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Abstract

Over part of its course, the river Loire today presents an archetypal landscape. This is the royal river, with vineyards and châteaux listed as UNESCO World Heritage Sites since 2000. In this chapter it is demonstrated that the river presents other landscapes of interest, notably those of the Armorican Loire. This downstream section of the river made of river landscapes is characterised by the geomorphological constraints of the morphostructural system of the Armorican Massif. The valley, quite narrow, is bordered by hillsides, which sometimes forms steep slopes. The hydrosystem consists of a patchwork of geomorphic compartments (valleys, islands, multiple branches of the river, etc.). The promontories, which punctuate the river Loire, allow for remarkable oblique viewpoints which are still little known. The landscape of the Armorican Loire is also a lived space with diverse social uses around the river, which has progressively acquired heritage recognition. It is nevertheless important to avoid the phenomenon of heritage face.

Keywords

Loire Valley • River patterns • Lived space • Cultural heritage

7.1 Introduction

The inscription of the Loire Valley on the UNESCO World Heritage List in November 2000 contributed to shape its perception as the “last wild river in Europe” around landscape patterns which are recognised worldwide: a majestic and slow-moving river lined with royal castles behind which lie the gentle contours of famous vineyards (Fig. 7.1).

The construction of this image has induced a touristic boom around this World Heritage Site, i.e. along the 250 km of the Loire Valley located between the towns of Sully and Chalonnes.

The Loire Valley is an outstanding cultural landscape of great beauty, containing historic towns and villages, great architectural monuments (the châteaux) and cultivated lands formed by many centuries of interaction between their population and the physical environment, primarily the river Loire itself.

Criterion (i): The Loire Valley is noteworthy for the quality of its architectural heritage, in its historic towns such as Blois, Chinon, Orléans, Saumur and Tours, but in particular in its world-famous castles, such as the Château de Chambord.

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Fig. 7.1 Saumur castle (Credit: H. Davodeau)

Criterion (ii): The Loire Valley is an outstanding cultural landscape along a major river which bears witness to an interchange of human values and to a harmonious development of interactions between human beings and their environment over two millennia.

Criterion (iii): The landscape of the Loire Valley, and more particularly its many cultural monuments, illustrate to an exceptional degree the ideals of the Renaissance and the Age of the Enlightenment on western European thought and design.

Source : <http://whc.unesco.org/en/list/933>

In this article, the authors intend to take a wider perspective in order to demonstrate that there are also other Loire landscapes which are less renowned because they belong to another section of the valley, more specifically the stretch of the Armorican Loire which lies between Angers and Nantes (Fig. 7.2).

7.2 Geographical and Geological Setting of the Loire Valley

To understand the Armorican Loire, one should consider this section of the Loire Valley as part of its drainage basin, notably regarding its morphostructural and hydrogeomorphological dimensions.

As shown in Fig. 7.3, the Loire river system can be subdivided into three functional parts (Schulé 2000): the Upper Loire (*haut bassin*), the Central Loire (*Loire moyenne*) and the Lower Loire (*Loire océane*).

7.2.1 The Three Loire

Upstream from the “bec de Nevers” (the confluence of the Loire and the Allier), the two rivers of the high drainage basin run parallel. Their sources both lie in the Cévennes (medium-altitude Mediterranean mountains) and their flows are irregular, being strongly influenced by the climate and landscape of the Cévennes, but also practically equivalent in terms of discharge (150 m³/s for the Allier, 182 m³/s for the Loire at the confluence). The term “cévenol regime” is used to describe the regimes of both these rivers.

Downstream from Nevers, between the Nivernais and Touraine areas, the Loire leaves the Massif Central and enters the Paris Basin, where it opens out into the wider floodplain of the Loire Valley. The river landscapes of both sections are subject to similar flows and river regime to those described for Nevers. In Orleans, for instance, the discharge is only 350 m³/s.

Downstream from Tours, the shape of the river is changing. The term *Loire océane* (“Atlantic Loire”), suggested by Schulé (2000), refers to the arrival of the river in a region exposed to a maritime oceanic climate. Schulé also suggests that the Atlantic Loire may in turn be subdivided into four functional sectors: the Touraine Loire, the Saumur Loire, the Armorican Loire and the Loire Estuary.



Fig. 7.2 The île Batailleuse (an island near Saint-Florent-le-Vieil) (Credit: N. Carcaud, 12/2012)

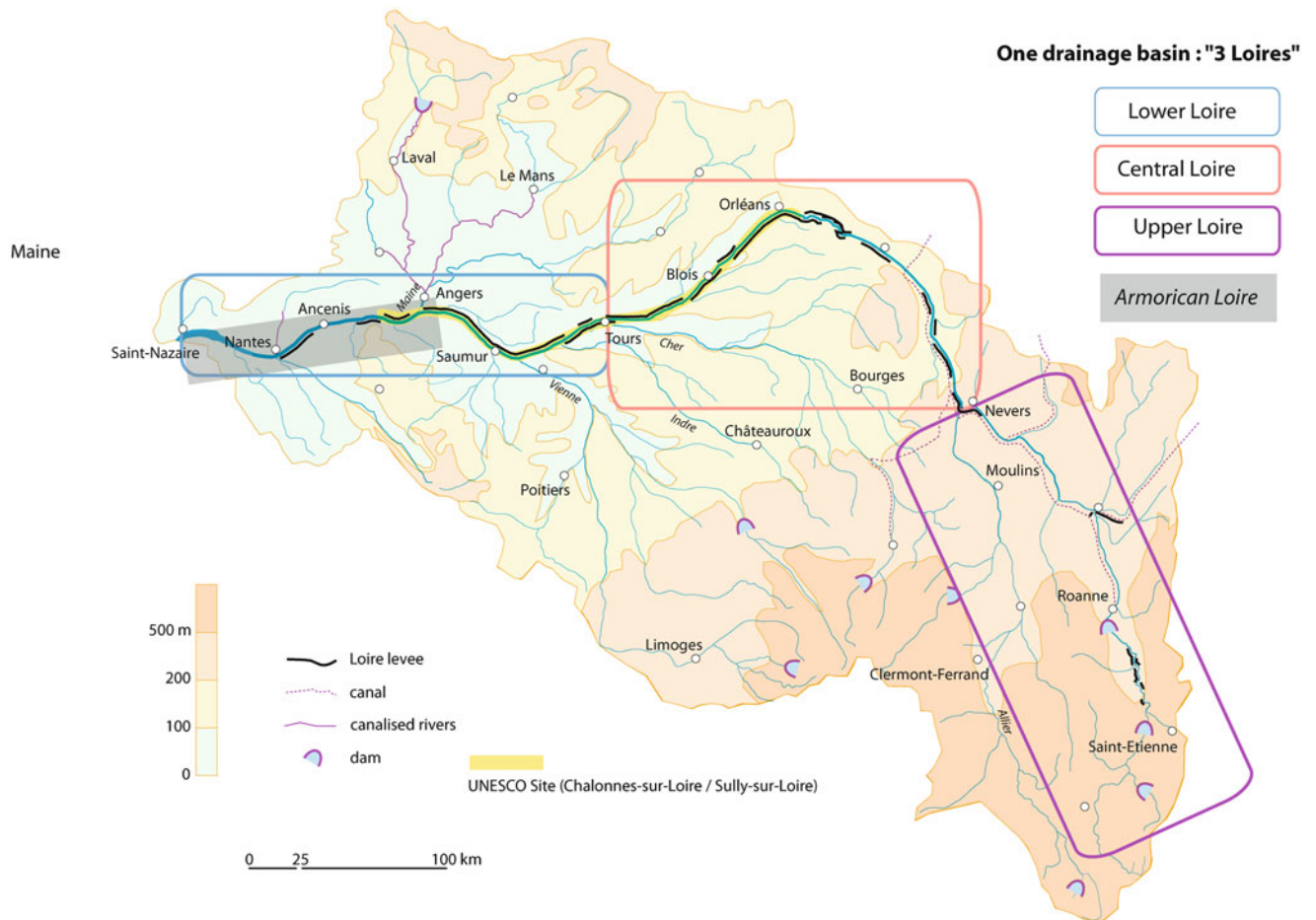


Fig. 7.3 The lower (Atlantic) Loire in the drainage basin of the river Loire (Credit: N. Monnier and N. Carcaud)

The Touraine Loire is characterised by several confluences. Three tributaries join the Loire over a distance of less than 60 km: the Cher (discharge $90 \text{ m}^3/\text{s}$), the Indre (discharge $20 \text{ m}^3/\text{s}$) and above all the Vienne (discharge $200 \text{ m}^3/\text{s}$). The flow of the Loire is thus almost doubled and strongly influenced by water from the Limousin Region, notably from the Millevaches Plateau, and therefore by medium-sized maritime mountains. There are no major tributaries along the Saumur Loire (the discharge at Saumur is $698 \text{ m}^3/\text{s}$), but this section remains influenced by the increased discharge of the Touraine section of the Loire thus allowing the river to open up a wide floodplain in the Authion Valley. It is at the end of this valley that the river leaves the Paris Basin and enters the Armorican section of the Loire. The last major confluence (the Maine) is to be found downstream from Angers. The river Maine leaves a drainage basin, which is quite distinct from the previous ones since its waters come from the crystalline plateaus of the Perche and the sedimentary plateaus of Normandy, with typically maritime landscapes and climates and an average discharge of $120 \text{ m}^3/\text{s}$. The Maine and its drainage basin impose a different hydrological rhythm and new constraints on local populations living along this section of the Loire. The Loire Estuary is even more radically different. The limit of the estuary has varied over time. Today it is located at Ancenis, which marks the limit of tidal influence. This part of the Loire is subject to numerous threats.

7.3 The Armorican Loire and Its Specific Landscapes

7.3.1 The Armorican Massif: A Source of Constraints

As the Loire runs through the Armorican Massif, it crosses a rigid morphostructural system, which is reflected in the shape and course of the river valley. The Armorican Massif was affected by the Cadomian (about 600 Ma) and Hercynian deformations (about 300 Ma). It is a polygenetic mountain range with Appalachian morphology. Outcrops reveal its basic metamorphic terrains with granite injections and Palaeozoic “syncline folds”. The Loire crosses a series of eroded structures which today correspond, in most instances, to sedimentary basins separated by large-scale-oriented structures which have reinforced the separation of these basins (Fig. 7.4) (Alcaydé 1990; Sellier 1986).

The broken line of the Armorican Loire Valley is a result of the underlying tectonic framework. Similarly, the contrasting lithology created by these tectonic movements provides a fundamental explanation for the shape of the valley. After Ponts-de-Cé (the point at which the river enters the Armorican Massif), the valley narrows to a width of just 1.5 miles. Downstream, apart from the two main narrow points at Denée (1 mile) and Champtoceaux (0.8 mile), the morphological fea-

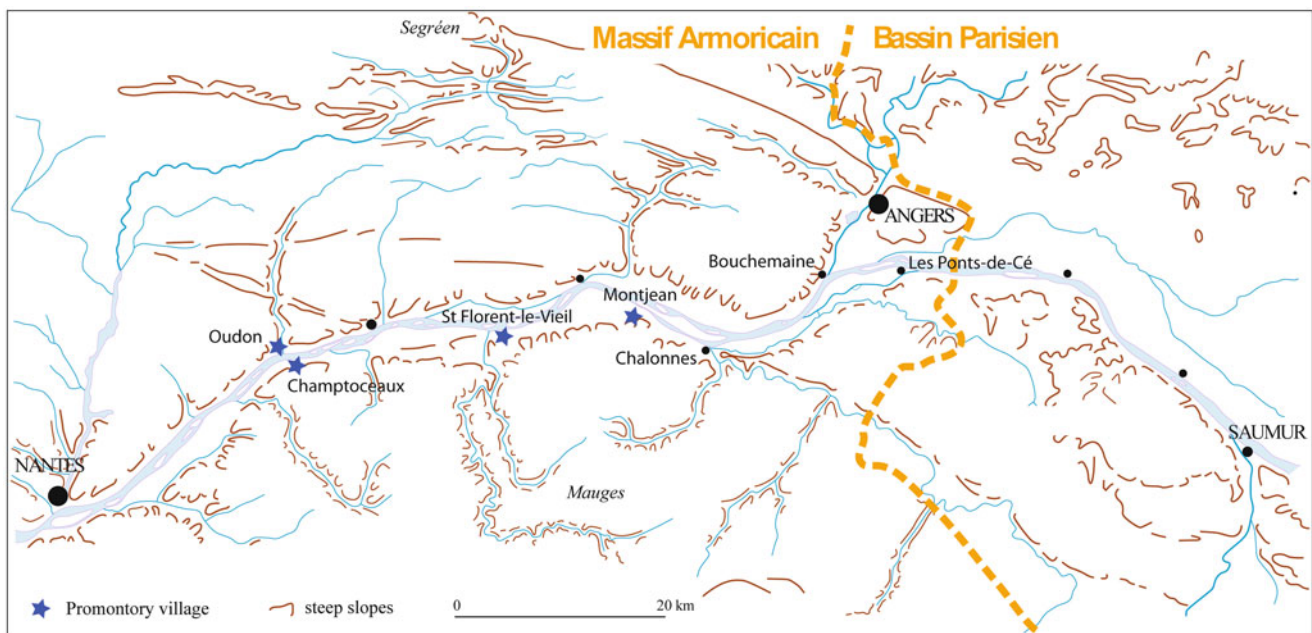


Fig. 7.4 The Armorican Loire and its specific features: islands, valleys and promontories (Credit: N. Monnier and N. Carcaud)

tures of the valley remain more or less homogeneous. In the Segréen and Châteaubriant plateaus towards the North and in the Mauges plateau towards the South, the river has generally cut convex hillsides, which locally form steep slopes and cliffs. This is notably the case on the left bank of the river where it narrows at Ponts-de-Cé (Mûrs-Erigné cliffs), and also on the Bouchemaine/Chalonnnes-sur-Loire section of the river (Corniche Angevine and the Coteau de Savennières hillsides), or at the Champtoceaux river gorge (Fig. 7.5a–c).

7.3.2 A River Regime Marked by Temporal Irregularity

As is the case for all “maritime” rivers, the Loire merely appears more stable from a statistical point of view. The river still presents considerable behavioural instability with alternating periods of water abundance and shortages. The water monitoring station at Montjean-sur-Loire provides an accurate picture of the Armorican Loire. The river regime (measured from 1900 onwards) reveals an average yearly discharge of 875 m³/s. The maximum annual flow occurred in 1910 (1,960 m³/s), the same year as the greatest flood (6,330 m³/s); the lowest discharge occurred in 1949 (282 m³/s) with the lowest water level of the century. The annual variation in flow is thus within the range of 1–6.95. Floods have also periodically occupied the Loire landscape. On average there is a flow of 4,500 m³/s once every 5 years. The highest floods per decade are over 5,300 m³/s. The flood levels of December 1910 and December 1982 return on average at least every 50 years.

7.3.3 A Mosaic of Fluvial Landforms

Regarding its hillside morphology, the *Atlas of Maine and Loire Landscapes* and the *Atlas of Loire Atlantique Landscapes* describe the Armorican section as the “Loire of promontories” (Conseil Général de Maine-et-Loire 2003). Its hydrosystem consists of a patchwork of interdependent and dynamic geomorphic compartments formed at different temporal and spatial scales, which offer a wide range of possibilities for human life (Fig. 7.6).

In the floodplain, we find the “*Val de Loire*” as defined by Dion (1961). Between Nevers and Nantes, it covers a considerable surface area of 133,750 ha, a large part of which is today equipped with levees which substantially reduce the floodplain. Between the *Bec d’Allier* and Nantes, over a distance of 487 km, there is linear protection of 484 km, covering 72 % of the floodable area. A reconstruction of the landscape of the Loire Valley before the building of the levees would reveal two large morphodynamic units. The riverbanks are protected from annual floods. Of variable width, these

levees are regularly interrupted by breaches created by the Loire corridors. Lateral depressions of various widths are formed by overflow areas, which are naturally flooded during the annual breaching of the banks. These depressions called “*vals*” are currently occupied by a Loire tributary whose connection with the main channel is obstructed by the bank ridges. Smaller ridges, formed by the remains of a very low Quaternary terrace, sometimes rise several metres above the lateral depression (Arnaud-Fassetta et al. 2010).

In the Armorican Loire River, the “*vals*” lose some of the size they reach in the Saumur section of the river. Their surface area is around 1,000–2,000 ha as against 34,000 ha in the Authion Valley. The latter were the last valley sections to be equipped with “unsinkable” levees during the second half of the nineteenth century.

Between the levees and the valley sides, the low-water channel is often straight with an average width of 1,000 m. This is a physical river landscape dominated by a moving bed load, a type of hydrosystem which is stable during historical times but subject to annual channel adjustment limiting the river transport (Babonaux 1970). There are two main elements at work in this phenomenon: the islands and the multiple branches of the river. The islands occupy a lateral position and disperse the flow of the river towards branches in which there is a succession of pools and riffles, which can attain a considerable size (several hundred metres). Some of the branches are called *boires* or oxbow lakes (Fig. 7.7). During low-water periods, only the main branch is drained. It was in this multiple-channel system that engineers built the Armorican fluvial groins at the beginning of the twentieth century in order to facilitate the deepening of the main channel and thus allow river transport as far as Angers.

In the low-water channel of the Armorican Loire River, the submerged groins are certainly the most amazing landscape element. They consist of rock blocks placed perpendicular to the river axis, which emerge during low-water flows. These structures were built at the beginning of the twentieth century in order to create a navigable channel for large boats. Between Angers and Nantes, 700 groins border the low-water channel and still allow the river, at least downstream from Bouchemaine, to be recorded among navigable French watercourses. However, these groins did not allow the river to compete with the railways, which began to reach the Loire Valley towards the mid-nineteenth century. Despite fluvial transport continued until the 1980s with the last oil tankers, the groins were already obsolete when they were built.

The project of rendering the Loire navigable is now viewed as a nineteenth-century engineering utopia, and the groins and other hydraulic works are generally considered to have had a negative impact on the natural balance of the river environment. By favouring the digging of a navigation channel, the groins (along with the river sand mining industry which is today banned) decreased the low-water mark by 2 m on average and thus contributed to disconnecting secondary



Fig. 7.5 The promontories of the Armorican Loire: (a) Montjean-sur-Loire (Credit H. Davodeau 06/2012), (b) Saint-Florent-le-Vieil (Credit H. Davodeau 06/2012), (c) Champtoceaux (<http://www.champtoceaux.fr>)

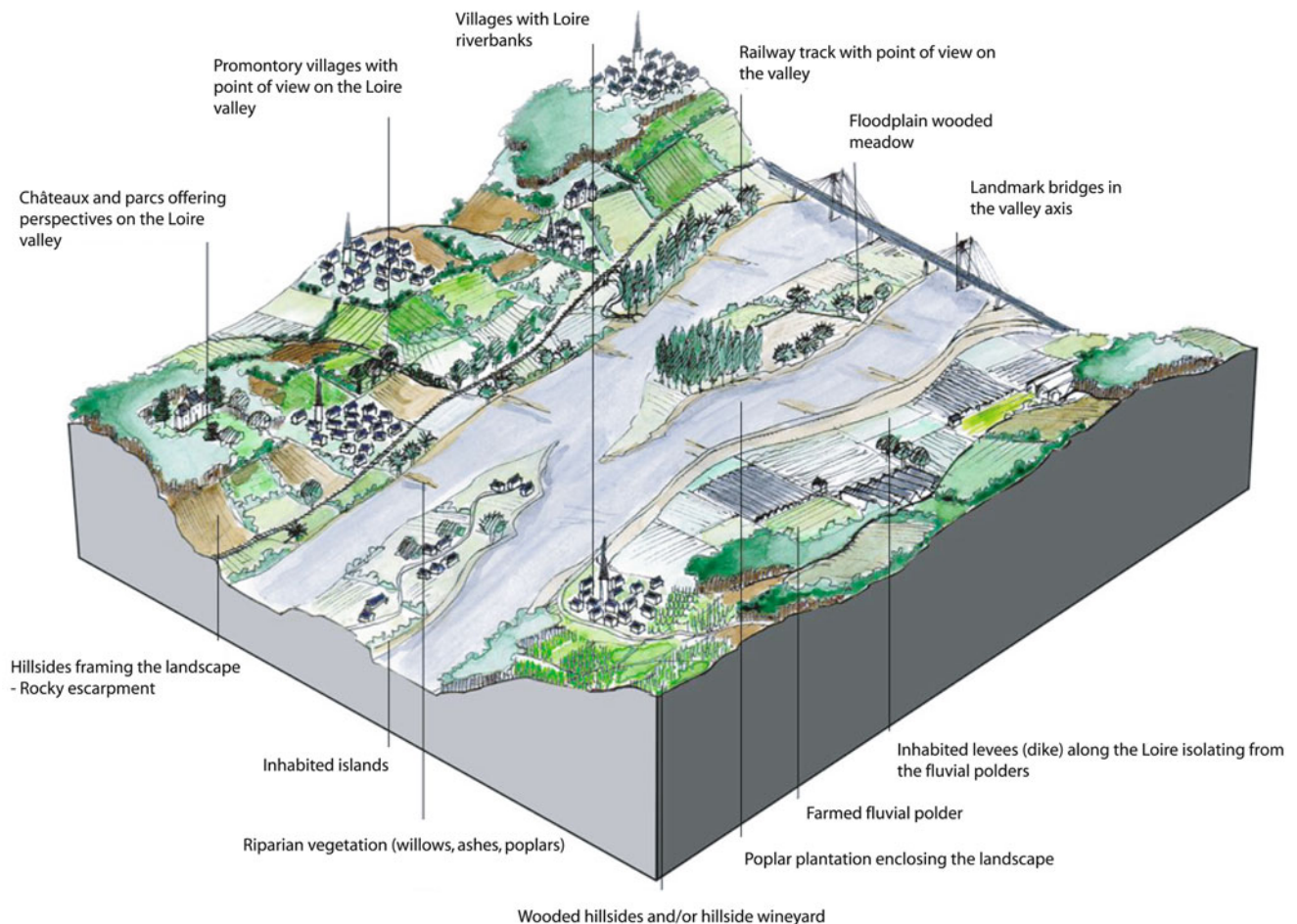


Fig. 7.6 3D diagram. The Loire of the Promontoires (Atlas des paysages de Loire-Atlantique 2012, with permission: <http://www.paysages.loire-atlantique.gouv.fr>)

branches from the main course of the river. The groins are thus today increasingly seen as a symbol of an era during which the river was outrageously altered and they are therefore the target of environmentally motivated political decisions: in 2009–2010 this led to experimental remodelling of the groins (they were shortened and lowered) which may be a first step to their complete removal. Whereas being criticised by politicians and more particularly by environmentalists, the groins are nevertheless considered useful by riverside residents of the Armorican Loire: not as navigational works but, for example, as observation points (they allow perpendicular access to the river), fishing swims (downstream swims are sheltered from the current) and as bathing spots (e.g. between two groins). The diverse uses of the groins raise the issue of local residents' and river users' attachment to the groins. Recently conducted surveys demonstrate that local residents, although they do not explicitly recognise any heritage value, nevertheless express a certain attachment to these hydraulic works, which surprising as it may seem are not considered as being contrary to the established image of the “wild river” (Davodeau et al. 2013).

The singular nature of the Armorican Loire is established through a series of contrasts with the Saumur and Touraine sections of the Loire. The former is darker (due to the schist), while the other two are brighter (due to the *tuffeau*, a whitish soft limestone); it has steeper valley sides with promontories in contrast with the wider valleys and horizons of the latter two sections. The resulting dichotomy is that of the “wild river” v. the controlled river (with its navigational groins), the Loire Châteaux and vineyards v. the popular industrial river, and thus, as a result, the Saumur and Touraine sections are viewed as a more touristic part of the Loire (the World Heritage Site, the Loire Anjou Touraine Regional Park) v. a more “ordinary” Armorican Loire.

7.4 The Advantages and Potential Risks of Heritage Status

The promontories, which punctuate the valley, allow for remarkable oblique viewpoints, which are much less frequent upstream. Historically, the rocky outcrops of the promontories



Fig. 7.7 Oxbow lake (Credit: N. Carcaud, 09/2008)

favoured the development of villages and towns located in the immediate vicinity of the river and yet protected from its vicissitudes. Situated outside the perimeter of the UNESCO Heritage Site and relatively distant from the two main urban centres of Angers and Nantes, these small rural communities are not subject to intensive tourism. The promontories have therefore not been promoted in accordance with the touristic potential of their panoramic viewpoints. Montjean, Oudon and Saint-Florent-le-Vieil (the birthplace of the famous French writer Julien Gracq) certainly offer scenic viewpoints but they are mostly visited by locals.

7.4.1 A Living Loire

The distant and panoramic views from the promontories are less representative of local habits than the close-knit links at the foot of the valley sides between local residents and their river. The Loire is not so much a spectacle appreciated from above but rather a constant “presence” which locals seek from below, near the riverbanks. This contact with the river is facilitated by the perpendicular groins, which allow access to the centre of the river. The diverse social uses on and around the groins, the “flood culture” which has developed on the large inhabitable islands and specific activities like playing bowls in the river sand (much less well known than *boule de fort*, which is an indoor version of the game, typical to the Anjou region further upstream) testify to a certain Loire lifestyle which may be observed along the whole length of the river but with greater intensity and authenticity along the Armorican Loire (Fig. 7.8).

7.4.2 The Current Heritage Process

The international recognition of the heritage value of the Saumur Loire has perhaps provoked confusion, jealousy and a feeling of injustice among some local politicians who would like to have seen their communities benefit from the same Heritage Status. The heritage area would have greater geomorphological consistency if it had excluded the 15 km stretch of the *Corniche Angevine*, which is already protected under a 1930 French statute relating to natural sites (2003) and which is today the largest protected area (2,400 ha) along the Armorican Loire between Angers and Nantes. Outside this stretch, the regulations pertaining to historical monuments or the protection perimeter for urban and rural sites allows for the protection of the greatest monuments or architectural ensembles. Despite being outside the World Heritage Site, the landscapes of the Armorican Loire have nevertheless progressively acquired heritage recognition. Apart from its buildings, the natural landscape of the Armorican Loire enjoys indirect protection aimed at protecting biodiversity (Natura 2000) or benefits from the banning of any construction work in areas prone to flooding (through a French national plan for the prevention of flooding). Such regulations reinforce the local power of state services and ensure more effective protection than any extension of the Heritage Status perimeter requested by some local politicians, since the Heritage Status provides no specific regulation. They also provide more effective protection than any regional park, which might be created along the Armorican Loire (along the lines of the Loire Anjou Touraine Regional Park along the Saumur stretch of the Loire).



Fig. 7.8 Another function for the groins: an access to the river (Credit: N. Carcaud, 02/2012)

7.4.3 The Risks of Heritage Status

The need for recognition of the Armorican Loire could result in a “heritage race” which we believe presents certain risks: firstly, because the existing regulations are already very demanding, and, secondly, because it could be detrimental to the intimate relationship with the river which we consider to be one of the virtues of this very lively section of the Loire Valley. The “race for Heritage Status” does not appear to be the best response to a legitimate need for recognition because it could result in the opposite effect due to the risk of erasing the specific lifestyles of this section of the valley in order to conform to dominant representations of the river and thus lead, above all, to a reduction in the liveliness of these places. *When I walk down the streets of Saint-Florent or when I walk along the banks of the Loire I am surprised by the absence of games and children shouting in those places where, at the age of eight or ten, my gang spent their lives on the quayside or in the bushes which lined the river banks. At that time the submerged groins of the navigable Loire were being built: big piles of chestnut hurdles lay on the slipway: one of our favourite games was to climb up and then jump down from as high as possible onto the cobblestones of the quay* (Gracq 1967).

7.5 Conclusion

The geomorphological particularities of the Armorican Loire have given rise to landscapes, which do not quite correspond to the world-famous image of the Loire Valley. It would be

futile to try to deploy public measures in order to reduce the gap between the reality of life along the river and the dominant representations of the river, since, beyond their physical appearance, these specific landscapes, which possess their own qualities, express, above all, a certain lifestyle along the river. It is this relationship, which must be preserved and placed at the heart of public policies, which today takes as its reference point all Loire landscapes whether Armorican or non-Armorican.

Acknowledgement We would like to dedicate this chapter to our cartographer N. Monnier, who passed away recently (2011).

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