Water Democracies on the Upper Rio Grande, 1598-1998

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Abstract—The acequia irrigation systems of northcentral New Mexico and southern Colorado are the oldest, continuously functioning water management institutions in the United States. For a period of four hundred years, 1598-1998, the acequias have sustained the agropastoral economies of the region while protecting the watershed resources on which downstream water stakeholders depend. The acequia customs of sharing and system of self-government provide a framework for sustainable resource use into the twenty-first century in a time of changing and often conflictive values. Continuance of these traditional institutions, however, depends on how successfully they adapt to the new realities of the emerging water markets in the region.

This year marks the *cuarto centenario* or 400th anniversary of the establishment of the first Spanish colony in *El Reino del Nuevo México*, the northern border province of *Nueva España* in the New World. On July 11, 1598, *Capitán General* Juan de Oñate arrived at present day San Juan Pueblo and established the first European colony in this northern Spanish frontier, calling it *San Juan de los Caballeros* (Simmons 1991). During the early period of Spanish exploration and expansion, *Nuevo México* loosely encompassed the territory north of *Nueva Viscaya* (Chihuahua) with no fixed boundaries west or east (D. Cutter and Engstrand 1996). From the start, Oñate and his party conducted expeditions in both directions; but they expended the majority of their efforts at establishing a permanent colony and seat of government, initially at San Juan on the eastern banks of the *Río del Norte*, as the Río Grande was known at the time. Here, according to Oñate biographer Marc Simmons (1991), Oñate planned to build a new municipality he intended to call *San Francisco de los Españoles*. With the help of 1500 laborers from the nearby Indian Pueblos, construction of a ditch was begun to support this new town site and eventual capital city of *El Reino del Nuevo México* (Simmons 1991; Hammond and Rey 1953).

For unknown reasons, Oñate abandoned his plans for the building of a Spanish municipality in the vicinity of San Juan, and instead he moved the colony to the west bank of the *Río del Norte* directly across from the original site (Simmons 1991). This settlement was called San Gabriel, itself built on a partially abandoned Tewa Pueblo. Here, too, one of the first tasks of the Oñate party was to construct an irrigation ditch sufficient to support the expansion of cultivated fields essential for the permanent occupation of the Spanish colony (Baxter 1997). San Gabriel (now known as Chamita) remained as the capital of the fledgling province throughout Oñate's term as governor. In 1610 a subsequent governor, Pedro de Peralta, moved the capital to a more strategic location at Santa Fe, where once again, the construction of a municipal irrigation system was a primary and early public works project. Two *acequia madres* (main canals) were dug to irrigate fields on both sides of the *Río de Santa Fe*, the river that passed through the center of the new and permanent capital city (Simmons 1972; Twitchell 1925).

The occasion of the *cuarto centenario* anniversary provides an opportunity to recognize the cultural, historic, political, economic and ecological importance of the acequia-based irrigation systems constructed at San Gabriel, Santa Fe, and other later sites. Following Spanish laws, the acequia appropriators long ago evolved customary rules for the administration and equitable distribution of water resources, traditions that have continued in force but that differ in some respects with modern legal systems in the western states. Though acequias are built systems carved into the natural landscape, these earthen ditches in a sense mimic the physics of the natural watercourses in the surrounding area as much as alter them, relying as they do on the relatively benign technology of gravity flow. Acequias contribute to the diversity of the landscape by extending the biotic environment beyond the narrow confines of the river channels from where they take water for the purposes of irrigation.

In the semiarid environment of the uplands region, the external effects of these ditches are largely beneficial, a characteristic of acequia watercourses that needs to be more widely recognized by other water stakeholders and the general public. In most uplands river valleys, the acequia communities are the first points of diversion of headwaters streams. Their location in the area of origin upstream makes them central to the maintenance of pure and clean stream waters for all categories of uses downstream. Sustainability of these communities, thus, coincides with values that acequia irrigators hold in common with the multitude of other users throughout the watershed: healthy forest ecosystems and benign upstream uses preserve water quality for everyone. In this sense, the historic stewardship role of acequia communities should be recognized, validated and supported in modern water planning, state policies and laws.

Acequia agriculture also should be credited for providing the social organization critical to the goals of Spanish colonization in the high altitude region which at the time formed the northern borders of the vast Spanish empire in the New World. This accomplishment makes the acequias of present

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day northcentral New Mexico and southern Colorado the oldest, continuously functioning water management institutions in the United States. For centuries the irrigators have operated their acequias as water democracies, governing their own water affairs, electing their officers, and enforcing their own rules. Functioning as they have under three sovereigns (Spain, Mexico, and the United States), these local acequia institutions have thus far survived the test of time with only minor adjustments in their customary practices, traditions and system of self-government.

Also, we should recognize that the first water laws of New Mexico were based on customary usage and local traditions passed on from generation to generation. These acequia practices were crystallized into law by the New Mexico territorial assemblies of 1851 and 1852. In southern Colorado, the San Luis People's Ditch holds the oldest water rights in the entire state, a distinction commemorated by way of a state monument which marks the location of this "oldest continuously used ditch in Colorado, with court decree priority right no. 1." For centuries the acequias in both states have carried on a tradition of resource stewardship and can be credited with adopting the first environmental laws to protect water quality and to promote water conservation and public health. The remaining sections of this paper demonstrate these and many other contributions of the acequia waterworks located on the valley bottomlands of the Río Grande watershed and other river systems in the region. The paper concludes with a discussion of a few contemporary issues impacting the acequia communities in a time of changing realities and the emerging water markets that challenge the continuance of the historic acequia institution into the 21st century.

Evolution of Watershed Communities

Since the establishment of the first Spanish colony at *San Juan de los Caballeros*, the upper Río Grande has served as a continuous homeland for *hispano mexicanos*, a mixed race of people who migrated as colonists from central Mexico in order to occupy and settle the northern borders of New Spain. Watersheds have long defined the boundaries of community in this semiarid environment, not only as hydrologic units that support local agropastoral economies, but also as the basis for social and political organization (Rivera and Peña, 1998). Nestled within the canyons and valley floors, tiny rural villages dot the spectacular and enchanting landscape. These settlements survive due to the infrastructure of earthen ditches, native engineering works known locally as acequias, that divert the precious waters from the river systems to extend life into every tract and pocket of arable bottomland. (Rivera 1996; Carlson 1990). In the uplands physiography of northcentral New Mexico and southern Colorado, these watercourses of rivers, streams, creeks and acequias are the single most critical resource needed for the survival of all forms of life: biotic, animal and human.

The acequia-based farming methods that are still utilized extensively in the upper Río Grande have Roman, Moorish-Iberian as well as indigenous, Pueblo Indian roots. The Spanish and Mexican settlers who occupied the river corridors of the northern frontier melded the Roman and Moorish-Iberian customs transplanted from Spain to Mexico with the irrigation practices they observed at many Pueblo Indian villages during their expeditions of the late sixteenth century (Simmons 1972). As to their own contributions, these *pobladores* adapted and expanded irrigation farming throughout the region, including diversions built on the mightiest stretches of the Río Grande, the Río Chama, the Río Pecos, the Mora and Gallinas rivers, and others. Constructed of locally available materials, the acequia irrigation works included an earthen presa (dam), the acequia madre (main canal), and a network of *sangrías* or lateral ditches that irrigated the individual parcels of farmland. Together, the system of rivers, streams and acequias dominated the natural and rural landscape of the region, demarcating land uses and defining places of human occupation and settlement.

Spanish Settlement Policies

The general region designated as *El Reino del Nuevo México* was expansive and its boundaries indeterminate, but the first Spanish communities were established along the more confined *Río del Norte* corridor north and south of Santa Fe from Taos to Socorro either on the present day Río Grande or some of its tributaries (C. Cutter 1995). These settlement practices concerning location generally adhered to the ordinances set out in the Laws of the Indies and issued by the Spanish crown to colonial officials as instructions governing the pacification, development and permanent occupation of newly discovered lands, the *Ordenanzas de Descubrimiento, Nueva Población de las Indias dadas por Felipe II en 1573* (Crouch, Garr, and Mundigo 1982). Codified in 1681, the ordinances in the Laws of the Indies provided the framework for colonists and provincial governors to follow when selecting sites for occupation and development.

An important element in the ordinances was that fact that Spanish settlement planning through these instructions was environmentally guided from the outset (Arellano 1997; Carlson 1990). The ordinances, for example, instructed officials and colonists to establish settlements in sites with access to plentiful supplies of clean and pure waters for irrigation and domestic uses. In addition, the lands and the surrounding environments should be replete with the natural resources necessary to sustain permanent colonies: forests to supply fuel wood and building materials, abundant pasture lands for the grazing of livestock, lands with healthy and fertile soils for the cultivation and harvesting of crops, and a sky with clean, benign and pure air without impediments or alterations (Arellano 1997; Crouch, Garr and Mundigo 1982).

Throughout the period of Spanish settlement, colonial officials for the most part complied with the necessity of locating villages in places where reliable water supplies could support the permanent occupation of the province and thus secure the northern Spanish borders. As noted by Carlson (1990), agrarian planning reflected strongly the environmental realities of the settlement region, where rough terrain, aridity and high altitude limitations on the growing seasons necessitated an integrated approach to colonization. Spanish officials overcame these physical

barriers, Carlson and others argue, by implementing a wide array of land grant policies on the Río Grande watershed and its short but numerous perennial streams. In the case of communal land grants, for example, settlers petitioning for lands were required to specify the physical boundaries of the desired grant of land. Significantly, the boundaries of the land grants were not predetermined according to any formal grid plan, and instead were established according to the natural contours of the land, resulting in irregular shapes highly adaptive to local topography, vegetation, soils, hydrology and mircrobasin climates (MacCameron 1994; Van Ness 1987; Scurlock 1998).

In the next step, the governor would order an inspection of the boundaries to be conducted by the *alcalde mayor* of the jurisdiction. This official had to ascertain that the land in question was not already settled nor prejudicial to the welfare of any existing Indian Pueblo or other Spanish land grants in the vicinity. Part of the investigation on-site also included an evaluation of the water supply needed for irrigation and domestic uses, and for the watering of livestock (Baxter 1997). Further, the *alcalde mayor* made sure that the land, water and other natural resources within the boundaries of the grant would encourage tilling of the land, the grazing of cattle and other elements essential for permanent occupation (Keleher 1929). Absent any legal protests from adjacent Indian Pueblos or other neighboring communities with potential claims on the existing resources of the area, the governor would then be free to confirm the grant and authorize that the *alcalde* place the settlers in possession of the designated lands.

As part of the possession activities, each petitioner would be allocated a *solar de casa* for a homesite and an accompanying *suerte*, an irrigable parcel with boundaries laid out in a spatial arrangement consistent with the topographical and hydrological character of the watershed. The width of these individual tracts varied from site to site, dependent on local physical conditions and an estimation by the *alcalde* as to the size and configuration of bottomlands necessary for successful cultivation (Carlson 1990; Wozniak 1987). This unique farming landscape integrated each farm unit into the lay of the land and the watercourses for irrigation. The *tiras*, elongated long lots that resulted from partitioning, provided each land grant family with access to the fertile bottomlands and river banks, an essential aspect of gravity flow, communal equity and social organization (Rivera and Peña 1998; Carlson 1990). Similarly, all families would have access to the *ejidos* or common lands in accordance with the Spanish laws and local customs of the times. In these open lands, native pastures and forested areas typically surrounding the land grant community, villagers could freely graze their livestock, gather wood, harvest native plants and berries, hunt for wild game, and engage in other collective use privileges (Tyler 1989).

After the partitioning of the land, the settlers began the process of forming their community. Though the Spanish planning precepts for town layout and physical design were followed loosely—adapted to local conditions and resources—the upstream boundaries of each village were usually designated according to the place where the stream source was diverted and a dam installed. As part of the initial inspection, when needed, the *alcalde* would help locate suitable places where one or more ditch diversions could feasibly be built to take water from the river source (Carlson 1990; Wozniak 1987). Once determined, this *saca de agua* (the diversion dam) was the first public works construction project undertaken in the formation of most communities, begun even before the building of the local mission or church.

On larger streams, such as the *Río del Norte*, the settlers built wing dams protruding into the river from one of the banks; these simple structures were usually sufficient to channel water into ditches during the irrigation season when natural flows were highest. Streams with intermittent flows, on the other hand, required the construction of dams across the width of the watercourses in order to impound portions of the flows and form small reservoirs. The *presas* (diversion dams also called *atarques*) were constructed of forest timbers, juniper brush, boulders, rock slabs, earth and other local materials, resulting in structures that often resembled beaver dams. These building materials were placed on the streambed in a layered fashion gradually raising the level of impounded water closer to a ditch headgate constructed on the banks of the stream. Containment of the water by the *presa* would accomplish the rest of the task, with gravity flow pushing the water into and through the main irrigation ditch or *acequia madre*.

To complete the infrastructure for irrigation, the *pobladores* excavated the *acequia madre* off one or both banks of the river, thereby extending the irrigable lands adjacent to the watercourse for several miles downstream. Typically, each *acequia madre* was cut perpendicular to the stream source at the upper end of the community in order to then convey water downstream, parallel to the river alongside the foothills or natural slope of the terrain, all the while enclosing the practical limits of irrigable land. Then, at the bottom end of the community the ditch was made to return to the original stream source through a *desague* channel.

Each commons ditch, described in the Spanish of the times as the "*acequia de común*," was the main force that established a distinct place, defined the community boundaries, and bonded the irrigators obligating them all to the collective management of the local water system and their village enterprise as a whole. The idea of a common property ditch for all irrigators in any new settlement was replicated time and again in the province and, in fact, was the key to both the development and economic survival of local communities. As Tyler (1989, p. 26) vividly describes, the officials who placed the grantees in legal possession of the community grants made sure that the settlers acknowledged their rights and responsibilities to the common welfare "by swearing *de mancomún* or *de mancomunidad*," meaning that they agreed to "work together for the benefit of the community and jointly manage their common property."

Land and Water Petitions

Spanish colonization policy, thus, resulted in the building of communities alongside the *Río del Norte* and its tributaries in both westerly and easterly directions, further and further from the main stem of the river, eventually dispersing the population into numerous *plazas*, *ranchos*, *villas*, and other water-based colonies. Access to irrigation water served as the guiding principle, a continuation of land policy implemented from the outset since the founding of the early villas: San Gabriel in c.1600, Santa Fe in 1610, Santa Cruz de la Cañada in 1695, and Albuquerque in 1706.

When Governor Don Diego de Vargas proclaimed Santa Cruz in 1695 as the next *villa* after Santa Fe, for example, he did so because of the known fertile soils and plentiful supply of irrigation water available at the valley area known as La Cañada (Baxter 1997). By 1696, newly arrived families from Zacatecas and Mexico City could no longer be supported by the acequias and cultivated fields irrigated by the *Río de Santa Fe* at the capital city. Additional water and land resources would be needed to accommodate the growing population of the province. In his 1696 decree allowing a second group of Spanish-Mexican families to move to the Santa Cruz land grant, De Vargas assigned to them the use of the agricultural lands, irrigation ditches and dams, built at his expense, as well as access to the natural resources within the La Cañada environs. The decree by De Vargas illustrates the Spanish colonial precepts for town site planning, common lands use, and the reciprocal interdependence of land grants, irrigation, and the formation of community in the acequia culture that was emerging in the fledgling province:

> Having recognized that in this villa of Santa Fe there is not the supply of water which is requisite to insure the irrigation of the cultivated fields, in order to maintain the families domiciled thereon; and having recognized that this said villa [of Santa Cruz] has better accommodations … I assign them to said villa for the aforesaid reason.
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> I, the said Governor and Capitan General, have decided to go personally to the said Villa Nueva de Santa Cruz … to examine the lands, whose sections are uncultivated, being naturally fertile, and being under irrigation as they are, and able to use the water which the rest have had generally in great abundance, assured by their ditches, clean and running, which have been established at my own expense, as I have also repaired and made their dam secure.
>
> …likewise this will serve them as a patent to be residents belonging and assigned to the said Villa Nueva de Santa Cruz, and as such will further their use of the said lands, and their right to the pastures, woods, waters and minerals, as it appears in the [land] grant made to the said Mexican residents of said Villa Nueva, and that the said order made in their favor will be sufficient title for the privileges derived from the grant that I, the said Governor and Capitan General, have assigned to them in the name of his majesty (De Vargas Decree 1696).

Expansion of settlements to the upper reaches of the *Río del Norte* and to other basins frequently resulted from petitions by groups of restless *colonos* (colonist settlers) for more land and water to support the growing population in the uplands region. These petitions enabled the *pobladores* to respect the carrying capacity of the land and watershed streams they believed were already fully developed and appropriated. Repeatedly, groups of settlers took initiative to branch out in search of new territories just when the local natural resources, especially irrigation water from the rivers and creeks, began to show signs of stress. By around 1800, there were some 164 community ditches in the province, a number that would continue to grow at an even faster rate during the late colonial and the start of the Mexican period of land grant concessions (Hutchins 1928). Population growth and policies in support of colonization prompted *hispano mexicanos* to seek new lands for development well into the Mexican period. Availability of water was always of paramount concern. In 1837, for example, a group of *vecinos* (citizen residents) from the Valle de Santa Gertrudis (Mora) petitioned the *alcalde* at Las Trampas for additional lands a few miles to the east, permitting them to take possession of the Guadalupita Valley on the *Río del Coyote*, a tributary of the Mora River. The petitioners proclaimed that new cultivable lands were necessary to sustain themselves and their families due to the scarcity of water at their current location in Mora:

> We, the citizen colonists, among your Lordship's proven subjects, upon finding ourselves very cut back in water supply at this current place of residence, appeal to your kindness in the name of God and his divine laws, if you could be magnanimous and grant us the right to take possession of the Valley of Guadalupita, at the Coyote River, to cultivate and sustain a settlement there…. [To sustain] our families and in all reverence to the nation, with dignity, please accept our stated need with the list [of petitioner names] attached so that you may know the number of individuals that we submit for your kindness, and that is why we place this request to see if you can serve in the name of Justice to decree your wishes (Petition to Take Possession of Valle de Guadalupita, 1837).

The alcalde of the jurisdiction, Juan Nepumuseno Trujillo, acknowledged their petition and requested that the *colonos* appear before him within a few weeks of that same year, clearing the way for the eventual approval of the new settlement at Guadalupita and subsequent river communities downstream on the *Río del Coyote* (Lower Coyote, Lucero, and El Llano del Coyote, now Rainsville).

Social, Political and Ecological Values

Besides performing their irrigation function, the acequia waterworks have served other equally important roles: social, political and ecological. As a social institution, the acequia systems have preserved the historic settlements and local cultures spanning four major periods of political development: Spanish Colonial (1598-1821), Mexican (1821-1848), Territorial (1848-1912), and New Mexico Statehood (1912-Present). Politically, most acequia villages continue as unincorporated entities. In most places, the irrigators and their acequia associations serve as the only form of local governments below the county level. In the New Mexico portion of the region, these associations have been recognized time and again as political subdivisions of state government, a legal status similar to that of counties, townships and school districts (Report of the Attorney General of NM, 1963-64). More recently, the federal government has also recognized the acequia associations as public entities. In the Water Resources Development Act of 1986, Congress directed the Army Corps of Engineers to help restore and preserve the acequia engineering works and to enter into agreements with the acequias themselves as the local sponsors of the projects (Public Law 99-662). By 1996 these cooperation agreements had resulted in fifty-two contracts with local acequias for the financing of forty-nine ditch rehabilitation and diversion projects amounting to 14.2 million dollars in federal funds (Annual Report, SEO/ISC, 1996).

General maintenance of the community ditches continues to be a responsibility of the acequia officers and *parciantes* (the irrigators). The annual *limpia* (cleaning) of the acequia not only marks the beginning of the agricultural season in early spring, it is also an occasion for the *vecino* irrigators to

address local issues, reconfirming the traditions and values that undergird the social and political life of the community. During this ritual event, the ditch officers and irrigators, informally or in small groups, may address a broad range of topics such as the condition of the *presa* in the river, any repairs that might soon be needed, the amount of projected water flows based on the winter snowpack at the *sierra* headwaters, and other items of importance to the ditch or to the community as a whole. By the end of the ditch cleaning process, the irrigators have dutifully renewed their attachment to the land base of their own particular locality, assuring the continuance of place for yet another cycle of irrigation.

Recently, bioregional studies have documented that these earthen waterworks serve ecological and other purposes that should also be recognized by the public. Acequias, for example, extend the riparian zone, preserve farmland and rural open space, increase local biodiversity and protect the hydraulic integrity of the watershed. According to research conducted by Devón Peña and his colleagues, acequia landscapes in the San Luis Valley of Colorado and throughout the upper Río Grande double as important biological corridors and habitat islands for many species of plants and wildlife (Peña 1997) Conservation biologists, per Peña's analysis, might say that the acequia human community becomes the "keystone" species in the bioregional environment because numerous other life forms, wild flora and fauna, become dependent on the expanded habitat made possible by the ditch watercourses (Peña 1997; Noss 1994).

The beneficial impacts of acequia irrigation methods on the landscape, hydrology and the local ecology are many. For example, the earthen acequia watercourse itself helps to recharge the local acquifer through the natural process of seepage. Aided by gravity flow, water that continues to flow through the ditch extends the stream to a new, wider landscape; meanwhile, the water moves gently through the ditch and its *sangrías*, a process that spreads water slowly through the long-lot fields, helping to retard soil erosion. Water that percolates down to the aquifer aids in the cleansing of groundwater. Seepage throughout the ditch system nourishes the cottonwood bosques as well as native shrubs such as plum, chokecherries, willows, and other native plant species which, in turn, provide corridors of shelter, cover and food sources for wildlife (Peña 1997). Any unused waters are returned to the stream as *sobrantes*, or surplus waters, destined for other beneficial uses downstream.

Putting stream waters to beneficial use through acequia-based farming can also help to maintain instream flows for the protection of fish habitats. Both of these uses need not be viewed as conflictive, one at the expense of the other. Instead, they can be viewed as relatively compatible in the sense that they each require a minimum flow or otherwise sufficient hydraulic head of water in the river, as long as there is adequate quantity for both uses. Other water use alternatives, especially water-rights transfers from surface use to groundwater pumping, deplete hydrologically connected stream flows. This application can result in the lowering of the flows to levels potentially adverse to fish and other wildlife dependent on river systems that are wet year round. Acequia systems, on the other hand, contribute to the health of the river by flushing silt and taking surface water in the season when it is available, as opposed to groundwater pumping, which most often creates deficits of water quantity by depleting the aquifers well into future years.

Stewardship and Environmental Ethics

The Spanish institutional framework for arid-lands irrigation has survived essentially intact into the modern era of agropastoral farming on the upper Río Grande. Unlike the fate of the community ditches in San Antonio, Texas, where the once indispensable network of mission acequias has been destroyed or reduced to tourism sites as remnants of the past, the acequias of northcentral New Mexico and southern Colorado continue to function in the traditional manner. Around the globe, the traditional and political rights of land-based peoples are increasingly threatened by demands placed on the limited resource base critical to the survival of local cultures. But there is growing evidence that countries in both the Third World and the West are giving serious attention to alternative models of development that emphasize community-based conservation and the utilization of the many reservoirs of indigenous and traditional knowledge. In the field of development administration, for example, planners and other officials now propose that cultural diversity itself is a global resource that should be preserved alongside the need to maintain and protect biodiversity (Kleymeyer 1996; Berkes and Taghi 1989; Redclift and Sage 1994). Customary rights and local traditions need not be regarded as impediments to rational water management; instead, modern legal systems should be redefined to co-exist with customary practices and thus achieve optimum resource utilization.(S. Clark 1990).

After four hundred years of successful adaptation, the acequias of the upper Río Grande are model institutions worthy of further research. A good starting point is to consider the conservation ethics and environmental values that acequia irrigators inherited and transplanted from Old World irrigation systems. In his study of medieval Valencia, Spain, Glick (1970) found that the basic irrigation unit in the society was the *comuna*, a unit he defined as a group or community of irrigators all irrigating from a single main canal. These *comunas* were instruments for self-government in the water affairs of local society; and by way of ordinances, they provided for the maintenance of the canal, authorizing the local *cequier* (official similar to the ditch boss or *mayordomo* in New Mexico and Colorado) to impose fines in cases where water was being wasted or polluted through unauthorized uses (Glick 1970).

Water quality protection and conservation were likewise taken seriously in the *acequias de común* that flourished centuries later in the upper Río Grande, carrying forward the water ethic evident in the irrigation societies of medieval Spain. In his review of customary practices transplanted from Spain to New Mexico, Malcolm Ebright (1994) noted that the environmentalist ethic was woven directly into the very fabric of custom and public law in the Spanish and Mexican land grant communities. A 1705 decree by Governor Francisco Cuervo y Valdez, Ebright points out, mandated that villagers of Santa Fe should not drive their livestock onto a marshy wetland and public commons known as the *cienega*; anyone who violated this order would face a jail sentence. These orders were repeated by subsequent

governors such as in 1717 when the village pigs and other loose animals were rounded up to prevent damage to the planted fields and the grass meadows found at the *cienega* commons (Ebright 1994).

Guided initially by Spanish and Mexican water laws, the early settlers were mindful of conserving the resource base for themselves and for future generations, especially when the existing water supply could no longer support additional community growth. As mentioned earlier, petitions for additional land grants were submitted to the authorities with admirable regularity as population densities and the need for increased agricultural productivity outstripped the carrying capacity of the land base. After the new lands were occupied, irrigation practices were regulated in a manner designed to conserve the scarce water supply in each farm village. During the Mexican period, the Provincial Statutes of 1824-26 authorized local *alcaldes* to impose a one *peso* fine, plus the costs of repairs, on any irrigator who caused the flooding of roads and fields by not closing off his ditches when they overflowed (Provincial Statutes 1824-26). The first comprehensive acequia statutes were adopted in 1851 and 1852 at the start of the territorial period in New Mexico (Laws of 1851-52). Here again, water conservation was mandated. Section thirteen of these water laws stipulated that the *mayordomo* (ditch boss or superintendent) should apportion the available waters to each particular irrigator, but not only according to the amount of cultivated land he owned; the *mayordomo* should also take into consideration "*la naturaleza de las semillas, cosechas y de las legumbres que se cultivan…*" (the nature of the seeds, crops and plants to be cultivated…). Furthermore, each irrigator was entitled to retain all native plants of any description growing naturally on the ditch banks bordering and running through his property (Laws of 1851-52).

Other territorial laws specifically addressed the need to maintain water purity and quality in local ditches. In some ditches, *mayordomos* were authorized to levy fines against persons who befouled acequia waters by washing dirty clothes, bathing, or allowing swine to wallow inside the ditch (Laws of 1868 and 1872, cited in I. Clark 1987). By the turn of the century, a series of general, anti-pollution water laws had been enacted (1880, 1897, and 1899) that applied to all acequias of the territory. These laws prohibited the pollution of streams, lakes, and ditches by any number of means or the discarding of objects that would endanger the public health of the community. The penalties, upon conviction, were gradually made more severe, up to one hundred dollars and/or a sixty-day jail sentence in the 1897 laws (cited in I. Clark 1987).

Dividing and Sharing the Waters

Water conservation became a frequent concern in the late nineteenth century as the number of ditches and irrigators increased in some of the more densely populated valleys. The solutions and arrangements for the sharing of available water were primarily of local design, either by custom or legal agreements on how to divide the water, practices that continue to the present either intact or in some modified form. Some localities divide the water according to fractions where each ditch is entitled to its prorated amount of water, such as a one-third share in the case of three acequias sharing the water in equal parts out of a common *compuerta* or headgate at the stream source. Other arrangements divide the water based on a scheduled time rotation, as in an 1895 example where ditches located in two Taos precincts agreed to take water from four streams in their area according to a predetermined weekly schedule. One precinct would be entitled to all the available water flowing in the four streams for their exclusive use and benefit from Friday of each week at sunset until the following Sunday at twelve noon; the second precinct thus, would take the water the rest of the time, from Sunday at noon until sunset on Friday. Per the terms of the agreement, this rotation plan would be repeated through the remainder of the irrigation season, lasting until the fifteenth of September every year (Agreement to Divide Irrigation Waters 1895).

During periods of drought or low water flows in the river source, most local acequias strongly value their customary practices of sharing, setting aside any legal rights based on prior appropriation. In many watersheds, acequia irrigators prefer the *repartimiento* system of dividing water according to local customs and traditions, where water is shared by all users, regardless of priority dates. Under these arrangements of customary usage, irrigators divide water based on historic practices of sharing and the need to provide *auxilio* (emergency mutual aid) during times of shortage or drought. This time-honored system of reciprocal assistance runs counter to the prior appropriation doctrine which forces a system of hierarchy among acequias and users who share the same stream source. Acequia officials and the *parciantes* as a whole are aware of this conflict, but most opt to ignore the strict system of priority calls on the river and would rather continue to share the water in the traditional manner (see Adjudication Hearings 1991).

This obligation to offer *auxilio* in times of special need and to share water during conditions of drought continues to be a deeply held belief of the acequia irrigators, an influence perhaps from the Moorish traditions evident in Spanish water law. According to I. Clark (1987), the Islamic law of thirst granted free access of water for all living things to satisfy their needs in the aridity of the north African homeland. "Islam not only subscribed to a belief in the purifying character of water … but also the moral obligation of each to help all others of the community in the time of need" (I. Clark 1987, p. 9). Or in the words of a Taos *parciante* at the adjudication hearings on customs and traditions held in 1991 by Special Master Frank Zinn: "When [the flow is] low, nobody has any. When it's high, everybody has some. That's the way it was too. If there's a cup of water there, we will share it" (Adjudication Hearings, Testimony of Esequiel Trujillo, May 20, 1991).

Repartimiento, water rotation schedules and other devices of sharing water have continued as local practices into the contemporary period, evidence of the persistent conservation ethos among acequia *parciantes*. Often, water rotations are established where individual irrigators from a single ditch are assigned certain days and hours of the week when it is their turn to take water from the ditch to irrigate their fields and gardens. Ditch rules provide for stiff penalties should an irrigator take water out of turn. Rules have also been crafted by the users themselves to protect and enforce water quality standards in the ditch. Just before statehood in 1911, for example, the *parcionistas* (landowner

irrigators) of the Margarita Ditch in Lincoln County charged the *mayordomo* with enforcing the "*Reglas de Limpiesa*," (Rules for Cleanliness). The Margarita Ditch Rules prohibited anyone from discarding junk in the community ditch, namely, "*garras, cajetes, puercos cueros, barriles o otras porquerillas que sean en prejicio de la saludbridad de los ha[b]litantes*" (rags, tubs, pig hides, barrels, or other filthy objects which might endanger citizen health).

Acequias and Contemporary Public Policy

The goal of Spanish settlement during the colonial period was to inhabit the vast reaches of the province based on agropastoral economies, a land use practice resulting not in the establishment of *municipios* (municipalities) but in the dispersal of the population throughout the rural jurisdictions of the region (Tyler 1990; Simmons 1969). Within the confines of available resources, some physiographic limitations, and many opportunities for creative engineering, the early *pobladores* proved adept at implementing the goals of colonization expressed in royal Spanish ordinances and subsequent Mexican land grant concessions. With the active encouragement of government officials who liberally implemented Spanish and Mexican land-distribution policies, the *hispano mexicano* settlers established permanent communities throughout the narrow valley bottomlands of *La Provincia del Nuevo México*. Acequias have withstood the test of time and insured the survival of a unique regional culture into the twenty-first century. These water institutions have operated with a few basic rules based on customs and traditions managing communal property resources with minimal government interference or assistance, features they share with other small-scale irrigation organizations around the world: the *subaks* of Bali, the *zanjeras* of the Philippines, the *sociedades de riego* in the Tehuacan Valley of central Mexico, and the *huertas* of Valencia, Spain. (Ostrom 1990; Berkes and Taghi 1989; Whiteford and Henao 1980; Maass and Anderson 1978).

In the upper Río Grande, the benefits of acequia-based farming extend well beyond the consumptive needs of the irrigators themselves. Watershed studies have established that acequias also help to maintain other important social, cultural, economic and environmental values that should be recognized by downstream water stakeholders, policymakers and the general public:

1. The acequia culture of the region promotes tourism and economic development;
2. Protection of the acequia system of agriculture also protects the health of rivers, forests and the watershed headwaters in the sierra peaks;
3. Acequias promote a land ethic supportive of responsible stewardship of the watershed ecosystem in a high altitude, arid lands environment;
4. Acequias double as wildlife habitat and travel corridors, and therefore promote both wildlife and plant biodiversity; and
5. Acequia associations are democratic institutions that are dynamic, self-reliant and sustainable forms of local government (Rivera and Peña 1998; Rivera 1996).

Comparatively, the upper Río Grande community acequias of southern Colorado and New Mexico stand apart from the fate of many other irrigation canals in the western United States. In Worster's historical study (1985), most irrigation systems in the American West have succumbed to the forces of the new hydrologic society, where water has been reduced to a simplified, abstracted resource, separated from the earth in a manipulative relationship with nature:

> The modern ditch is lined along its entire length with concrete to prevent the seepage of water into the soil; consequently, nothing green can take root along its banks, no trees, no sedges and reeds, no grassy meadows, no seeds or blossoms dropping lazily into a side-eddy. Nor can one find here an egret stalking frogs and salamanders, or a red-winged blackbird swaying on a stem, or a muskrat burrowing into the mud. Quite simply, the modern canal, unlike a river, is not an ecosystem (Worster 1985, p. 5).

The earthen acequias of the upper Río Grande are unique in the western states. The *acequias de común* continue to function much as before, as model institutions of water management in environments where water is not plentiful and where reciprocal relationships of mutual aid are increasingly necessary if the human, animal and plant communities are to survive in balance and harmony. These keystone acequia villages perpetuate cultural continuity, a sense of place, and an indigenous system of participatory democracy that is worthy of public support as we enter the twenty-first century and already are confronting the challenges and opportunities of a pluralistic, diverse society of competing and often conflictive values.

Fortunately, values and perspectives concerning water resources policy are changing, especially in the American West where the era of large scale water development projects, meant to harvest and channel water destined for urbanizing regions or to reclaim desert lands for agribusiness welfare, is rapidly ending. Most river streams are fully appropriated or committed to the delivery requirements of interstate compacts and binational treaties. Thus, a new conservation ethic is taking root, but so are water markets and other mechanisms to transfer water away from historic or traditional uses in order to accommodate population growth, industrial development, recreational uses and other demands. These "higher use" values increasingly threaten the ability of acequia irrigators to compete on even terms. In Colorado and New Mexico water rights can be severed from the land and sold in the marketplace much like other property commodities. Some of the competing stakeholders perceive the acequia institution as antiquated and an obstacle to growth and development. To the critics, the acequia methods are wasteful and too primitive for the needs of a modern economy based on new industries, corporate agriculture, municipal growth and recreational tourism.

The challenge to acequia users is to retain ownership of their ancestral water rights in the face of mounting pressures to sell or otherwise transfer water rights out of the community. Not only must they continue to put their water to beneficial use, to avoid forfeiture, but in most cases they must also increase production, raise incomes and generate economic returns sufficient enough to discourage sales and transfers. Already, some ditch associations experience difficulties when it comes time to clean or repair the ditch waterworks. Maintenance of the system requires full and sustained participation from all *parciantes*, whether they

farm or not. Acequia officials fear that one water transfer from within the group of irrigators will lead to others, creating a domino effect, leaving fewer and fewer *parciantes* to maintain the ditch, raise funds for the seasonal repairs, enforce and administer the rules, and generally keep up with the chores of organizational maintenance. A collapse of the acequia institution would be catastrophic to the community and perhaps the surrounding area (Rivera 1996).

The event of the *cuarto centenario* provides an opportunity for all stakeholders and public officials to reflect on the historic and cultural values intrinsically connected to traditional water uses in both the Hispanic and Pueblo Indian communities. In the long run, sustainability of water quantity and quality may depend more on democratic and social processes than on technological or regulatory fixes. Understanding, dialogue and new ways of sharing are imperative. The four hundred years of acequia customs, traditions and values have endured and passed the test of time thus far. The pressures of the water markets in the bioregion have surfaced new realities creating tensions and conflicts across the myriad of users and stakeholders, and within the acequia communities themselves. Survival of the acequia institution depends on how adeptly the irrigators and their officers respond to these challenges and chart a course of action into the 21st century.

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