

Fresh Water in Roman Law: Rights and Policy*

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ABSTRACT

Fresh water came from a variety of sources, streams and springs as well as aqueducts. Much of the Roman law on fresh water concerns its supply, regulating rights to use it with a variety of legal institutions from public and private law (e.g. ownership, servitudes, interdicts). The study of fresh water has usually followed the legal categories, segregating the public water supply from water that was private property, and consequently segregating different types of evidence. In this paper varied evidence is analysed using the ‘bundle’ approach, an analytical framework from legal scholarship on rights in the environment, in which water rights are not monolithic but are represented by component rights, including rights of access, withdrawal, management, exclusion and alienation. Analysing component rights in fresh water reveals significant continuities in the Romans’ regulation of it and the impact of this regulation. Although there was no centralized water administration in the early Empire, Romans took a systematic approach to regulating fresh water based on consistent working principles and policy priorities.

Keywords: Roman law; water rights; policy; aqueduct; fresh water; property; public

I INTRODUCTION

Fresh water was a valuable resource in the Roman world, that came from sources both man-made (aqueducts) and naturally occurring (rivers, streams, lakes). Romans used fresh water for a variety of productive activities, such as irrigation and milling.¹ The Roman state also had interests in fresh water, both financial (e.g. tax revenue derived from agriculture) and ideological (e.g. imperial benefaction in hydraulic construction). Yet, it appears that fresh water was largely unregulated, because emperors issued little legislation on it until the late law codes.² Other types of evidence, however, are available for the early Empire, roughly from Augustus through the Severan jurists (27 B.C.–A.D. 235), including Frontinus’ treatise on the aqueducts, municipal laws, and the writings of the Roman jurists in the *Digest of Justinian*. Even if there was no centralized administration of water, the evidence is sufficient to reconstruct the rights regime in fresh water as well as the policy and working principles that guided it.³

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¹ Shaw 1984: 135–51; Thomas and Wilson 1994: 157–71; Morley 1996: 103–7; Horden and Purcell 2000: 59, 237–57; Wikander 2000a and 2000b.

² Bruun 2012; Jaillette and Reduzzi Merola 2008: 236–7.

³ No centralized regime: Zoz 1999: 89–90. Gualandi 2012, 13–42 demonstrates that the jurists recognized consistent principles in imperial constitutions and rescripts, but there are too few examples addressing water rights to discern policy.

Roman discussions of fresh water begin in Republican literature with the assumption that it should be free and open to all.⁴ Cicero listed running water, *aqua profluente*, first among the common goods that all humans share (*Off.* 1.52). The phrase, *aqua profluens*, is neither a common nor an exclusive expression nor is it a legal term.⁵ *Aqua viva* is similarly restricted, used for ‘spring’ primarily by surveyors when marking boundaries.⁶ Romans recognized fresh water as a diverse resource, most simply defined in contrast with the sea (e.g. Varro, *Rust.* 3.17.3). More commonly they referred to it by the name of a particular water feature, e.g. *amnis*, *lacus*, *flumen*, *rivus*.⁷ But fresh water could also have a man-made source, such as an aqueduct. The usage of *rivus* and *lacus* reflects the intersection of natural and man-made, as does the Romans’ hydraulic infrastructure: aqueducts were fed by springs, springs were regularly improved, and rivers were often dammed to facilitate diversions.⁸ Likewise both natural and man-made sources of fresh water were endowed with ideological meaning through military conquest and imperial government.⁹ Despite the lack of a single term or definition, the Romans saw in fresh water a resource to be regulated and organized for the benefit of individuals and the state.

The earliest evidence for law on fresh water concerns its removal rather than supply. The *actio aquae pluviae arcendae* protected landowners from damaging run-off already in the *Twelve Tables* (c. 450 B.C.). The *Twelve Tables* also dealt with the supply of fresh water through the servitude for *aquaeductus*, a type of property right in water.¹⁰ But there was much diversity in the legal treatment of fresh water. First, it could be governed by both property and personal (or contractual) rights. In this respect, aqueducts were distinguished from natural sources, since water from the aqueducts was typically governed by personal rights while water from natural sources was treated as property. But the distinction between personal and property rights was not systematized until the Severan era.¹¹ Within property law itself, the treatment of fresh water is even more complicated because it was assigned to different categories that were neither clearly defined nor mutually exclusive. Roman property categories began from the distinction between things subject to human law and those subject to divine law.¹² Within human

⁴ Plaut., *Asin.* 198 and *Rud.* 434, with Cangelosi 2014: 63–81. Similar view of the sea and its shores, e.g., *D.* 7.4.23 Pompon. 26 *ad Q. Muc.*, and Cic., *Top.* 32, with Fiorentini 2003: 417–26; De Marco 2004: 23–41.

⁵ *Aqua profluens* occurs three times in the *Digest of Justinian*: twice in Labeo’s discussion of the *actio aquae pluviae arcendae* (*D.* 39.3.1.20 and 22, Ulp. 53 *ad Ed.*) and once in Marcian’s well-known list of *res communes* (*D.* 1.8.2.1 Marcian. 3 *Inst.*), where it means running water without a technical legal term: Zoz 1999: 40–1. In non-legal contexts *fundo* and *profluere* commonly describe running water (e.g. Cic., *Q.Fr.* 3.1.3; Ovid, *Ars* 3.62; Pliny, *HN* 4.4).

⁶ Campbell 2000: 534 indexes twenty-six examples of *aqua viva*. In the *Digest of Justinian*, *aqua viva* occurs twice, both times of a perennial source governed by a servitude: *D.* 43.22.1.4 Ulp. 70 *ad Ed.*, *D.* 43.24.11 pr Ulp. 71 *ad Ed.*, with Grosso 1969: 114.

⁷ *Aqua profluens* in some legal contexts may be equivalent to *flumen*, see De Marco 2004: 23–4.

⁸ *Lacus* for natural lake, e.g., *D.* 8.2.28 Paul. 15 *ad Sab.* [private], *D.* 43.14.1 pr Ulp. 68 *ad Ed.* [public]; for man-made basin, e.g. *D.* 43.22.1 pr Ulp. 70 *ad Ed.* and Front., *Aq.* 3.2, with Rodgers 2004: 137; ambiguous examples, e.g., *D.* 43.15.1.6 Ulp. 68 *ad Ed.*, *D.* 43.21.3.3 Ulp. 70 *ad Ed.* On the usage of *rivus*, see Fiorentini 2003: 105; Campbell 2012: 34–5, 87. On the development of springs for aqueducts, see Hodge 1991: 72–8.

⁹ Purcell 1996.

¹⁰ *XII Tab.* 7.7 (Fest. p. 371 M) and *XII Tab.* 7.6 (= *D.* 8.3.8), with Watson 1975: 161–4.

¹¹ The distinction between personal and property rights to water (*D.* 43.20.1.43 Ulp. 70 *ad Ed.*) was an innovation of the Severan era, according to Maganzani 2004: 189. Earlier evidence is indecisive. For example one *senatus consultum* cited by Frontinus refers to rights on the aqueducts as *haustus* (i.e. a rustic praedial servitude or property right), assuming correct emendation of Front., *Aq.* 108, with Rodgers 2004: 290–1. The verb *haurire* in Front., *Aq.* 129.11 may not have the technical meaning of *haustus*. For more blurring of categories when the language of sale (property) was used for contractual (personal) rights in public law and contracts, see Mommsen 1885.

¹² Gaius, *Inst.* 2.1.2, 9–11, with Zoz 1999: 20–6; De Marco 2004: 12–18. When Justinian (*Inst.* 2.1 pr–2) adopts Gaius’ categories he adds *res extra commercium* (things that cannot be subject to economic transactions) and *res*

law, property could be either private (*res privata*) or public (*res publica*) or no-one's property (*res nullius*).¹³ Fresh water could and did fall under all these categories in Roman law. For example, a spring on land owned by an individual was considered private property whereas a stream on *ager publicus* was public property.¹⁴

Property categories were important in defining rights to fresh water because they affected the legal remedies available to protect those rights. Sacred springs, for example, were for the most part governed by religious law because they were classified as sacred property, *res divini iuris*, in contrast to property subject to human law, *res humani iuris*.¹⁵ For *res humani iuris*, there were separate remedies for public and private property. For example, disputes about fresh water sources were resolved through *vindicatio* only when private property was at stake. And decisions about when to apply the praetorian interdicts depended on property categories because some interdicts protected only public property, others only private property.¹⁶ An interdict was a legal remedy implemented by the praetor that protected an individual's interest in property. Several interdicts applied to fresh water, and there is extensive juristic commentary on them. Yet there was no universal definition of public fresh water, although the jurists agreed about public rivers, that they had to flow year round.¹⁷ While 'public' might seem to be a self-evident concept, Romans — especially the jurists — debated its meaning and scope.¹⁸

In the legal sources, public water generally was characterized by the notion of shared use, an idea formulated by Ulpian as *usus publicus*.¹⁹ The same notion informs the category of *res communes*, as defined by Marcian: 'air, running water, the sea and with it the sea shore, these things are in fact common to all by a sort of natural right', 'et quidem naturali iure omnium communia sunt illa: aer, aqua profluens, et mare, et per hoc litora maris' (*D.* 1.8.2.1 Marcian. 3 *Inst.*). Marcian's expression recalls Cicero and his philosophical approach, and it also evokes public property which was also to be shared by all, although it is not clear whether Marcian meant to assimilate the categories.²⁰ For fresh water, shared use is most often associated with public rivers, which the jurists describe as open-access, to borrow a modern term.²¹ Yet the jurists invoked shared interests in fresh water most often when they discussed regulating it (i.e. when it was not treated as something to be shared freely), for example, in applying the interdicts to restrict use of a public river. Throughout the period of Classical Roman law, public property had a dual nature — open-access and regulated — and perhaps for this reason public property generated a good deal of discussion among the jurists, most of it focused on defining the categories. The jurists' focus on categories may result from the importance of the interdicts in regulating fresh water or efforts to accommodate the *ius civile* to property regimes in the provinces before A.D. 212. Or it may reflect their

extra patrimonium (things not owned by humans) which describe both some public property and all property subject to divine law, see Zoz 1999: 17–20.

¹³ Property belonging to no-one is designated as *res nullius* when under human law but *res nullius in bonis* when under divine law, see Thomas 2002: 1447–8, 1457–62.

¹⁴ Franciosi 1997: 12; Fiorentini 2003: 103–5; the situation of public rivers was more complicated, see Fiorentini 2003: 87–9.

¹⁵ Gaius, *Inst.* 2.3–8 with Kaser 1971: 377–80.

¹⁶ Di Porto 1994.

¹⁷ *D.* 43.12.1.3 Ulp 68 *ad Ed.*, with Fiorentini 2003: 75, 87–90, 100–5; De Marco 2004: 103–11, 187–8.

¹⁸ Daube 1973 examines self-understood concepts in Roman law but not 'public'.

¹⁹ Zoz 1999: 18–20; De Marco 2004: 76–88, 184–9.

²⁰ Marcian formulates ideas long present in the legal discussions, even if this passage was changed in compilation: De Marco 2004: 18–29; Zoz 1999: 40–3. Marcian's list of *res communes* was adopted in post-Classical law, although without clarifying its relation to *res publicae*, Just., *Inst.* 1.2.1 pr–2, with Zoz 1999, 11–14, 18–20, 24.

²¹ e.g. *D.* 8.3.17 Papir. 1 *Const.*; *D.* 39.2.24 pr Ulp. 81 *ad Ed.*; *D.* 43.20.3.2 Pompon. 34 *ad Sab.*; discussed in Section IV of this paper on public natural sources.

academic debates about abstract legal notions or the effects of compilation. Scholars have mostly followed the jurists in examining the definitions of property categories and the views of individual jurists, without finding much systematization.²²

The focus on property categories generally and on public property in particular has proved inadequate to understanding the regime of water rights in Roman law. The problem is particularly clear in the treatment of public rivers. Since the category of *res publicae* is defined as free and open to all, public rivers should be open-access. Yet the jurists recognized regulation through the praetorian interdicts as well as imperial rescripts and senate decrees. While some primarily older scholarship attempted to resolve the inconsistency one way or another, the current consensus view endorses the disjunction.²³ This paper offers a broader rationale of rights in public water that transcends property categories, bridging legal and historical scholarship on water rights. Historians tend to discuss civic aqueducts as a feature of imperial administration, using inscriptions and Frontinus primarily.²⁴ Legal scholars focus on legal concepts treated in the imperial codes and the *Digest of Justinian*.²⁵ Some studies address both kinds of evidence, but none offers a co-ordinated examination of both public and private water rights.²⁶ This paper takes a new approach to property law that both moves beyond property categories and combines different types of evidence to uncover continuities in the treatment of various types of fresh water.

II A NEW APPROACH TO ROMAN WATER RIGHTS

The new approach here applied to Roman water rights treats rights as a ‘bundle’, a concept drawn from legal scholarship on property rights, specifically ownership. Roman economic and legal historians have recognized that property law was a critical tool in the Romans’ exploitation of other natural resources, and that ownership in Roman law was not monolithic.²⁷ Ownership was described by Honoré in a well-known article as a ‘bundle of sticks’ or component rights, such as residual rights or a right to alienate.²⁸ More recently, scholarship on contemporary environmental law has adapted the bundle approach to environmental resources. This ‘environmental bundle’ typically includes rights of access, withdrawal, management, exclusion and alienation.²⁹ A person with a right of exclusion can bar others from entering into (access) or taking from (withdrawal) the resource. For example, on a river, a right of access might mean travel by boat on the water whereas withdrawal could involve diverting the water into a field for irrigation.³⁰

²² e.g., Fiorentini 2003; Zoz 1999; Capogrossi Colognesi 1999. Exceptions are Maganzani 2004, who observes an overlap between public and private water rights, and De Marco 2004, who argues for the inadequacy of categories.

²³ Alburquerque 2002: 284–9 recaps the scholarship. Only De Marco (2004) moves beyond the categories, charting the development of the notion of *usus publicus* as a working principle of the jurists that unifies their treatment of public property. Fiorentini (2003: 113) notes the jurists’ lack of interest in categories. Maganzani 2004 points to overlap between public and private water rights.

²⁴ e.g., Eck 1987; 1995; De Kleijn 2001; an exception is Maganzani 2004.

²⁵ e.g., Zoz 1999; De Marco 2004.

²⁶ Scholarship bridging legal and historical approaches includes Bruun 2015; Capogrossi Colognesi 2014; Kehoe 2008; Maganzani 2004; Fiorentini 2003; Franciosi 1997.

²⁷ e.g., Kehoe 2007; 2008; on Roman ownership, Jakab 2015: 110–12.

²⁸ Honoré 1961.

²⁹ Notably Cole and Ostrom 2012: 39–41.

³⁰ Fishing rights are distinct from the right to withdraw water but treated similarly: on private property, fish were considered part of the ‘equipment’ of a rural estate just like the ponds and pools in which they swam (*D.* 19.1.15 Ulp. 32 *ad Ed.*; also the slaves who tended them, *D.* 33.7.17.1 Marcian. 7 *Inst.*). Public rivers, lakes and the sea were open to all for fishing, although the fishing on some lakes was also contracted out to *publicani*, see Fiorentini 2003: 381–9, 461–83.

A right of management means the power to construct and maintain the physical infrastructure necessary for, for example, exercising rights of access and withdrawal. A right of alienation empowers its holder to transfer ownership of the resource to another person or group. The bundle approach can be used to evaluate not only ownership itself but also other types of property rights, notably rights of use which were (and are) a common way of structuring rights in environmental resources. Often a right-holder (who may or may not be an owner) controls some of the component rights or shares control of these component rights with other individuals who use the same resource, for example, access to a river or withdrawal of water from a spring. The configuration of component rights varies situationally, depending on use of the resource as well as the interests of the right-holders.

This paper analyses rights in fresh water in Roman law using the environmental bundle as a guide, with a few other sticks from Honoré's bundle, especially the ban on harmful use. The 'bundle' approach has opened new perspectives on property categories (public, private, common) in contemporary scholarship on rights in the environment, in particular, Elinor Ostrom's work on Common Pool Resource (CPR) theory.³¹ CPR theory explains why some configurations of rights in common resources successfully mediate competition over resources (public or private), while others lead to the proverbial 'tragedy of the commons'. Rather than a discreet legal category, a 'commons' is a resource, public or private, that is open to shared use, difficult to regulate, and diminished by use.³² Common resources are usually regulated in some way, and the key question is, how are rights in them configured? The conditions for successful management of resources are that the rights regime be designed and implemented by local communities; in such systems, conflict is rare and easily resolved.³³ 'Local' community means the people who use the water, and group size is less critical to the success of a water regime than a community's ability to negotiate economic and social inequalities.³⁴ Similarly in the Roman world, 'local' water communities may be as small as two neighbours or as large as an irrigation community or a city. CPR theory offers a useful frame for Roman water rights because the dual nature of Roman public property corresponds to the modern concept of a commons. Also, in Roman law on private water rights, the jurists implement the principles of CPR theory often implicitly, as I have argued previously.³⁵ In this broader analysis of water rights, CPR theory explains the articulation of rights and, more generally, helps to diagnose problems in the regulation of both natural sources and aqueducts.

The aim of this paper is modest: to develop a conceptual basis for analysing conflicts over water, especially public water from both aqueducts and natural sources. Because the discussion focuses on legal rules and concepts, it is technical and idealizing to some extent, and its scope allows only a sketch of potential disputes. Indeed, rights regimes that fulfill CPR theory in contemporary communities often seem too good to be true. The competitive nature of Roman society, especially among its ruling élite, might seem to preclude the success of CPR solutions. But in fact social competition co-exists with and even strengthens the normative force of community designed rights regimes.³⁶ The configuration of rights in public sources is more prone to conflict, yet even here the Romans demonstrated an awareness of CPR principles, although they were not always able to apply them to minimize conflict over water, notably in the case of Rome's aqueducts.

³¹ The seminal work is Ostrom 1991.

³² Dietz *et al.* 2002: 17–18.

³³ Cole and Ostrom 2012: 39–41, 47–51.

³⁴ Cole and Ostrom 2012: 51; cf. Olson 1998; Baden 1998: 67–8.

³⁵ Bannon 2009: 103–16.

³⁶ Specifically in relation to Roman water rights, Bannon 2009: 110–16; Beltran Lloris 2006: 187, 193–4. Generally on cohesion and competition among the Roman élite, Hölkeskamp 2010: 98–106, and on the nature of communities that support commons principles, McCay 2002: 381–4.

The following discussion examines the configurations of rights to fresh water in four legal contexts, starting with ownership and servitudes (both governing private property) and followed by rights in civic aqueducts and public natural sources (public property). Analysing the component rights in fresh water reveals the underlying principles and priorities that guided the Romans' decisions about regulating this valuable resource. The analysis relies on a wide range of evidence: legal and historical literature, inscriptions, surveyors' writings, and Frontinus' treatise on the aqueducts. Combining such disparate evidence can be effective with careful contextualizing. The jurists' writings are especially important, not only because they are the primary source for the regulation of fresh water but also because they span the time periods of the other sources, providing a backdrop for continuity and change during the period of Classical Roman law (c. 27 B.C.–A.D. 235). For most of this era, until Caracalla's universal grant of citizenship in A.D. 212, the Empire was governed under mixed legal regimes: Roman citizens used the *ius civile* as did those with Latin rights while others relied on local or customary law. Roman property law applied only to land (and water) in Italy owned by Roman citizens. In the provinces, private property rights were defined by local law, while Roman public law governed most water resources because they were classified as public property. In these varied legal contexts, the jurists adapted water rights to local conditions, using the *ius civile* as a point of reference.³⁷ This process accounts for both their success in configuring water rights and the lack of a unified policy. It also generates some ambiguity in the notion of 'local', which may connote regional specificity or face-to-face groups (either small private groups or civic administration) or, in some cases, both. At the end of the Classical era, the jurists laid the groundwork for the co-ordinated regulation of water that emerges in later law and the imperial codes.³⁸ In the present paper, the bundle analysis of rights in fresh water shows that abstract property categories (e.g. public, private) are less significant for defining water rights than the articulation of component rights. This observation both clarifies our interpretation of Roman legal writings on water rights and corroborates scholarship on property rights in contemporary environmental law.

Ownership

In all periods of Roman law, water on the surface, underground, or collected in cisterns belonged to the landowner if the land was subject to *ius civile* ownership (*dominium*).³⁹ This was local control in the narrowest sense. The landowner held all five component rights in the environmental bundle: access, withdrawal, management, exclusion and alienation. These broad powers are justified by his interest in securing a supply to cultivate his land, but they are not unlimited. Landowners used various legal mechanisms to enforce their water rights, including the interdict *quod vi aut clam* and the *actio de dolo* as well as contracts of sale.

The landowner's rights to exclude others and control withdrawal can be traced to the Republican era through Pomponius' commentary on the writings of Quintus Mucius (cos. 95 B.C.). The case concerns the interdict *quod vi aut clam* and whether it could be used to protect water rights. With the interdict *quod vi aut clam*, a plaintiff could recover damages and costs to restore private property damaged by force or stealth.⁴⁰ In this case, the water

³⁷ e.g. Capogrossi Colognesi 1966: 82, 119–20; Capogrossi Colognesi 2014.

³⁸ For example, Ulpian's development of the concept of *usus publicus*, see De Marco 2004: especially 76–88, and for later regulation, Jaillette and Reduzzi Merola 2008.

³⁹ Water like other natural resources was considered part of the land in Roman law, e.g. in Sabinus' opinion about reeds, *D.* 33.7.12.11 Ulp. 20 *ad Sab.*, with Costa 1919: 1–12; Capogrossi Colognesi 1966: 58. The gift of a *fons* also shows ownership, according to Bruun 2015: 141 n. 36.

⁴⁰ *D.* 43.24.1 pr Ulp. 71 *ad Ed.* and *D.* 43.24.15.7 Ulp. 71 *ad Ed.*, with Kaser 1971: 1.409.

had its source in an underground spring on land owned by one person ('I') although it emerged on land owned by another person ('you'). What happens when you have diverted the water in some way ('eas venas incideris') so that it no longer comes to my land?

Si in meo aqua erumpat, quae ex tuo fundo venas habeat, si eas venas incideris et ob id desierit ad me aqua pervenire, tu non videris vi fecisse, si nulla servitus mihi eo nomine debita fuerit, nec interdicto quod vi aut clam teneris. (D. 39.3.21 Pompon. 32 ad Q. Muc.)

If water rises on my land that has underground sources from your estate, if you cut off those underground sources and for this reason water stops coming to me, you do not seem to have acted with force, unless a servitude is owed to me on this account, and you may not be bound by the interdict *quod vi aut clam*.

Both jurists agree that 'I' may not use the interdict unless 'I' have a servitude or a right to use water from 'your' spring.⁴¹ By denying the interdict, they affirm that the owner of the land ('you') also controls withdrawal and access to the water beneath it, just as he owns other things above and below the surface of his land.⁴²

The owner's control of water rights is directly connected with his interest in cultivation already in Republican commentaries on the *actio aquae pluviae arcendae* (AAPA). The AAPA protected rural land from damaging run-off only if it was caused by human intervention (not natural causes). Exceptions were made for activities aimed at cultivating the land (*fundi colendi causa*) but, as Mucius wrote, a landowner should improve his own land without making his neighbour's worse, 'sic enim debere quem meliorem agrum suum facere, ne vicini deteriorem faciat' (D. 39.3.1.4 Ulp. 53 ad Ed.). The principle applied to both keeping water out and to managing water on one's land, as Ulpian makes clear in a case about a spring. After the landowner dug around a spring on his land, it stopped flowing down to his neighbour's land. To recover the water, his neighbour tried to bring an action on fraud (*actio de dolo*), but was unable to do so because this action required intent to harm.⁴³ To demonstrate the lack of intent, Ulpian suggests cultivation as an alternative motive, qualifying it with an echo of Mucius' opinion: his digging could divert the spring as long as he aimed at improving his own land not at harming his neighbour, 'si non animo vicino nocendi sed suum agrum meliorem faciendi id fecit' (D. 39.3.1.12 Ulp. [Mucius] 53 ad Ed.; cf. D. 43.24.7.7 Ulp. 71 ad Ed.). Improving the spring was equivalent to trenching around trees: both counted as cultivation (D. 39.3.1.5 Ulp. [Mucius] 53 ad Ed.). In fact, any work or construction around the water supply could be interpreted as an expression of the owner's right to the water, as suggested by Labeo in a case about a well. A landowner could use the interdict *quod vi aut clam* against a neighbour who polluted his well:

Is qui in puteum vicini aliquid effuderit, ut hoc facto aquam corrumperet, ait Labeo interdicto quod vi aut clam eum teneri: portio enim agri videtur aqua viva, quemadmodum si quid operis in aqua fecisset. (D. 43.24.11 pr. Ulp. 71 ad Ed.)

A person who poured something into his neighbour's well in order to pollute the water may be held by the interdict *quod vi aut clam*, as Labeo says: for fresh water is a part of the land, just as if he had done work on the water.

⁴¹ The clause specifying a servitude, 'si nulla servitus mihi eo nomine debita fuerit', has been suspected as an interpolation, Levy and Rabel 1929–35: 3.97. If the clause is removed, the case is an even stronger statement of the owner's control of water as it would prohibit any use of the interdict. The landowner could grant access to such underground water with a servitude, e.g. D. 43.20.4 Iul. 41 Dig. and D. 43.20.1.27–8 Ulp. 70 ad Ed., with Capogrossi Colognesi 1966: 4 n. 10. Cf. D. 39.2.24.12 Ulp. 81 ad Ed. (a well in an urban setting).

⁴² The landowner also owned metals and earth products, e.g. D. 4.3.34 Ulp. 42 ad Sab., D. 19.1.17.6 Ulp. 32 ad Ed., D. 19.5.16 pr Pompon. 22 ad Sab., with Marrone 1971; Meincke 1971: 144.

⁴³ On *actio de dolo* and its requirement of harmful intent, see Kaser 1971: 628.

The phrase *portio agri* expressly identifies the water as part of the land, and Labeo's rationale connects the landowner's work with ownership of the water.⁴⁴

In addition to controlling the environmental bundle, the landowner also had exclusive right to alienate water sources on his land because it promoted agriculture. This right is confirmed by the treatment of servitudes, as will be discussed shortly, and also in inscriptions. For example, L. Vennius Sabinus gave to the town of Tifernum Tiberini a source and its water, 'fontem et conceptum aquae' (*CIL* XI.5942 = *ILS* 5761). An even clearer example of the right of alienation occurs in a long inscription recording the purchase by Mummius Niger Valerius Vegetus of a spring along with the land on which it arose, 'cum eo loco in quo is fons est emancipatus' (*CIL* XI.3003 = *ILS* 5771 ll. 5–6).⁴⁵ While outright purchase of a water source could incur high costs, it also provided the greatest security of the water supply for agricultural use as well as opportunity for additional profit from selling the water in turn to other users.⁴⁶ The owner also had a right to profits from the water when he delivered it in exchange for a fee.

Ownership afforded the landowner control of the environmental bundle of rights in water rising on or under his land. The rights of exclusion, withdrawal and management were assigned to the owner because they were directly related to the agricultural purposes served by the water: withdrawal and management contribute to cultivation while fruits represent its economic success. His broad authority was, however, limited by a prohibition on harmful use through the application of the *actio de dolo* and also in the AAPA. The prohibition provided a legal standard for negotiating conflicts that arose as neighbouring landowners exercised their bundle of rights. The owner's control of water rights was predicated on his interest in cultivation but it might not impinge on his neighbour's interest in doing the same.

Servitudes (Private Property, Rights of Use)

A servitude was a right of use that governed fresh water on private property. Three servitudes governed water rights: *aquaeductus* (the right to channel water), *haustus* (the right to draw water), and *adpulsus pecoris* (the right to water animals). They were treated as a type of property and were subject to the same legal mechanisms that applied to ownership.⁴⁷ Servitudes gave the right-holder nearly the same control of component rights as ownership. Like the landowner, the right-holder had legal power over access, withdrawal, management, fruits and alienation, as well as residual rights because these rights advanced agricultural productivity and encouraged local control of water sources.

The component water rights in servitudes and in ownership were treated similarly at least in part because servitudes developed from ownership. In its original form *aquaeductus* combined ownership of a water source with a right to channel the water across land owned by another person.⁴⁸ By the second century B.C. there were two other water servitudes, *haustus* and *adpulsus*, and all three were treated as incorporeal rights of use rather than corporeal property.⁴⁹ The servitude was attached to the dominant

⁴⁴ Franciosi 1997: 15. Similar usage of *portio* in *D.* 44.2.14.1 Paul. 70 *ad Ed.*

⁴⁵ Alienation of the spring, see Capogrossi Colognesi 1966: 88–96. For this inscription as evidence for ownership of water resources, see Eck 1987: 59.

⁴⁶ Bruun 2015: 136–41.

⁴⁷ The same legal mechanisms apply to rustic praedial servitudes as to other types of real property, for example, *vindicatio* (*D.* 8.1.4 pr Papin. 7 *Quaest.*; *D.* 8.3.5 pr Ulp. 17 *ad Ed.*; *D.* 8.5.2.3 Ulp. 17 *ad Ed.*), conveyances (*D.* 8.1.9 Cels. 5 *Dig.*; Gaius, *Inst.* 2.31), *actio in rem* (Gaius, *Inst.* 4.3), and the *actio communi dividundo* (*D.* 43.20.4 Iulian. 41 *Dig.*).

⁴⁸ On the early form of servitudes: *D.* 8.3.30 Paul. 4 *Epit. Alf.* and *D.* 18.1.40.1 Paul. 4 *Epit. Alf.*, with Capogrossi Colognesi 1966: 52–106; Grosso 1969: 14–18.

⁴⁹ Capogrossi Colognesi 1966: 103, 149–57.

estate, whose owner (the right-holder) had a right to use resources on the servient estate, an adjacent parcel owned by someone else.⁵⁰ A servitude had no term, a component right that was the same in ownership.⁵¹ The lack of term looks to reliability but it may also be related to agricultural productivity and local control, since it makes the water supply predictable and thus facilitates planning.

Most component rights were treated similarly in servitudes and ownership. But the owner of the source controlled the initial creation of servitudes through his right of access. He could grant as many servitudes as the source could support or, as Neratius wrote, 'si ... aquae sufficiens est'.⁵² Neratius does not define *sufficiens*, 'enough', but the qualification implies that the water was already in use and that the landowner considered the impact of the new servitude on pre-existing uses, in particular his own interests in the water supply. To a modern reader, 'enough' might suggest sustainability in a broad sense, but for the Romans it was probably defined more narrowly in terms of agriculture, as the primary use of water.

Once a servitude had been created, the right-holder controlled the right of access just like the owner of the source.⁵³ When more than two parties shared a source, they comprised the local community that controlled exclusion and withdrawal.⁵⁴ When a new servitude was created on a shared source, all parties should be consulted, in addition to the owners of the source, as Ulpian advised 'eorum in quorum loco aqua oritur verum eorum etiam ad quos eius aquae usus pertinet, voluntas exquiritur' (D. 39.3.8 Ulp. 53 *ad Ed.*). They all shared the right to exclusion because each risked the negative impact of an additional servitude on his right of withdrawal, 'cum enim minuitur ius eorum'.⁵⁵ Ulpian ends with a general comment putting right-holders and owners on an equal footing: both have a right to decide, whether their legal authority derives from ownership or a right of use, 'sive in corpore sive in iure loci'.⁵⁶ Equating ownership and servitudes might seem inconsistent, but it offers several advantages: conceptual simplicity, ease of application, and equity among those sharing the water. Ulpian's approach assumes a local, face-to-face community in which water users configure the rights regime rather than a centralized state system.

Local control was a typical approach to rights of withdrawal in servitudes. When there were multiple servitudes, all right-holders co-ordinated allocation of water, exercising their respective rights of withdrawal. For example, they could arrange a schedule and could be flexible in its implementation, swapping days or times.⁵⁷ When informal negotiation failed, right-holders could negotiate using a legal remedy modelled on the action to divide jointly owned property (a remedy applicable first to ownership).⁵⁸ While the recourse to local control may reflect path dependence, it could still have provided incentives and

⁵⁰ Grosso 1969: 110; Capogrossi Colognesi 1966: 96 n. 176.

⁵¹ Grosso 1969: 112–16. The lack of term is implied by the requirement of *perpetua causa*, that is, a servitude could be established only on a permanent resource.

⁵² cf. D. 8.4.15 Paul. 1 *Epit. Alf.* (right of way) and D. 43.20.1.3–4 and 30–1 Ulp. 70 *ad Ed.*, with Bannon 2009: 51.

⁵³ e.g., the same rule about digging applied to owners and right-holders, D. 43.20.1.27 Ulp. [Labeo] 70 *ad Ed.*

⁵⁴ More than two parties ('pluribus per eundem locum concedi') to a servitude for *adpulsus* could determine the terms of its exercise, D. 43.20.1.18 Ulp. [Treatatius] 70 *ad Ed.*

⁵⁵ The case addresses servitudes not public grants, according to Fiorentini 2003: 234–5. The disagreement between Labeo and Proculus in D. 8.3.24 Pompon. 33 *ad Sab.* may address the same question, although that case probably involves using water from a servitude on land other than the servient estate, see Capogrossi Colognesi 1966: 159–72.

⁵⁶ Protection is extended because of the particular circumstances of *aquaeductus*, according to Grosso 1969: 286–7; further discussion in Grosso 1931: 372–5.

⁵⁷ Time schedules in legal cases, D. 8.3.15 Pompon. 31 *ad Q. Muc.*, D. 8.6.10.1 Paul. 15 *ad Plaut.*, D. 43.20.1.3 Ulp. 70 *ad Ed.*; in inscriptions, *CIL* VI.1261, XIV.3676 (Tivoli). Flexibility in implementing a schedule: D. 43.20.5 pr–1 Iulian. 4 *ex Minicio*.

⁵⁸ Analogous action based on the *actio communi dividundo*, D. 43.20.2. Pompon. 32 *ad Sab.*, cf. D. 10.2.47 pr Pompon. 21 *ad Sab.*

opportunities for water users to plan and implement the rights regime effectively.⁵⁹ Comparative studies of water systems show that right-holders are more likely to follow the rules when they have a rôle in making them.⁶⁰ In turn, more effective enforcement of rights of withdrawal could also promote agricultural productivity by ensuring a more reliable water supply for farming needs.

Water servitudes, like other rustic praedial servitudes, were defined by their rôle in supporting cultivation of the land, as articulated by the jurist Paul in a case about *adpulsus* (D. 8.3.4 Papin. 2 *Resp.*). The priority of agriculture is reflected in the classification of these servitudes as *res Mancipi* (D. 8.3.1.1 Ulp. 2 *Inst.*; Gaius, *Inst.* 2.17). *Res Mancipi* was a type of property defined by a list of things essential to agriculture: slaves, beasts of burden, land in Italy and the buildings on that land, and rustic praedial servitudes.⁶¹ Rustic praedial servitudes were likewise defined in relation to cultivation of the land.⁶² In addition, when the interdict for daily and summer water (*De aqua cottidiana et aestiva*) was used to protect rights of withdrawal, irrigation was the primary use of water, as emphasized by Ulpian (D. 43.20.1.11 Ulp. 70 *ad Ed.*). When Labeo applied the interdict to hot as well as cold water, his rationale cited irrigation practice in regions where hot water was used to water the fields, ‘quod in quibusdam locis et cum calidae sunt, irrigandis tamen agris necessariae sunt, ut Hierapoli’ (D. 43.20.1.13 Ulp. 70 *ad Ed.*).⁶³ Labeo’s opinion endorsed local control of water rights in the sense of regional specificity, although irrigation communities, ancient and modern, are typically face-to-face groups that configure and enforce their own rights regime.⁶⁴

The right of management in servitudes was also designed to promote a reliable water supply and, in turn, agricultural productivity. The right-holder controlled the right of management (viz. building and repairing infrastructure) because he (and not the owner of the source) bore the related risks and benefits. On the one hand, he could lose his right of withdrawal by non-use, if problems with the infrastructure prevented his exercise of the right.⁶⁵ On the other hand, because servitudes had no term, the right-holder had an incentive to maintain and even improve the infrastructure, knowing that he could enjoy a return on his investment in the long term. In fact, the economic incentive is assumed in an early case about improvements that enhanced agricultural productivity, for example, laying a pipe in order to spread water more widely, ‘quae aquam latius exprimeret’ (D. 8.3.15 Pompon. 31 *ad Q. Muc.*). Wider diffusion would increase cultivation and, hopefully, its financial returns. Mucius limited the right-holder’s control over the physical structures with a prohibition on harmful use that protected the owner’s water supply, ‘dum ne domino praedii aquagium deterius faceret’.⁶⁶ Such protection was critical to the owner’s economic interests because management involved access and physical changes to his property. The prohibition on harmful use may also be connected with the rule that servitudes could be attached only to adjacent

⁵⁹ On path dependence in Roman property law, see Kehoe 2007: 91.

⁶⁰ Ostrom 1991: 59–61; Bannon 2009, 101–44.

⁶¹ cf. Kaser 1971: 1.123–4, 381–2, 441. On the classification of servitudes, see Grosso 1969: 14–19.

⁶² Grosso 1969: 71, 91–2, 97–108.

⁶³ Fiorentini 2003: 117–20.

⁶⁴ Rural organization in the region of Hierapolis (Roman Anatolia) is consistent with small group, local management of water, see Mitchell 1993: 1.181–97; cf. Ostrom 1991: 58–102.

⁶⁵ D. 8.5.4.5 Ulp. 17 *ad Ed.*: this case concerns repairs to a right of passage but the principle applies *a fortiori* to *aquaeductus*.

⁶⁶ An abridged version of this case in D. 43.20.3.5 Pompon. 34 *ad Sab.*; the same principle in servitude for removing water in D. 8.3.29 Paul. 2 *Epit. Alf.*, and in urban servitude *altius tollendi*, D. 8.2.11.1 Ulp. 1 *de Off. Cons. Aquagium*, is an unusual term for the physical infrastructure for *aquaeductus*, based on the three passages where it occurs in the *Digest of Justinian*: D. 8.3.15 Pompon. 31 *ad Q. Muc.*; D. 8.6.9 Iavol. 3 *ex Plaut.*; D. 43.20.3.5 Pompon. 34 *ad Sab.*

land.⁶⁷ The rule on adjacent land may first have arisen to protect intervening land owned by third parties with no rôle in the negotiations over the servitude. In all these situations, the prohibition on harmful use formalized expectations about local control of water and its economic potential.

In addition to the environmental bundle of rights, a servitude also included the right to profit which was defined by agricultural productivity, as articulated in disputes between the right-holder and the owner of the water source. In such disputes the parties used a modified version of *vindicatio*, the legal mechanism for resolving disputed ownership. There were two forms of action: the *actio confessoria* for the right-holder, and the *actio negatoria* for the owner of the source. Both parties could claim monetary compensation based on the *fructus*, ‘returns’ or ‘profits’, from the servitude:

In confessoria actione, quae de servitute movetur, fructus etiam veniunt. sed videamus, qui esse fructus servitutis possunt: et est verius id demum fructuum nomine computandum, si quid sit quod intersit agentis servitute non prohiberi. sed et in negatoria actione, ut Labeo ait, fructus computantur, quanti interest petitoris non uti fundi sui itinere adversarium: et hanc sententiam et Pomponius probat. *D. 8.5.4.2 Ulp.17 ad Ed.*

Profit comes in the *actio confessoria* brought for a servitude. But let us consider what profit there could be from a servitude. It is also more reasonable that there should be calculation on the account of profits, if the plaintiff has any interest in not being prohibited from exercising his servitude. But profit is also calculated in the *actio negatoria*, as Labeo says, by the value of the plaintiff’s interest in the defendant’s not using his land. Pomponius also endorsed this view.

For the owner of the dominant estate, *fructus* meant the cost of not being able to exercise his rights. For the owner of the servient estate, *fructus* meant the value of his land not being burdened with a right of use. Both costs and profits were measured in monetary terms calculated in terms of agricultural productivity in a case about *aquaeductus* (*D. 8.5.18* Julian. 6 *ex Minicio*). When the owner of the water source sent his slaves to interfere with his neighbour’s servitude, the right-holder brought a legal claim for compensation to cover losses resulting from the lack of water. The examples in the case — dried up meadow or trees — show that economic costs and profits come from cultivating the land.⁶⁸

Economic interests also account for the treatment of the right of alienation in servitudes. In ownership, the landowner could alienate water on his land because it was considered part of the land. In servitudes, the right-holder also had the right of alienation, even though the source was not part of his land, because servitudes were transferred tacitly with the land, unless other arrangements were made.⁶⁹ Similarly, the right-holder could give a servitude as a pledge as if he owned it (*D. 8.1.17* Pompon. 1 *Reg.*). Assimilating servitudes to ownership rewards the right-holder for effective management because he could sell (or pledge) his land for a higher price with water rights attached.⁷⁰ The higher price recognizes the economic value of the water supply itself and its reliability as guaranteed by the servitude. The treatment of alienation shows that water rights were treated as an economic asset, related to not simply agricultural productivity but also a more abstract notion of economic interest and profit.

⁶⁷ For the rule on adjacent land, see *D. 8.3.7.1* Paul. 21 *ad Ed.* and *D. 8.3.23.3* Paul. 15 *ad Sab.*, with Grosso 1969: 110; only in post-Classical law could servitudes be established on non-adjacent land, according to Capogrossi Colognesi 1966: 96 n. 176.

⁶⁸ Bannon 2009: 164–6.

⁶⁹ *D. 8.4.12* Paul. 15 *ad Sab.* and *D. 8.3.36* Paul. 2 *Resp.*, with Grosso 1969: 94–5; Capogrossi Colognesi 1966: 77–81.

⁷⁰ On the impact of a servitude on sale of land, see Bannon 2009: 204–19.

The right of alienation created economic opportunities for the right-holder, although its implementation does not appear to have been part of a co-ordinated policy. First, it replaced local control with a strict rule that prejudiced the interests of the owner of the source. Sale of land could create an occasion for local control in renegotiating servitudes, but only if the purchaser of the land took the initiative. The owner of the source had no legal power to change the arrangement. Second, the impact of the rule was greater when the dominant estate was sold in parcels because the servitude went with each parcel along with a proportional amount of water.⁷¹ The owner of the source suffered a disadvantage both legally and economically: both his legal power as owner and his interest in the water were ignored. His loss could be minimal in a simple sale, but when land was divided, changes in cultivation or the multiplication of users could decrease his water supply. By contrast, the right-holder had both advantages: legal control of the resource and economic power to negotiate a better sale price for his land because of its water supply. The treatment of alienation does not adequately take into account the costs and benefits of water servitudes. Moreover it is inconsistent with the principle of local control and promoting agriculture that guides configuration of the other component rights in servitudes.

While the treatment of component rights in servitudes is not entirely systematic, the legal opinions consistently emphasize local control of resources and promotion of agricultural productivity. The right-holder co-ordinated rights of access, withdrawal, exclusion and management with the owner of the sources and, when necessary, with other right-holders. While this balancing of rights among the parties may reflect a legal principle it also had a significant practical impact of allowing those who used the water to define and enforce the rights to it. Law was a tool of landowners and local communities who had the best knowledge about private water sources and the economic interests that depended on them.

III CIVIC AQUEDUCTS

Civic aqueducts, whether in Rome or other cities of the Empire, were public property, and the state monopolized the component rights of access, exclusion, withdrawal, management and alienation.⁷² Rights of access and withdrawal were assigned to private individuals by the state, as a mark of honour or in exchange for a fee. Such individual grants were different from servitudes because they were personal, not property rights, and the state retained control of exclusion and alienation.⁷³ The rights regime in civic aqueducts had a dual nature: water was both regulated and unregulated, that is, it flowed continuously to open-access fountains. The rights regime thus served conflicting priorities. Maximizing the water supply was a clear priority, connected with the health and safety of the city.⁷⁴ Civic aqueducts were also used to reinforce social and political hierarchies. The configuration of component rights in the water from the aqueducts reflects both the co-ordination and divergence of these priorities. The evidence for component rights comes largely from Frontinus' treatise but is corroborated by inscriptions and literary evidence.

⁷¹ e.g. *D.* 8.3.25 Pompon. 34 *ad Sab.*: 'pro modo agri detenti aut alienati fiat eius aquae divisio'; cf. *D.* 8.3.23.3 Paul. 15 *ad Sab.* for a case probably about a right of way.

⁷² On the classification of aqueducts and their water as public property, see Zoz 1999: 142–3.

⁷³ Orestano 1935: 307–10.

⁷⁴ Front., *Aq.* 1.2; supplying the city as policy generally: Geißler 1998: 187; Campbell 2012: 90–4; as Frontinus' priority, though with some scepticism, Peachin 2004: 130–4.

Aqueducts in the Republic

Evidence for component rights in civic aqueducts begins with the right of management in the construction of the aqueducts by the censor Ap. Claudius Caecus in 312 B.C. and M'. Curius Dentatus in 272 B.C. The senate had some authority over management through its control of financing, although these two censors acted independently: Claudius reportedly spent public funds on the aqueduct without senate approval, and Curius financed construction *ex manubiis*.⁷⁵ In the second century B.C. elected magistrates had authority over the right of management as well as access, exclusion and withdrawal. In 184 B.C. the censors M. Porcius Cato and L. Valerius Flaccus cut off illegal withdrawals of water from the aqueducts, 'aquam publicam omnem in privatum aedificium aut agrum fluentem ademerunt' (Livy 39.44.4).⁷⁶ These historical accounts of rights in the aqueducts are corroborated by Republican statutes quoted by Frontinus and by the so-called *lex Rivalicia*.

The Republican statutes reported by Frontinus outline the state monopoly on the component rights in water from the city aqueducts.⁷⁷ The first of these laws concerns the censors' control of rights of access, withdrawal and exclusion, and assigns the same powers to aediles when no censors were in office.⁷⁸ These magistrates regulated grants to *privati*, that is, they were empowered to assign rights of withdrawal to private individuals. Although their legal power is framed in terms of sale, 'ius dandae vendendaeve aquae', the water was not alienated, i.e. there was no transfer of ownership; instead rights were arranged by contract in exchange for a fee for use.⁷⁹ The magistrates' right to assign private withdrawals was, however, limited, because these rights could be assigned only on overflow water, *aqua caduca*, and only to particular groups: baths and fullers (who paid a fee for use), and to leading men (whose right of withdrawal was a mark of honour).⁸⁰

The right of withdrawal was the main focus of a *Senatus Consultum* of 116 B.C. which also addressed access and management (*Aq.* 97; summarized in [Table 1](#)).⁸¹ The *Senatus Consultum* confirms the rôle of censors and aediles in controlling withdrawal inside and probably outside the city (*Aq.* 97.2–3). It prescribes a penalty for contractors to deter illegal withdrawals (*Aq.* 97.4). This penalty implies the right of management as well, since the censors contracted and approved repairs and maintenance. The prohibition on pollution regulates the right of access (*Aq.* 97.5–7). The magistrates exercised their rights indirectly through the neighbourhood deputies appointed in the last provision. These deputies were responsible for the open-access public basins, 'in publico saliret',

⁷⁵ For Claudius' disregard of the senate, see Diod. 20.36 with Cornell 1995: 373–4.

⁷⁶ *Publicam aquam* refers to the aqueducts according to Walsh 1994: 161; similarly in Plut., *Cato Mai.* 19.1. Cato's speech against L. Furius Purpureus (*ORF*³ frag. 102) may be connected with the censors' actions, according to Mommsen 1887: 2.435–6 n. 4; for an alternative view, see De Kleijn 2001: 95.

⁷⁷ The nature of these laws is difficult to determine because of a textual crux (*quilata*), but both likely emendations (*datas* or *dictas*) make them magistrate's decrees rather than plebescites, according to Crook 1996a: 729–30. Alternatively they derive from censors' contracts: Mateo 1996: 289–98. On the emendations, see Rodgers 2004: 258.

⁷⁸ Censors' right of access, withdrawal and exclusion: Front., *Aq.* 95.1–2, 97.2; management, *viz.* contracts for construction: Front., *Aq.* 5 (Appia), 6 (Anio Vetus), 8 (Tepula). Aediles: Front., *Aq.* 95.2, 96, 97.1. See Rodgers 2004: 114–15, 152; Eck 1987: 67–8.

⁷⁹ Mommsen 1885: 267–70. Compare similar language in the aqueduct decree from Venafrum, to be discussed shortly.

⁸⁰ For the fee paid by baths, Vitruvius 8.6.2. This Republican fee bears no explicit relation to the fee paid in the imperial era, Front., *Aq.* 118, with Rodgers 2004: 302; Eck 1995: 163–4. Defining *aqua caduca*: Bruun 1991: 73 n. 44 and 110.

⁸¹ For the date, Rodgers 2004: 261; Crook 1996b: 729–30. The original extent of this SC is unknown, but Frontinus' information is likely to be reliable because his source was Ateius Capito who was both *curator aquarum* in A.D. 13–23 and a distinguished jurist: Front., *Aq.* 97.2 and 102.2–3, with Rodgers 2004: 262.

TABLE I Summary of the Provisions of the Senatus Consultum of 116 B.C. in Front., *Aq.* 97

Illegal withdrawal of water is prohibited (<i>Aq.</i> 97.1)
Watering the Circus Maximus is prohibited without permission of aediles or censors (<i>Aq.</i> 97.2)
Fields illegally irrigated with public water are to be confiscated (<i>Aq.</i> 97.3)
A fine is prescribed for a contractor who fraudulently diverts water (<i>Aq.</i> 97.4)
A fine is prescribed for polluting the water (<i>Aq.</i> 97.5–7)
Aediles are to appoint two landowners per city district to oversee the water supply (<i>Aq.</i> 97.8)

and they may be identified with the *montani* and *pagani* who are mentioned in another Republican statute, the *lex Rivalicia*.⁸²

The *lex Rivalicia* is known from a partial quotation in Festus' definition of *sifus*, 'siphon' (Festus 458L). This statute may have been a *lex Sulpicia*, proposed by and named for the consul of 50 B.C., the jurist Servius Sulpicius Rufus, if this is the correct restoration of the text.⁸³ Festus refers to it as *lex Rivalicia*, for its subject, *rivi* or water channels that carried their water in the city.⁸⁴ It assigns legal power, *iurisdictio*, over water use to *montani* and *pagani*:

	Sifus
[dicitur in legibus publi]c is ipsis, id quod Graece	
[σίφων vocatur, et in lege rivalicia sic est	
[scriptum, quam de usu aqu]ae populum Ser. Sulpi-	
[cius--- rogavit: mon]tani paganive si-	
[fis---]o; donec eam inter se	
[---]s iudicatio esto.	(Festus 458L)

'Siphon' — the word that is called σίφων in Greek — is used in public laws and it is written in the *lex Rivalicia* that Servius Sulpicius proposed to the people about the use of water: 'montani and pagani' shall ... as long as this [law] among them ... there will be power of granting judgement.

Iurisdictio usually refers to a magistrate's authority to issue judgement in a legal action, but here it is interpreted to mean rights of withdrawal and management.⁸⁵ The magistrates, *montani* and *pagani*, administered rights of access and withdrawal, possibly to collect the fee for use, as they are otherwise connected with the census and finance.⁸⁶

The treatment of component rights in the Republican statutes offers indirect evidence for their policy aims. For example, the prohibition on pollution in the SC of 116 B.C. promoted

⁸² On the interpretation of *salire*, see Rodgers 2004: 264. Alternatively, the *montani* and *pagani* are to be identified with the group that authorizes honorary grants to *privati*: Mommsen 1887–88: 2.1.436 n. 4 and 3.1.115–16 n. 4.

⁸³ Alternatively the consul of 144 B.C., see Crook 1986: 47–8. Text in Crook 1996a (no. 42).

⁸⁴ *Rivus* can designate either natural or man-made conduits, according to Fiorentini 2003: 99–107. On the siphon from the Aqua Traiana to Trajan's baths, see Bruun 1991: 135. Crook (1986: 50) takes *rivi* as natural and infers a date before the Appia Claudia (312 B.C.). For natural sources in the city, see Rinne 1999.

⁸⁵ Mommsen 1887–88: 2.437 n. 2. According to Crook 1986: 49–51, they supervised not aqueducts but natural water sources, arguing from Frontinus' silence on their rôle and from the assumption that *rivi* must be natural streams; see now Fiorentini 2003: 105.

⁸⁶ On *pagi* and *montes* at Rome, Tarpin 2002: 186–91.

water quality.⁸⁷ Maximizing the city supply emerges as a clear priority in the treatment of rights of withdrawal. In the SC of 116 B.C., the penalties for contractors and the prohibition on illegal irrigation also aim to maximize supply to the city, and may reflect tension between urban and *extra urbem* supply.⁸⁸ The relative size of the penalty for illegal irrigation indexes the seriousness of the offence as measured by its impact on the supply of water to the city.⁸⁹ Even the rights of withdrawal assigned to baths and fullers might serve this policy.⁹⁰ The rights assigned to leading men, however, decrease the supply for other residents and instead reinforce social and political distinctions.⁹¹ The regulation of withdrawal and its divisive impact seem to preclude a policy of local control for city aqueducts. Yet local control is institutionalized in Republican law and practice. The first Republican law affirms local control within the face-to-face society of the senate, since the élite controlled honorary rights of withdrawal by granting (or withholding) consensus, ‘concedentibus reliquis’.⁹² Both the SC of 116 B.C. and the *lex Rivalicia* authorize institutional forms of local control. In the SC, aediles appoint neighbourhood deputies to administer water rights who must either reside or own property in the neighbourhood, ‘qui in unoquoque vico habitarent praediae haberent’ (*Aq.* 97.8). The alternative hints at the challenges posed by implementing the rights regime in the city aqueducts. Resident deputies, like those who shared private water sources, had a common interest in enforcing the system, while non-resident élites might exploit their influence to undermine the system. The *montani* and *pagani* in the *lex Rivalicia* probably played a similar rôle, that may also be connected with the rôle of *pagani* in a Spanish irrigation community, as documented in the Hadrianic *lex rivi Hiberiensis*. But the difference in context, rural versus urban, advises caution about assuming a similar rôle for the *montani* and *pagani* in Rome. Where the rural *pagani* were members of the irrigation community who used the water themselves, in Rome the *montani* and *pagani* were city officials administering water rights with no necessary personal stake. In other words, Roman city administration attempted to institutionalize the local control of water rights, but creating an administration undermined or at least redefined local control, replacing face-to-face negotiation with officials who might only abstractly represent the shared interests that informed effective water rights.

Aqueducts in the Empire

In the Empire, the state maintained a monopoly on water rights with similar priorities as in the Republic. The imperial rights regime was organized during the reign of Augustus (27 B.C.–A.D. 14), starting in 33 B.C. when Agrippa was aedile.⁹³ Like a Republican aedile, Agrippa controlled the rights of access, withdrawal and management. He systematized the right of withdrawal by organizing it into three categories: *publica opera*, *lacus*, grants to *privati*.⁹⁴ He also regularized the system of grants to *privati* and introduced a standard pipe for delivery in the city (the *quinaria*), which regulated withdrawal by

⁸⁷ An archaic inscription from Lazio records a similar prohibition governing a stream not connected with aqueducts, see Coste and Schutzmann-Bolzoni 1970: 368–9.

⁸⁸ Rodgers 2004: 262.

⁸⁹ On the volume of water consumed by irrigation, see Hodge 1991: 246–7.

⁹⁰ Rodgers 2004: 259.

⁹¹ Evans 1997: 141; compare the likely supply available for average citizens calculated by Bruun 1991: 101–4.

⁹² *Reliqui* as élites: Rodgers, 2004: 259; or neighbourhood deputies, cf. Front., *Aq.* 97.8, with Mommsen 1887–88: 2.437 n. 2. It is possible, as Rodgers suggests, that *concedentibus reliquis* refers to the legal mechanism of *in iure cessio*, the formal conveyance used to create servitudes (Gaius, *Inst.* 2.31). For parallels for honorary grants of water rights, see, e.g., *CIL* X.4654 = *ILS* 5779 (Cales) and *CIL* X.4760 = *ILS* 6296 (Suessa), with Eck 1987: 87.

⁹³ Agrippa may have begun work as praetor in 40 B.C. with the construction of the Aqua Julia (Cass. Dio 48.32), although Frontinus (*Aq.* 9.1) dates it to 33 B.C., see Rodgers 2004: 171.

⁹⁴ Front., *Aq.* 98.2 with Eck 1987: 67–8.

providing a measurable standard.⁹⁵ Agrippa exercised the right of management by building three new aqueducts and repairing the older ones.⁹⁶

After Agrippa's death, Augustus consolidated control of water rights in the person of the emperor. He assumed the censors' right of management by personally seeing to the repair and expansion of the aqueducts, as he boasted in the *Res Gestae* (20).⁹⁷ He also inherited Agrippa's slave crew and made it public property (Front., *Aq.* 99.1). Augustus endorsed Republican regulation of withdrawal (for example, restrictions on watering the Circus Maximus, Front., *Aq.* 97.2) and authorized Agrippa's system for administering the right of withdrawal in grants to *privati*. Additionally, he created the position of *curator aquarum* to take the rôle of Republican magistrates and exercised the right of withdrawal through delivery to imperial property and grants to *privati* (Front., *Aq.* 99.3–4).

Augustus' reform of the water regime in the aqueducts was authorized by a series of senatus consulta in 11 B.C., the *lex Quinctia* in 9 B.C., and undated imperial *mandata* (listed in Table 2). The first SC established the new position of the *curator aquarum* whose control of the component rights is implemented through the other Augustan laws. The *lex Quinctia* authorized the *curator aquarum* to exercise rights of access, withdrawal and management as well as to enforce the law (Front., *Aq.* 129.5, 9, 11). Three of the SC — fountains, maintenance, reserved zone — confirm the state's control of management (Front., *Aq.* 104, 125, 127). The SC on fountains along with the one on grants to *privati* implement withdrawal and access (Front., *Aq.* 104, 108). A separate SC, prohibiting transfer of grants to *privati*, shows that the state also controlled alienation: as Frontinus explained, when a water grant expired, it reverted to the state for reassignment (Front., *Aq.* 108. 109.1). This overview of the senatus consulta demonstrates the state monopoly on component rights. Further analysis reveals the priorities that this water regime advanced.

Securing the water supply of the city was an overarching priority of the imperial system. The rights of access, withdrawal and management are co-ordinated in five of the seven statutes (Front., *Aq.* 104, 106, 125, 157, 129). The decrees about maintenance, the buffer zone and damage secure the supply to the city by protecting the physical fabric of the aqueducts (*Aq.* 125, 127, 129).⁹⁸ The decree on grants to *privati* also connects withdrawal and management because grants to *privati* were defined by the pipe size and restricted to specific locations, i.e. not from the *rivus* but from a *castellum* (*Aq.* 106.3). A complementary administrative procedure ensured that the physical specifications were implemented accurately and honestly (Front., *Aq.* 105). Finally, the SC on fountains tasked the *curator* with maintaining the operation and stock of fountains (Front., *Aq.* 104.2, cf. 78–86 for the number of fountains). The right of management is thus deployed to both secure and maximize access to water for residents of the city, as suggested by Frontinus' emphasis on the constantly flowing fountains.

Frontinus' praise of Nerva sends the same message. Nerva's crack down on fraud in grants to *privati* is comparable to constructing more fountains for public access, which he also did, 'haec copia aquarum ... quasi nova inventione fontium accrevit' (*Aq.* 87.1, cf. 88.1). The increased supply implicitly augments grants to *privati* by making them more secure (*Aq.* 88.2). Even improved water quality is a by-product of increased supply (*Aq.* 88.3, 94.1). 'Bigger is better' works as rhetorical strategy both for Frontinus

⁹⁵ Front., *Aq.* 25.2 (introduction of *quinaria*), 34.5 and 105.4–5 (pipe size to regulate delivery), with Rodgers 2004: 211, 288.

⁹⁶ Front., *Aq.* 9.9 (repairs), 10.1 (construction of the Virgo), 11.1 (possibly also the Alsietina).

⁹⁷ Aug., *Anc.* 20. Other emperors followed suit: Anio Novus and Claudia, begun by Caligula and completed by Claudius, Front., *Aq.* 13.1–2; Pliny, *NH* 36.122. Trajan (*CIL* VI.126) and Alexander Severus (*HA Alex. Sev.* 25) each built an aqueduct.

⁹⁸ cf. Frontinus' proactive approach to leaks, Front., *Aq.* 122.1–2.

TABLE 2 Augustan Statutes on the Aqueducts

11 B.C.	SC establishing <i>curator aquarum</i> and honours, powers and funding of the office (Front., <i>Aq.</i> 100)
	SC on public fountains, maintain constant number and inventory (Front., <i>Aq.</i> 104)
	SC on grants to <i>privati</i> , administration and infrastructure (Front., <i>Aq.</i> 106)
	SC on inalienability of grants to <i>privati</i> (Front., <i>Aq.</i> 108)
	SC materials for maintenance and reimbursement to landowners for materials (Front., <i>Aq.</i> 125)
	SC reserved zone around aqueducts, with penalty for violations (Front., <i>Aq.</i> 127)
9 B.C.	<i>lex Quinctia</i> : penalties for damage, jurisdiction, regulation of reserved zone (Front., <i>Aq.</i> 129)
no date	<i>mandata on aqua caduca</i> (Front., <i>Aq.</i> 111)

and for Nerva himself: more water and more hydraulic infrastructure enhanced the reputation of both men.⁹⁹ Moreover, Frontinus' rhetoric demonstrates that maximizing the supply depends on the state's monopoly of water rights.

While the evidence for component rights gleaned from Frontinus points to a primary policy of maximizing supply to the city, the rights regime also supported deliveries outside the city. In fact, these two priorities — city supply and deliveries outside the city — were linked, and not only in the problem of illegal taps. Frontinus' treatment of the Aqua Alsietina hints at co-ordinated policy. At first he confesses that he is baffled by Augustus' decision to build the Alsietina because it earned no good and its water was of poor quality and not accessible to the people (*Aq.* 11.1). Then he discovers a rationale: construction of the Alsietina helped to maximize and improve the city supply by leaving better quality water for consumption, expanding delivery across the Tiber, and increasing irrigation outside the city (*Aq.* 11.2). This rationale, however *ex post facto*, implies that imperial policy included promoting agriculture in and around the city.¹⁰⁰ Frontinus' data show that the aqueducts delivered about a third of their water outside the city.¹⁰¹ Archaeological evidence confirms the pattern, although it cannot distinguish illegal taps, which would challenge the policy.¹⁰² The state's co-ordination of management and withdrawal may have aimed to mitigate conflict between urban and *extra urbem* delivery, balancing the needs of agriculture and city residents. Yet the persistent problem of illegal taps shows that the rights regime was not entirely successful, probably because the urban/rural divide further undermined the notion of a local community around the city aqueducts. Two separate communities (rural and urban) shared water from the aqueducts, and neither one had unified control over the rights regime and its implementation.

Corroborating evidence for policy on Rome's aqueducts comes from civic aqueducts in other cities of the Empire documented in inscriptions: the *Tabula Contrebiensis* (*AE* 1979, 377), the municipal law from the triumviral colony at Urso in Spain (*CIL* I².5) and the decree from Venafrum in Italy that records the regulation of an aqueduct built for the city by Augustus (*CIL* X.4842).¹⁰³ The *Tabula Contrebiensis* (89 B.C.) is earlier than the other two laws and different in nature, concerning only the right of management because it negotiates the purchase of land for a civic aqueduct, using legal fictions to

⁹⁹ König 2007: 190–7.

¹⁰⁰ Evans (1994: 140) infers the 'privileged position of suburban consumers' from Frontinus' delivery data.

¹⁰¹ Bruun 1991: 148; Rodgers 2004: 356, table 8.

¹⁰² Archaeological evidence in Wilson 1999: 315–17.

¹⁰³ Venafrum decree: Capini 1991: 29–31 (date). Municipal law from Urso: Crawford 1996a: 395 (date), 400–17 (text). Parallel between Rome and Urso: Mommsen 1887–88: 2.1.435–6 n. 4; generally on parallels between Rome and municipal cities, Campbell 2012: 94–5.

adapt Roman law to local law.¹⁰⁴ In Urso and Venafrum, the state monopolized the component rights in the water supply, but instead of Roman authorities, local magistrates (*duoviri* or aediles) controlled the rights of exclusion, access and management.¹⁰⁵ The system was probably modelled on Rome's. In the Urso law, attention to *aqua caduca* suggests a parallel with Rome's administration.¹⁰⁶ The Venafrum decree describes administration similar to what Frontinus reported for Rome: repairs and the reserved zone (ll. 1–29), penalties for damage and respect for property along the route (ll. 29–35), grants to *privati* and regulations on infrastructure (ll. 36–47), as well as legal procedure for resolving disputes (ll. 47–59).¹⁰⁷ Individual rights of withdrawal were arranged on the same bases as at Rome, as an honour or in exchange for a fee.¹⁰⁸ As at Rome, the rights of withdrawal and management were co-ordinated to enforce the state's control of the water supply.

At Urso and Venafrum supplying the city was the main priority but the state monopoly on component rights was attenuated to some degree by local control. In the Venafrum decree, the policy of maximizing supply to the city is expressed explicitly through the right of management in a prohibition on damage to the infrastructure:

neve cui eorum, per quo|rum agros ea aqua ducitur, eum aquae ductum corrumpere abducere aver|| tere facereve, quominus ea aqua in oppidum Venafranorum recte duci| fluere possit, liceat. (CIL X.4842.33–5)

Nor is it allowed for any of the people whose fields the aqueduct crosses, to break, withdraw, divert or do anything that makes it impossible for water to be channelled or to flow directly into the town of Venafrum.

The Urso law likewise prohibits interference with the infrastructure, but without mention of the city expressly, 'quo minus ita/aqua ducatur' (CIL I².5, ch. 99). Similar language is used in the *Tabula Contrebiensis* to justify construction, 'rivi faciendi aquaive ducendae causa' (l. 2). For Rome's aqueducts, neither the *lex Quinctia* nor the senatus consulta expressly connect management with supply to the city, although the connection is implicit in Frontinus' emphasis on repairs and maintenance. As for local control at Urso and Venafrum, the rules on management reflect the same rural/urban split in the local community, granting the city control over water in its rural territory. The language of the law, however, complicates the picture, revealing a layered approach to community. The phrase, *ius potestasque*, is used to designate legal authority over component rights in both laws and also in the *lex Quinctia* on Rome's aqueduct, but it refers to different rights and different right-holders. While the Urso law (ch. 99) and the *lex Quinctia* (Front., *Aq.* 129.5) grant this power to city officials, the Venafrum decree grants it to citizens, 'earumque rerum omnium ita habendarum || colon(is) Ven[afra]nis ius potestatemque esse placet' (CIL X.4842.29–30).¹⁰⁹ It is possible that the *coloni* are meant to stand in for the town's magistrates, but if not, the Venafrum decree creates a

¹⁰⁴ Birks *et al.* 1984. The *Tabula Contrebiensis* repeatedly refers to the community's law, *iure suo*, as the legal standard (ll. 4, 5, 9, 11).

¹⁰⁵ Withdrawal: CIL X.4842 ll. 36–8 (Venafrum); CIL I².5 ch. 99 (Urso). Management: CIL III.1750 (Epidaurum); CIL IX.6257 (Lacedonia). Some cities had a curator as at Rome: Eck 1987: 88.

¹⁰⁶ *Aqua caduca*: CIL I².5 ch. 100 (Urso); Front., *Aq.* 94–5, 110–11.

¹⁰⁷ e.g. both have the same regulation of pipes within fifty feet of the aqueduct: CIL X.4842 ll. 36–47; Front., *Aq.* 106.2, with Rodgers 2004: 295, 298; Cursi 2007: 128–30.

¹⁰⁸ Fee for private right of withdrawal: CIL X.4842 ll. 36–8 (Venafrum), with Cursi 2007: 126–7. Similarly, Cicero paid a fee for water delivery to his Tusculan villa, *Agr.* 3.7–8.

¹⁰⁹ The phrase 'ius potestasque' does not occur in the *Tabula Contrebiensis*, but the text grants legal authority to the communities by name to purchase the land and to build, while magistrates are directed to disburse the funds: 'quanti is a[ger] aestumat[us]|| esset, qua rivos duceretur, Salluienses pe[quia]m solverent' (ll.9–10), with Richardson 1983: 33–6.

TABLE 3 Interdicts relating to Water Sources with References to their Wording and Scope

Public only

Ne quid in flumine publico fiat, quo aliter aqua fluat, atque uti priore aestate fluxit (D. 43.13.1 pr. Ulp. 68 ad Ed.)

Ut in flumine publico navigare liceat (D. 43.14.1 pr. Ulp. 68 ad Ed.)

De ripa munienda (D. 43.15.1 pr. Ulp. 68 ad Ed.)

Public and private

De fluminibus: ne quid in flumine publico ripave eius fiat, quo peius navigetur (D. 43.12.1 pr. Ulp. 68 ad Ed.)

De aqua cottidiana et aestiva (D. 43.20.1 pr Ulp. 70 ad Ed.; D. 43.20.1.29 Ulp. 70 ad Ed.)

De rivis (D. 43.21.1 pr Ulp. 70 ad Ed.)

De fonte (D. 43.22.1 pr Ulp. 70 ad Ed.)

Private only

De cloacis (D. 43.23.1 pr Ulp. 71 ad Ed.; D. 43.23.1.3 Ulp. 71 ad Ed.).

broader community that could even include *coloni* who owned rural land. Thus, treatment of management in the Venafrum decree involves a local community in which civic regulation works like private water rights, in contrast to the divided community at Rome (and probably Urso). But not all control was local, because the decree also refers disputes to the court of the *praetor peregrinus* at Rome.¹¹⁰ This added level of administration interfered with the local community's control of component rights, likely imposing the status rift that characterized Rome's aqueduct administration.¹¹¹

Similar layering of authority and community is evident in provincial administration, as reported in Pliny's letter about the construction of an aqueduct at Sinope. When Pliny reports that he has financed some assays to determine whether the ground can support the aqueduct, Trajan supports Pliny's plan but insists that the town foot the bill.¹¹² Exercising the right of management required financing, both at Sinope and for Rome's aqueducts (e.g. Front., *Aq.* 118). In provincial cities, the articulation of component rights may involve a broader notion of public that includes citizens as well as magistrates in a local community. How local the community depends on whether these citizens had rights comparable to those of the *montani* and *pagani* in Rome or to the *pagani* in the irrigation community on the Ebro, who were more like owners than civic officials. If the citizens of Venafrum were responsible for maintaining the stretch of aqueduct that passed along their property (as was usual for public roads), the line between public and private rights of management is further blurred.¹¹³

Both in Rome and in provincial cities, the component rights in civic aqueducts were configured to secure the water supply of the city through a state monopoly. Civic officials (*curator* in Rome, magistrates elsewhere) were empowered to assign rights of access and withdrawal to private individuals but these were temporary arrangements, sometimes in exchange for a fee, as in a lease. These grants to *privati* could reinforce the social hierarchy or they could advance economic aims by supplying irrigation in and around the city, just as private water rights did. In addition, the rights regime in civic aqueducts also had a measure of local control, although this was more limited than for private water rights. More intersection with private water rights is found in the treatment of public natural sources.

¹¹⁰ *CIL* X.4842 l. 66, with *Cursi* 2007: 128.

¹¹¹ Bannon 2016: 19–20.

¹¹² Sherwin White 1985: 686.

¹¹³ Abutting landowners are to repair roads in the *Tabula Heracleensis*, *CIL* I.2² p. 482 no. 593, para. 7.

IV PUBLIC RIVERS AND OTHER NATURAL SOURCES

As the section heading indicates, public natural water sources were varied — lakes, streams, springs, rivers. For the most part, their status followed that of the land where they were found.¹¹⁴ Public rivers, however, were defined as perennial or flowing year round by the first-century A.D. jurist Cassius, and this definition became standard in Classical Roman law.¹¹⁵ Public rivers dominate the evidence for the rights regime of public natural sources because of their place in both law and policy: rivers were important to the development of interdicts on water and also to the economic aims served by this rights regime. Yet all fresh water sources were usually grouped with rivers in the legal discussions, even though some policy issues relate only to rivers (e.g. boat traffic).¹¹⁶ The interdicts are the main source for rights in public fresh water, and they are supplemented by inscriptions, literature and surveyors' treatises. A list and description of the interdicts is presented as an appendix.

The earliest evidence for an interdict regulating fresh water is an inscription from northern Campania dating to the second half of the second century B.C. (*CIL* X.8236).¹¹⁷ In the inscription, one Q. Folvius records his use of an interdict authorized by the urban praetor P. Atilius to protect his right to water:

Q · FOLVIUS · Q · F · M[N]
 HANCE · AQUA[M]
 INDEIXSIT · APU[D]
 P · ATILIUM · L · F
 PR · URB

(*CIL* X.8236)

Quintus Folvius, son of Quintus, grandson of Marcus claims a right to this water in the court of P(ublius) Atilius, son of Lucius, the urban praetor.

Both the verb *indeixsit* and the presence of the praetor point to an interdict as the relevant legal mechanism but not the specific interdict. Nothing in the text identifies the water sources as public or private, although the findspot, near the remains of a small aqueduct in a rural area, suggests private property.¹¹⁸ Folvius used the interdict to claim a right of access and/or withdrawal and probably also to exclude others.

Despite its lack of detailed context, the Folvius inscription effectively represents the state's use of interdicts to control component rights in natural sources and to assign them to private individuals.¹¹⁹ The senate and subsequently the emperor shared this legal authority.¹²⁰ For the interdicts, the praetor's rôle was jurisdictional, not administrative, in that he did not supervise a system like the grants to *privati* in civic aqueducts. The praetor took action only in response to complaints from private individuals.¹²¹ By giving a judgement in a legal dispute he created and affirmed an

¹¹⁴ Fiorentini 2003: 100–5.

¹¹⁵ *D.* 43.12.1.3 Ulp. 68 *ad Ed.* citing Cassius, with Fiorentini 2003: 75, 87–90; De Marco 2004: 103–11, 187–8.

¹¹⁶ Other fresh water sources are expressly included with rivers in the interdicts in *D.* 43.14.1 pr and 3–7 Ulp. 68 *ad Ed.*, *D.* 43.20.1.7–10 Ulp. 70 *ad Ed.*; or protected by analogy with the interdict, *D.* 43.15.1.6 Ulp. 68 *ad Ed.*

¹¹⁷ Brennan 2000: 340 n. 272; cf. Mommsen 1881: 496, for a slightly earlier date, based on the possible identification of Acilius with the praetor of 168 B.C.

¹¹⁸ Public source: Mommsen 1881: 497–8. Private source: Bannon 2009: 71–2; Pagano 1996: 105, who also describes the findspot and the course of the aqueduct.

¹¹⁹ Exclusion and withdrawal: *D.* 43.22.1 pr–2 Ulp. 70 *ad Ed.*; *D.* 43.20.1 pr, 15, 25; *D.* 43.13.1. pr–1 and 9 Ulp. 68 *ad Ed.* (with *D.* 43.12.1.22 Ulp. 68 *ad Ed.* which shows that *immissum* indicates diversion of river water). Access: *D.* 43.14.1.7 and 7 Ulp. 68 *ad Ed.* Management: *D.* 43.22.1.6 Ulp. 70 *ad Ed.*; *D.* 43.21.1 pr–1, 8 Ulp. 70 *ad Ed.*; *D.* 43.20.3.5–6 Pompon. 34 *ad Sab.*

¹²⁰ *D.* 8.3.17 Papir. 1 *Const.*; *D.* 43.12.2 Pompon. 34 *ad Sab.*

¹²¹ Fiorentini 2003: 233–41; Di Porto 1994.

individual's right to use water. These rights were analogous to servitudes in Classical law, even though they could be created on both private and public water.¹²² For private water, the interdict was a procedural alternative to the *actio confessoria* (used for servitudes). The interdict also protected individuals with an interest in water but no formal servitude, whether the water was public or private.¹²³ Public rivers were explicitly characterized as open access, by analogy with public roads and the seashore, and the right of withdrawal was available to everyone without a servitude.¹²⁴

The rights regime in public natural sources was thus characterized by the same duality between open access and regulation as civic aqueducts. This duality was resolved in post-Classical law when all public water was regulated through administrative grants.¹²⁵ Throughout the period of Classical Roman law, however, jurists perceived no contradiction in regulating an open-access resource such as public water, just like a modern commons.¹²⁶ Although there was no systematic approach, several issues guided the regulation of public rivers, including boat traffic, irrigation, local control, and the Roman state's interest in tax revenue from activities that depended on the water supply. Discussion of these issues tends to arise when there is conflict between different uses of water or between local control and the interests of the Roman state. Most of the evidence comes from the provinces, either due to accidents of survival or questions arising from the mixed rights regime or attention to the state's fiscal interest: taxes were collected primarily in the provinces. Typically, Roman law endorsed local configurations of water rights in natural sources, authorizing not only face-to-face local control but also local institutional control (similar to the civic aqueduct community at Venafrum). Policy issues, occasionally articulated, are more often implicit in the contours of the conflict.

Boat traffic is the first clearly articulated policy aim. Three interdicts specify boat traffic as a protected activity in their formulas (*Ut in flumine, De ripa munienda, De fluminibus*).¹²⁷ The protection of boat traffic implies a conflict with other activities, especially those depending on rights of withdrawal. Romans expected river water to be diverted for productive use, an assumption exploited by one of Plautus' clever slaves to justify theft with an analogy comparing money and river water: unless a river is diverted it runs useless to the sea: why not, he implies, take the money and put it to good use (Plaut., *Truc.* 561–7). The jurists also recognized that productive diversion merited protection. For example, Labeo extended the *Ne quid in flumine publico* to non-navigable rivers to protect productive activities.¹²⁸ But diversions caused conflict by lowering the water level, precisely the problem anticipated by Labeo's opinion that the praetor ought not to assign a right of withdrawal on navigable rivers (*D.* 39.3.10.2 Ulp. [Labeo] 53 *ad Ed.*). Ulpian generalized the rule for all rivers, authorizing the interdict only when diversions did not affect the flow of water.¹²⁹ He frames this limit as a ban on harmful use: any right of withdrawal must not cause foreseeable injury or inconvenience to the locals.¹³⁰ If it does, they will have recourse to the interdict to protect their interests. Conflict among those holding rights of withdrawal is also

¹²² Capogrossi Colognesi 1966: 140–1.

¹²³ *D.* 8.3.3.3 Ulp. 17 *ad Ed.* and *D.* 43.20.3.2 Pompon. 34 *ad Sab.* (withdrawal without a servitude).

¹²⁴ *D.* 39.2.24 pr Ulp. 81 *ad Ed.* (rivers, roads, seashore).

¹²⁵ *CJ* 3.34.4, with Zoz 1999: 118.

¹²⁶ e.g. *D.* 8.3.17 Papir. 1 *Const.*, with Zoz 1999: 117–18; Alburquerque 2002: 286–9; Fiorentini 2003: 113–17.

¹²⁷ There was also an action for clearing brush that interfered with river traffic: Gel. 11.17.2, with Albanese 1991; Zoz 1999: 89–90. On the economic importance of boat traffic, Campbell 2012: 200–8.

¹²⁸ *D.* 43.12.1.12 and 17 Ulp. [Labeo] 68 *ad Ed.*, with Zoz 1999: 83, 112–15; Fiorentini 2003: 161–2; De Marco 2004: 107–9.

¹²⁹ *D.* 43.13.1.1 Ulp. 68 *ad Ed.*; similar priority in *D.* 43.12.2 Pompon. 34 *ad Sab.*; on regulating the flow for boat traffic, Campbell 2012: 219–29.

¹³⁰ Fiorentini 2003: 235–8.

addressed in a rescript from the Antonine era concerning a conflict between irrigation and other unspecified uses of a public river (*D.* 8.3.17 *Papir. 1 Const.*). Apparently, when local control failed, the case came to the emperor, who was unable or unwilling to resolve the dispute. The rescript asserts a ban on harmful use, but does not rule on the dispute between the irrigators and other right-holders, returning the problem to local negotiation. ‘Local’ here probably means a community in the provinces, where the jurists adapted private law and the interdicts to configure rights in public rivers.¹³¹ Irrigation in a provincial context suggests a motive for the Roman state to intervene, namely, tax revenue derived from irrigated farmland. Indeed, both the rescript and Ulpian’s approach recognized that rights to withdrawal could serve irrigation and other productive aims, although these aims are not consistently protected. Instead tension between local control and state interest characterizes the treatment of natural water sources in both literary and epigraphical evidence.

The tension between local control and the Roman state’s interests appears in a late Republican conflict over the river *Darias* in northern Italy. When the Romans established a garrison at *Eporedia* around 100 B.C., they seized gold mines there from the *Salassi* and leased them to the *publicani*. The Romans were, however, unable to take control of the river *Darias*, which supplied water both to process gold and to irrigate downstream farmland. The *Salassi* held the mountain highlands and earned revenue by collecting tolls and selling the river water to the *publicani*.¹³² They controlled rights of access and withdrawal, and implemented them to their own advantage. When they diverted the river into secondary canals for gold processing, they deprived farms in the plains of water for irrigation:

προσελάμβανε δὲ πλεῖστον εἰς τὴν μεταλλείαν αὐτοῖς ὁ Δουρίας ποταμός, εἰς τὰ χρυσοπλύσια, διόπερ ἐπὶ πολλοὺς τόπους σχίζοντες εἰς τὰς ἐξοχτείας τὸ ὕδωρ τὸ κοινὸν ρεῖθρον ἐξεκένουν. τοῦτο δ’ ἐκείνοις μὲν συνέφερε πρὸς τὴν τοῦ χρυσοῦ θήραν, τοὺς δὲ γεωργοῦντας τὰ ὑπ’ αὐτοῖς πεδία, τῆς ἀρδείας στερουμένους, ἐλύπει, τοῦ ποταμοῦ δυναμένου ποτίζειν τὴν χώραν διὰ τὸ ὑπερδέξιον ἔχειν τὸ ρεῖθρον. ἐκ δὲ ταύτης τῆς αἰτίας πόλεμοι συνεχεῖς ἦσαν πρὸς ἀλλήλους ἀμφοτέροις τοῖς ἔθνεσι. (Strabo 4.205 (4.6.7))

The river *Darias* gave the most advantage to them in mining for washing gold, and for this reason they diverted the water into sluices in many places emptying the main channel. While this helped them in the pursuit of gold, it harmed the farmers of fields below them because they were deprived of irrigation, although the river was able to irrigate the land because its course ran on higher ground. For this reason there was constant hostility between the communities.

Their diversions lowered the water level in the main channel, just as anticipated in the interdicts. Strabo’s description of the main channel, τὸ κοινὸν ρεῖθρον, is suggestive of open access, characterizing the physical river with an idealizing image of shared water.¹³³ But instead of ideal sharing, the *Salassi* exploited their control of component rights to the disadvantage of the farmers, the *publicani*, and ultimately the Roman state which was interested in tax revenue from the gold. Recurrent conflict over the river *Darias* provided a ready pretext for repeated Roman military intervention which culminated in Augustus’ foundation of a veteran colony, *Augusta Praetoria*, in 25 B.C.¹³⁴

¹³¹ Bannon 2017: 123–6.

¹³² *Publicani* could be contracted to collect fees for water concessions: Vitr. 8.6.2, with Bruun 2003: 307.

¹³³ An issue characteristic of common pool resource management, according to Dietz *et al.* 2002: 18–22.

¹³⁴ Pretext for military intervention: Strabo 4.205 (4.6.7). Foundation of *Eporedia*: Vell. 1.15.5; Pliny, *NH* 3.123, with Broadhead 2000: 153, who cites Strabo as the basis for dating Rome’s takeover of the mines to 143 B.C. Augustus’ campaign against the *Salassi*: Cass. Dio 53.25.2–5.

The state's interest in the *Darias* is implied in Strabo's account, but the early imperial jurists Labeo and Sabinus made it explicit in a legal opinion about fishing rights in a lake. While fishing rights are not the same as withdrawal of water, they represent an analogous legal conflict over use of water. A *publicanus* had a contract with the state to fish a lake or lagoon; when he was prevented, he sought an interdict to protect his right. The jurists allowed him not the interdict itself but an analogous interdict. That is, the *publicanus* did not have the same standing as a right-holder (who could use the interdict) but his interests warranted the same protection, presumably because his circumstances were similar to those of right-holders; if Labeo and Sabinus gave a rationale, it was lost in compilation.¹³⁵ Ulpian, who cites their opinion, does give a rationale and he also extends the interdict's protection to contracts with *municipia* (not just with Rome itself): 'ergo et si a municipibus conductum habeat, aequissimum erit ob vectigalis favorem interdicto eum tueri' (*D.* 43.14.1.7 Ulp. 68 *ad Ed.*). The extension to *municipia* not only emphasizes the financial motive but also locates the case in the provinces where most natural sources of water were public property. While there is no rescript or constitution on this issue, Ulpian's rationale likely represents imperial policy, showing that local control was limited by Rome's revenue interest.¹³⁶ Nevertheless, local control seems to have been the usual approach to rights in natural sources in the provinces.

The Romans typically endorsed pre-existing property regimes in conquered territory. Augustus advocated for local control of colonial boundaries, although it is not known whether he mentioned water rights specifically because his speech is known only from a paraphrase in a surveyors' treatise.¹³⁷ These treatises also recommend preserving prior arrangements for fresh water resources as far as possible.¹³⁸ Inscriptions confirm the practice. First, the municipal law from Urso in Spain regulated natural sources: streams, springs, lakes, ponds, swamps and probably rivers.¹³⁹ It endorsed the pre-existing legal regime by granting the same rights of access and withdrawal to current owners and possessors as had been held before.¹⁴⁰

qui fluvi rivi fontes lacus aquae stagna paludes / sunt in agro, qui colon(is) h[ui]usc(e) colon(iae) divisus / erit, ad eos rivos fontes lacus aquasque sta/gna paludes itus actus aquae haustus iis item / esto, qui eum agrum habebunt possidebunt, uti / iis fuit, qui eum agrum habuerunt possederunt. / itemque iis, qui eum agrum habent possident ha/bebunt possidebunt, itineris aquarum lex ius/que esto.^{vacat} (*CIL* I².5 ch. 79, tab. a Col. II.39–40 and tab. b. Col. III.1–7)

¹³⁵ Similarly the interdict was extended to others with personal rights (*D.* 43.20.1.12 Ulp. 70 *ad Ed.*) and to those who believed mistakenly that they had a right (*D.* 43.20.1.20 Ulp. 70 *ad Ed.*).

¹³⁶ According to Gualandi (2012: 43–5), the jurists sometimes quoted imperial constitutions out of context and without identifying them as the emperor's ruling.

¹³⁷ Front., *agrim.* p. 7, with Campbell 2000: 6, 323 n. 18. Julius Caesar may have laid the groundwork in a letter about surveying in his colonial settlements, also mentioned in a surveyors' treatise, see Campbell 2000: xlvi. Although mostly later than legal sources and inscriptions, these treatises represent longstanding practices: Campbell 2000: lvi; only the *lex Mamilia* is contemporary with the Urso charter, according to Campbell 2000: 437; on the date of the other treatises, xxvii–xliv, 437, 445–6.

¹³⁸ The pre-existing condition of water resources was to be preserved as far as possible, whether public or private (*aquae publicae ac vicinales*), Agen., *agrim.* p. 83; cf. Hygin., *agrim.* p. 112 (*fossae communes*); *grom.* pp. 365–6 (*de paludibus*). Attention to water rights: Hygin., *agrim.* pp. 97–8 (servitudes), and water: Agen., *agrim.* p. 63 (*aquae inopiae*); Hygin., *agrim.* p. 145 (location of the colony *propter aquae commodum*); Agen., *agrim.* p. 43 (individual parcels). Boundary stones regularly bore marks indicating nearby water resources: *grom.* p. 309, 359, 361–4. Water resources feature prominently in the estates described in the *Casae Literarum*, *grom.* pp. 310–38.

¹³⁹ Omission of *fluvios*, see Crawford 1996b: 1.439.

¹⁴⁰ On parallels between the Urso charter and the surveyors, see Crawford 1996b: 1.439; Campbell 2012: 241. For the preservation of existing land regimes, see Capogrossi Colognesi 1999: 19–23.

Rights of approach and access to and a right of withdrawal from those streams, canals, springs, lakes, ponds, and lagoons that are in the territory which was allocated to colonists of this colony, shall belong to those who will have and hold this land, as they belong to those who used to have and hold it, and likewise the right and legal authority over channelling water shall belong to those who have and hold and will have and will hold this land.

The charter affirms the local configuration of water rights and assimilates them to Roman private law, using the language of servitudes, ‘itus actus (access), aquae haustus and itineris aquarum lex ius/que esto’. The status of the water is not indicated, but the law probably applied to both public and private sources, much as the praetorian interdicts did.¹⁴¹ The legal logic may derive from the interdicts, which could be used by owners and non-owners alike to protect rights in both public and private water.¹⁴²

Two other inscriptions show the same pattern. First, the Hadrianic *lex rivi Hiberiensis* (*lrH*) established an irrigation community on a canal (the *rivus Hiberiensi*, *lrH* para. 1, I.1) fed by the river Ebro in north-eastern Spain.¹⁴³ The decree was enacted to resolve a dispute between upstream and downstream irrigators.¹⁴⁴ Second, an early third-century A.D. inscription documents an irrigation community near Lamasba in North Africa (*CIL* VIII.18587 = 4440 = *ILS* 5793). In both inscriptions, the Romans endorse local control of component rights in public water sources, formalizing and strengthening local arrangements with Roman law.¹⁴⁵ For example, they confirm rights of withdrawal to individuals who used the water.¹⁴⁶ In the *lrH*, the local community also controlled the right of management and exclusion, although ‘right’ may be something of a euphemism for management since the decree imposes a penalty for failure to perform maintenance.¹⁴⁷ Neither inscription explicitly identifies the water as public or private, but Roman private law seems to be the model in both places.¹⁴⁸ Circumstances of both inscriptions suggest that irrigation served land subject to taxation. At Lamasba, the Roman authorities played a smaller rôle than in the *lrH* which was sanctioned by the governor’s legate who may also have been responsible for its skilful adaption of Roman law.¹⁴⁹ Further, the Ebro irrigation community was organized as a *pagus*, an administrative unit that was used to organize tax assessment, and the *publicani* had a rôle in enforcing the *lrH* that may reflect their interest in the system (paras 8 and 9, II.43–54, III.1–2). Thus the irrigation inscriptions document Rome’s endorsement of local control but may also represent effective manipulation of local water rights to achieve Roman fiscal priorities.¹⁵⁰

Financial concerns also led the Roman authorities to intervene in local rights of management when the construction of new hydraulic infrastructure was at stake. In

¹⁴¹ Capogrossi Colognesi 1966: 82, 119–20 n. 215. For the text, Crawford 1996b: 1.395.

¹⁴² *D.* 43.20.1.25 Ulp. 70 *ad Ed.* (extension of interdict to non-owners); suggested by mention of interdicts in Beltrán Lloris 2006: 188 n. 200.

¹⁴³ *lrH* paras 1a, 3a, 3c, 15 (I.1–2, I.27–31, I. 42–4, III.38–43) with Beltrán Lloris 2006: 160–3, 166–70. On Roman irrigation works in the Ebro river basin, see Arenillas and Castillo 2003. Text of the *lrH*: Maganzani 2012: 103–19.

¹⁴⁴ Beltrán Lloris 2006: 186–9; cf. Butzer *et al.* 1985.

¹⁴⁵ Shaw 1982: 68–9 and 1984.

¹⁴⁶ On the Ebro, *lrH* para. 1a (*ius aquae* as a basis for participation in the irrigators’ assembly); para. 3c (system of withdrawals); see Beltrán Lloris 2006: 176–7. At Lamasba, rights were indexed to cultivation of trees, according to Shaw 1982: 71–81; Kehoe 2008: 246–8. The Antonine rescript (*D.* 8.3.17 *Papir. 1 Const.*) probably belongs in the same context, see Bannon 2017.

¹⁴⁷ *lrH* paras 2b–3b (cleaning and maintenance).

¹⁴⁸ The Ebro should be classified as public, because it flowed year-round, or perennially: see Fiorentini 2003: 68–99; Zoz 1999: 110. On seasonal flow in the Ebro, see Al-Mudayna 1991: 15–16. On the status of the *lrH*, Capogrossi Colognesi 2014: 80–2, 86. Shaw 1982, assumes a model in private law (74–6) as implied also in his discussion of ownership (88–95).

¹⁴⁹ Nörr 2008: 111.

¹⁵⁰ In the post-Classical era, Roman interventions were not always successful, see Kehoe 2008: 248–51.

these cases, local means local governments that were more like large irrigation communities than the one-to-one neighbour relationships in servitudes. For example, when Pliny was governor of Pontus-Bithynia, he consulted with Trajan about the construction of a canal at Nicomedia. Pliny took a supervisory rôle, while local officials managed both financing and logistics for the project. Trajan's concerns were primarily fiscal: he urged curbing cost over-runs, while delegating both the right to manage the infrastructure and financial responsibility to the Nicomedians.¹⁵¹ Hadrian's project at Lake Copias in Boeotia followed a similar pattern, with policy aims articulated in an inscription that demonstrated the emperor's 'awareness of the project's agricultural benefits, expense, and (perhaps) potential ramifications, and his care to involve the Coroneans in the enterprise'.¹⁵² In both projects, the right of management was exercised by local government with supervision by the emperor. Tensions over rights of management arose when local control threatened Rome's finances, as with rights of withdrawal. Imperial policy seems focused more on financial impact than on configuration of water rights.

Rights in natural public sources were articulated in relation to the varied legal regimes in Italy and the provinces. Where the *ius civile* applied, the praetor controlled rights of access, withdrawal and exclusion through the interdicts, and assigned these rights to the individuals who used the water. In the provinces, Roman law institutionalized local water regimes, assimilating them to servitudes, sometimes in face-to-face communities, sometimes through civic administration. The right of management was implemented in the same way. The ban on harmful use was defined in terms of local practice as it was for private water rights, since those who used water from a public river were required to take each other's interests into account. Instead of monopolizing the component rights, Roman policy promoted local control while intervening to assert state authority when disputes arose or to promote its financial or ideological interests.

V CONCLUSION

This analysis of component rights reveals significant continuities in the treatment of water from both private and public sources that transcend property categories. The categories of public and private property were not consistently associated with distinct configurations of component rights. For the most part, jurists and lawmakers subordinated abstract legal concepts to the needs and interests of the people who relied on fresh water for economically productive uses, especially agriculture.

The rights regime of public natural sources intersects both private water rights and the administration of civic aqueducts (also public water). The most extensive overlap occurs between three legal contexts: ownership, servitudes and public natural sources. For all three, the rights of withdrawal, exclusion and management were exercised by the individuals who used the water, and local control was the working principle. In ownership and servitudes, the water users held these rights and exercised them directly. For public natural sources the state had a nominal monopoly on component rights but in practice assigned rights of access, withdrawal and exclusion to the individuals who used the water, sometimes in exchange for a fee. The right of alienability was also handled in the same way in these three types, probably because these water rights were attached to land and transferred with ownership of the land. In these three contexts,

¹⁵¹ On the canal at Nicomedia, Pliny's *Ep.* 10.41–2, 10.61–2 (cf. baths at Prusa, *Ep.* 10.23–4, 70–1), with Sherwin White 1985: 623 (the need for imperial sanction for new construction), 625 ('It is notable that Trajan makes no proviso about expense as in *Epp.* 24, 91, 99'). For similar treatment of Trajan's canal at the Iron Gate, see Šašel 1973. Cf. Campbell 2000: xlviiii (governors generally).

¹⁵² Boatwright 2000: 115.

water rights were also limited by a prohibition on harmful use, despite the fairly broad rights of owners on the one hand and on the other the expectation that public natural sources would be open-access. For all types of water, the right of management was always co-ordinated with rights of access and withdrawal, probably because the Romans recognized that a legal right to water was useless without the infrastructure to exercise it. Or as the Classical jurist Venuleius wrote, ‘quando non reffectis rivis omnis usus aquae auferretur et homines siti necarentur’ (*D.* 43.21.4 *Venul.* 1 *Interdicts*).

The similar treatment of all public sources (natural or aqueducts) lends a new unity to the category of public property. The rights regime created through praetorian interdicts resembles that of civic aqueducts in that both assumed a state monopoly on component rights as well as a dual system of regulation and open access. But the regulation of public natural sources was different from that of aqueducts because it overlapped with private water rights and was driven by private interests in water. Civic aqueducts were strictly regulated, and magistrates and emperors directly exercised component rights in their water. The state did assign rights of withdrawal and access to private individuals, but retained the rights of exclusion, management and alienability. For public natural sources, as previously described, the entire bundle of component rights was typically exercised by the individuals using the water while the state intervened only to resolve disputes or protect the state’s interests, typically financial. The state’s monopoly on civic aqueducts is probably to be explained by policy and ideology. Frontinus assumes that maximizing supply to the city justifies tight regulation, even though he also recognizes both the inadequacy of centralized administration and its ideological bias. Ideology offers a more persuasive explanation for strict regulation, because civic aqueducts were deeply embedded in social and political institutions. This is not to say that social and political factors did not influence private water or public natural sources. But for civic aqueducts the legal regime was an express tool for reinforcing the social hierarchy because individual rights of withdrawal were either conferred as an honour in recognition of status or involved a fee for use that linked access to economic power. Moreover, the right of management offered an avenue for élites and emperors to express their power by building and repairing aqueducts.

The continuities across different types of water rights arose from legal practice and imperial policy, when ‘policy’ is understood more as working principles than planning. Legal conservatism influenced the work of the jurists on water rights; that is, they re-used legal institutions, adapting them to new situations rather than creating new ones. The interdicts are the clearest evidence for such conservatism, as they first applied to public water and were later expanded to cover private water as well. The landowner’s rights to water was also a model for other configurations of water rights, first for servitudes and then for rights of use in public water, which were treated like servitudes, as is most clearly illustrated by the treatment of water in the provinces.

There was a coherent approach to water rights also because jurists and magistrates adopted local control as a guiding principle in the configuration of component rights in most types of water, even to a limited extent in the aqueducts in Rome where local deputies implemented the rights held by magistrates. While empowering local right-holders is consistent with ownership of private water, it seems to contradict the ideology of conquest associated with public property. Indeed the nominal state monopoly on component rights embodies this ideology. Yet local control was the dominant principle in configuring water rights. The preference for local control may be a reflex of Rome’s underdeveloped institutions or ad hoc governance. But it was likely an effective strategy for regulating water across a diverse empire and achieving other policy aims. First, locals knew the terrain, environmental and social, and were thus best positioned to make and enforce regulation on water resources. Problems with fraud in civic aqueducts, even if exaggerated by Frontinus’ rhetoric, show that Romans understood the limits of centralized control. Local control was also connected with the

use of water for agriculture and other economically productive activities. Promoting local control served Rome's financial interests by pre-empting costly re-negotiation of rights that could have interfered with cultivation and in turn with the collection of taxes based on it. Securing a water supply for agriculture enabled more reliable harvests and, in turn, payment of taxes. Local élites shared this interest with the Roman authorities because their wealth likewise depended on an adequate water supply — they were in the same position as landowners and right-holders who had water rights in ownership and servitudes. Local control may not rise to the level of unified policy but it was a self-conscious strategy that allowed the Romans to promote their interests in water resources and their economic potential. The Roman approach to fresh water corroborates the findings of scholarship on contemporary environmental law which show that the classification of environmental as public or private property is less critical to effective regulation than the configuration of component rights.¹⁵³

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APPENDIX

Several interdicts addressed the rights in public natural sources, as listed below. Some interdicts applied to only public property, others to only private property, while some applied to both. Three interdicts applied only to public rivers.¹⁵⁴ One, *De cloacis*, covered only private drains. The other four interdicts applied to both public and private fresh water. The *De aqua cottidiana et aestiva* applied both to public and to private sources governed by a servitude, as did the *De rivis*.¹⁵⁵ The *De fonte* applied in the same way as the *De rivis* because both were available to the same types of plaintiff and because their application depended on the same standard (viz. change in flow compared to last year).¹⁵⁶

BIBLIOGRAPHY

- Albanese, B. 1991: 'L'edictum vetus «su qui flumina retanda publice redempta habent»', *Annali del Seminario Giuridico dell'Univ. di Palermo* 41, 17–29
- Albuquerque, J. M. 2002: *La Protección o defensa del uso colectivo de las cosas de dominio público: especial referencia a los interdictos de publicis locis (loca, itinere, viae, flumina, ripae)*, Madrid
- Al-Mudayna (Association) 1991: *Historia de los regadíos en España (...a.c.–1931)*, Madrid
- Arenillas, M., and Castillo, J. C. 2003: 'Dams from the Roman era in Spain: analysis of design forms', in *Proceedings of the First International Congress on Construction History, Madrid 20th–24th January 2003*, Madrid, 243–57
- Baden, J. A. 1998: 'A new primer for the management of common-pool resources and public goods', in J. A. Baden and D. S. Noonan (eds), *Managing the Commons* (2nd edn), Bloomington, 51–62
- Bannon, C. J. 2009: *Gardens and Neighbors: Private Water Rights in Roman Italy*, Ann Arbor

¹⁵³ Cole 2000: 296–306.

¹⁵⁴ The interdict *Ne quid in flumine publico fiat* (D. 43.13) may have had a broader scope from the start, according to Albuquerque 2002: 267–9.

¹⁵⁵ For the interdict *De aqua cottidiana et aestiva*: D. 43.20.1.9 Ulp. 70 *ad Ed.* (servitude) and D. 43.20.1.38–44 Ulp. 70 *ad Ed.* (public sources), with Maganzani 2004: 189. The jurists are explicit about the interdict *de rivis*: 'hoc interdictum ad omnes rivos pertinet, sive in publico sive in privato sint constituti', D. 43.21.3.4 Ulp. 70 *ad Ed.*, with Fiorentini 2003: 124–5.

¹⁵⁶ D. 43.21.3.7 Ulp. 70 *ad Ed.*, D. 43.22.1.11 Ulp. 70 *ad Ed.* (eligible parties); D. 43.13 public; D. 43.20 private (change in flow standard). References to servitudes in the cases on the interdict *De fonte*, should not be interpreted as indicating that it was limited to private water sources, Grosso 1932: 423–4.

- Bannon, C. J. 2016: 'Ancient Roman water rights and Commons Theory', in C. M. Ashcraft and T. Mayer (eds), *The Politics of Fresh Water: Access, Conflict and Identity*, New York, 13–27
- Bannon, C. J. 2017: 'Rivers, rights, and "Romanization"', in D. P. Kehoe and T. A. J. McGinn, *Ancient Law, Ancient Society*, Ann Arbor, 122–44
- Beltrán Lloris, F. 2006: 'An irrigation decree from Roman Spain: the Lex Rivi Hiberiensis', *Journal of Roman Studies* 96, 147–97
- Birks, P., Rodger, A., and Richardson, J. S. 1984: 'Further aspects of the Tabula Contrebiensis', *Journal of Roman Studies* 74, 45–73
- Boatwright, M. T. 2000: *Hadrian and the Cities of the Roman Empire*, Princeton
- Brennan, T. C. 2000: *The Praetorship in the Roman Republic* (2 vols), Oxford
- Broadhead, W. 2000: 'Migration and transformation in North Italy in the 3rd to 1st centuries BC', *Bulletin of the Institute of Classical Studies* 44, 145–66
- Bruun, C. 1991: *The Water Supply of Ancient Rome: A Study of Roman Imperial Administration*, Rome
- Bruun, C. 2003: 'Medius fidius ... tantam pecuniam Nicomedenses perdiderint! Roman water supply, public administration and private contractors', in J.-J. Aubert (ed.), *Tâches publiques et entreprise privée dans le monde romaine*, Geneva, 305–25
- Bruun, C. 2012: 'Roman emperors and legislation on public water use in the Roman Empire: clarifications and problems', *Water History* 4, 11–33
- Bruun, C. 2015: 'Water use and productivity in Roman agriculture: selling, sharing, servitudes', in Erdkamp *et al.* (eds) 2015, 132–49
- Butzer, K. W., Mateu, J. F., Butzer, E. K., and Kraus, P. 1985: 'Irrigation agrosystems in eastern Spain: Roman or Islamic origins?', *Annals of the Association of American Geographers* 75.4, 479–509
- Campbell, B. 2000: *The Writings of the Roman Land Surveyors*, London
- Campbell, B. 2012: *Rivers and the Power of Ancient Rome*, Chapel Hill
- Cangelosi, E. 2014: *Publica e Communis. Acqua, mondo romano e beni comuni*, Rome
- Capini, S. 1991: 'Venafrum', in *La Romanisation du Samnium aux IIe et Ier siècles av. J.-C. Actes du Colloque organisé par le Centre Jean Bérard 4–5 Novembre 1988*, Naples, 21–33
- Capogrossi Colognesi, L. 1966: *Ricerche sulla struttura delle servitù d'acqua in diritto romano*, Milan
- Capogrossi Colognesi, L. 1999: 'Spazio privato e spazio pubblico', in S. Quilici Gigli and L. Quilici (eds), *La Forma della città e del territorio*, Rome, 17–41
- Capogrossi Colognesi, L. 2014: 'La lex rivi Hiberiensis e gli schemi delle servitù d'acqua in diritto romano', in L. Maganzani and C. Buzzacchi (eds), *Lex Rivi Hiberiensis. Diritto e tecnica in una comunità della Spagna romana*, Naples, 75–91
- Cole, D. H. 2000: 'New forms of private property: property rights in environmental goods', B. Bouckaert and G. De Geest (eds), *Encyclopedia of Law and Economics, Volume I. The History and Methodology of Law and Economics*, Cheltenham, 274–314
- Cole, D. H., and Ostrom, E. 2012: 'The variety of property systems and rights in natural resources', in D. Cole and E. Ostrom (eds), *Property in Land and Other Resources*, Cambridge, 37–64
- Cornell, T. J. 1995: *The Beginnings of Rome: Italy and Rome from the Bronze Age to the Punic Wars (c.1000–264 BC)*, London and New York
- Costa, E. 1919: *Le acque nel diritto romano*, Bologna
- Coste, J., and Schutzmann-Bolzon, P. 1970: 'Roma (agro romano). Il cippo arcaico della tenuta Sbardella', *Notizie degli Scavi di Antichità* ser. VIII, 24, 364–71
- Crawford, M. H. (ed.) 1996a: *Roman Statutes* (2 vols), London
- Crawford, M. H. 1996b: 'Lex Coloniae Genitivae', in Crawford 1996a, 393–454
- Crook, J. A. 1996a: 'Lex Sulpicia', in Crawford 1996a, 727–8
- Crook, J. A. 1996b: 'Leges de aquis', in Crawford 1996a, 729–30
- Crook, J. A. 1986: 'Lex "rivalicia" (FIRA I no. 5)', *Athenaeum* 74 (N.S. 64), 45–53
- Cursi, M. F. 2007: 'L'edictum Augusti de aquaeductu Venafrano e l'amministrazione delle acque pubbliche. Un esempio di regolamentazione di rapporti privati e pubblici', in *Samnium* 70, 121–32
- Daube, D. 1973: 'Das Selbstverständliche in der Rechtsgeschichte', *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte* 90.1, 1–13 (translated as 'The self-understood in legal history', *Jur. Rev.* 18, 126–34. Reprinted in *The Green Bag* 2, 413–19 and *Collected Studies* 2, 1277–85)
- De Kleijn, G. 2001: *The Water Supply of Ancient Rome: City Area, Water, and Population*, Amsterdam

- De Marco, N. 2004: *I loci publici dal I al III secolo. Le identificazioni dottrinali, il ruolo dell'usus, gli strumenti di tutela*, Naples
- Dietz, T., Dolšák, N., Ostrom, E., and Stern, P. C. (eds) 2002: 'The drama of the Commons', in E. Ostrom *et al.* (eds), *The Drama of the Commons*, Washington, 3–35
- Di Porto, A. 1994: 'Interdetti popolari e tutela delle «res in usu publico»', in *Diritto e processo nella esperienza romana: atti del seminario torinese (45 dicembre 1991) in memoria di Giuseppe Provera*, Naples, 481–520
- Eck, W. 1987: 'Die Wasserversorgung im römischen Reich: Sozio-politische Bedingungen, Recht und Administration', in G. Garbrecht (ed.), *Geschichte der Wasserversorgung. Vol. 2 Die Wasserversorgung antiker Städte, Pergamon*, Mainz am Rhein, 49–100
- Eck, W. 1995: *Die Verwaltung des römischen Reiches in der hohen Kaiserzeit*, Basel
- Erdkamp, P., Verboven, K., and Zuiderhoek, A. (eds) 2015: *Ownership and Exploitation of Land and Natural Resources in the Roman World*, Oxford
- Evans, H. B. 1994: *Water Distribution in Ancient Rome: the Evidence of Frontinus*, Ann Arbor
- Fiorentini, M. 2003: *Fiumi e mari nell'esperienza giuridica romana*, Milan
- Franciosi, G. 1997: 'Regime delle acque e paesaggio in età repubblicana', in A. Coen and S. Quilici Gigli (eds), *Uomo, acqua e paesaggio*, Rome, 11–19
- Geißler, K. 1998: *Die öffentliche Wasserversorgung im römischen Recht*, Berlin
- Grosso, G. 1931: 'Appunti sulle derivazioni dai fiumi pubblici nel diritto romano (A proposito di uno studio di Emilio Albertario)', *Atti Reale accademia delle scienze di Torino. Classi de scienze morali, storiche e filologiche* 66, 369–91
- Grosso, G. 1932: 'Sulla servitù di aquae haustus', *Bulletino dell'Istituto di Diritto Romano* 40, 401–36
- Grosso, G. 1969: *Le servitù prediali nel diritto romano*, Turin
- Gualandi, G. 2012: *Legislazione imperiale e giurisprudenza*, Bologna
- Hermon, E. (ed.) 2008: *Vers une gestion intégrée de l'eau dans l'Empire romain*, Rome
- Hodge, A. T. 1991: *Roman Aqueducts and Water Supply*, London
- Hölkeskamp, K. J. 2010: *Reconstructing the Roman Republic: An Ancient Political Culture and Modern Research*, rev. edn, trans. H. Heitmann-Gordon, Princeton
- Honoré, A. M. 1961: 'Ownership', in A. G. Guest (ed.), *Oxford Essays in Jurisprudence*, Oxford, 370–5
- Horden, P., and Purcell, N. 2000: *The Corrupting Sea: A Study of Mediterranean History*, Oxford
- Jaillette, P., and Reduzzi Merola, F. 2008: 'L'eau à usage agricole dans la législation romaine de l'époque tardive: du Code Théodosien au Code Justinien', in Hermon 2008, 229–41
- Jakab, E. 2015: 'Property rights in ancient Rome', in Erdkamp *et al.* 2015, 107–31
- Kaser, M. 1971: *Das römische Privatrecht*, 2 vols (2nd edn), Munich
- Kaser, M., and Hackl, K. 1997: *Das römische Zivilprozessrecht* (2nd edn), Munich
- Kehoe, D. P. 2007: *Law and the Rural Economy in the Roman Empire*, Ann Arbor
- Kehoe, D. P. 2008: 'Economics and the law of water rights in the Roman Empire', in Hermon 2008, 243–51
- König, A. 2007: 'Knowledge and power in Frontinus' *On Aqueducts*', in J. König and T. Whitmarsh (eds), *Ordering Knowledge in the Roman Empire*, Cambridge, 177–205
- Levy, E., and Rebel, E. 1929–35: *Index Interpolationum quae in Iustiniani Digestis Inesse Dicuntur*, Weimar
- Maganzani, L. 2004: 'L'approvvigionamento idrico degli edifici urbani nei testi della giurisprudenza classica: contributi giuridici alle ricerche sugli acquedotti di Roma antica', in M. A. Gallina (ed.), *Acque per l'utilitas, per la salubritas, per l'amoenitas*, Milan, 185–220
- Maganzani, L. 2012: 'Lex rivi Hiberiensis', in G. Purpura (ed.), *Revisione ed integrazione dei Fontes Iuris romani Anteiustiniani (FIRA), studi preparatori, vol. 1, Leges*, Turin, 171–85
- Marrone, M. 1971: 'Considerazioni sui "ruta (et) caesa"', in G. Falcone (ed.), *Studi in onore di Edoardo Volterra*, 6 vols, Milan, 1.213–23
- Mateo, A. 1996: 'Sobre la supuesta *Lex Sulpicia rivalicia*', *Studia et Documenta Historiae et Iuris* 62, 287–308
- McCay, B. 2002: 'Emergence of Institutions for the Commons: contexts, situations, and events', in E. Ostrom *et al.* (eds), *The Drama of the Commons*, Washington, D.C., 361–402
- Meincke, J. P. 1971: 'Superficies solo cedit', *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte Romanische Abteilung* 88, 136–83
- Mitchell, S. 1993: *Anatolia: Land, Men, and Gods in Asia Minor*, 2 vols, Oxford
- Mommsen, T. 1881: 'Inscript aus Caiatia', *Hermes* 16, 495–8

- Mommsen, T. 1885: 'Die römischen Anfänge von Kauf und Miethé', *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte Romanische Abteilung* 19, 260–74
- Mommsen, T. 1887–88: *Römisches Staatsrecht* (3rd edn), Leipzig
- Morley, N. 1996: *Metropolis and Hinterland: The City of Rome and the Italian Economy 200 B.C.–A.D. 200*, Cambridge
- Nörr, D. 2008: 'Prozessuales (und mehr) in der *lex rivi Hiberiensis*', *Zeitschrift der Savigny-Stiftung für Rechtsgeschichte Romanische Abteilung* 125, 108–88
- Olson, M. 1998: 'Group size and group behavior', in J. A. Baden and D. S. Noonan (eds), *Managing the Commons* (2nd edn), Bloomington, 39–50
- Orestano, R. 1935: 'Concessione personale e concessione reale dello *ius aquae ducendae ex castello* (contributo all'esegesi del fr. I. 38–43 D. 43.20 di Ulpiano)', *Bullettino dell'Istituto di Diritto Romano* 43, 297–313
- Ostrom, E. 1991: *Governing the Commons: the Evolution of Institutions for Collective Action*, Cambridge
- Pagano, M. 1996: 'Note su alcuni acquedotti romani in Campania', in N. De Haan and G. C. M. Jansen (eds), *Cura Aquarum in Campania*, Leiden, 101–8
- Peachin, M. 2004: *Frontinus and the Curae of the Curator Aquarum*, Stuttgart
- Purcell, N. 1996: 'Rome and the management of water: environment, culture and power', in G. Shipley and J. Salmon (eds), *Human Landscapes in Classical Antiquity. Environment and Culture*, London, 180–212
- Richardson, J. S. 1983: 'The *Tabula Contrebiensis*: Roman law in Spain in the early first century B.C.: I', *Journal of Roman Studies* 73, 33–41
- Rinne, K. W. 1999: 'Aequae Urbis Romae: the Waters of the City of Rome' <http://www3.iath.virginia.edu/waters/first.html>
- Rodgers, R. H. (ed.) 2004: *Frontinus De aquaeductu urbis Romae*, Cambridge
- Šašel, J. 1973: 'Trajan's canal at the Iron Gate', *Journal of Roman Studies* 63, 80–5
- Shaw, B. D. 1982: 'Lamasba: an ancient irrigation community', *Antiquités Africaines* 18, 61–103
- Shaw, B. D. 1984: 'Water and society in the ancient Maghrib: technology, property and development', *Antiquités Africaines* 20, 121–73
- Sherwin White, A. N. 1985: *The Letters of Pliny: a Historical and Social Commentary*, Oxford
- Tarpin, M. 2002: *Vici et Pagi dans l'occident romain*, Rome
- Thomas, Y. 2002: 'La valeur des choses: le droit romain hors la religion', *Annales (HSS)* 57 (6), 1431–62
- Thomas, R., and Wilson, A. 1994: 'Water supply for Roman farms in Latium and South Etruria', *Papers of the British School at Rome* 62, 139–96
- Walsh, P. G. 1994: *Livy Book XXXIX*, Warminster
- Watson, A. 1975: *Rome of the XII Tables*, Princeton
- Wikander, O. 2000a: 'The water-mill', in O. Wikander (ed.), *Handbook of Ancient Water Technology*, Leiden/Boston/Köln, 371–400
- Wikander, O. 2000b: 'Industrial applications of water-power', in O. Wikander (ed.), *Handbook of Ancient Water Technology*, Leiden/Boston/Köln, 401–10
- Wilson, A. S. 1999: 'Deliveries *extra urbem*: aqueducts and the countryside', *Journal of Roman Archaeology* 12, 314–31
- Zoz, M. G. 1999: *Riflessioni in tema di res publicae*, Turin