

**WATER MANAGEMENT AND CONFLICTS IN
OKLAHOMA: REGULATING AND COMPETING FOR
LIMITED COMMON POOL RESOURCES**

TONY E. WOHLERS
Cameron University

AARON MASON
Northwestern Oklahoma State University

ERIC J. SCHMALTZ
Northwestern Oklahoma State University

JOHN WOOD
Rose State College

Relying on the theoretical frameworks of the tragedy of the commons and the tragedy of the anti-commons, we argue: 1) the water management approach pursued by Oklahoma's government is likely to contribute to the tragic overuse of groundwater resources and 2) the involvement of large and opposing groups that operate within an environment of competing access rights undermine the emergence of an efficient water management regime for Sardis Lake.

Some people call water the oil of the 21st century. While this description may not be exact, one thing is clear: the availability of water will be a key factor in the development of the world's economy and government policies in the next decade (Alexandra Cousteau, 2011).

Water covers more than 70 percent of our planet. However, 97 percent of that water is found in the oceans; only three percent is fresh water; and, about three-quarters of that fresh water exists in ice sheets. It is the remaining one percent—stored in underground aquifers; flowing in rivers and streams; teaming in freshwater lakes—that represents what human beings use to support life. This small portion is increasingly jeopardized by a combination of climatic variations, accelerated use, and population growth in certain parts of the world, including the American Southwest. In light of these broader challenges, the need for sound fresh water management will also become an increasingly important policy issue for states, such as Oklahoma, where less than two percent of the state’s land mass is “inland” water (Perlman 2012). With a focus on groundwater and freshwater lakes, this study offers an overview and analysis of Oklahoma’s water management approach as well as a case study of a major political conflict over water in the state. On the basis of longitudinal data and archival research, this study seeks to provide a basis for understanding and finding efficient solutions to manage common pool resources, defined as a resource that benefits segments of society, but offer diminishing benefits as individuals pursue their own self-interest (Ostrom 2008).

Oklahoma’s water management approach to groundwater district jurisdiction and the subsequent role of the Oklahoma Water Resources Board (OWRB) provides the policy background to analyze the institutional design of groundwater management and the practices of groundwater permitting since 1990 within the theoretical context of the tragedy of the commons. In addition to this institutional focus and longitudinal analysis of groundwater permitting patterns across the state, cases like Sardis Lake water-storage rights illustrate how controversial water is from the perspective of the anti-commons. Accordingly, the analysis will conclude with a discussion of the political conflict surrounding Sardis Lake. As the longitudinal analysis unfolds within the context of groundwater permitting patterns, we argue that the water management approach pursued by Oklahoma within an unclearly defined water management policy framework is likely to contribute to the tragic overuse of groundwater resources. Finally,

opposing and sovereign groups pursue different interests and operate within an environment of fragmented or competing access rights, thereby, as implied by the anti-commons, undermining an efficient water management regime for Sardis Lake.

WATER RESOURCES AND MANAGEMENT IN OKLAHOMA

Oklahoma is located on the Southern Great Plains. Varying from nearly flat in the west to rolling hills in the central and near east, the plains are intersected by hilly areas that include the Wichita Mountains in the southwest, the Arbuckle Mountains in the south-central and the Ouachita Mountains in the southeast. Given Oklahoma's geographic location, water is not abundant. The spatial distribution of rainfall is characterized by a sharp decrease of precipitation from east to west. Though rainfall may vary considerably on an annual basis and may be extremely heavy in certain areas, average annual precipitation generally ranges from about 17 inches in the far western panhandle to about 56 inches in the far southeast.

The Ogallala, or the High Plains, Aquifer is one of the largest underground sources of freshwater in the world. Formed by ancient sediment from the Rocky Mountains and discovered in the 1890s, the 174,000 square-mile Ogallala Aquifer serves as the primary water resource for a vast agricultural area in the United States that stretches from South Dakota to West Texas, including the Oklahoma Panhandle (Opie 1993; High Plains Associates 1982). Receiving less than an inch of annual freshwater recharge, the amount of water storage in the aquifer varies by state. In 1990, approximately 3.5% was located under Oklahoma's Panhandle counties: Cimarron, Texas, and Beaver. As irrigated acreage has increased dramatically from 11,500 acres in 1950 to 347,665 acres in 2005, these counties are the primary beneficiaries of this groundwater resource (see Map 1). Though the amount of water in the aquifer is enormous, it is quite difficult to recharge. The United Nations in its 1996 Comprehensive Global Freshwater Assessment estimated that withdrawals from the Ogallala Aquifer exceed recharge by approximately a 3 to 1 margin. With 3,250 million acre-feet of drainable water according to the United States Geological Survey (1 acre-foot equals 325,805 gallons), the Ogallala Aquifer has lost a large

volume of this water due to agricultural uses, having dropped by an average of 3.2 feet annually between 1980 and 1999. As the water table continues to drop, reports indicate that the levels of pesticides and nitrates entering the water system have increased (U.S. Water News Online 2009; 2007; Peck 2007; American Groundwater Trust 2002; Guru and Horne 2000; Massey and Sloggett 1984).

Institutional approaches to manage groundwater vary across the United States. Though Congressional directives may supersede state control of water, each state in the United States has the “authority to determine how water will be allocated and administered among its citizens” (Wood 2008, 247). In 1936, the Oklahoma Supreme Court decided in favor of the reasonable use principle or American rule declaring that landowners are entitled to use groundwater on their own land without

Map 1: Ogallala Aquifer



waste (Solanes 1999, 71). Thirteen years later, the first statutory law to regulate groundwater in Oklahoma replaced the common law American rule of reasonable use and imposed the appropriation doctrine with provisions on beneficial use. Deemed as ineffective and too restrictive and faced with the increasing scarcity of groundwater by the late 1960s and early 1970s, the 1949 law was completely replaced by the current Oklahoma Groundwater Law that became effective in 1973. The 1973 allocation law makes a direct connection to land ownership and ownership of groundwater and authorizes the OWRB to regulate the use of both surface and groundwater.

The OWRB is responsible for a wide range of water regulation issues, including the determination of water rights for groundwater and the development of a strategic plan for managing Oklahoma's water resources. Groundwater has remained a private property matter, giving landowners "the right to develop the percolating ground water flowing beneath their lands" (Roberts and Gros 1987, 536-537). The relevant 1973 law, designed to protect aquifers from depletion based on a utilization policy rather than the preservation of water, directs the Ground Water Division of the OWRB to determine maximum annual yield (MAY) for each groundwater basin in the state and make the hydrologic surveys available to the public (82 Oklahoma Statute § 10210.1-1020.22). Based on hydraulic surveys that determine MAY, the OWRB determines the equal proportionate share (EPS) for each parcel of land dedicated to the permit application and requires a groundwater permit for the irrigation of cropland more than three acres in total size (Ferrell, Adams, Kizer, and Ott 2010). The 1973 Oklahoma Groundwater Law also authorizes the OWRB to issue temporary groundwater permits before the determination of the MAY for a basin. In light of the high costs and limited budgets, studies and determinations of the MAY have not been completed for many basins in the state.

Research indicates that the OWRB's inability to implement fully the 1973 law stems from limited agency resources and political asymmetries across the state. The lack of financial resources and qualified personnel hamper the OWRB's ability to complete expensive hydraulic surveys. As a result, the agency routinely resorts to issuing temporary groundwater permits. In addition to these challenges faced by the

OWRB, farmers, especially those in the Panhandle, resist groundwater management by the state. Support for reforms remains concentrated in the eastern, more urban half of the state. However, it is difficult to mobilize urban voters in favor of reform (Roberts and Gros 1987, 540). Consequently, political leaders are neither inclined to undertake serious water management reforms nor strongly advocate reduced water use in the Ogallala.

Equally important is the management of surface water. In 1974, the Oklahoma state legislature passed 82 O.S. §1086.2(1), requiring the OWRB to develop a strategic plan for managing Oklahoma's water resources over the course of the next 50 years (Water Research Institute 2012). Oklahoma's first comprehensive water plan was created in January 1980 (Oklahoma Water Resources Board 1980). More than a decade following its first update in 1995, the Oklahoma Water Resources Research Institute (OWRRI), located in the Division of Agricultural Sciences and Natural Resources at Oklahoma State University, hosted 86 local, regional, and statewide water planning meetings to produce the 2012 updated Oklahoma water plan (Oklahoma Water Resources Board 2012). The current comprehensive water plan proposes upgrades to the state's drinking water and wastewater infrastructures and also includes a resolution on state/tribal water consultation to ensure tribal input in the process (Oklahoma Water Resources Board 2012; Journal Record Staff 2011).

THEORETICAL FRAMEWORK, HYPOTHESES AND DATA

Long-term population growth is problematic in a world where essential resources like fresh water, either beneath or above the surface, is finite. This theme, as exemplified by the inauguration of the Club of Rome in 1968 and the publication of *The Tragedy of the Commons* by Garrett Hardin in the same year, is anything but novel. However, in a world of increased pressures on common resource allocations, it remains more relevant than ever. From a *homo economicus* perspective and acknowledging the increasing pressures on resources exerted by population growth, the classic notion of the tragedy of the commons argues that men will overuse a scarce resource that is held in common. As a result, "[r]uin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom

of the commons” (Hardin 1968, 1244). To prevent the population problem in a world where human interference via welfare state benefits and food aid undermine the corrective influence of natural catastrophes, Hardin suggests that Adam Smith’s invisible hand of the free market must be discarded and replaced with a social arrangement of “mutual coercion mutually agreed upon” (Hardin 1968, 1246).

Though the principal logic of the tragedy of the commons is sound, a number of analytical shortcomings weaken the deterministic nature of it. Hardin’s commons is usually referred to in the literature as a *common-pool resource*, which yields a finite flow of benefits (Ostrom, Gardner and Walker 1994). By relying on Hardin’s argument, initial studies have assumed that the resource under consideration yields a predictable and finite supply of one specific type of resource unit. Moreover, users, homogenous and equipped with all information to make rational decisions, are engaged in short-term and profit-maximizing activities. Unable to change, users are trapped in the dilemma that underpins the tragedy of the commons. To escape this trap and create a situation where all users can benefit from common-pool resources, societies can craft institutional rules aimed at authorizing users (Olson 1965). Studies have demonstrated that users have overcome the free-rider dilemma and crafted institutions to govern their own resources (Somma 1997; McCay and Acheson 1987; Ostrom 1990; 2005; 2008).

With the hope to manage common pool resources successfully, public officials have employed different management approaches. A centralized management approach, as employed in the case of forested land and inshore fisheries, have been disappointing and have accelerated resource deterioration. Ostrom (2008) offers a series of factors that increase the likelihood of developing effective institutions for regulating the use of common-pool resources. They include: 1) low discount rates (most resource users have secure tenure, and plan on using the resource for a long time into the future); 2) homogeneous interests (most resource users share similar technologies, skills, and cultural views of the resource); 3) low cost of communication among individuals; and 4) relatively low cost of reaching binding and enforceable agreements.

In recent decades, research in the area of the tragedy of the commons has also introduced the concept of the anti-commons. Following the

Soviet Union's fall and the transition from a planned economy to a free-market system, storefronts in Moscow remained empty for several years. Rather than explaining this puzzle within the context of new rights, local government corruption, and the lack of a functioning legal framework, Michael Heller (1998) argues that the emergence of such anti-commons property is the result of fragmented property rights across owners. While one owner has the right to sign the lease for a given property, others have the right to sell, receive sale revenue, determine use, and occupy the property. This creates a situation of fragmented property privileges or access rights where one owner can employ his specific property right to block any other party with a property right to use or access a resource. In other words, the anti-commons represents "a type of property regime that may result when initial endowments are created as disaggregated rights rather than as coherent bundles of rights in scarce resources" (Heller 1998, 623). In contrast to the tragedy of the commons, and as a logical consequence of the argument so far, the anti-commons suggest waste and underuse of resources – a situation that can be overcome by "unifying fragmented property rights into a usable bundle" (Heller 1998, 640).

According to 82 Oklahoma Statute § 1020.1, groundwater is defined as "fresh water under the surface of the earth regardless of the geologic structure in which it is standing or moving outside the cut bank of any definite stream" (Ferrell, Adams, Kizer, and Ott 2010). The OWRB serves as the central groundwater management agency responsible for issuing water permits and establishing maximum annual yields for groundwater resources like the Ogallala Aquifer. Given the areas of irrigated acres across the state and the decreasing annual average precipitation from the eastern part of Oklahoma to the west, we expect that there is considerable regional pressure on groundwater. Hence, the number of regular groundwater permits issued by the OWRB is considerably higher for the irrigated and more arid counties located in the west compared to their counterparts in central and eastern Oklahoma. Particularly, the arid climate prevailing in Oklahoma's Panhandle region is likely to yield a higher number of groundwater applications associated with landowners residing in the respective Beaver, Cimarron, and Texas Counties compared to the remaining western, central, and especially eastern regions of Oklahoma. Data to investigate the above propositions within the context of the tragedy of

the commons and for the period between 1990 and 2010 are derived from the monthly board meeting minutes of the OWRB.

The testing of the previous propositions based on simple frequency patterns serve as a stepping stone to focus on the role of the OWRB in the management of groundwater resources. The conduct of hydraulic surveys by the OWRB is essential to manage groundwater resources. Highly complicated and requiring substantial resources, hydraulic studies characterize the water resource contained by an aquifer across a number of aquifer properties and the amount of water entering the basin (recharge) and the amount of water leaving it (discharge). The completion of several hydraulic surveys has not been done and, as a result, we anticipate that the issuance of temporary groundwater permits will remain high compared to regular groundwater permits. Data from the OWRB will serve as the primary data source to investigate the number of temporary permits compared to regular permits between 1990 and 2010.

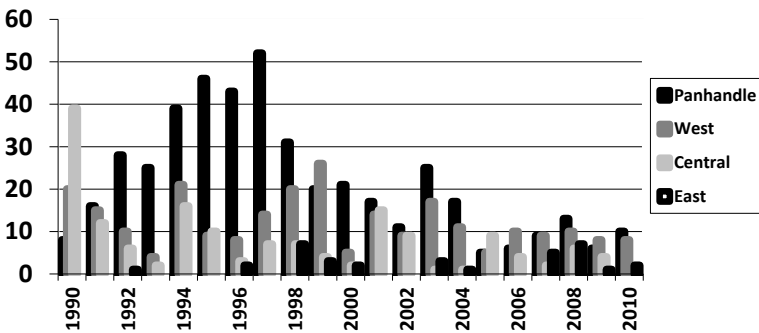
From the perspective of the anti-commons, the second part of the findings section turns to a major political conflict concerning the state's water resources. Sardis Lake, a reservoir in Pushmataha County and Latimer County, has become increasingly complex due to federal and state legal matters as well as the Choctaw and Chickasaw Nations' water rights claims. The tribal dimension is complicated by the broad parameters established by Article I, Section 8 of the U.S. Constitution. The federal government in general and the Congress in particular possess plenary power "to regulate commerce with foreign nations and among the several states, and with the Indian Tribes." Within the context of the legal matters surrounding these intergovernmental relations, we argue that the establishment of an efficient water management regime for Sardis Lake is undermined by the involvement of opposing and sovereign groups that pursue different interests and operate within an environment of fragmented or competing access rights. To investigate this proposition, a number of newspaper archives and other relevant qualitative resources will serve as the primary data sources.

FINDINGS

Groundwater Management and the Tragedy of the Commons

The Ogallala Aquifer, the single largest source of groundwater in the state, underlies the Panhandle and portions of extreme western counties in Oklahoma where annual rainfall ranges from 16 to 28 inches. As the major source of freshwater, the aquifer supports the most extensive agricultural activities in Oklahoma’s Panhandle region, providing fresh water for crops and feeding operations. Within the context of these agricultural activities, longitudinal patterns indicate that these groundwater applications are associated with counties in the western part of Oklahoma and especially those drawing from the Ogallala Aquifer. Figure 1 below illustrates the relatively high groundwater applications originating in the western counties of the state. Covering about one third of the state, the western counties dominate the requests for groundwater applications. Except for 1990 and 2005, groundwater applications from that part of the state clearly outweigh those from the central and especially eastern thirds of the state. This pattern is reinforced further by the number of groundwater applications from the three Panhandle counties of Beaver, Cimarron, and Texas, relying predominantly on the Ogallala Aquifer to satisfy their demand for water.

Figure 1 Number of Regular Groundwater Permit Applications by Region (1990-2010)



The average saturated thickness of the Ogallala Aquifer across the region is 129 feet. However, it varies considerably from nearly zero to 430 feet with the greatest thickness occurring in eastern Texas and northwestern Beaver Counties. Texas, the largest county of the Oklahoma Panhandle and completely dependent upon the Ogallala Aquifer, has 210,826 acres under irrigated acres, while Beaver, the region's smallest county, has 35,264 irrigated acres. As with Texas County, the Ogallala Aquifer underlies the total Beaver county area. With about 101,575 irrigated acres, eighty percent of Cimarron County is directly above the aquifer (Almas, Colette, and Adusumilli 2008). Given these basic characteristics and in an effort to support the growth of wheat, corn, and sorghum, groundwater permit applications associated with these counties have been consistently high, peaking in 1997 with more fifty groundwater applications. Beaver County and especially Texas County dominate and, with the exception of 2005, clearly overshadow the remaining counties in Oklahoma's central and eastern regions. On average, about fifty percent of all groundwater permits originated in the Panhandle between 1990 and 2010 – a declining trend compared to the time period between 1970 and 1989 when more than sixty percent of all groundwater applications can be traced to the three Panhandle counties.

Groundwater remains essential to Oklahoma. According to a technical report produced by the OWRB, more than sixty percent of the total water use in Oklahoma, including almost ninety percent of the state's irrigation needs, comes from groundwater. Moreover, groundwater represents a major source of water for Oklahoma's cities and towns. Stored in basins like the Ogallala, Central Oklahoma, and Rush Springs aquifers, Oklahoma's twenty-three major bedrock and alluvium or terrace-based aquifers contain an estimated 320 million acre feet of water in storage and yield on average between fifty and one hundred gallons per minute. In addition to the major aquifers, more than 60 minor aquifers also yield a significant amount of fresh water (Osborn, Eckenstein and Koon 1998).

For each of these aquifers, the determination of MAY, i.e., the amount of water that can be safely withdrawn from an aquifer to ensure a

minimum basin life of 20 years, falls under the OWRB's responsibility. However, the issue of permits and thus the allocation of groundwater are not determined at the time MAY is specified. As a result, the OWRB cannot decrease the MAY even if updated studies show that too much water could be withdrawn from the basin. The existence or non-existence of hydraulic studies also has a direct impact on the type of permit issued. Landowners who seek groundwater from an aquifer linked to a hydraulic study will be issued a regular permit, but those who want to draw water from an unstudied aquifer can only apply for a temporary permit.

Though the OWRB is often the sole agency conducting the hydraulic studies, it has also reached out to other state and federal agencies in order to complete these studies. Accordingly, the study of the Garber-Wellington Aquifer is a cooperative effort between the OWRB, U.S. Bureau of Reclamation, U.S. Geological Survey, Association of Central Oklahoma Governments, Oklahoma Geological Survey, Tinker Air Force Base, and other state and federal agencies. Tables 1 and 2 below provide an overview of the studied and unstudied major aquifers in Oklahoma. Currently, the OWRB has been able to establish MAY and Equal Proportionate Share (EPS) for a number of aquifers, including Tillman, North Canadian Rivers, Antlers, and Ogallala, etc. However, a substantial number of major aquifers have not been assessed yet or require renewal.

As a result of the relatively high number of aquifers without MAY, the OWRB has issued a substantial number of temporary groundwater permits – a trend that already persisted between 1970 and 1990 when 1,680 regular water permits, but 2,861 temporary water permits were issued. Figure 2 indicates that for that specific time period under consideration, temporary groundwater permits have been generally outnumbering their regular counterparts since 1990. Between 1990 and 2010 the overall trend suggests that temporary permits equaled or outnumbered regular permits. In fact, the data also suggests a widening gap in favor of temporary permits between 1991 and 1997, thereby feeding into the tragedy of the commons. Regional patterns of temporary water permits are equally interesting and reflect that widening gap. As suggested by Figure 3, the western and central regions of Oklahoma were consistently receiving a higher number of these permits compared to the Panhandle counties between 1990 and 2010.

The regional focus also reveals that the eastern region of Oklahoma was the major recipient of temporary water permits between 1990 and 1998, followed by a sharp decline between 1999 and 2002.

Table 1: Studied Major Oklahoma Aquifers

	Aquifer	Location	Study/EPS
1	Tillman	Southwest	1978
2	North Fork of Red River	South	1981
3	Enid Isolated Terrace	Central	1982
4	Elk City Sandstone	West	1982
5	North Canadian River	Central	1983/1990/1995
6	Gerty Sand	Central	1989
7	Washita River	West	1990
8	Vamoosa-Ada	East	1990
9	Antlers	South	1995
10	Ogallala	West	2002

Table 2: Unstudied or No MAY Major Oklahoma Aquifers

	Aquifer	Location	No MAY (@) / Study (†)
1	Blaine	West	@
2	Cimarron River	Central	@
3	Arbuckle-Simpson	Central	@
4	Garber Wellington	Central	@
5	Arbuckle-Timbered Hills	Southwest	†
6	Arkansas River	East	†
7	Canadian River	Central	†
8	Dockum-Dakota Sandstone	West	†
9	Red River	South	†
10	Roubidoux	East	†
11	Rush Springs	West	†
12	Salt Fork of Arkansas River	North	†
13	Salt Fork of Red River	South	†

Figure 2: Total Number of Regular and Temporary Groundwater Permit Applications (1990-2010)

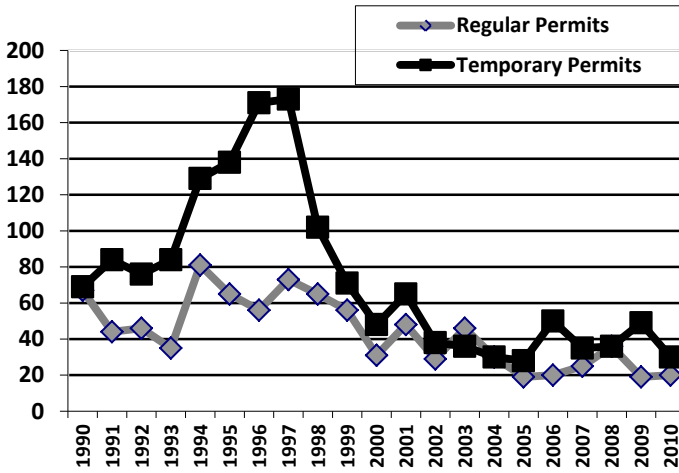
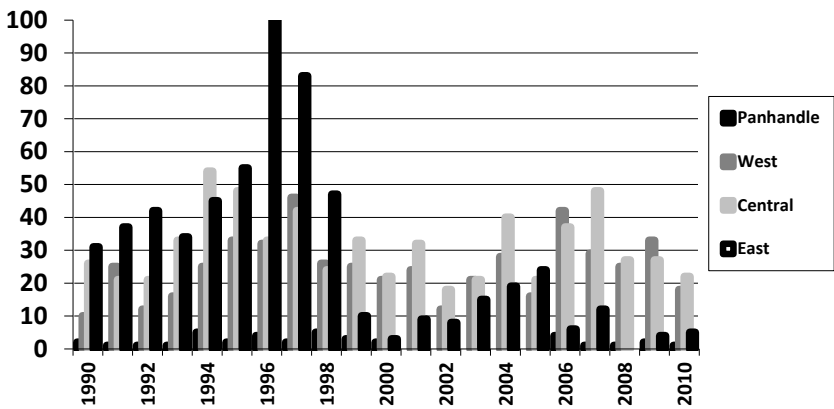


Figure 3: Number of Temporary Groundwater Permit Applications by Region (1990-2010)



Sardis Lake and the Anti-Commons

The complexity surrounding Sardis Lake begins with the development of water policies at the federal and state levels. Early in American and Oklahoma history, water policy was really incremental disaster management for which Sardis Lake may not have existed otherwise. As early as the 1790s, the Federalist economic doctrine focused on internal infrastructure improvements (Shaw 1993). With *Gibbons v. Ogden* in 1824, the federal government was first able to utilize the commerce clause, covering river navigation. A few months later, the General Survey Act was approved by President James Monroe. It allowed for the surveying of the country's infrastructure and ultimately put the U.S. Army Corps of Engineers in charge of that task. These early policy decisions paved the way for the federal government to mitigate flooding, increase water supply, and control erosion through incremental policy making (Clary 1985). Over time, water infrastructure policies were also advanced at the state level. An early Oklahoma proponent of water infrastructure improvements was former Governor and U.S. Senator Robert S. Kerr who served on the Public Works Committee and helped set in motion the development of water infrastructure in the 1950s and 1960s, including the Flood Control Act 1962, which created Sardis (Tennery 2012).

The Flood Control Act instituted that Sardis Lake should facilitate flood control but also recreational use and water supply. Attorney General Larry Derryberry signed the contract for Sardis Lake's construction in 1974; however, construction itself did not begin for another several years (Carter 2010b). At the time, it was actually called Clayton Lake. Presciently, this name became Sardis Lake's first controversy because Clayton was also a neighboring state-maintained lake, a few miles south of the City of Clayton—the same name, thus creating much confusion (U.S. Army Corps of Engineers 2011). Public Law 97-98 in December 1981 changed the name to the current "Sardis Lake" after the town it literally replaced. Today's lake covered what was once the City of Sardis, and the local cemetery is now located on a tiny island connected by a small causeway to the shore. Water itself did not fill the lake until the mid-1980s (Pushmataha County Historical Society 1988; Carter 2010b). Immediately, Sardis Lake created more

controversy as the Choctaw Nation was not convinced of the lake's benefits. "At first, we weren't sure what to do with it," Choctaw Chief Greg Pyle said. "We didn't know exactly what we had" (Carter 2010b).

Sardis Lake construction was certainly not free to Oklahoma as the contract for the lake's construction with the U.S. Army Corps of Engineers in 1974 was actually a 50-year loan bearing interest (Hutchinson 1997). Oklahoma had to pay construction costs, later estimated at about \$16.4 million. By 1997, what Oklahoma owed with compounded interest ballooned to approximately \$38 million and up to \$68 million by 2007 because of lack of payment (Journal Record Staff 2007). In 1983, when construction was finalized, the state owed an initial payment of \$415,000, but without much demand or infrastructure, no market for water sales existed (Carter 2010b). Oklahoma City's needs certainly lacked not only infrastructure at the time, but its growth did not go beyond its current water supply from nearby McGee Creek Lake. By the 1990s, Oklahoma City's take on the need for Sardis Lake still lay in the distant future, an estimated 50 to 75 years, according to Jim Couch, current Oklahoma City manager (Carter 2010b). Without a market to make payments to the Corps, the OWRB was left with the bill, specifically using a state sewer and infrastructure repairs fund. Only two payments were made over the course of the next five years. In 1997, former Oklahoma Environmental Secretary Brian C. Griffin said former Governor Frank Keating facilitated the state legislation to pay for another \$1 million installment, but only \$3.2 million was paid of the original \$16 million, not counting accrued interest.

It is possible that the 16 major FEMA flooding and storm disasters, droughts, as well as population growth in the 1980s and 1990s, prompted not only Oklahoma City to rethink buying out the federal loan on Sardis Lake, but even selling it to Tarrant County, Texas (FEMA 2012; Hutchison 1998). In 1993, State Senator Gene Stipe shepherded a state resolution, allowing OWRB to sell water from Sardis Lake to the North Texas Municipal Water District, which serves cities around suburban Dallas (Bean 1993b). However, the sale of Sardis never happened and the State Senate was authorized to make negotiations at that time. However, loud protests registered in the state legislative chamber because of the Lake's public reputation for great bass fishing and fears that the reservoir would suffer. In opposition, the

OWRB suggested to retire the debt they held a few years earlier (Bean 1993a). Chairman of the Sardis Lake Water Authority Jim Koopman wrote in a letter to State Senator Robert Cullison: “Sardis Lake and Kiamichi River Basin water should go north, south, east, west and be used several times by Oklahomans before we consider selling it to Texas, our economic competitor” (Bean 1993c).

Though opposition to the sale of Sardis Lake water to Texas prevailed, the federal price tag for the lake swelled ten years later to \$68 million (Journal Record Staff. 2007). Later in the year, several cities, including Oklahoma City, Norman, and Edmond, agreed to merge endeavors to obtain water rights to Sardis Lake by founding the Oklahoma Regional Water Utilities Trust (ORWUT). The ORWUT adopted a resolution to evaluate alternatives for buying water and storage rights from Sardis Lake in southeastern Oklahoma (Brus 2007). In 2009, Oklahoma City decided that it was in its best interest to pay the \$42 million. This would gain the city 90 percent of the lake’s water and allow the city to pay off Oklahoma’s debt of \$27 million (Journal Record Staff 2009). A year later, the OWRB gave Oklahoma City permission to move forward with the deal that will likely end up costing the city around \$1 billion in order to build the pipeline infrastructure necessary to pump the water (Estus 2010). In addition to acquiring a water storage contract for 136,000 acre feet of water in Lake Sardis in 2010, the Oklahoma City Water Utilities Trust has already endorsed a five-year water service agreement with the tiny town of Coalgate, Oklahoma, in 2012 (Associated Press 2012; City of Oklahoma 2010). Now that this long-term debt is finally paid off, Sardis Lake area residents fear that the Lake will be “drained and be nothing but a large mud hole” (Carter 2010b).

The Sardis Lake case is particularly complicated because of a tribal dimension that is deeply rooted in legal history. Dealing with the Fort Belknap Reservation in Montana, the U.S. Supreme Court in the landmark case of *Winters v. United States* (1908) ruled that Indian tribes located on federally created reservations were entitled to reserving water rights for current and future use. The decision was important in that, among other things, it eventually helped to elevate the status of tribes to legitimate political actors. Before this ruling, state governments had been seen as the primary actors concerning water rights and water allocation. The Winters Doctrine, as it came to be known, “held that this reservation of water was unaffected by the

subsequent admission of Montana into the Union” (Canby 1998, 403). Later in the case of *Arizona v. California* (1963), the court reaffirmed the findings in *Winters* and further delineated the issue of water usage in favor of tribes. Much of the controversy litigated here dealt with reservations created by presidential or congressional authority. Regardless of their source of origin, the court upheld the right of the federal government to establish reservations. As a result, the water belonging to that land could be reserved for the purposes for which the reservation was established. This meant that the tribes had legitimate claims on water.

Though the Winters Doctrine has now aided tribes to broaden tribal water rights further, state governments have also attempted to reassert their rights. The issue of water rights illustrates one of the fundamental clashes which exist within the U.S. Constitution. On the one hand, the Tenth Amendment would seem to reserve to the states the majority of power to handle water rights. In addition, no specific grant of authority exists within the enumerated powers that would specifically afford the Congress the prerogative to grant water rights to tribes other than perhaps an expansive view of the commerce clause. On the other hand, Article 6 states that the U.S. Constitution, federal laws and the treaties established by the federal government with the tribes constitute the supreme law of the land. Today, many tribes cite treaty obligations which, depending upon interpretation, may or may not include relevant water rights for the tribes.

On August 18, 2011, the Choctaw and Chickasaw Nations filed a lawsuit over the purchase of Sardis Lake (Carter 2011; Barringer 2011a). The Caddo Nation also joined the lawsuit (Carter 2010a). Conversely, the Apache Tribe had another tactic in mind by trying to create a side deal to supply Tarrant County on its own (Barringer 2011b). The origin of this water dispute had been simmering for more than a year when the state of Oklahoma approved the export of water from Sardis Lake to Oklahoma City. The tribes accused the state of depriving them of their water rights which the tribes have held for about 180 years. Specifically, the tribes claim that Governor Fallin and the OWRB erroneously based their water rights to the distant water on state law. However, the tribes argue that federal law governs cases of Indian water rights (Ellis 2011). Accordingly, the Chickasaw and Choctaw Nations oppose the export of water and ask the federal courts to

acknowledge that the tribes hold regulatory authority over water in southeastern Oklahoma under an 1830 treaty and to issue an order that stipulates that their water rights pre-empt state law (Miller 2012).

The impetus of the suit concerned the state's use of water resources on lands guaranteed by the 1830s removal treaties to each of the tribes. Subsequently, tribes have pursued legal actions and arguments to make their case. In *Choctaw Nation* (1970), the Supreme Court agreed that the Choctaw Nation enjoyed certain claims to the riverbed underlying portions of the Arkansas River in Oklahoma. Another primary legal argument that the tribes argue on their behalf concerns so-called state disclaimers. State disclaimers represent an old and important aspect of tribal-state history (Wilkins 1998). They have appeared immediately following the Revolutionary War. In the wake of the American victory against Great Britain, the federal government began to assert its plenary power over Indian affairs. One of the significant aspects of this attempt was to encourage states to extinguish their claims to Indian lands and resources as a way to ensure federal dominance of Indian affairs. An example of this concerns the Compact of 1802 in which Georgia agreed to give up all claims to Indian lands within the state to help establish the state's western boundary. In exchange for this concession, the federal government promised eventually to remove all tribes from Georgia. From time to time, similar arrangements were made with some of the other twelve original states (Prucha 1986).

As new states began to be added to the union, the same problem arose. However, as western territories became states, sometimes significant tribal communities existed within their boundaries. The tribes could not always be removed as they were in the case of Georgia. When states entered the Union, they were required to issue state disclaimers in which the states extinguished title to Indian lands upon entering statehood. In this way, new states forever disclaimed any right to regulate Indian lands, their people and resources. Each of these disclaimers differed, but most tended to reiterate these limitations on state regulation. These disclaimers were sometimes included as territorial pronouncements before a state was admitted. Other disclaimers were inserted into the enabling acts which paved the way for territories to become states. Still, other disclaimers were actually incorporated into various state constitutions. In the case of Oklahoma, Article I, Section 3 of the state constitution contains the wording:

The people inhabiting the State do agree and declare that they forever disclaim all right and title in or to any un-appropriated public lands lying within the boundaries thereof, and to all lands lying within said limits owned or held by any Indian, tribe, or nation; and that until the title to any such public land shall have been extinguished by the United States, the same shall be and remain subject to the jurisdiction, disposal, and control of the United States.

Though Governor Fallin has recently asked the tribes to withdraw their lawsuit against Oklahoma in order to allow for a mediation process, the leaders of the Choctaw and Chickasaw Nations argue that their nations hold substantial water rights protected by federal law and that such disclaimers deny the state of Oklahoma from using water resources on tribal land without their consent or compensation (McNutt and Knittle 2012). Such arguments seem logical and reasonable. However, the opposing view of the state concerns some of the vagaries of the U.S. Constitution. If these disclaimers give federal control over Indian affairs to the federal government, can the federal government not devolve these powers to regulate certain aspects of Indian Country back to the states if Congress so wishes? From time to time, Congress has enacted laws such as the McCarren Amendment in 1952 which limited the federal government's right to reserve water rights by waiving "its sovereign immunity in cases involving the general adjudication of water rights" (Bureau of Land Management 2012). The practical effect of this legislation was to strengthen state claims to regulate water, which in turn makes tribal claims on water more difficult to enforce if the claim to that right is based upon the supposition of federal control.

CONCLUSION

The efficient management of common pool resources like groundwater and freshwater lakes remains particularly important for the American Southwest and Oklahoma in particular. Drawing on the theoretical

frameworks of both the tragedy of the commons and the tragedy of the anti-commons, the study analyzes the impact of Oklahoma's water management approach and the subsequent role of the OWRB and offers a case study analysis of the water conflict surrounding Sardis Lake. Based on a combination of quantitative data provided by the OWRB and qualitative data from various newspaper archives and other related sources, the study argues that within the context of the tragedy of the commons the water management approach pursued by Oklahoma is likely to contribute to the tragic overuse of groundwater resources. Finally, from the perspective of the anti-commons, the involvement of large and opposing groups that operate within an environment of competing access rights to water undermine the emergence of an efficient water management regime for Sardis Lake.

In general, the findings support the propositions. Within the context of climate and precipitation patterns, an overwhelming majority of groundwater applications between 1990 and 2010 originated in the western part of Oklahoma. The Panhandle counties of Beaver, Cimarron, and especially Texas - the primary beneficiaries drawing from the Ogallala Aquifer - dominate. In addition to this regional focus of groundwater permits, many of the major aquifers have not been assessed in terms of their maximum annual yield. This inability to create permanent water permits has resulted in the issuance of a substantial number of temporary ones, thereby representing an additional and increasingly unpredictable pressure on groundwater aquifers across the state. In fact, between 1990 and 2010 temporary permits equaled or outnumbered regular permits, which is illustrative of a tragedy of the commons on our groundwater resources and indicates a lack of sound groundwater management planning for that part of the state.

Starting with the Flood Control Act of 1962, the purpose of Sardis Lake was to serve as flood control, recreation, and water supply. Though water did not fill the lake until 1980, the creation of this state-maintained lake immediately stirred controversy among the Choctaw Nation and on the issue of covering construction costs. Construction loan costs for Oklahoma were initially estimated at \$16.4 million. By 2007, however, that cost, because of lack of payment and compounded interest, increased to approximately \$38 million. Major flooding and storm disasters, droughts, as well as population growth in the 1980s

and 1990s, convinced Oklahoma City to sell water from Sardis Lake to Tarrant County in Texas. Accordingly, State Senator Gene Stipe introduced a state resolution, allowing OWRB to sell water from Sardis Lake to the North Texas Municipal Water District in 1993. As opposition to the sale of Sardis Lake water to Texas prevailed, several cities secured a piece of Sardis, including Oklahoma City, Norman, and Edmond. In doing so, these municipalities both agreed to obtain water rights by founding the Oklahoma Regional Water Utilities Trust and will ultimately have to spend \$1 billion to build the necessary infrastructure with a spending mechanism as yet undetermined.

In addition to these competing access rights, the establishment of an efficient common pool resource for Sardis Lake remains difficult. Within the broader context of the 1908 landmark case of *Winters v. United States*, ruling that Indian tribes located on federally created reservations are entitled to reserving water rights, the Choctaw, Chickasaw, and Caddo Nations filed a lawsuit over the export of water from Sardis Lake in southwestern Oklahoma to Oklahoma City. Pumping water out of Sardis Lake and transporting it to Oklahoma City, the Nations argued, deprived the tribes of their long-standing water rights. Specifically, the tribes claim that Oklahoma erroneously based on state law their water rights to distant water sources, thereby ignoring the supremacy of federal law and a disclaimer in the State Constitution that prevents Oklahoma from using tribal water resources. Because of the complex legal nature and the stakeholders' involvement in litigation, Sardis Lake represents a case of the anti-commons. This case, if water rights are clarified over time, could quickly revert to a tragedy of the commons. Any of these scenarios represent unsustainable uses of a common good or pool resource.

The policy discourse concerned with the sound institutional design and practices associated with the management of common-pool resources such as aquifers and freshwater lakes will become increasingly important in Oklahoma. Based on the findings, the basic trends are clear. The risk of entering a phase of the tragedy of the commons regarding the Ogallala Aquifer and the other major water bodies across the state is increasingly likely. Furthermore, the establishment of efficient common-pool resources remains difficult with respect to Sardis Lake due to competing interests and access rights. These challenges require the discovery of institutional arrangements that strike

a sound balance among management approaches, different interests, and environmental concerns. Possible policy responses include a more active involvement of the federal government promoting grants and incentives to state and private universities for desalinization efforts, dry farming, and other drought- resistance efforts. A reconsideration of Oklahoma's current water plan, which among others, was criticized for the top-down water resources planning process and the exclusion of tribal rights and claims to define water demands, represents another point of departure. Regardless of the policy avenue selected, the pursuit of discovering sound water management policies remains critical. Accordingly, future research should consider a systematic comparison of different water management approaches as well as the collection of additional data to substantiate further the regional overuse of aquifers across the state.

REFERENCES

- Almas, L. K., Colette, W. A. and Adusumilli, N.C. 2008. "Economic Value of Groundwater and Irrigated Agriculture in the Oklahoma Panhandle." Paper Presented at the Southern Agricultural Economics Association Annual Meeting. Dallas, Texas, February 2-6.
- American Groundwater Trust. 2002. What Have we Done to the Ogallala Aquifer? *The American Well Owner*. (3).
<http://www.agwt.org/tawo/Issues/2002-3%20TAWO%20.pdf>
 (accessed August 13, 2011).
- Associated Press. 2012. "SE Oklahoma Town Signs Agreement to Buy Water From Oklahoma." January 4, 2012.
<http://www.therepublic.com/view/story/2e905438ecb84e588573eeb38895f43d/OK--Oklahoma-City-Water-Coalgate> (accessed January 5, 2012)
- Barringer, F. 2011a. "Indians Join Fight for an Oklahoma Lake's Flow." *New York Times*. April 11.
http://www.nytimes.com/2011/04/12/science/earth/12water.html?_r=1 (accessed January 4, 2012).
- Barringer, F. 2011b. "Two Oklahoma Indian Tribes Contest State for Water Rights." *New York Times*. August 19, 2011.
<http://www.nytimes.com/2011/08/20/science/earth/20tribe.html>
 (accessed August 27, 2011).
- Bean, C. 1993a. "House Tries to Put a Stopper in Lake Sardis Plan." *Daily Oklahoman*. February 21: 10.
- Bean, C. 1993b. "Sardis Not Down Drain Yet. . ." *Daily Oklahoman*. January 31: 10.
- Bean, C. 1993c. "Water Sale Plan Fuels Controversy." *Daily Oklahoman*. June 13: 12.
- Brus, B. 2007. "Central Oklahoma Cities Combine Efforts to Acquire Rights to Water." *Journal Record*. December 20.

Bureau of Land Management. 2012. "Federal Reserved Water Rights." <http://www.blm.gov/nstc/WaterLaws/fedreservedwater.html> (accessed August 21, 2011).

Canby, W. 1998. *American Indian Law*. West Group Publishers. St. Paul, Minnesota.

Carter, S. 2010a. "Caddo Nation Opposes Plan to Buy Sardis." *Journal Record*. May 21.

Carter, S. 2010b. "Standing Their Ground: Those Opposing Sardis Deal Vow to Continue Fight." *Journal Record*. July 12. <http://journalrecord.com/2010/07/12/standing-their-ground-capitol/> (accessed December 26, 2011).

Carter, S. 2011. "Choctaws, Chickasaws File Lawsuit Over Sardis Lake Purchase." *Journal Record*. August 18.

City of Oklahoma. 2010. "Water Quality Report." City of Oklahoma. <http://www.okc.gov/water/service/Forms/WaterQualityReport.aspx> (accessed February 12, 2012).

Clary, B. B. 1985. "The Evolution and Structure of Natural Hazard Policies." *Public Administration Review*, 45: 20-28.

Cousteau, A. 2011. Alexandra Cousteau Cited in Water Politics. <http://www.waterpolitics.com> (accessed November 9, 2011).

Ellis, R. 2011. "Tribal Water Rights Claims Complicate Oklahoma's Water Planning efforts." *Daily Oklahoman*. June 5. http://www.saveourwaterlakeeufaula.com/2011%2006%2005%20Tribal%20water%20rights%20claims%20complicate%20Oklahoma%27s%20water%20planning%20efforts%20_%20NewsOK.com.pdf (accessed December 26, 2011).

Estus, J. 2010. "Oklahoma Water Resources Board Approves Sardis Lake Deal for Oklahoma City." *Oklahoman*. June 11.

FEMA. 2012. "Disaster Search Results. Federal Emergency Management Agency."
<http://www.fema.gov/femaNews/disasterSearch.do>

Ferrell, S.L., D.C. Adams, M.A. Kizer, D.M. Engle, and Ott, C. 2010. The Oklahoma Water Law Handbook. E-1016. Oklahoma Cooperative Extension Service Division of Agricultural Sciences and Natural Resources Oklahoma State University.
<http://www.crossroads.odl.state.ok.us/cgi-bin/showfile.exe?CISOROOT=/stgovpub&CISOPTR=14218&filename=14516.pdf> (accessed February 10, 2012).

Guru, M. V. and Horne, J. E. 2000. "The Ogallala Aquifer." Poteau, Oklahoma: The Kerr Center for Sustainable Agriculture.

Hardin, G. 1968. "The Tragedy of the Commons." *Science* 162: 1243-1248.

Heller, M. 1998. "The Tragedy of the Anticommons: Property in the Transition from Marx to Market." *Harvard Law Review* 111(3): 621-688.

High Plains Associates. 1982. "Six-state High Plains Ogallala Aquifer Regional Resources Study." A report to the Department of Commerce and the High Plains Study Council, Austin, TX

Hutchinson, M. 1997. "Feds Pressing State to Pay Lake Debts." *Daily Oklahoman*. June 15, pg. 1.

Journal Record Staff. 2011. "By the Numbers." August 11. <http://journalrecord.com/23rd-and-Lincoln/2011/08/30/by-the-numbers-%E2%80%A6/#more-150715> (accessed January 20, 2012).

Journal Record Staff. 2009. "Oklahoma Agrees on Lake Payment Plan." *Journal Record*. September 23. <http://journalrecord.com/2009/09/23/oklahoma-agrees-on-lake-payment-plan> (accessed January 20, 2012).

Journal Record Staff. 2007. "High Court Refuses to Hear Sardis Lake Case: Decision Hands Oklahoma a Bill of \$68M or More." *Journal Record*. January 9. <http://journalrecord.com/2007/01/09/high-court->

refuses-to-hear-sardis-lake-case-decision-hands-oklahoma-a-bill-of-68m-or-more (accessed January 20, 2012).

Massey T. D. and Sloggett R. G. 1984. "Managing Groundwater in the Ogallala Aquifer for Irrigation." *Oklahoma City University Law Review* 9 (3): 379-410.

McCay, B. and Acheson, J. 1987. *The Question of the Commons: The Culture and Ecology of Communal Resources*. Tucson: University of Arizona Press.

McNutt M. and Knittle, A. 2012. "Oklahoma Governor Asks Chickasaw, Choctaw Nations to Dismiss Water Lawsuit." *NewsOK*. February 3, 2012. <http://newsok.com/oklahoma-governor-asks-chickasaw-choctaw-nations-to-dismiss-water-lawsuit/article/3645707> (accessed February 5, 2012).

Miller, K. 2012. "Tribes Want Order Denying Oklahoma Water Rights." *Native American Times*. February 20. <http://nativetimes.com/news/environment/6868-tribes-want-order-denying-oklahoma-water-rights> (accessed February 21, 2012).

Oklahoma State Legislature. 2009. "Oklahoma State Legislature. 2009 End of Session Report." <http://www.opha.com/Portals/0/docs/Microsoft%20Word%20-%20Taylor%20Group%202009%20End%20of%20Session%20Report.pdf> (accessed September 1, 2011).

Oklahoma Water Resources Board. 2012. "2012 Update of the Oklahoma Comprehensive Water Plan." <http://www.owrb.ok.gov/supply/ocwp/ocwp.php> (accessed January 17, 2012).

Oklahoma Water Resources Board. 2011. "Oklahoma Comprehensive Water Plan Executive Report, Final." Approved October 17, 2011. http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/draftreports/OCWP%20Executive%20Rpt%20FINAL.pdf (accessed January 8, 2012).

Oklahoma Water Resources Board. 2011a. "Court of Appeals Affirms Oklahoma's Defense of Tarrant and Hugo Lawsuits." Press release September 7, 2011.

<http://www.owrb.ok.gov/news/news2/pressrelease2011.php>
 (accessed December 26, 2011).

Oklahoma Water Resources Board. 2011b. *Tarrant Regional Water District v. Herrmann*. <http://caselaw.findlaw.com/us-10th-circuit/1579449.html>
 (accessed December 26, 2011).

Oklahoma Water Resources Board. 1995. "Overview of Water and Related Resources Part 1: History of Water Resource Development." http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/4water_relatedres1.pdf (accessed December 26, 2011).

Oklahoma Water Resources Board. 1980. "Letter from the Oklahoma Water Resources Board to Governor Nigh." http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/1980_OCWP/Foreword-Letter-1980OCWP.pdf (accessed December 26, 2012).

Olson, M. 1965. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge, MA: Harvard University Press.

Opie, J. 1993. *Ogallala: Water for a Dry Land*. Lincoln: University of Nebraska Press.

Osborn, I. N, Eckenstein, E. and Koon Q. K. 1998. "Vulnerability Assessment of Twelve Major Aquifers in Oklahoma." Technical Report 98-5. Oklahoma City: Oklahoma Water Resources Board. <http://www.owrb.ok.gov/studies/reports/aq-vuln/rpt98-5b.pdf> (accessed August 23, 2011).

Ostrom, Elinor. 2008. "Tragedy of the Commons." In *The New Palgrave Dictionary of Economics*. Second Edition. Eds. Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan.

Ostrom, E., Gardner, R. and Walker, J. 1994. *Rules, Games, and Common-Pool Resources*. Ann Arbor: University of Michigan Press.

Ostrom, E. 1990. *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

Peck, C. J. 2007. "Groundwater Management in the High Plains Aquifer in the USA: Legal Problems and Innovations." In *The*

Agricultural Groundwater Revolution: Opportunities and Threats to Development, ed. M. Giordano and K.G. Villholth. Cambridge: CABI, 296-319.

Perlman, Howard. 2012. "How much of your state is wet?" The USGS Water Science School. <http://ga.water.usgs.gov/edu/wetstates.html> (accessed September 17, 2011).

Prucha, F. 1986. *The Great Father; The United States Government and the American Indians*. Lincoln: University of Nebraska Press. Lincoln.

Pushmataha County Historical Society. 1988. *Pushmataha County Cemeteries—Old and New*.

Reuss, Martin. 2004. *Designing the Bayous: The Control of Water in the Atchafalaya Basin, 1800-1995*, College Station, TX: Texas A&M Press, pg. 10.

Roberts, S. R. and Gros, L. S. 1987. "The Politics of Ground Water Management Reform in Oklahoma." *Ground Water*. 25 (5): 535-544.

Shallat, T. and W. H. Goetzmann. 1994. *Structures in the Stream: Water, Science, and the Rise of the U.S. Army Corps of Engineers*. Austin: University of Texas Press.

Shaw, R. 1993. *Canals for a Nation: The Canal Era in the United States, 1790-1860*. Lexington, KY: University Press of Kentucky.

Solanes, M. 1999. "Institutional and Legal Issues Relevant to the Implementation of Water Markets." In *Groundwater: Legal and Policy Perspectives. Proceedings of a World Bank Seminar*, ed. S. M. A. Salman. Washington, D.C.: The World Bank, 69-90.

Somma, M. 1997. "Institutions, Ideology, and the Tragedy of the Commons: West Texas Groundwater Policy." *Publius* 27 (1): 1-13.

Tennery, J. 2012. "Project Master Plan Into a Sardis Lake Recreation." Brochure.

U.S. Army Corps of Engineers. 2011. "Sardis Lake Oklahoma" Brochure. U.S. Army Corps of Engineers, Tulsa District. In current use.

U.S. Water News Online. 2009. "Ogallala Aquifer has Shrunk 9 Percent, New Report Says." (April).

<http://www.uswaternews.com/archives/arcsupply/9ogalaqui4.html>
 (accessed August 13, 2011).

U.S. Water News Online. 2007. "Oklahoma's Underground Water Resources Might be Disappearing." *U.S. Water Online News* 2007 (April).

<http://www.uswaternews.com/archives/arcsupply/7oklaunde4.html>
 (accessed August 13, 2011).

Water Research Institute. 2012. "Strategic Water Resource Planning. 2011." Water Research Institute.

<http://environ.okstate.edu/owrri/waterplan/mission.asp> (accessed December 26, 2012).

Wilkins, D. E. 1998. "Tribal -State Affairs: American States as 'Disclaiming' Sovereigns." *Publius The Journal of Federalism* 28 (4): 55-81.

Wood, A. 2008. Note. "Watering Down Federal Court Jurisdiction: What Role do Federal Courts Play in Deciding Water Rights?" *Journal on Environmental Law and Litigation*. 23 (1): 247-274.