

Path dependency and collective action in common pool governance

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Abstract: Collective action among resource users has long been identified as a basic element of successful common pool governance, and one of the main concerns of common pool research is the identification of factors that affect collective action. Among the most commonly identified factors are trust, social capital, common preferences, shared knowledge, collaborative experiences, focusing events and expectations of future interactions. Thus far, however, relatively little attention has been paid to the historical-institutional context of collective action and the constraining effects of path dependency. Path dependency suggests that investments and adaptations in early resource management institutions can make it difficult for actors to abandon these institutions, thereby influencing and shaping subsequent collective action efforts. This article examines the impact that path dependency can have on collective action in common pools, by examining basin-level water management in the Murray-Darling Basin of Australia, the Colorado Basin of the US and the Saskatchewan-Nelson Basin of Canada. In all three cases, early water apportionment institutions have proven strongly path dependent, significantly shaping subsequent collective action efforts at water conservation.

Keywords: Environment, heritage, irrigation, path dependency, water

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1. Introduction

Collective action among resource users has long been identified as a basic element of successful common pool governance, and one of the main concerns of common pool research is the identification of factors that affect collective action. Among the most commonly identified factors are trust, social capital, common preferences, shared knowledge, collaborative experiences, focusing events and expectations of future interactions. Thus far, however, relatively little attention has been paid to the historical-institutional context of collective action and the constraining effects of path dependency. Path dependency suggests that investments and adaptations in early resource management institutions can make it difficult for actors to abandon these institutions, thereby influencing and shaping subsequent collective action efforts. This article examines the impact that path dependency can have on collective action in common pools, suggesting that it should be added to the list of factors outlined above.

To explore this assertion, this paper offers a longitudinal comparison of basin-wide collective action in the governance of water resources in the Murray-Darling Basin of Australia, the Colorado Basin of the United States, and the Saskatchewan-Nelson Basin of Canada. These cases have been selected using a 'most different' comparative approach which attempts to show the 'apportionment to conservation' development path in different cases from different parts of the world. This demonstrates the importance of path dependency in contrasting settings, suggesting its general relevance to analyses of collective action in common pool governance. In all cases, collective action is examined at the basin level, between sub-national governments and, less often, within national governments. Since there is no 'normal' or 'typical' collective action situation in common pool governance, this focus on large-scale basin level collective action is meant to be illustrative rather than representative and was done primarily for ease of data collection. Given the paper's historical/longitudinal approach, the main sources of data were previous academic studies and government documents, all of which were analysed using qualitative content analysis, and triangulated to ensure the accuracy of findings.

The paper proceeds in three sections below. The first section describes the concept of path dependency in some detail and makes the case that path dependency is important for understanding contemporary collective action. Section two illustrates the relevance and influence of path dependency on basin level collective action in the Murray-Darling, Colorado, and Saskatchewan-Nelson basins, respectively. Section three then offers some concluding observations and suggestions for further work in this area.

2. Common pool governance institutions and path dependency

In semi-arid regions, river basins are the lifeblood of local economies, many of which were originally based on mining and/or agricultural irrigation, both water-intensive activities. To facilitate economic development, early water management

efforts were geared primarily toward the claiming and distribution of water entitlements, allowing miners, irrigators and other water users to attain secure resource flows. In the early stages of development, the river basins were so large, and the demands on them so small, that the conservation of resource stocks was not really a concern. As a result, the early institutions of water management in most semi-arid river basins were designed to facilitate the appropriation of water flows, not the conservation of water stocks. This was true at all levels of governance, including the basin level where the riparian governments sharing a river basin typically negotiated, and in some cases litigated, water apportionment institutions to divide the waters amongst themselves.

Apportionment institutions are characterised by rules that establish a division of resource flows, often at multiple, nested levels. In semi-arid river basins, for instance, intergovernmental apportionment agreements divide water into state/provincial shares, allowing the riparian governments to divide their respective shares amongst individual, collective, or corporate water users in the form of licenses or water rights. The underlying objective of apportionment institutions is to provide governments and resource users with some certainty of resource flows – notwithstanding natural variability – so they can develop their resources without fear of encroachment by others. Examples of basin-wide apportionment institutions include the River Murray Waters Agreement (1914) in south-eastern Australia, the Master Apportionment Agreement (1969) on the Canadian prairies, and a variety of apportionment agreements in the American West, including the Colorado River Compact (1922). All three of these examples are explored in more detail below.

In most cases, the early apportionment institutions proved quite successful in attaining their underlying economic development objectives, but had the long-term, unintended effect of contributing to the degradation of water stocks through overuse. Over the last few decades, governments have responded to these problems with efforts to develop conservation institutions aimed at achieving basin-wide stock restoration or preservation objectives. One of the key distinguishing features of conservation institutions is their emphasis on limiting water diversions and consumption throughout an entire basin. This is an explicit recognition that all water uses in a basin are interdependent and that all of these activities should be regulated so the water stock can be preserved or restored. In this way, the underlying objective of conservation institutions is sustainable development, though it is certainly questionable whether many of them actually succeed in achieving this goal. One of the best examples of a water conservation institution is the Murray-Darling Cap on Diversions (1995) in south-eastern Australia, explored in greater detail below.

The historical fact that apportionment institutions preceded conservation efforts in many semi-arid river basins is important because it means that the actors undertaking conservation efforts did not start with an institutional blank slate, as is often assumed in analyses of collective action. The existing literature on common pools and resource governance points to a number of factors that affect

actors' capacity for collective action, including trust, common preferences, shared knowledge, collaborative experiences, focusing events and expectations of future interactions (Gerlak and Heikkila 2007; Ostrom 1990; Raymond 2006; Singleton 1998; Singleton and Taylor 1992). While all of these are clearly important, so is the historical-institutional context in which collective action occurs. The 'apportionment to conservation' development path is by no means unique to the governance of semi-arid river basins. In many fisheries, forests, and wild animal stocks, early collective action efforts were dedicated to apportionment in various forms and these apportionment institutions have persisted to shape and constrain more recent efforts at resource conservation. In short, path dependency is an under-explored variable in the governance of common pools of various types and is probably deserving of greater emphasis in common pool analysis.

The use of path dependency as an explanatory variable implies an historical approach to analysis that emphasises the importance of the order in which things happen. However, path dependency is not about historical determinism or inevitability, but is instead about "context-bound rationality:" past events and choices establish constraints and incentives that narrow future choice sets (Kay 2005, 564). In other words, the sequencing of events is crucial because early events alter the context of future decision-making, pre-empting some options and making other options more or less attractive (Pierson 2004, 18–19). Thus, it matters that apportionment institutions were introduced well before efforts at resource conservation because the pre-existence of these apportionment institutions constrains the decision options available to actors involved in conservation issues.

Institutions become path dependent and constrain future choice sets when they provide "positive feedback" to the actors subject to them. This positive feedback often relates to adaptations and investments that actors have made in an institution and are reluctant to abandon, notwithstanding the institution's economic, social or environmental effects. North (1990) has pointed out that there are usually steep transaction costs and learning costs involved in major institutional change and actors may be very reluctant to abandon investments in and adaptations to existing institutions, providing positive feedback that helps to perpetuate status quo institutions. The longer an institution exists, the greater are the investments and adaptations in the institution, and the more difficult it is to undertake major institutional change (Pierson 2004, 22–23). Positive feedback helps to explain the long-term persistence of many institutions, particularly those institutions that appear to be anachronistic or socially dysfunctional. In the cases analysed here, positive feedback helps to explain why apportionment institutions remain the centrepiece of water governance in semi-arid river basins today, despite the pressing urgency of conservation issues.

Positive feedback constrains actor decision-making because it provides positive reinforcement for the institutional status quo compared to potential reform options, prompting actors to forgo major institutional reform. When this calculus is repeated over time, institutions providing positive feedback tend to remain on

a relatively constant trajectory (or path), the selection of which is dependent on choices made early in the process of institutional development (Pierson 2004, 21). So, the early historical decision to create apportionment institutions continues to have a major influence on current decision-making because positive feedback from these institutions makes it extremely difficult to abandon or reform them to achieve conservation goals, resulting in path dependent resource management. Thus, the current collective action challenges of water conservation are historically rooted in apportionment and should be understood as such.

As noted above, whether an institution is path dependent or not depends largely on its capacity to provide positive feedback to key political actors. Summarising the burgeoning path dependency literature, Kay (2005, 562–563) has catalogued a variety of sources of positive feedback that can contribute to path dependency. Among these, the most relevant sources of positive feedback from early apportionment institutions has been the entrenchment of vested interests, the onset of network effects, the investment of sunk costs, and the creation of formal or informal contracts. Together, they have combined to make apportionment institutions in semi-arid river basins politically resilient, perpetuating them and constraining conservation efforts. The nature of each of these sources of positive feedback is described below:

1. Vested interests – By design, apportionment institutions create vested interests at a variety of governance levels. The purpose of apportionment institutions is to provide governments and, ultimately, water users with relatively secure shares of a scarce resource, thereby encouraging the economic development of the resource. In so doing, apportionment institutions clearly advantage those actors who gain shares of the apportionment, creating a constituency with a strong interest in perpetuating the institution. In many semi-arid river basins, for instance, apportionments exist both between the riparian governments and within each of the riparian jurisdictions, creating vested interests on multiple governance levels. So, any effort to undertake major reforms of apportionment institutions must run a gauntlet of vested interests both at the domestic and basin levels, raising the difficulty and cost of reform and reinforcing the institutional status quo.
2. Network effects – Apportionment institutions also provide positive feedback to actors apart from the material benefits they confer on vested interests. When apportionment occurs on multiple governance levels – between jurisdictions and between water users within each jurisdiction – a network of functionally integrated rules is created. This integration is important because it becomes quite difficult to undertake reforms to some apportionment rules without undertaking reforms to the entire institutional network, substantially raising the costs of any reform. This is referred to as a network effect. For instance, in semi-arid river basins, intergovernmental apportionments cannot be rolled back without also undertaking major reforms of domestic water entitlement

systems. Due to this network effect, the difficulty and cost of institutional reform increases greatly, thereby providing a source of positive feedback and contributing to path dependency.

3. Sunk costs (Stranded assets) – Over time, governments and water users have not only made investments in the apportionment rules themselves, but also in extensive water management infrastructure to facilitate the implementation of these rules. This infrastructure variously includes dams, weirs, canals, pipelines, hydro-electricity generating facilities and irrigation projects, often funded with public money and carrying price tags into the billions of dollars. Institutional reforms resulting in apportionment roll backs would make at least some of this infrastructure redundant, stranding these assets and abandoning massive investments (Glenn 1999; Lloyd 1988; Reisner 1993). The reluctance to abandon these sunk costs is a significant source of positive feedback, contributing to the overall resilience of apportionment institutions.
4. Formal/Informal contracts – Although their legal status varies from place to place, the water entitlements created by apportionment institutions can be difficult to reform due to their contractual nature. In some places, such as Australia and western Canada, water entitlements are granted by the state and constitute an informal contract between the state and license-holders. Although the state has the authority to alter the terms of this contract, there is an expectation that the licenses are semi-permanent and this is usually respected (Percy 2005, 2094–2095). In other places, such as the western US, water entitlements constitute a formal property right with judicial enforcement, making them quite difficult to reform (Tarlock 2001, 276–278). Whether formal or informal, the contractual nature of water entitlements adds to the cost of institutional change, providing an additional source of positive feedback from apportionment institutions and contributing to path dependency.

While vested interests, network effects, sunk costs and the contractual nature of water entitlements have been the main sources of positive feedback and path dependency for apportionment institutions in the cases examined in this paper, institutions in other common pool situations may have other distinctive sources of positive feedback. The objective here is not to provide an exhaustive list of positive feedback sources, but to show that path dependency can be important in shaping and constraining collective action efforts in common pool management. Path dependency comes into play when there is sufficient positive feedback – from one or more sources – to make an institution so politically entrenched that there is a “lock in” effect in which it is very difficult to deviate from the path set by the established institution (North 1990, 94). When this occurs, the range of viable future reform options is considerably narrowed so that early institutional choices cast a long shadow on subsequent collective action efforts.

3. Path dependency in three semi-arid river basins

In the remainder of this article, the impact of path dependency on current water conservation efforts in three semi-arid river basins is examined in more detail. These basins include the Murray-Darling Basin in Australia, the Colorado Basin in the United States, and the Saskatchewan-Nelson Basin in Canada. In accordance with the ‘most different’ comparative approach taken in this paper, these cases were selected to show that the ‘apportionment to conservation’ development path – and path dependency – is not unique to one region, but is common across different parts of the world. The analysis focuses on basin-wide collective action efforts in water management, often between sub-national governments and sometimes within national governments. Given that there is no ‘typical’ or ‘normal’ collective action situation in common pool governance, this focus on large-scale collective action is meant to be illustrative rather than representative and was done primarily for ease of data collection. Future research will have to determine if the substantial impact of path dependency evident in the basin level collective action efforts described below is as prevalent at smaller and larger scales.

3.1. Murray-Darling Basin

The Murray-Darling Basin is located in south-eastern Australia and covers parts of Queensland, New South Wales, Victoria, South Australia, and the Australian Capital Territory. The source of the basin is in the Great Dividing Range in the east, its rivers flowing westward until they ultimately converge in the River Murray, eventually emptying into the Indian Ocean southeast of Adelaide. The Murray-Darling is the most productive agricultural area of Australia, and irrigation plays a major role in this productivity. Crops such as hay, wheat, rice, stone fruits, citrus, and wine grapes are grown across the basin, and all but the former would not be possible without irrigation (Murray-Darling Basin Commission 2008). While irrigated agriculture is by far the largest user of water in the Murray-Darling, the basin is also the source of domestic water for two of the country’s largest cities, Canberra and Adelaide (Murray-Darling Basin Commission 2008). The flows of the Murray-Darling tend to be quite variable, and, from its early days of development, this has created basin-wide scarcity problems that have threatened economic development.

In the Murray-Darling, basin-wide water management has taken place mostly through sub-national cooperation. Under the Australian Constitution, water management was left primarily to the states; section 51(I) gave the Commonwealth a role in protecting the River Murray as a trade and transportation link, but section 100 limited this power by specifically protecting irrigation rights from Commonwealth impairment (Wright 1975, 170). Periodically, the Commonwealth government used its substantial spending power to get involved in water management issues, through the funding of dam construction or the offering of financial incentives for state water reforms, but the states have been the main water managers. Very recently, in response to an unprecedented multi-year

drought, the Commonwealth government has taken on a larger water management role in the Murray-Darling than it has had in the past, but it is unclear whether this will continue when the drought finally breaks.

During the federation debates in the last decade of the 19th century, control of the River Murray was one of the most contentious issues addressed, and it remained largely unresolved until an interstate apportionment was finally negotiated in the River Murray Waters Agreement of 1914. Negotiation of this apportionment was motivated by a severe drought in the early 1900s as well as the Commonwealth government's willingness to come forward with funds for the construction of a series of dams and weirs that would facilitate navigation on the river and allow for some water storage and release capacity to meet state allocations (Wright 1975; Wright 1978). The apportionment itself was quite complex, but had three essential features: 1) New South Wales and Victoria would divide the Murray waters upstream of Albury equally between them; 2) New South Wales and Victoria had full use of the Murray tributaries downstream from Albury; but, 3) New South Wales and Victoria had to guarantee downstream South Australia a minimum annual allocation of 1,254,000 acre-feet, distributed in monthly installments to support irrigation (Wright 1975, 175). An intergovernmental organisation comprised of representatives from the three Murray states and the Commonwealth – the River Murray Commission – was also created to construct and operate the dams and weirs on the main stem of the Murray and to administer the apportionment on behalf of the states (Johnson 1974, 284).

In short order, the River Murray Waters Agreement became one of the institutional foundations of water development in the Murray-Darling. Using their respective apportionments, the states allocated water licenses, embarked on expansive programmes of irrigation development, and, in partnership with the Commonwealth, constructed a massive water control and storage infrastructure that included engineering marvels such as the Snowy Waters Project (Wigmore 1968). By the 1960s, South Australia reached the objective of “full development” – putting all of its allocation to economic use – and New South Wales and Victoria were not far behind (Cooper 1985, 104–107; Alvarez, pers. comm.; Fitzpatrick, pers. comm.). Over time, the established apportionment institution provided increasing levels of positive feedback for key political actors in the basin: vested governmental and private interests benefited from established water apportionments; intergovernmental apportionments became intertwined with domestic water entitlements, creating a dense network of institutional rules; investments in physical infrastructure resulted in substantial sunk costs; and, the contractual nature of the apportionments made them difficult to reform in political processes. All of this positive feedback combined to make the early apportionment institution in the Murray-Darling politically unassailable, even as the dysfunctions of this institution became increasingly evident.

By the 1980s, it became widely apparent that full development was creating severe environmental problems in many parts of the basin, and that a basin-wide water conservation effort was seriously needed. A drought in the early 1980s

brought the Murray-Darling governments together and resulted in the creation of the Murray-Darling Basin Ministerial Council in 1986, focusing high-level political attention on the environmental problems in the basin (Powell 1993, 77–78). Then, in 1991, poor water quality and diminished flows on the Darling River led to a 1,000 km long blue-green algae bloom, killing scores of fish and making the river toxic to animals and humans. During the same period, diminished flows on the River Murray led to the closing of the Murray Mouth, separating the river from its outlet in the Indian Ocean, and forcing governments to bring in excavation equipment to reconnect them. This combination of political attention and environmental crises created a situation conducive to conservation reforms, and the most significant of these reforms was achieved in 1995 with the negotiation of the Murray-Darling Cap on Diversions.

However, the design of the Murray-Darling Cap on Diversions was greatly constrained and influenced by the longstanding apportionment institution in the basin. Despite evident environmental problems, abandonment of the River Murray Waters Agreement was not on the table. Consequently, the Cap did not replace the River Murray Waters Agreement but was grafted onto it. This not only meant that the apportionment institution was largely preserved, but the new conservation institution took on some of its characteristics as new rules were added to old. One illustration of this is the apportionment-like manner in which the Cap sets out its conservation objectives. Under the Cap, Murray-Darling governments commit themselves to limiting water diversions in any given year to a level congruent with 1993/94 levels of development¹, effectively establishing state water allocation ceilings to complement the state water allocation floors outlined in the River Murray Waters Agreement (Close and Connell 2000). In this way, the Cap is shaped and, to a large extent, incorporated into the established apportionment, a clear illustration of path dependent water governance.

Subsequent conservation efforts have also reflected this path dependency, particularly in efforts to restore water flows in the Murray and Snowy Rivers. In these rivers, conservation efforts have focused on government buybacks of water licenses and changes in dam management practices, both of which are compatible with the maintenance of the apportionment status quo. The continued resilience of the apportionment institution is all the more remarkable in the context of the current drought and recent efforts by the Commonwealth to take over substantial water management authority in the Murray-Darling. This institutional resilience, along with the path dependency of Murray-Darling water management in general, suggests that the conservation options available to the Commonwealth may be seriously constrained and the transfer of water management responsibility to the

¹ More specifically, the Cap is defined “...in any year as the volume of water that would have been used with the infrastructure (pumps, dams, channels, areas developed for irrigation, etc.) and management rules that existed in 1993/94, assuming similar climatic and hydrologic conditions to those experienced in the year in question. Thus, the Cap provides scope for greater water use in certain years and lower use in other years.”

federal government may not be the conservation panacea that many are hoping for (Connell 2007).

3.2. The Colorado River Basin

The Colorado is one of the most economically important rivers of the American West. From its source in the Rocky Mountains to its delta in the Gulf of California, the Colorado Basin encompasses seven states – Wyoming, Colorado, Utah, New Mexico, Nevada, Arizona and California – as well as part of Mexico, and users in all these jurisdictions have placed heavy demands on the basin's waters. The primary use of the Colorado is irrigated agriculture, though demand from domestic and industrial users in cities like Los Angeles, Phoenix and Las Vegas continues to grow and may eventually displace irrigation as the dominant use. Like the Murray-Darling, the Colorado Basin has highly variable flows and is among the most highly developed in the world in terms of dams and water storages, helping to mitigate scarcity problems during low flow periods and encouraging economic growth (Reisner 1993, 120–121). Given its endemic water scarcity and the continually growing demands on the basin, the Colorado has had plenty of water management problems and was one of the earliest basins in the United States to develop an interstate water apportionment institution.

Historically, the federal government, the state governments, and the courts have all played important roles in the management of the Colorado Basin. Federal jurisdiction in the Colorado and other transboundary waters is constitutionally related to its powers over interstate commerce and the management of public lands, and because federal laws in the US supersede state laws, Congress has been able to promulgate rules for the management of the Colorado (Getches 2001, 6). In addition, the federal government has been heavily involved in building and operating dozens of major dams and diversions throughout the Colorado Basin, and this involvement has given them a major role in the basin's management through their discretion over water storage and release (Tarlock 2001, 771). Interstate water conflicts have also been frequently brought to the US courts for resolution and there is a well-established body of jurisprudence on these issues, making the courts a viable alternative to collective action, notwithstanding the time and money involved in lengthy litigation. Nevertheless, the state governments have remained the primary regulators of water withdrawals and the main distributors of water entitlements in the US, giving them formative roles in water management. When interstate cooperation has been pursued it has usually been in the form of interstate compacts, a type of legally enforceable intergovernmental agreement unique to American federalism that also requires the approval of Congress (Florestano 1994).

The first basin-wide water management institution in the Colorado Basin was the Colorado River Compact of 1922, an apportionment agreement negotiated between the seven riparian governments and approved by Congress. The motivating factor for the negotiation of the Compact was California's growing

demand for Colorado River water and concerns from other basin states that California would lay claim to most of the basin's water before they could capture and develop resource flows for themselves (Reisner 1993, 124–125). After some difficult negotiations, an agreement was reached by dividing the river at Lee's Ferry, Arizona into an upper basin (Wyoming, Colorado, Utah, New Mexico) and a lower basin (Nevada, Arizona, California), the division being politically expedient but hydrologically arbitrary. The upper and lower basins were each allocated 7.5 million acre-feet of Colorado water to be divided among their respective states, at a later date. Though this eased the fears of upper basin states, it did little to appease Arizona who was grouped together with California in the lower basin and feared future encroachment on their water. Arizona's dissatisfaction with the Compact was so deep that it did not actually ratify it until 1944, twenty-two years after the other riparian governments, and then only because its ratification was linked to the passage of the Central Arizona Project in the US Congress (Gelt 1997).

The final apportionment of the Colorado was not actually accomplished until forty years after it was initiated, and then only after a period of protracted intergovernmental negotiations and litigation. In 1948, the upper basin states, where water development was still relatively nascent, negotiated a precise interstate apportionment of the upper basin waters, allocating 51.7% to Colorado, 23% to Utah, 14% to Wyoming, and 11.25% to New Mexico (Gelt 1997). The lower basin states, however, had their apportionment settled in the courts. In 1963, the Supreme Court ruled in *Arizona v. California* that the lower basin would be apportioned so that California would receive 4.4 million acre-feet, Arizona 2.8 million acre-feet and Nevada 300,000 acre-feet from the main stem of the Colorado, and each state would be entitled to its own tributaries. The ruling also allowed the federal Secretary of the Interior to act as water master on the Lower Colorado due to the federal water control works at Boulder Canyon, which were crucial to the apportionment's implementation (Gelt 1997). Since the *Arizona v. California* ruling, controversies have arisen over California's tendency to take more than its allotted allocation, even in recent years, but the apportionment has remained intact (Davis 2001, 533).

The apportionment issue was crucial to the riparian states because extensive programmes of agricultural and urban development were predicated upon access to Colorado flows. While California had the earliest and most extensive development programme, the other states have followed suit in their own ways, particularly in Arizona and Nevada where some of the fastest growing urban areas in the US are now located. A crucial part of these state development programmes was the extensive distribution of water rights to irrigators and landowners, the security of these rights largely dependent on the availability of Colorado flows. Overall, due to massive public and private water investment, the creation of water-dependent vested interests, and the institutional intertwining of the interstate apportionment with state water entitlement systems, the Colorado interstate apportionment institution became politically unassailable and essentially "locked in". This has

made basin-wide water management strongly path dependent in the Colorado, shaping conservation efforts in the basin when they were eventually undertaken.

When the initial Colorado apportionment was made in 1922, it was based on data from the federal Bureau of Reclamation which showed average annual flows on the Colorado to be in excess of 15 million acre-feet. Subsequent data suggested, however, that average annual flows are probably much less than this, creating a serious over-allocation problem in the basin (Gelt 1997). This over-allocation has impaired the resource stock so that, in many years, very little Colorado water actually reaches Mexico, the water that does get through is highly saline, and the riverine environment has deteriorated significantly. However, due to the vested state interests in the current apportionment institution and the extensive water development programmes that have grown up around it, the apportionment institution has proven quite resilient and more recent conservation efforts have been moulded around the established apportionment. Furthermore, the states are so heavily invested in the apportionment that interstate cooperation on conservation has been minimal and all of the major conservation reforms have been introduced, instead, at the federal level.

Over the last three and a half decades, Congress has passed a plethora of laws to facilitate basin-wide water conservation in the Colorado Basin. Some of these laws are specific to the Colorado while others are more general. The most important pieces of general legislation date from the early 1970s and include the *Clean Water Act*, *Federal Land Policy and Management Act*, *National Forest Management Act* and *Endangered Species Act* (Getches 2001, 15–16). Specific to the Colorado Basin are the 1974 *Colorado River Basin Salinity Control Act* and the 1992 *Grand Canyon Protection Act* (Gelt 1997). Although none of these pieces of federal legislation have canceled or altered the apportionment institution itself, they have incrementally added to the ‘Law of the River,’ constraining how states use their respective allocations and providing direction to the federal administrators managing the storage and release of water in the basin, all with the view of attaining conservation objectives. In some cases, for instance, this has meant leaving more water in the river to protect endangered species and environmentally sensitive areas, creating serious tensions with established state and private water allocations. In short, the apportionment institution persists with federal conservation laws operating at its margins.

The overall result in the Colorado River Basin is path dependent water management in which conservation rules have been shaped by early apportionment rules. The continued prevalence of apportionment is explained by the resilience of the apportionment rules, in which the riparian states invested a lot of negotiation and litigation over a number of decades, and which form the basis for the extensive economic development that is still taking place in the US Southwest. The more recent conservation rules were developed in response to deteriorating environmental conditions in the basin – created, in part, by the apportionment institution – and were only possible due to the presence of Congress as an

alternative venue for collective action in the US federal system. The addition of conservation laws to the existing apportionment institution has created a number of tensions between these divergent institutions, and it remains to be seen how these tensions will be resolved as cities and water demands continue to grow, particularly in the lower part of the basin.

3.3. The Saskatchewan-Nelson Basin

The Saskatchewan-Nelson Basin in western Canada has its source in the Rocky Mountains and flows eastward through the provinces of Alberta, Saskatchewan and Manitoba before draining into Hudson's Bay. The largest consumptive use of Saskatchewan-Nelson water is irrigated agriculture, particularly in the semi-arid areas of southern Alberta and southern Saskatchewan, though hydro-electric generation, oil extraction, manufacturing, and domestic consumption also figure prominently in different regions. The basin's flows are variable, but a spate of dam and storage construction in the mid 20th century – though not on the scale of the Murray-Darling or the Colorado – have helped to mitigate this variability for water users and assisted the riparian governments in managing their interdependencies (Glenn 1999, 15).

Like the Murray-Darling, basin-wide water management in the Saskatchewan-Nelson has been largely left to inter-provincial cooperation. Although the federal government has jurisdiction over fisheries, navigation and shipping, and international waters under the *Constitution Act*, 1867, the provinces regulate most water withdrawals within their borders and the federal government remains reluctant to challenge this authority when it comes to inter-provincial rivers (Kennett 1991; Saunders 1988). Past conflicts over the control of natural resources have caused the provinces, particularly Alberta, to guard closely their jurisdiction over natural resources, and, in the interest of national unity, Ottawa has generally respected this. This is the case even though there may be grounds for federal intervention in inter-provincial waters under the “peace, order and good government” clause in section 91 of the *Constitution Act*, 1867 (Saunders and Wenig 2007, 122–123). Overall, by virtue of constitutional and political factors, management of the Saskatchewan-Nelson Basin has been an inter-provincial affair, with low-level federal consultation and involvement.

Due to concerns from downstream Saskatchewan and Manitoba that water development in upstream Alberta could leave them with diminished water flows, apportionment became a central issue in early efforts at basin-wide collective action. Apportionment was first addressed with the formation of the inter-provincial Western Water Board in 1930, which was eventually transformed into the Prairie Provinces Water Board in 1948. Initially, the Prairie Provinces Water Board was created as an advisor on apportionment, “... to recommend the best use of the waters of the Saskatchewan River system, and how it should be allocated amongst the provinces” (Glenn 1999, 14). “This method worked well until the 1960s, when the provinces began requesting large allocations of water. Since the

approach used by the Board was no longer adequate to allow long-term planning by the provinces, a new system for sharing this limited resource was developed" (Prairie Provinces Water Board 2007). The new system involved clear and formal apportionment rules for the waters of the Saskatchewan-Nelson Basin, outlined in the Master Apportionment Agreement of 1969 and overseen by the Prairie Provinces Water Board.

Negotiated between the three Prairie provinces and facilitated by the federal government, the Master Apportionment Agreement divided the Saskatchewan-Nelson's waters so that "... Alberta and Saskatchewan may each take up to one half of the natural flow of water originating within its boundaries and one half of the flow entering the province. The remainder is left to flow into Manitoba" (Prairie Provinces Water Board 2007). This apportionment was designed to provide the provinces with relatively equal shares of the basin, and each province was left to develop and manage its share at its own discretion (Prairie Provinces Water Board 2007). The Prairie Provinces Water Board was assigned the task of monitoring the apportionment and remained a forum for intergovernmental coordination and information sharing, but had no authority to enforce the agreement.

Over time, the Master Agreement on Apportionment has become a key institution for water development in the Canadian Prairies. In southern Alberta, and to a lesser extent in southern Saskatchewan, governments and irrigators have invested heavily in dams and other irrigation infrastructure, expanding water use to the limits of their respective apportionments. This not only resulted in substantial sunk costs in the apportionment but created politically powerful vested interests to defend it, particularly in Alberta where the Progressive Conservative party has ruled consecutively since 1971 based largely on the support of the province's rural ridings. In addition, the provincial water entitlement systems have become dependent on the preservation of the apportionments and the two have become institutionally intertwined, as a result. This combination of sunk costs, vested interests, and institutional network effects has resulted in the "lock-in" of the Master Agreement on Apportionment, as evidenced by the fact that no serious effort has been launched to reform the provincial apportionments since its introduction.

Yet, while the apportionment institution was becoming increasingly entrenched, water conservation issues also began to emerge. As the waters of the basin were increasingly appropriated, water quality deteriorated and some fish stocks went into decline (Glenn 1999). By the mid 1980s, the basin's water was so heavily used in its upper reaches that Alberta came close to exceeding its apportionment on the South Saskatchewan River in 1984, 1985 and 1988, and actually exceeded its apportionment on some smaller rivers in a number of years around this time (Environment Canada 2002, 5; Figliuzzi 2002, 13).

However, the established apportionment has proven so resilient that all basin-wide conservation measures have been added to its margins, rather than reforming its core. In 1992, for instance, the Master Apportionment Agreement

was amended to include a new Agreement on Water Quality that established water quality objectives for various parts of the Saskatchewan-Nelson Basin, to be monitored, but not enforced, by the Prairie Provinces Water Board (Environment Canada 2002, 5). Provincially, the Alberta and Saskatchewan governments have also reformed some of their water management practices in the 1990s and early 2000s to achieve a variety of water conservation objectives, but not on a basin-wide level (Percy 2005). None of these intergovernmental or provincial reforms has altered the basic features of the established apportionment institution, which continues as it was, and, indeed, remains so influential that it constrains the range of viable options for water conservation in the Saskatchewan-Nelson Basin.

4. Conclusions

Among the cases examined in this article, the political resilience of early apportionment institutions has been universal, manifesting itself as path dependent water governance in three ways. First, in all three cases, collective action efforts to adopt conservation institutions were inhibited and delayed for fear that conservation rules might undermine the apportionment institutions in which governments and resource users were heavily invested. Second, when conservation institutions were eventually adopted, the apportionment institutions were not only preserved, but the conservation rules were built around the apportionments to ensure their preservation. Third, at least one of the conservation institutions – the Murray-Darling Cap – took on design characteristics of the established apportionment institution, creating conservation rules with distinctive apportionment-like features.

Altogether, these findings lead to the general conclusion that path dependency can be an important factor influencing collective action in common pool governance, particularly in common pools with a long history of collective action. These findings also suggest that path dependency is particularly relevant in common pools characterised by the ‘apportionment to conservation’ development path, where early efforts at collective action focused on the apportionment of resource flows and were only later directed to the conservation of resource stocks. The resilience of early apportionment institutions can make them very difficult to displace when serious conservation concerns emerge later on, constraining the development of much-needed conservation initiatives. Thus, in many common pools, institutional legacies may be just as important as the knowledge, preferences and mutual trust of current actors in determining the outcomes of collective action efforts.

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