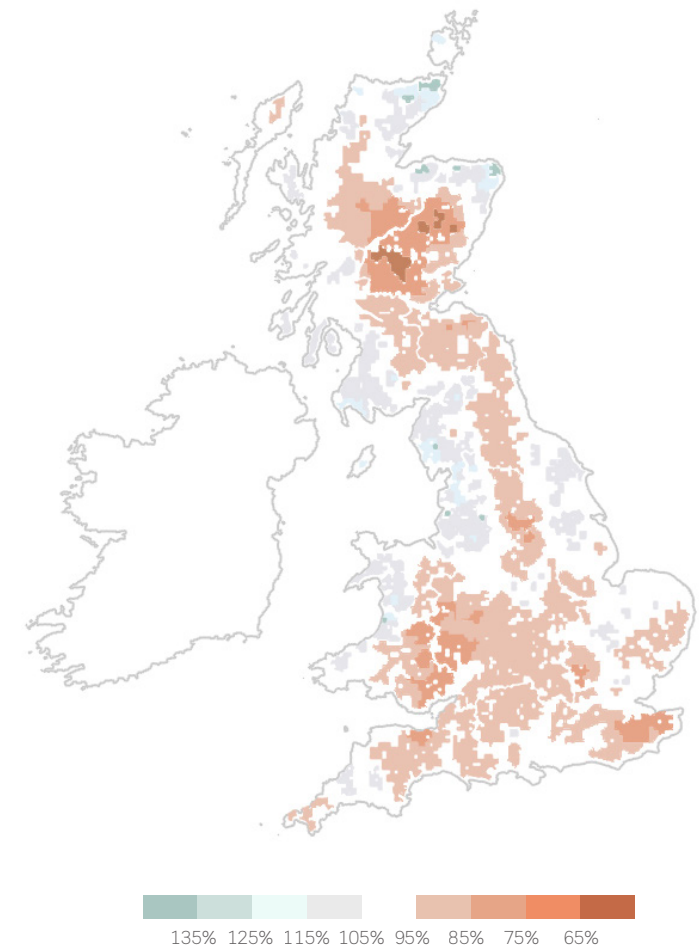


Figure 12b
Rainfall: % of 1981-2010 average in 2017



Catchment area.

The largest river running through Harnham is the Avon. The upper part of the catchment area contains a radial pattern of tributaries (Bourne, Wylfe, Till and Nadder). They converge around Harnham where the river Avon continues to flow southwards. The upper catchment area is mostly rural, dominated by intensive arable farming, grasslands and abandoned water meadows within the river valleys.



Figure 13
River tributaries of the water catchment area converging around Harnham

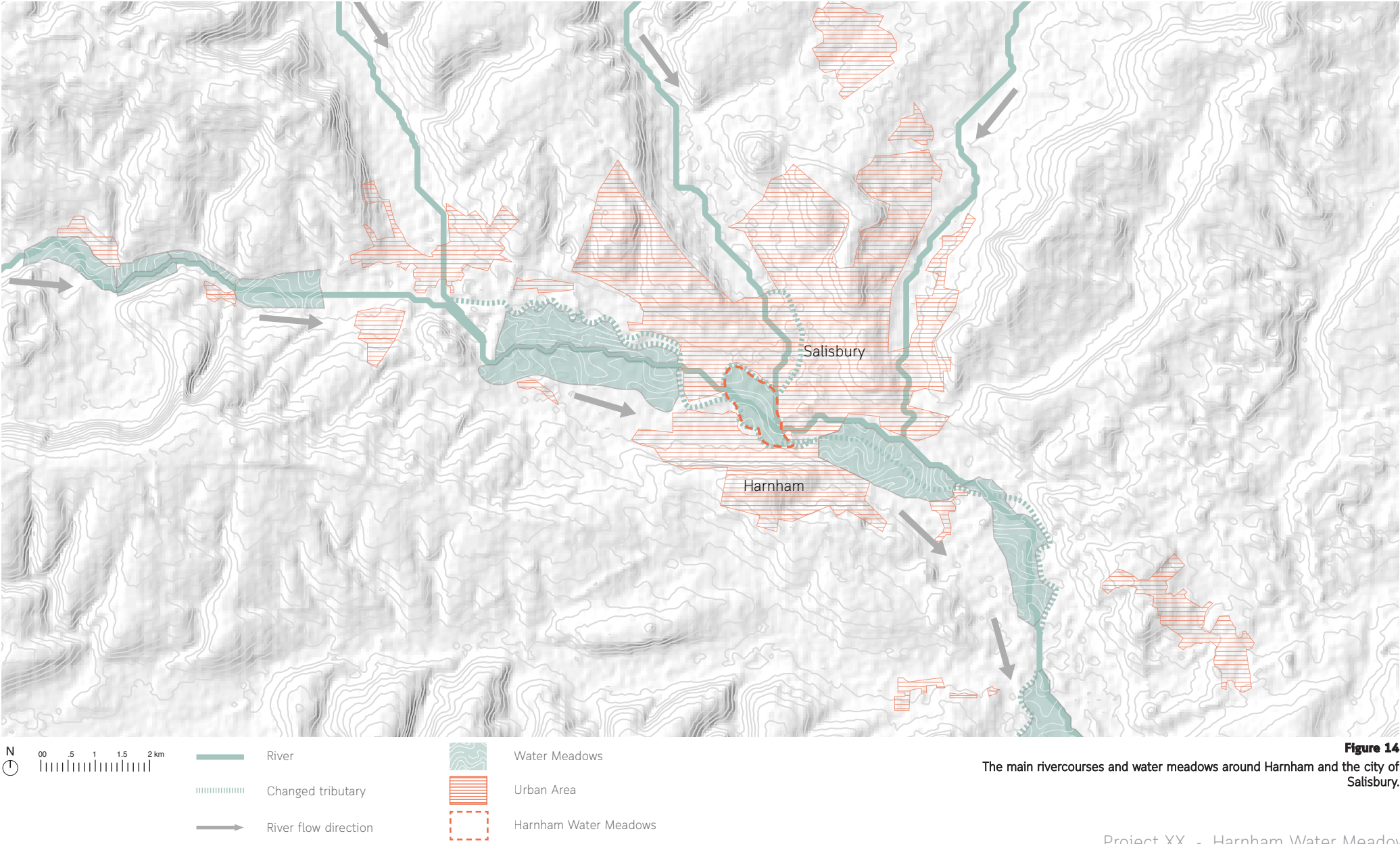


Figure 14
The main rivercourses and water meadows around Harnham and the city of Salisbury.

Water System Plan.

The type of water meadows used at Harnham are called ‘bedworks’ (figure 15). Water is diverted from both branches of the river Nadder (figure 16a) and flows in channels called ‘carriers’ into the meadows (figure 16b). It returns via a series of drains which feed a tail drain that returns the flow back to the river (figure 16c).

In more detail, in figure 17 it becomes evident that the two mills at Salisbury and Harnham are integrated into the watersystem and provide a raised waterlevel upstream through impoundment. Then, main carriages, controlled by so called hatches or sluice gates, allow the flow of water into the meadows. Eventually, river water would run along the tops of the constructed ridges so that water trickles through the grass at a depth of 25mm. The passage of water would return back into the river system via drains that lead to a tail drain back into the river Avon.



Figure 16a
The rivers Avon and Nadder.

Figure 15
Diagram of a general bedwork watersystem

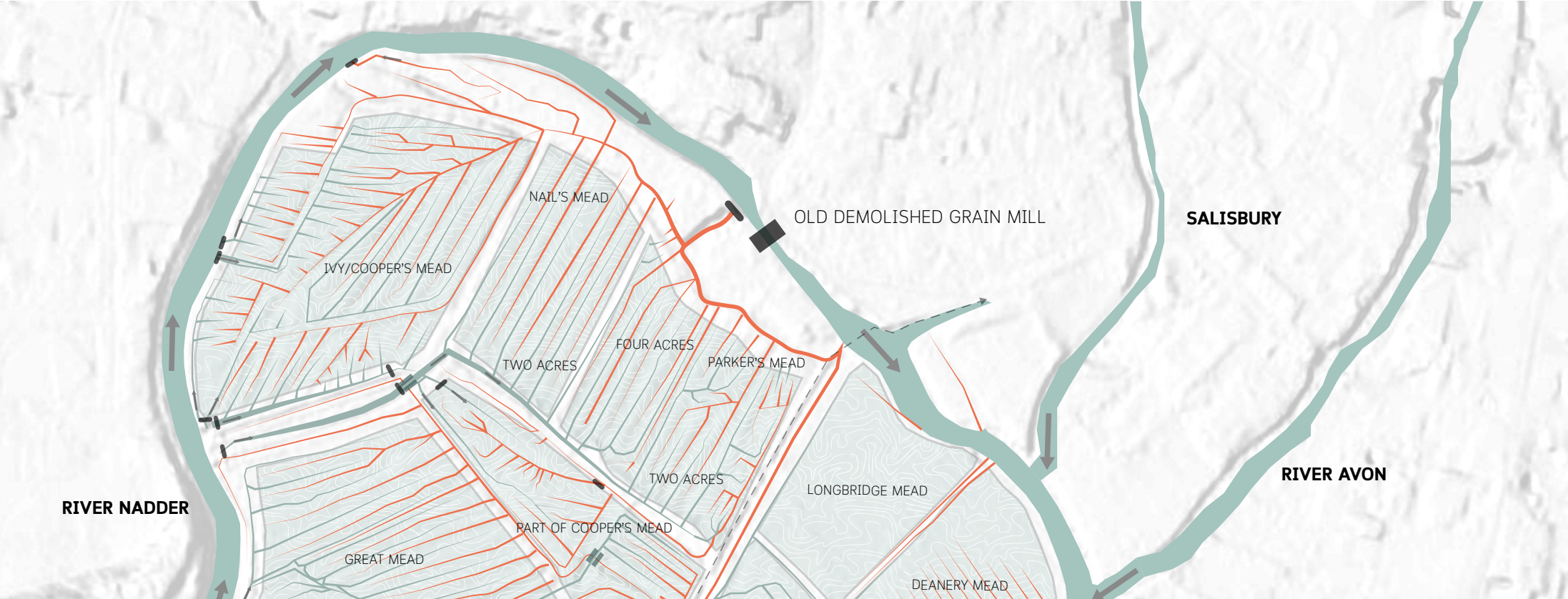
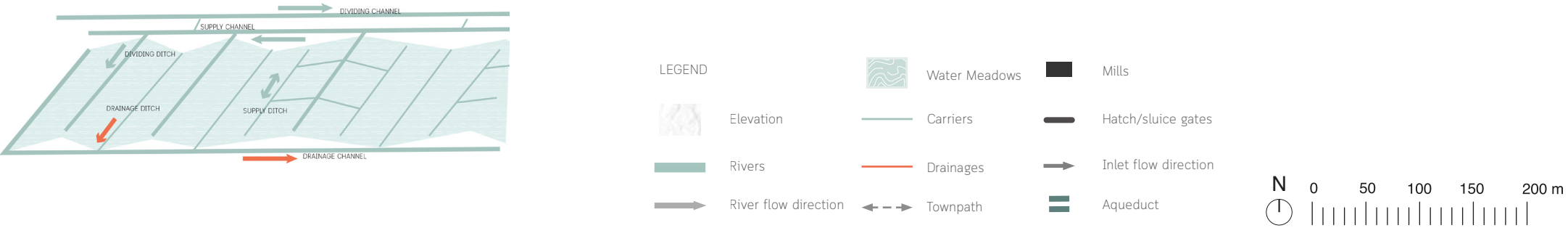




Figure 16b
The inlets/'carriers' into the meadows.

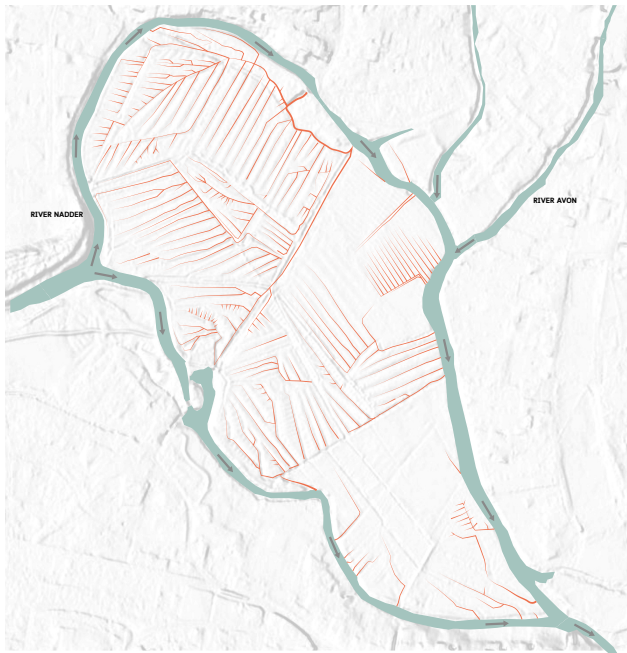


Figure 16c
The outlets/drainages out of the meadows.

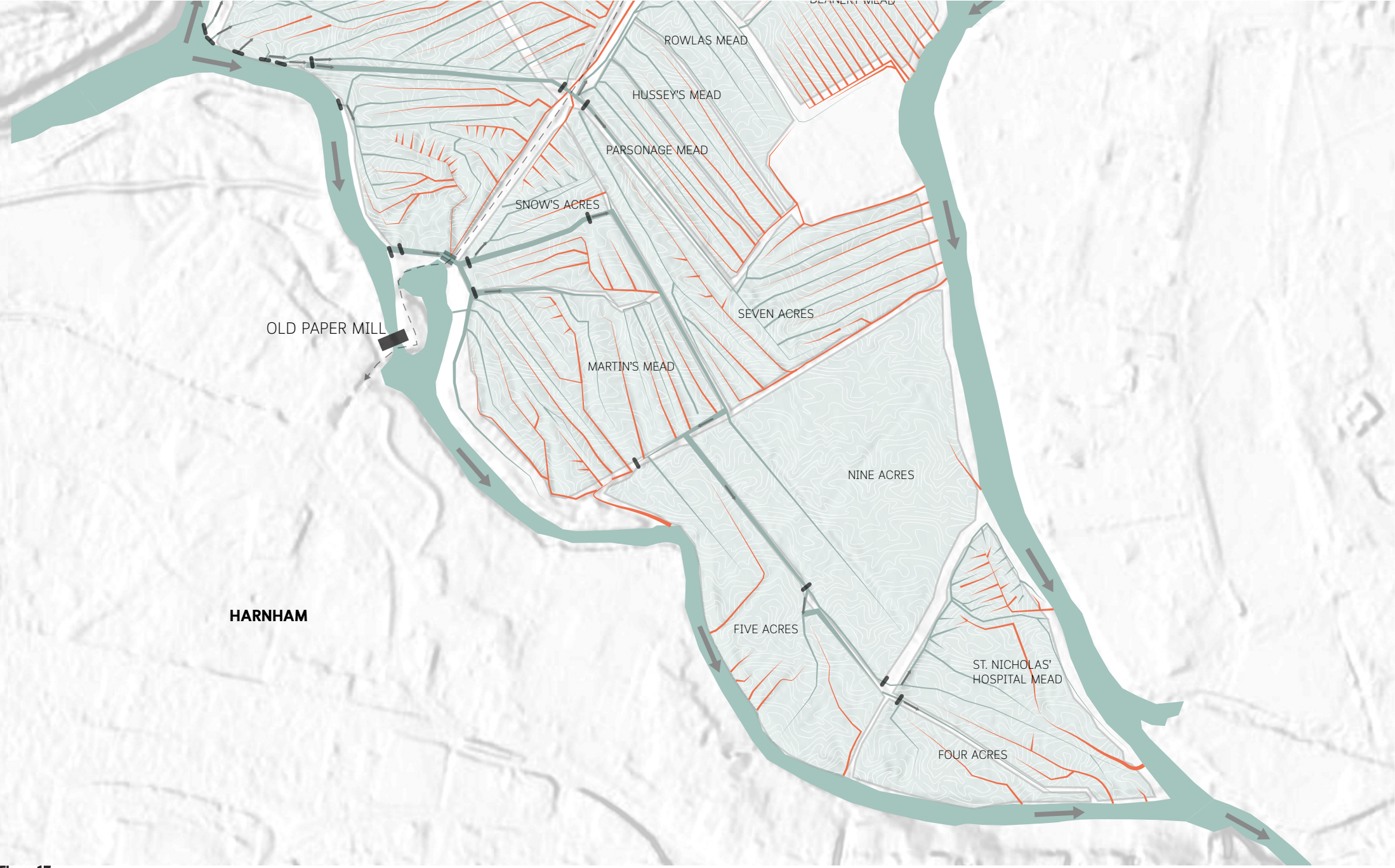


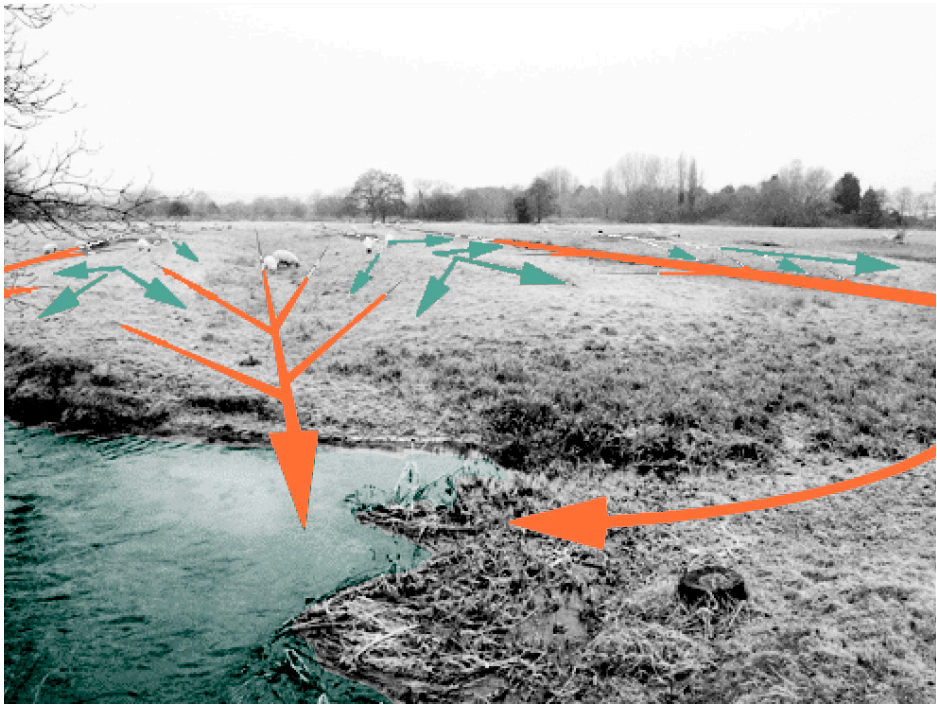
Figure 17
The watersystem plan including mills, hatches and aqueducts.

Water System Plan.

A true water meadow is a pasture irrigation system that is irrigated at the discretion of the farmer. They are distinguished from floodplain meadows which are inundated by adjacent rivers but only wetted when the river naturally overflows its banks. Water meadows on the contrary have an infrastructure to achieve this 'drowning' to increase the production of grass.



Figure 18
The water system from left to right: the spatial lay-out, water carried by ridges, irrigated downward into the soil and drained by ditches.

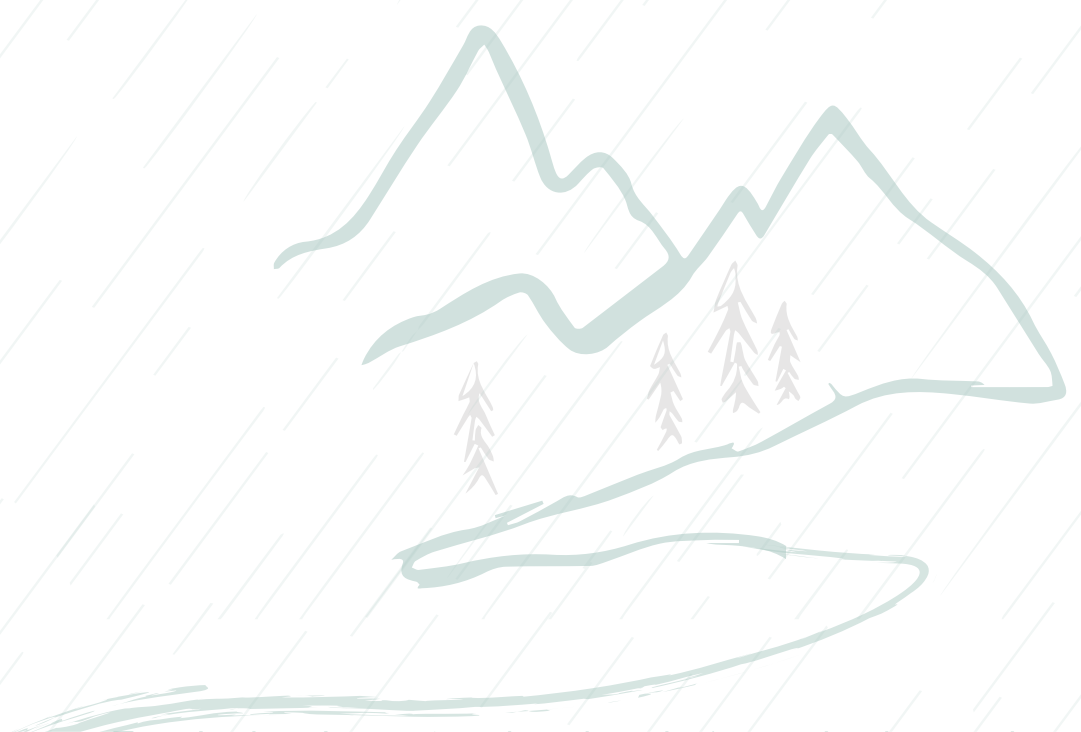
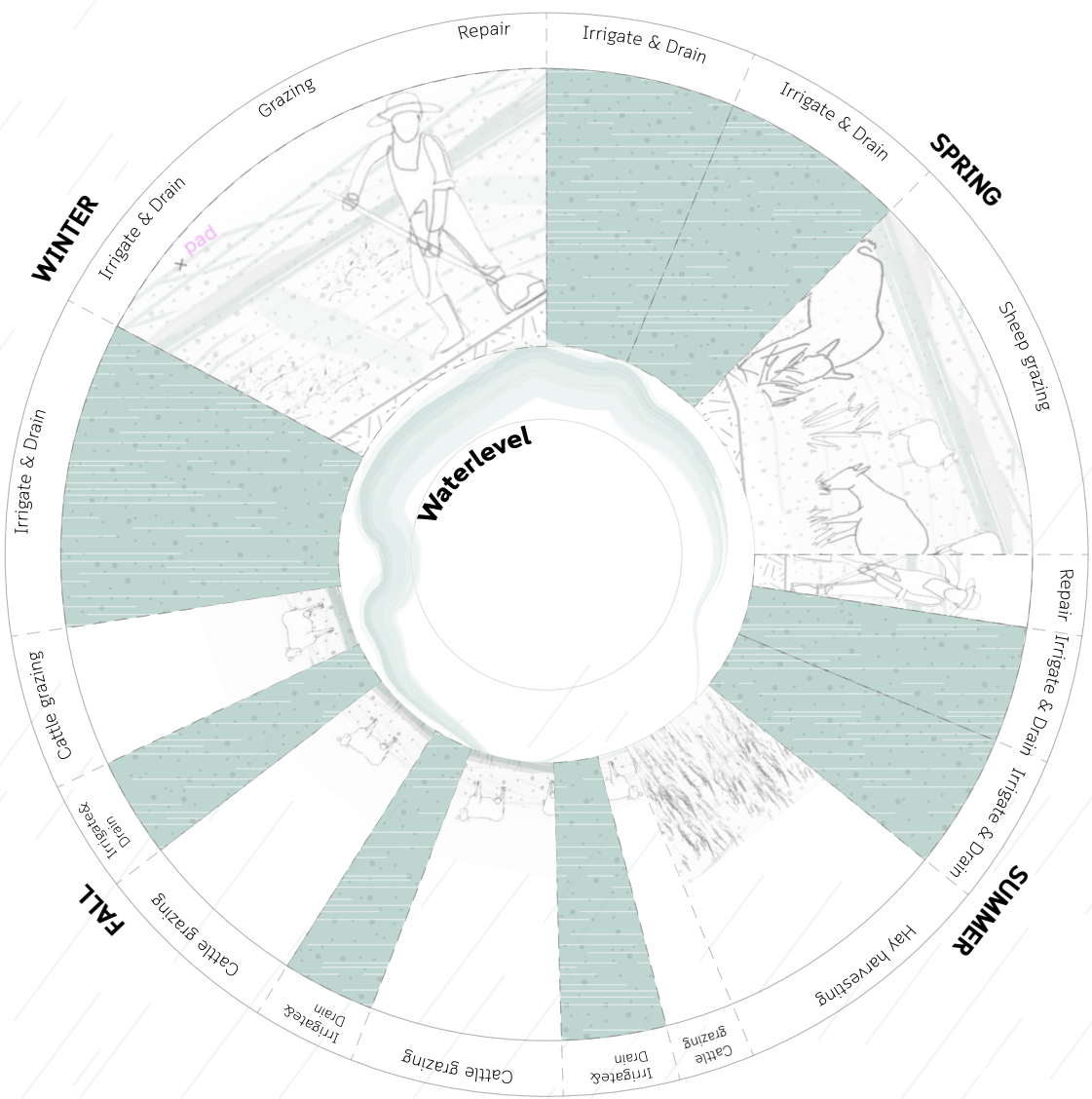


Details and Circularity.

Initially, water meadows were part of the English agricultural ‘Sheep-Corn System’. The meadows provided grass while the sheep grazing this grass provided fertilization, leading to better crops on surrounding arable fields.

Within this agricultural system ‘floated’ watermeadows were used for irrigation in the winter or early in spring, bringing nutrients and oxygen into the soil. Typically this caused grass to start growing about one month earlier than un-floated floodplain meadows. In this way animals could benefit from the ‘early bite’ of grass. Later in the season, during the summer when the soil was drying out, water meadows were re-watered so that (typically) two cuts of hay were taken and used to feed other animals – cattle and horses.

The drowning of the meadows took place in a cyclical management sytem. Meadows were usually drowned for a few days followed by drained for a few days (3-7 days). In mid-March when grass would reach a height of 150mm, sheep would graze the fields of the meadows. Towards the end of May the sheep would be removed again, allowing the grass to produce hay crops. From June until the end of September dairy cattle grazed, causing problems for the meadow surface and waterbanks. The latter, leading to bedwork maintenance during the end of fall.



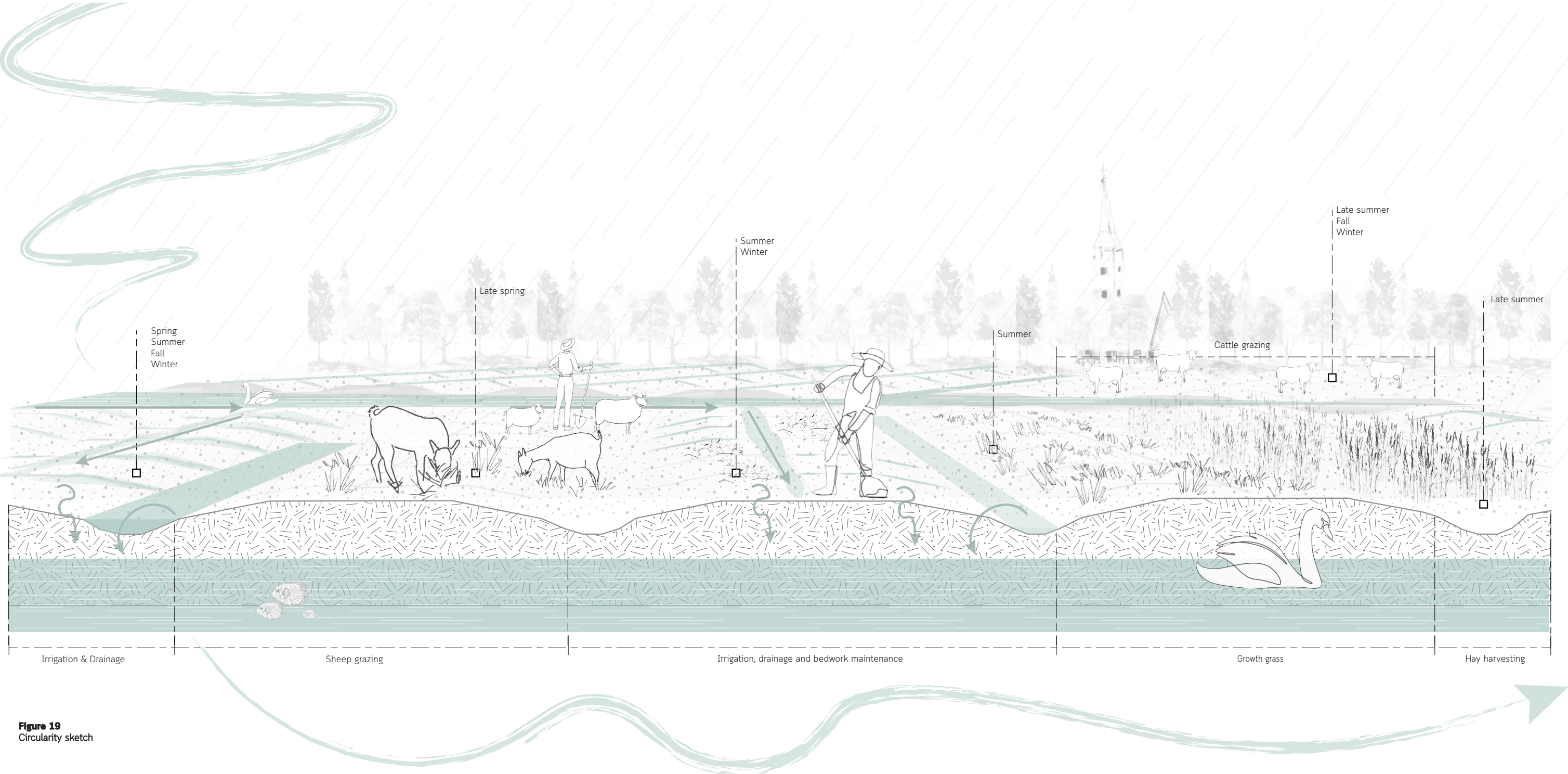


Figure 19
Circularity sketch

Conclusion.

Lessons to be learned- The Harnham Water Meadows are characterized by both a circularity in watermanagement and in agricultural production, both of the systems being regulated through seasonality. Thus, the lessons to be learned are diverse. Species rich grasslands are a threatened ecosystem in Europe, either suffering from intensification or abandonment. Floated water meadows do not only regulate the water supply but also have a positive effect on the soil quality, availability of nutrients, pest control, and a longer growing period of vegetation. The lessons to be learned are multifaceted and this diversity in the water meadow system, land use, and knowledge in itself might be the answer to healthier landscapes and ecosystems in the future.

Landscape Values- The bedworks of the Harnham Water Meadows are created and altered by human beings. The knowledge behind this system together with the herringbone layout, give this landscape a high cultural significance. Its success in Wiltshire however was also based geomorphological values, on the chalkland rivers of southern England which provided a reliable flow at a constant temperature and a good subsoil drainage.

Strategic Values- The reason that bedworks gained popularity and became profitable, despite the expenses to construct and maintain them, has to do with the ‘sheep and corn’ economy of that time. Sheep grazed on the meadows during the day and were moved to unsown arable fields during the evening to enrich the soil with their manure. This shows the relevance of the meadows in a bigger, more regional picture. A dialogue with another system that is x kilometers ahead.

Functional Values- The fields were usually irrigated a couple of times a year. During the winter months this would cause the grass to grow faster in the spring, providing an ‘early bite’ for livestock. The second irrigation would lead to a large hay crop which was used to feed the animals during the winter. So the sophistication of the whole system also provided an efficient way of production and profitability that contributed to the English agricultural wealth.



Figure 20
Painting of the meadows.
"Maintaining and working water meadows was a skilled art and water meadow downers enjoyed a high status amongst farm staff."

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Figure 1 - Conserving Historic Water Meadows. [Image]. Retrieved from <https://historicengland.org.uk/images-books/publications/conserving-historic-water-meadows/>

Figure 2 - Map of the United Kingdom, developed from <https://www.conceptdraw.com/How-To-Guide/uk-map>

Figure 3 - Map of England and Wales divided into federal states, developed from https://www.reddit.com/r/imaginarymaps/comments/kk6jex/england_and_wales_divided_into_federal_states/

Figure 4 - Map of the Water Catchment Area of the Avon, developed from Heppell, C. M., Binley, A., Trimmer, M., Darch, T., Jones, A., Malone, E., ... & Lloyd, C. E. (2017). Hydrological controls on DOC: nitrate resource stoichiometry in a lowland, agricultural catchment, southern UK. Hydrology and Earth System Sciences, 21(9), 4785-4802.

Figure 5-10 - Conserving Historic Water Meadows. [Image]. Retrieved from <https://historicengland.org.uk/images-books/publications/conserving-historic-water-meadows/>

Figure 11 - Climate Diagram, developed from <https://weatherspark.com/y/41638/Average-Weather-in-Salisbury-United-Kingdom-Year-Round>

Figure 12a/b - Rainfall Amount. [Image]. Retrieved from <https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2021/2020-statistics-round-up>

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Figure 14 - Regional Map of Harnham and the city of Salisbury. Drawn by Author.

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Figure 18 - Harnham Water Meadows Bedwork System in photographs. [Image]. Retrieved from <https://www.strollingguides.co.uk/books/wiltshire/places/harnham.php>

Figure 19 - Details and Circularity Sketch. Drawn by Author.

Figure 20 - Two views of hatches and carriers in the late nineteenth century by Edwin Young. [Image]. Retrieved from Cook, H., Cowan, M., & Tatton-Brown, T. (2008). Harnham water meadows: history and description (No. 3). Hobnob Press.