STATE-CENTERED MANAGEMENT AND LOCAL LEVEL REVOLT: THE CASE OF ARIZONA GROUNDWATER MANAGEMENT

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I. Introduction

Arizona is one of the fastest growing states in the U.S. Located in the desert southwest, water scarcity is a perennial problem. Groundwater basins, that in some cases reach a depth of 7,000 feet, are the state's major source of water (ADWR 1991). Multiple and growing demands threaten the viability of the some of the basins. Historically, agriculture has controlled and used the most water, and that remains true today, with agriculture consuming approximately 80% of all groundwater pumped in the state (Cory, et.al. 1992). Booming metropolitan areas, however, have placed additional demands on groundwater resources.

Until recently, groundwater basins in Arizona were governed by the doctrine of reasonable use. Landowners situated above groundwater aquifers had the right to pump as much water as they could put to reasonable use. Given minimal rules of access--land ownership, and no limits placed on pumping, beginning in the 1930s Arizona citizens found themselves in the midst of a commons dilemma--increasingly severe groundwater overdrafts. By 1980, Arizona citizens were consuming 2.5 million acre feet of mined groundwater (ADWR 1984). It was also in that year that Arizona replaced the reasonable use doctrine with a complex set of rules governing groundwater use in the most heavily overdrafted basins.

The 1980 Arizona Groundwater Management Act (AGWMA) received mixed reviews. The Ford Foundation is enamored with it. Scholars and practitioners devoted to local level governance or co-management are wary of it. The Ford Foundation is an avid supporter of the act because it appears to be a centralized comprehensive approach to resolving some very thorny issues. The Arizona Department of Water Resources (ADWR), which implements the act, appeared to be given sufficient authority to rationalize the use of groundwater basins. Devotees of self-governance are wary of it for the same reasons that the Ford Foundation supports it. Within the framework of the Act there does not appear to be much room for local-level input or governance.

This paper provides a political analysis of the AGWMA. The political analysis is organized around two puzzles or problems, posited and popularized by Ostrom (1990:42). They are " (1) the problem of supplying a new set of institutions, and (2) the problem of making credible commitments" (Ostrom 1990:42).[1]

Supplying institutions may be problematic because institutions share the characteristics of public goods. Individuals attempting to design institutions to coordinate their use of a shared resource must overcome freeriding problems. In addition, the supply of institutions may be

[1] Ostrom discusses a third problem, which will not be addressed in this paper, that is the problem of mutual monitoring (Ostrom 1990:42).

confounded by distributional issues. While all participants may benefit from a new set of institutions, some may be made better off than others, depending upon the precise configuration of institutions adopted. Participants may be unable to agree upon a fair distribution of the benefits produced by new institutional arrangements.

Even if a new set of institutions is adopted the temptation to cheat still exists. If sufficient numbers of participants cheat, those still following the rules may cease to do so, causing the institutions to breakdown. As Ostrom (1990:44) explains, "No one wants to be a 'sucker', keeping a promise that everyone else is breaking". Simply adopting a new set of rules does not resolve commons dilemmas. Those rules must be followed. Individuals must commit to a set of rules.

Failing to resolve any one of these problems means that individuals will fail to adopt institutional arrangements to coordinate and govern their use of shared resources. As Ostrom (1990:45) explains, "Without monitoring, there can be no credible commitment; without credible commitment there is no reason to propose new rules."

This paper tells the story of how Arizona addressed the problems of supply and commitment in grappling with the commons dilemmas associated with the shared use of groundwater basins. It also provides an initial evaluation of the outcomes produced by the Arizona Groundwater Management Act. In terms of promoting the efficient allocation and use of groundwater, the Act has been less than successful. In terms of promoting the political ambitions and goals of the major actors, the Act has met with remarkable success.

This story provides numerous important lessons and challenges to those scholars and practitioners interested in and devoted to the creation, design, and implementation of institutions for the governance of common-pool resources. The Ford Foundation's infatuation with the AGWMA is misguided. Scholars and practitioners supportive of self-governance and co-management are correct in their suspicions of the Act, but for all the wrong reasons. This is not a state-centered, state controlled policy, as those terms are commonly understood. Rather, it is an example of local and regional level interests gaining control of state mechanisms, and using public authority to disadvantage their opponents and to pursue their own narrow self-interests. In other words, this is not a story of local level interests cooperating to realize gains from trade. As such, it presents a recognized, but rarely accepted, challenge to the self-governance/co-management scholars and their faith in local level actors and initiatives. While these scholars have mounted a sustained and convincing attack on centralized government, they have not adequately confronted the possibility that local-level groups can use mechanisms of public authority for socially questionable ends.

In the following, rather lengthy section, the problem of supply is directly addressed in three parts. The first part presents a description of the institutions supplied as part of the Arizona Groundwater Management Act and the process used to supply them. The second part focuses on the actors involved in the design and adoption of the Act, who they are, the roles they play, the influence they exercise and the strategies they support and turn to in supplying institutional

arrangements. The third part is devoted to a careful analysis of the authority of the Arizona Department of Water Resources. Section II more briefly discusses and examines the problem of commitment and how it has been addressed. Section III provides an initial evaluation of the AGWMA. The final section presents concluding challenges.

II. The Problem of Supply

Supplying a new set of institutions for the governance of groundwater in Arizona was a complex, lengthy process, resulting in a complex set of rules. Institutions were supplied and took the form that they did, in part because of the increasing political clout of municipalities, who heretofore could not compete with the political influence of agriculture. The first part of this section consists of a description of the events leading to the adoption of the 1980 Arizona Groundwater Management Act, and the structure of the Act itself. In the second part of this section, the actors actively involved in supplying, implementing, and adapting the 1980 Act are examined, with particular emphasis placed on the relative importance of the various actors and the strategies actors use in attempting to change and adapt to the 1980 Act.

Adopting the 1980 Arizona Groundwater Management Act

Economic development in Arizona has depended on the development of water supplies. Much of that development in the twentieth century used local groundwater stored in basins extending through the central part of the state from Prescott through Phoenix to Tucson. By 1980, groundwater wells in Arizona were drawing 2.5 million acre-feet more than was being replenished each year (ADWR, 1984). In 1980, the Arizona legislature enacted the Arizona Groundwater Management Act (AGWMA) in hopes of addressing the state's mounting overdraft problems.

Historically, the Arizona legislature has had difficulty passing effective water legislation, despite (or because of) its importance to economic development in the state. Only in moments of real or perceived crisis has water legislation been adopted (Woodard, 1989). The focus of much of the legislation has been to limit the adverse consequences arising from governing groundwater through the doctrine of reasonable use. This doctrine derives from English common law, which treated water percolating through the soil (as opposed to water found in channels) as belonging absolutely to the owners of the soil (Mann 1963:45). Since reasonable use establishes private property rights in groundwater, landholders above a groundwater aquifer have the right to pump as much water from the aquifer as they choose as long as they put it to reasonable use. In Arizona no use has been declared unreasonable, so there are no limits on quantities that can be pumped. Consequently, landholders above an aquifer can easily find themselves in a "tragedy of the commons" situation.

Arizona landholders began to realize such a situation in the 1930s, but the only action that legislators could agree upon was to fund groundwater studies by the U.S. Geological Survey (USGS) beginning in 1939 (Mann 1963:48). For the next ten years, based on its findings, the USGS warned state officials of the increasing severity of the overdraft problem and the threat it

posed to economic stability in the state. In fact, there was reason to be concerned. During the 1940s the amount of water pumped for irrigation more than doubled and water tables declined precipitously (Mann 1963:44).

The legislature took no action until it was confronted with what was to become a commonly used stick--a threat to the Central Arizona Project (CAP). In 1945, the Bureau of Reclamation reported favorably on CAP, which was to be a canal that delivered Colorado River water to the thirsty central part of the state. The Bureau found the project to be economically feasible, however, it was unwilling to recommend that it be authorized until Arizona addressed its groundwater depletion problem. The legislature responded by passing the Groundwater Act of 1945 which required that wells be registered with the State Land Commissioner. The 1945 Act failed to address the groundwater overdraft problem.

In 1948, the Bureau renewed its threat to CAP. Governor Osborne, who wanted a groundwater code passed, used the threat to attempt to wring out some form of legislation during the regular session but failed. The primary opposition came from farmers who felt that any code would threaten their private property rights in water. As one farmer stated, "Who is going to tell me what to do and how to do it? If my land is destroyed through lack of water I want to destroy it myself; I don't want you {presumably the state legislators} to do it" (Mann 1963:50).

Governor Osborne resorted to calling three special sessions of the legislature. Finally the legislature passed the Ground Water Act of 1948. The Act permitted the State Land Commissioner to create critical groundwater areas, areas that did not have sufficient groundwater to continue to provide a dependable supply of irrigation water to existing users at current rates of withdrawal. If an area was declared critical no new wells could be drilled and no additional land could be brought under irrigation. However, existing wells could be replaced and even deepened.

The only outcome the act could possibly achieve was to slow down the rate of groundwater depletion in critical areas, but not eliminate it. Most legislators realized that the act left a lot to be desired. Representative Murphy from Maricopa County stated that the act was "as weak as restaurant soup and should have been sent from the Senate with crutches" (Mann 1963:52). Many people considered the 1948 Act to be a stopgap measure until something more comprehensive could be enacted. When that would occur was uncertain, and in fact, the legislature did not attempt to pass any comprehensive groundwater legislation for 32 years.

Two incidents created the crisis atmosphere in 1980. One was a renewed threat to CAP and the other was a water rights decision by the Arizona Supreme Court adverse to the interests of a group whose political power was beginning to rival that of agriculture--municipalities.

President Carter placed the Central Arizona Project on his "hit list" of western water projects. Reflecting both the federal government's fiscal straits and his own policy views, Interior Secretary Cecil Andrus made it clear that the CAP would not be a federal "bailout" of an Arizona that failed to responsibly manage its own local water resources. Andrus conditioned the CAP's

removal from the hit list on Arizona's adoption of a system for controlling its groundwater overdraft problem (Connall, 1982; Smith, 1985).

In 1976, the Arizona Supreme Court announced its decision in the case of Farmers Investment Company v. Bettwy [113 Ariz. 520, 558 P.2d 14(1976)]. The Farmers Investment Company (FICO), which owned and operated a 7,000 acre pecan grove, sought to enjoin Anamax, a copper mining company, from pumping groundwater near FICO's pecan groves south of Tucson and transporting the water to Anamax mines in another area. FICO argued that the reasonable use doctrine required that water be used on the land from which it was pumped. The Supreme Court sided with FICO, granting it the right to seek injunctive relief.

Arizona's cities as well as its mining companies recognized the potentially disastrous implications of the decision. Cities and industries with demands for large quantities of water had long satisfied those demands by pumping groundwater where it was available and transporting it to where it was needed. The FICO decision reinforced the ability of Arizona irrigators to shut down this practice, even though the economic base of the state was shifting away from agriculture and toward urban and commercial development. The absence of secure rights to transport groundwater for Arizona's growing population and economy threatened the further development of cities and industry (Connall 1982)

FICO did not want an injunction. It did not want to shut down mining operations employing thousands of people (Connall 1982). Instead, mining and agriculture interests attempted to work out compromise legislation that would overturn the FICO decision, but they were unsuccessful. Mining representatives then turned to representatives from cities in order to strike a deal. The Arizona legislative leadership became involved in the negotiations and eventually all interested parties, including agriculture, were brought together to devise legislation. The group met in private sessions and agreed that whatever legislation emerged from its deliberations would be passed without amendments. Recognizing the difficulty of passing any type of water legislation, as well as the temptation to amend undesirable parts of legislation, the legislative leaders felt such an agreement was crucial if the problem were to be solved.

The Arizona legislature responded in 1977 by adopting a series of amendments to the 1948 Ground Water Act allowing the transport of groundwater, while authorizing those harmed by the transport to claim money damages. Water transportation could not be enjoined if it were done lawfully. If cities or mines wanted to undertake new transports of water they had to acquire and retire irrigated farmland.

These amendments are interesting not so much for how they addressed the water transportation issues, but for the groundwork they laid for the adoption of a comprehensive groundwater code, a code believed necessary if CAP were to be built. The legislation established a 25 member groundwater management study commission. All previous groundwater commissions had failed. Either they could not achieve consensus on drafting legislation, or once the legislation was reported to the legislature it was never reported out of committee. This commission was going to be different from its predecessors because its enabling act changed the

rules that governed the passage of legislation. If the Arizona legislature failed to enact a comprehensive groundwater management code by September 17, 1981, the code recommended by the commission would automatically become law (Arizona Laws, 1977, Ch.29, section 7). It was adopted because those most intimately involved in water issues in Arizona recognized and understood that the existing rules governing the passage of legislation provided too many opportunities to block controversial bills, as any groundwater bill surely would be.

The clause allowing the commission to enact legislation substantially changed the rules, and consequently, the incentives that legislators faced. No longer did legislators have the opportunity to block undesirable legislation by bottling it up in committee, or by amending it, or by simply voting against it. Now, if they did not like the code that the commission recommended, they would have to pass their own legislation. Change was coming to Arizona groundwater law, whether through an act of the legislature or through the actions of the commission.

The mining and municipal interests on the commission cooperated to devise a code that was completely unacceptable to agriculture. Under the commission's recommendations only the most severely overdrawn groundwater aquifers would be actively managed. Active management would involve the quantification of all groundwater rights in the basin. Nonagricultural users would have their "grandfathered groundwater rights" based on the maximum amount pumped and put to use in any one of the previous five years. Farmers, on the other hand, would have their "grandfathered groundwater rights" based on the average reasonable use of groundwater for farming. "Average reasonable use" would be less than "historical use" since municipal and mining interests believed that farmers were very wasteful of water (Groundwater Management Study Commission 1979). Farmers would lose rights to substantial amounts of groundwater that they heretofore considered their own private property.

In addition, grandfathered groundwater rights could only be transferred with the land and only for the same uses. Landowners would be permitted, however, to sell one acre foot of water per acre of land owned. This "quantified right" could be severed from the land and used for any purpose. Additional water could be obtained by cities and mines from the state through a permit process. Thus, instead of selling as much water as they had rights to, farmers would only be allowed to sell one acre foot of groundwater per acre of land for non-agricultural uses. While farmers controlled much of the groundwater they would not be permitted to profit from its sale.

The actively managed areas would be governed by local entities--groundwater management districts--that would be political subdivisions of the state. Agricultural interests feared local control, believing that municipalities would control the districts and use them against agriculture. The groundwater management districts could use a variety of methods in achieving safe yield (when average annual groundwater withdrawals equal replenishment), the management goal recommended by the commission. Those methods included pro rata reductions in use, conservation requirements, the purchasing of land and the retirement of the associated water rights, and, as a last resort, the condemnation of land.

The purchasing and retirement of rights was only grudgingly allowed. Municipal and mining interests felt that agriculture was responsible for the overdraft problem. Purchasing and retiring land and water rights would simply be rewarding the culprits with windfall profits. Tucson attorney Tom Chandler summed up this attitude in saying, "We do not want the farmers retiring to La Jolla and raising martinis" (Glennon 1991:101).

While municipal and mining interests rejected the option of retiring irrigated agricultural land, agricultural representatives on the Commission adopted a minority report supporting just such an option. Agriculture uses approximately 90% of all groundwater pumped in Arizona (Arizona Groundwater Study Commission 1979). Thus, to address the overdraft problem, the state of Arizona should go where the water is, agriculture, and purchase and retire irrigated acreage sufficient to achieve safe yield of groundwater basins. Agriculture representatives estimated that close to 200,000 acres of irrigated land would have to be retired (ibid). According to agriculture supporters this would be the simplest and most direct method of addressing the groundwater overdraft problem.

Confronted with an unacceptable commission code, and a renewed threat from Secretary Andrus not to build the CAP, Arizona Governor Bruce Babbitt convinced the most crucial representatives of the farmers, the miners, and the cities to sit down and work out a more acceptable alternative, one that would not simply take water from agriculture. Babbitt convened the group at a retreat north of Tucson and instructed the Arizona State Police not to allow anyone to leave until an agreement had been reached.

After much struggle the group devised an alternative piece of legislation, which they took great pains to protect from attack. They agreed that legislators would not have any opportunities to amend the act before voting upon it. In addition, they agreed among themselves not to permit the act to be destroyed through amending it in future years. Finally, they attached a nonseverability clause to the legislation. If any part of the act was found by a court to be invalid the entire act would be void. A special one-day session of the legislature was called in June 1980 to adopt the resulting Arizona Groundwater Management Act. Construction of the CAP ensued.[2]

The goal of the Act is for the state's most severely depleted groundwater basins to be at safe yield by the year 2025. Safe yield is defined as achieving and maintaining "a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial groundwater recharge in the active management area" (ADWR 1991:6). In order to achieve this goal, the Act consists of a complex amalgamation of rules, regulations, and organizational structures, reflecting the many compromises reached in obtaining its passage. First, its provisions apply only within state-designated Active Management Areas (AMAs). The traditional reasonable use doctrine still applies outside those

[2] "The CAP is a 335 mile long system of canals, pumping plants, tunnels, inverted siphons, ... The project brings 1.5 million acre feet of water from the Colorado River, and through a series of 14 pumping plants, lifts it to Phoenix and Tucson" (Arizona Senate Committee on Natural Resources and Agriculture 1991:5).

areas. Four AMAs were identified in the act, covering the most populous parts of the state, which were also experiencing the most severe groundwater overdrafts.[3]

Instead of permitting local control of groundwater management, as the municipalities wanted, the act created the Arizona Department of Water Resources (ADWR) and gave it and its director extensive authority to implement and administer the act, including the development of more specific guidelines. The ADWR director -- appointed by the governor -- is often referred to as Arizona's "water czar," and, on paper at least, is supposed to have almost complete discretion in devising groundwater management practices for each of the AMAs (Leshy and Belanger, 1988). Two supporters of the Act, in an article written several years after its passage stated, "such prescient delegation is remarkable when one considers that the architects of the Act--the farmers, miners, and cities--had historically been at odds with one another and had vigorously promoted their own interests at the expense of efficient water management" (Leshy and Belanger 1988:709). In a concession to municipal interests, however, each AMA has its own local director and a local citizens advisory board.

The act and its implementation have established a system of quantified groundwater use rights that protects existing pumpers. Irrigators were granted Irrigation Grandfathered Rights, based on their historic use which averaged about five acre-feet of groundwater per acre annually. Irrigation grandfathered rights are not absolute. The quantity of water they represent will be reduced, as increasingly strict conservation requirements are applied to farms. In addition, the irrigation grandfathered rights can be converted to Type 1 Nonirrigation Grandfathered Rights when farmland is transferred to nonagricultural use. Thus, while farmers can no longer pump as much water as they want, and they cannot expand irrigated areas, their historic use patterns of water have been recognized. In addition, they are permitted to transfer their rights to different uses.

Individuals holding Type 1 rights may pump about three acre-feet per acre per year. Under a 1991 amendment to the AGWMA, these Type 1 rights are transferable to other locations under certain circumstances. Type 2 Nonirrigation Grandfathered Rights were also allocated based on historic use, primarily to industrial users. Type 2 rights are transferable to other locations.

Cities, towns, private water companies, and water districts were assigned "service area rights" rather than grandfathered rights. Service area rights are based on gallons of water per day per customer served, rather than feet of water per acre of land. The per-capita service area right is subject to increasingly strict conservation requirements over the life of the act.

The Act is implemented through a series of five management plans, each plan governing a decade of groundwater use, except for the last plan which governs from 2020 to 2025. An individual management plan is designed for each AMA, allowing it to take into account the

[3] "In 1990, AMAs accounted for approximately 70 percent of Arizona's water use and over 80 percent of the state's population" (ADWR no date:4).

specific circumstances and needs of each management area. The director of ADWR possesses the authority to devise the management plans. The plans consist of increasingly stringent conservation requirements for municipalities and farms. For instance, under the Second Management Plan which is in effect from 1990-2000, farmers are required to improve their irrigation systems, typically by "laser leveling of all fields to level basins", thereby achieving a level of efficiency in water use of 85% (ADWR no date: 10).

In the past Arizona farmers had successfully prevented enactment of a code to govern groundwater pumping. In a clear break from that past, municipalities exercised their growing clout, cooperated with mining interests, and forced the supply of a new set of institutions. Those new institutions imposed a much more strict management regime than farmers desired, but less strict than desired by municipalities. While farmers exercised sufficient political muscle to avoid the disaster of the code recommended by the Arizona Groundwater Study Commission, under the 1980 Arizona Groundwater Management Act, farmers, relative to their municipal and mining counterparts, were treated less favorably. Mines were give ownership rights in the groundwater they had historically pumped. The Act recognized and retained the status quo for mines. Municipalities, while subject to increasingly strict conservation requirements, were not subject to overall pumping limits, at least not immediately. Overall pumping limits for municipalities were to be negotiated at a later time. Municipalities did not consider eventual pumping limits onerous because by the time they would go into effect, the CAP would be built, giving cities access to hundreds of thousands of acre feet of renewable water. Farmers, however, were subject to increasingly strict conservation requirements, and overall pumping limits that would gradually reduce the supply of agricultural groundwater over time. In addition, farmers were not allowed to put additional land under irrigation. Farms could not expand. Finally, they were allowed to transfer only a portion of their irrigation groundwater rights to other uses.

In considering the structure of the 1980 AGWMA, it appears that the ADWR, and in particular, its director is quite powerful. It is ADWR that implements, monitors, and enforces this act. It is ADWR that devises and implements each of the five management plans. It is ADWR that defines groundwater rights, allows or disallows their transference, and that issues assorted permits. In considering the structure of the 1980 AGWMA it is understandable that the Ford Foundation would consider it to be well-defined and comprehensive, a model to be followed by other states. In considering the structure of the 1980 AGWMA it is understandable the suspicions of scholars and practitioners devoted to local level management would be raised. Is the ADWR, or its director, a water czar? Is the 1980 AGWMA a comprehensive framework for the management of groundwater basins? It is these appearances that will be examined next.

Influence, Strategies, and Coalition-Building of Local-Level Water Actors

Describing the institutions adopted to manage the use of groundwater basins in Arizona only tells a part of the supply story. An equally important part of the story involves the actors themselves and their continuing participation in changing and implementing the Act. It is this part of the story that reveals the strengths and weaknesses of the various actors. It is this part of the story that more clearly defines which organizations exercise substantial authority in

developing and implementing groundwater policy. It is here that one gains a sense of the degree to which the AGWMA represents a state-centered management tool, some form of co-management, or some form of self-governance backed by the authority of the state.

This part of the story brings us forward in time to 1994. Data collected about the actors involved in both collective choice and operational level actions concerning the management framework established by the 1980 AGWMA come from interviews conducted in 1994. Water policy experts from private and municipal water utilities, water districts, trade associations, public interests groups, and environmental organizations were interviewed, using closed ended questions, concerning perceptions of the Arizona groundwater policy domain, groundwater issues of particular interest to the organizations, the process of supplying new institutions, coalitional partners, perceptions of which organizations are most influential in the process of supplying institutions, and strategies organizations use to achieve their institutional supply goals. Approximately 33 interviews have been conducted to date, with approximately 15 interviews to be completed.

In examining this data one primary issue will be considered: the role and relative influence of state-level institutions, particularly ADWR and the state legislature, relative to local-level and regional-level organizations in supplying groundwater management institutions. This issue will be explored through various routes, such as examining the process and strategies used by water actors in developing and introducing legislation to amend the AGWMA; and by considering the extent of the authority of ADWR, in terms of the comprehensiveness of the AGWMA, the various attempts of the ADWR to engage in rulemaking activities, and the scope and purpose of the amendments to the AGWMA.

To understand who the influential actors are, its perhaps best to begin with the process of enacting legislative statutes or adopting administrative rules and regulations. The processes used in supplying rules provide greater advantage to some actors as opposed to others. The process of supplying legislative statutes is a case in point. The Arizona legislature can be considered an amateur, or citizen, legislature. First, it is in session for less than 100 days each year, substantially circumscribing the number and types of policy issues it can address. Second, legislators are not provided staff to assist them in their work. Only committees and legislative leadership is provided with staff, and even that resource is severely limited. For instance, each committee has exactly one staff member to assist it in its proceedings. Thus, the average legislator does not possess sufficient resources, either in terms of time or staff support and expertise, to develop and write legislation. Instead, legislation is devised outside of the legislature by individuals and organizations most interested or affected by an issue.

In this context, the role of legislators is that of shepherd. Organizations assiduously cultivate the legislative committee chairs, and the leadership of the House and Senate, in order to call upon these individuals to shepherd legislation through the legislature to a successful conclusion. The legislator must ensure that the legislation is heard by the appropriate committees, that it is not amended to death, that others do not tack their desired bills on to it thereby turning it into a Christmas tree, and so forth.

In addition, given the compressed time period in which the legislature is in session, major pieces of legislation can face little serious opposition if they are to be addressed before the legislative session concludes. Consequently, a curious practice has developed among committee chairs of the Arizona legislature. If, when a committee hears a bill and serious opposition to the bill arises, the committee chair will adjourn the committee and instruct all participants, both supporters and opponents, to retire to the basement to work out their differences. Only when a general consensus is achieved among affected parties will the committee devote its limited resources towards addressing and promoting the passage of the bill.

The role of the legislature places particular demands on the participants which is reflected in the strategies they pursue in attempting to supply rules governing groundwater management. All of the organizations interviewed share a particular set of core strategies. The strategies on which they differ reflect only a difference in identity. For instance, all organizations use, and highly rank strategies that involve building coalitions around a particular piece of legislation, and of contacting, meeting with, and working with the chairs of legislative committees, legislative leadership, the governor's office, and the top officials in ADWR. However, strategies that involve "going public", such as making grassroots appeals, holding press conferences, publicizing research findings, receive mixed reviews.

Figure 1. Coordination of Policy Activities

	Operates Alone	Coordinates	Does Both	Total
AG Groups	0 (0%)	2 (25%)	6 (75%)	8 (100%)
M&I Groups	0 (0%)	9 (57%)	7 (44%)	16 (100%)
PI Groups	1 (11%)	4 (44.5%)	4 (44.5%)	9 (100%)
Total	1	15	17	33

Figure 1 exhibits the commonality in strategies. Organizations are grouped by sector, as opposed to strictly by function. Organizations that either deliver water for industrial or residential use, or that represent organizations that do, are grouped in the municipal and industrial (M&I) sector. Organizations that represent agricultural interests, or that deliver water for agricultural use are grouped in the agricultural (AG) sector. Organizations that represent environmental values, consumers, or citizens, are grouped in the public interest (PI) sector. Representatives of organizations were asked to self-report the extent to which they coordinate their policy actions with other organizations. That is, do they primarily work alone, do they work with others, or do they do both--sometimes working alone and sometimes with others. As Figure 1 demonstrates, all of the thirty-three organizations, except for one, coordinates policy actions with other

organizations. AG organizations differ somewhat compared to the other organizations. They are less likely to always work with others. Only 25% report always working with others. Instead, they are more likely to sometimes work alone and sometimes work with others. M&I organizations and PI organizations are about evenly split between always working with others or using a mixed strategy. For instance, 44.5% of PI organizations report always working with others, with an equal number reporting that they do both, working alone and with others.[4]

Representatives of these organizations were also asked to evaluate the usefulness of strategies that involved contacting high level state government officials.[5] As Figure 2 demonstrates almost all representatives rank such strategies as useful to very useful. In fact, each sector's ranking of the strategies is almost identical. For instance, 84% of the responses of M&I organizations and of PI groups rank contacting and discussing policy with the governor, legislative leaders, legislative committee chairs, and agency officials as very useful or useful. The AG organizations also rank such strategies highly with 81% of the responses of the organizations ranking such strategies are useful to very useful.

Figure 2. Contact Top State Officials

	Very Useful	Useful	Sometimes/ Not Useful	Not Useful	Harmful	Total
AG Groups	17 (53%)	9 (28%)	4 (13%)	2 (6%)	0 (0%)	32 (100%)
M&I Groups	29 (58%)	13 (26%)	7 (14%)	1 (2%)	0 (0%)	50 (100%)
PI Groups	21 (58%)	9 (25%)	1 (27%)	4 (11%)	1 (3%)	36 (100%)
Total	67	31	12	7	1	118

Organizations do differ on other strategies that reflect their different identities. For instance, asked to evaluate the usefulness of "going public" to promote one's policy goals produced substantially different responses from the various organizations, as Figure 3 reveals. Figure 3 consists of organizations' responses to three strategies, publicizing research results on a

[4] Asked to evaluate the usefulness of coordinating actions with other organizations with similar policy goals, three-quarters of the organizations ranked such a strategy as very useful.

[5] Figure 1 was produced by combining the responses of organizations to four different questions. Respondents were asked to rank the usefulness of the following strategies using a scale of 1 for very useful to 5 for harmful: 1) contact public agency officials to discuss policy with them, 2) contact the governor or his/her staff to discuss policy with them, 3) contact legislative leaders to discuss policy with them, 4) contact legislative committee chairs to discuss policy with them. Among the 33 organizations there were 132 possible responses (33 organizations x 4 questions). Fourteen responses were coded as missing. Thus, in this case N=118 responses.

particular policy, mobilizing public opinion through the use of the media, and mobilizing opinion at the grassroots. Among the M&I organizations, 60% of their responses indicated that they do not use such strategies. The responses of PI organizations were quite different, with only 15% of their responses indicating such strategies were not used, but with 63% of the responses ranking such strategies as very useful to useful. The responses of the AG organizations were mixed. About half of the responses from AG organizations evaluated the strategies of "going public" as very useful to useful, while 41% of the responses indicated that such strategies were not used. The differences in using publicity to promote one's policy goals reveals the different purposes of these organizations. While public interest groups are expected to use publicity to promote their ends, municipal utilities and private water companies rarely choose to operate so publicly.

The common core of strategies that all organizations use in attempting to supply their preferred set of rules both reflects the pressure of the legislative structure on these organizations and articulates the process used by organizations to achieve their policy goals. For major pieces of legislation to pass through the legislature, coalitions must be built among parties directly affected by the legislation, consensus must be achieved, or at least dissent must be minimized, over a particular set of rules, and top public officials must be "worked", must be kept informed, so that they either will be ready, or they will not stand in the way, when the time comes to guide it through the legislature.

Figure 3. Go Public With Position

	Very Useful	Useful	Sometimes/ Not Useful	Not Useful	Do Not Use	Total
AG Groups	8 (33.3%)	4 (16%)	2 (8.3%)	0 (0%)	10 (41%)	24 (100%)
M&I Groups	6 (13%)	3 (6%)	9 (19%)	1 (2%)	29 (60%)	48 (100%)
PI Groups	13 (48%)	4 (15%)	3 (11%)	3 (11%)	4 (15%)	27 (100%)
Total	27	11	14	4	43	99

Although not a formal question addressed to the respondents, each one emphasized that no single organization had the authority to push its preferred set of rules through the legislature alone. Developing new sets of water rules required the building of coalitions and consensus outside of the legislature, unless, of course, the new rules were so narrow that other organizations were not affected by them. However, just because no organization can single handedly push its own agenda does not mean that all organizations are equally influential, or conversely, equally powerless. Some organizations participate in every coalition formed around new groundwater rules, other organizations participate only in those coalitions whose rules directly and immediately affect them. Some organizations have veto power, that is, they can block legislation, even though they do not have the power to achieve legislation acting alone.

The most direct approach to determining which organizations are the most influential or consequential in the development of groundwater policy is to ask the representatives of the organizations themselves. Each organization was asked to name up to five of the most influential organizations. Figure 4 reports the results. There are five organizations that are mentioned many more times than any of the others. Leading the way is ADWR. It was identified 26 times as one of the five most influential organizations in Arizona groundwater policy. Approximately 79% of the 33 organizations interviewed nominated ADWR. A close second is the Arizona Municipal Water Users Association (AMWUA). It represents the water interests of the major cities in Maricopa county. Full members include Phoenix, Tempe, Chandler, Scottsdale, and Mesa, the major cities of Arizona. Of all of the organizations interviewed, 73% nominated AMWUA. In third place is the Salt River Project (SRP). SRP controls and operates a series of dams on the Salt River and its tributaries, built by the Bureau of Reclamation earlier in this century. SRP wholesales and retails water and electricity throughout the Phoenix metropolitan area, primarily to municipalities. SRP is the oldest and one of the largest water providers in Arizona. In fourth place is the Central Arizona Water Conservation District (CAWCD), which operates and manages the CAP. It more than rivals the SRP in the amount of water and electricity it controls. Finally, in fifth place is the Agri-Business Council (ABC), which represents a variety of agricultural interests, from growers to suppliers to bankers.

Figure 4. Influential Organizations

Influential Organization	Frequency of Mentions	[illegible]	Percentage of Organizations Mentioning
ADWR	26	16	79
AMWUA	24	15	73
SRP	23	14	70
CAWCD	20	12	61
ABC	13	8	39
Phoenix	6	4	18
Tucson	6	4	18
AZ Mining Assoc.	5	3	15
ADEQ	5	3	15
AZ Farm Bureau	3	2	9

There were 10 additional organizations mentioned--two mentioned twice and eight mentioned once each.

The five most influential organizations represent the major interests involved in Arizona groundwater policy. The major municipal providers or their representatives, AMWUA and SRP, the most comprehensive agricultural organization, ABC, and the two major state agencies, one that regulates water demand, one that supplies renewable water, make up the top five. The next five organizations on the list simply amplify these interests. The two major cities in Arizona, Phoenix and Tucson, a major agriculture organization that represents growers, the Farm Bureau,

the Arizona Mining Association, and the state agency responsible for water quality, the Arizona Department of Environmental Quality, fill out the bottom half of the list.

Another means of identifying the most influential organizations is to determine with whom organizations regularly discuss water issues. Those organizations that others most frequently turn to for water advise and general policy discussions can make a claim to being influential. The five most frequently mentioned organizations with whom other organizations regularly discuss water policy are identical to the list above, ADWR, AMWUA, CAWCD, ABC, and SRP. In examining just the AG groups, they report most frequent discussions with ABC and DWR, with the Farm Bureau a close third. In examining just the M&I organizations, they report that water discussions occur most frequently with AMWUA, the Water Utilities Association of Arizona (WUAA), which represents private water providers, ADWR, and CAWCD. Finally, among just the PI organizations, ADWR and ADEQ are most frequently mentioned as discussants in water policy.

While tedious to wade through, the evidence on influential organizations and frequent policy discussants is consistent. There are several organizations that are central players in defining, and adapting Arizona groundwater policy, and only two are state agencies, ADWR and CAWCD. Local and regional level interests heavily dependent on groundwater are powerfully represented. Municipal and industrial users are represented by AMWUA, and SRP. Agricultural interests are represented by ABC. ADWR is simply one organization among several that plays an important role in defining and implementing groundwater policy. In coalitions created to devise new rules, and in implementing and enforcing groundwater rules adopted by the legislature, ADWR consistently confronts and must work with agricultural and municipal interests.

Just How Powerful is ADWR?

There is little evidence to suggest that the ADWR is a water czar, unequaled in its authority to define and command groundwater policy. Instead, it shares that authority with organizations that represent local and regional, public and private, organizations. On the other hand, the evidence presented thus far is less than overwhelming. So just how powerful is ADWR? There are a number of ways to answer this question besides relying on the reports of organizations actively involved in the Arizona water policy arena. One way is to consider the scope of ADWR's actions in relation to managing groundwater basins in Arizona.

Ostrom, Gardner, and Walker (1990) argue that in relation to any given common-pool resource (CPR), multiple common-pool resource dilemmas may occur. CPR dilemmas may occur as a result of demand side activities or supply side activities. Demand side dilemmas raise issues of efficient and fair allocation of the flow of a CPR. In other words, such dilemmas occur as a result of excessive demand placed on harvesting from the CPR. Supply side dilemmas occur as a result of underinvesting in activities that would ensure that the CPR continues to produce a flow of resources over time. Underinvestment may occur in relation to maintenance, or in relation to a number of other activities that would either prevent the degradation of the CPR, or that would enhance its productivity (Schlager, Blomquist, and Tang 1994).

The Ostrom, Gardner, and Walker (1990) typology of commons dilemmas can be used to evaluate the scope of the authority of an organization. The more dilemmas an organization is authorized to address the greater the scope of its authority, and perhaps, the greater its power. Thus, if an organization was authorized to address a single demand side dilemma, the scope of its authority is much narrower than an organization that was authorized to address multiple demand and supply side dilemmas. In the case of ADWR , the AGWMA authorizes it to address groundwater basin overdrafts by **only** limiting demand for groundwater. As discussed earlier in this section , ADWR implements and enforces limits on pumping groundwater. Mines cannot take more than what they have historically used. Farmers cannot pump more than what they have historically pumped. Municipal water providers are to ensure that their customers only use a certain number of gallons of water per day. ADWR does not have the authority to augment or enhance the amount of water stored in groundwater basins; it does not have the authority to prevent the degradation of groundwater basins; it does not have the authority to ensure that groundwater basins are maintained. These are all powers that, subsequent to the adoption of the AGWMA, were granted to other organizations.

A second way of addressing the question of just how powerful the ADWR is, is by examining the amendments made to the AGWMA. If ADWR is in fact a water czar, then it would be reasonable to expect that as it implements the AGWMA and encounters unintended consequences and unanticipated circumstances, that the AGWMA would be amended to allow the ADWR to address such problems. A number of unintended consequences and unanticipated and anticipated circumstances did occur, but the authority of ADWR was not expanded. These problems were addressed through other mechanisms.

During the 1980s, as ADWR implemented the 1980 Act and limits were imposed on the demand for groundwater, it became abundantly clear to the various water organizations that supply side problems had to be addressed. That is, if safe yield of the state's most heavily used groundwater basins was to be achieved, water providers and users would have to gain access to alternative supplies of water, whether it was renewable supplies from surface water sources, or mined groundwater from rural, unregulated groundwater basins. Every major amendment to the AGWMA centers on addressing supply side dilemmas, primarily the augmentation and recharge of groundwater basins, the transportation of groundwater, and the transfer of groundwater rights.

One of the first major amendments to the AGWMA occurred in 1986, when the Arizona legislature allowed water providers to engage in recharge and replenishment of groundwater basins, and directed ADWR to recognize and grant ownership rights in such water. Prior to 1986, there were no incentives to recharge basins as property rights in the recharged water were not defined. Notice that this amendment did not expand the powers of ADWR. ADWR already held the authority to define rights in groundwater. Under this amendment ADWR was simply directed to recognize a new form of groundwater right.

Numerous amendments quickly followed the 1986 Underground Storage and Recovery Act. In lieu recharge programs were authorized. In lieu recharge programs allow water

providers, primarily municipal utilities, to exchange their unpotable CAP water for potable agricultural groundwater. Cities deliver their CAP water to farmers via the CAP canal, and in exchange they receive rights in groundwater that they may use at any time. The advantages of such an exchange program for both parties are many. Municipal utilities avoid the expense of treating CAP water, and they avoid the expense of building recharge projects to store excess CAP water. Farmers avoid the expense of pumping groundwater.

For many local level water providers the next step in addressing supply side problems was to enhance coordination of recharge programs. Instead of each water provider engaging in its own augmentation and recharge programs, water providers could gain access to economies of scale and lower administrative costs, and promote the transfer of water rights, by creating regional level "water banks". These water banks would develop a portfolio of water rights which water providers could then purchase. In 1990 and 1991 the Arizona legislature passed enabling legislation permitting water providers in the Tucson and Phoenix metropolitan areas, respectively, to organize regional water banks. As it turns out, neither water bank was created. Local water providers in each region could not reach agreement on the structure, authority, or financing of water banks.[6]

Groundwater transportation problems also emerged as cities attempted to address issues of supply. In anticipation of limits placed on municipal groundwater pumping, Phoenix, Mesa, and Scottsdale, the three major cities in Maricopa County, purchased farms outside of the Phoenix Active Management Area, just for the water rights. These cities planned on pumping and transporting the water from the farms to their thirsty citizens. The purchase of these "water farms" alarmed rural residents. First, municipal owned property is not subject to taxation, so these farms were removed from the tax rolls. Second, the farms were fallow, creating problems of unsightly weeds and blowing dust in rural areas. Third, rural residents were worried that the pumping and transportation of water by cities would deprive them of sufficient supplies to maintain their livelihoods. Eventually, rural residents and cities reached a compromise to resolve these problems, which the legislature enacted in 1991. Called the Groundwater Withdrawal and Transportation Act, it grandfathers in existing water farms, bans the purchase of additional water farms, limits the amount of water that can be transported, and requires cities that own water farms to make tax contributions on their holdings.

Most of the amendments to the AGWMA have attempted to address problems of water supply. Problems of groundwater aquifer augmentation, and recharge, and the transport of groundwater were addressed by giving local level organizations the authority to solve these problems themselves. The ADWR, the "water czar" of Arizona, was not granted authority beyond what it already possessed. It was simply directed to recognize and keep track of the new

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[6] A water bank, or more formally a groundwater recharge district, was created in 1993 by the state legislature. It is a subdivision of CAWCD, and it services those areas also served by the CAP. The CAWCD, as the owner and operator or the CAP has the engineering expertise, and certainly the water to effectively operate a replenishment district.

forms of water rights that water providers were creating as they grappled with problems of water supply.

A third, and final, way of examining just how powerful the ADWR is, is to examine whether it has engaged in independent activities and initiatives in implementing the AGWMA, that is, independent of those interests it was meant to regulate and oversee. Presumably, engaging in independent action signals that a public agency exercises a modicum of power. Under the AGWMA, by the year 2000 M&I providers were to demonstrate a water supply adequate to meet all new and existing uses sufficient for 100 years. This 100 year supply of water could not be met by mining groundwater. In other words, water providers would have to find renewable supplies of water to meet the requirements of the AGWMA. In 1986-1987, ADWR attempted to implement this requirement of the AGWMA by defining groundwater pumping limits for municipal and industrial water providers. The requirements severely limited the density of residential housing, and it required real estate developers to rely upon municipal water systems to supply their subdivisions. The response by the real estate industry and the developers was swift. They refused to accept or abide by these regulations. Developers made their living by building adult and retirement communities in rural areas away from metropolitan areas. Providing affordable housing for most citizens requires multiple houses per acre, not a single house per acre of land. The director of ADWR narrowly avoided losing his job by rescinding the rules.

Five years later, ADWR began a new rule making process to define rules limiting the pumping of groundwater by M&I providers. The process began with the publication of a position paper, and for three years continued through multiple drafts of rules, numerous public meetings, and multiple comment periods. Eventually, all interested parties endorsed the rules, and in 1995 they were adopted. ADWR learned from this incident. The agency has created numerous advisory committees, such as the committees addressing municipal and agricultural conservation requirements. These committees are not window dressing. Those parties most directly affected by the rules adopted by ADWR are actively involved in devising those rules.

It is difficult to characterize ADWR as a 'water czar' for many reasons. First, several influential organizations representing the most important interests in groundwater policy compete with ADWR in directing and influencing the supply of rules. ADWR is not the only, nor necessarily the most powerful, of active water policy organizations. Second, the scope of the authority of ADWR is relatively limited. It only addresses and regulates demand for groundwater. It does not participate in many crucial issues of augmenting the supply of water. Third, since its creation ADWR has not been able to expand its authority, nor has it been able to act independently of the interests it is meant to regulate. Far from being a 'water czar', ADWR appears to be much more of a facilitator and gatekeeper. It facilitates the rule making activities of its constituents, while at the same time acting as a gatekeeper by ensuring that the new sets of rules follow the spirit of the AGWMA.

Since it is difficult to characterize ADWR as a 'water czar', it is also difficult to characterize the institutions used by Arizonans to manage groundwater basins as state-centered. The locus of power does not appear to reside in state offices; rather it appears to reside in several

powerful organizations, such as AMWUA, SRP, and ABC, that represent municipal and industrial water providers and the agricultural sector. The process of managing Arizona groundwater use may be considered state-centered only in the sense that these and other local and regional level interests have captured and used the mechanisms of the state to achieve and impose their desired rules. Will the rules achieved their stated goals? Are they relatively efficient and/or fair in their operation? Before the AGWMA is evaluated a brief interlude to explore the problem of commitment is in order.

III. An Interlude: The Problem of Commitment

The story of how the various water organizations confronted the problem of supply and developed, adopted, and adapted the 1980 AGWMA is complex and multi-layered. Not as complex, but just as important, is the story of how the problem of commitment was addressed. Commitment, in this case, means avoiding the unraveling of the AGWMA, either by not attacking it in a state court or in the state legislature. Those who crafted the Act used formal and informal mechanisms to prevent opponents of it from gaining access to either of these arenas.

Discouraging a court based attack on the AGWMA was accomplished by inserting a nonseverability clause in the original legislation. As discussed in Section II, a nonseverability clause means that if any part of the Act was found invalid then the entire Act would be void. In other words, the Act could not be picked apart piece by piece in court. It would stand as enacted, or it would fall in its entirety. To date, fifteen years after the passage of the Act, the nonseverability clause has not been triggered.

In addition to insulating the AGWMA from attack in court, it was also insulated from attack in the legislature. After its enactment an informal "rump" group formed to monitor and protect the Act from attack during each session of the legislature. The rump group consisted of the representatives of the municipalities, farms, and mines, that devised the Act, the state legislative leaders, and ADWR. The rump group reviewed all groundwater legislation, burying any amendments to the AGWMA that would substantially change its character. This rump group has since been formalized and turned into a working group associated with ADWR. The ADWR Omnibus Committee, consisting of representatives of each of the major groups, reviews any suggested changes to the Act. If the changes are minor, such as changing reporting requirements, and all representatives agree they are minor, then they are included in an omnibus water bill which is introduced each session into the legislature. If the changes are substantial, then supporters of such changes must attempt to gain their adoption through the usual process of coalition building, as discussed in Section II. If the change would endanger or "gut" the AGWMA, one of the powerful organizations discussed in Section III would most likely veto it. Thus, there is an informal agreement among the major water actors that the AGWMA will remain in tact. The rump group/Omnibus Committee has, to date, successfully averted the unraveling of the AGWMA in the legislature.

III. An Initial (and perhaps cursory) Evaluation of the AGWMA

Thus far, only one part of the thesis of this paper has been supported: local level interests play the major role in supplying institutions. The supply and imposition of rules governing groundwater use is not state-centered. The second part of the thesis remains to be examined. Do the groundwater institutions adopted provide an example of local level interests cooperating to realize gains from trade? Do these institutions provide an example of local level interests cooperating to make themselves collectively better off by resolving commons dilemmas? Or, do these institutions provide an example of local level interests using state authority to impose their policy preferences on others? Is there a coercive element to these institutions? These questions are difficult to answer directly because there are so few attempts at partial, let alone comprehensive, evaluations of the AGWMA. Not to be deterred, however, by a lack of data, there are bits and pieces of circumstantial evidence that suggest an answer.

One means of addressing this issue is to review either cost-benefit analyses or cost effectiveness analyses of the AGWMA to determine whether net social benefits are positive, or whether benefits that are realized are produced in a cost effective manner. If net social benefits were positive, then we could rest assured that the institutions adopted to govern groundwater use represent a situation in which gains from trade were realized among local level interests. Unfortunately, no such studies have been conducted (according to officials at ADWR).

Another means of evaluating the AGWMA is to examine whether the stated policy goal of the AGWMA will be achieved. Will the institutions in place to govern groundwater use achieve the goal of safe yield by 2025? According to ADWR in its second management plan the answer is no. For instance, in the Tucson Active Management Area, the current groundwater overdraft is estimated to be 206,000 acre feet of water per year. Even if all water conservation requirements are met, Tucson's allotment of CAP water is fully utilized, and effluent is substantially utilized, by 2025 ADWR estimates that the overdraft will be 90,000 acre feet per year (ADWR 1991:19). This continued overdraft is attributable to population growth. The population of the Tucson Active Management Area is expected to more than double between 1990 and 2025.

This places the Tucson Active Management Area, and indeed, the Phoenix Active Management Area, in a curious position. In 1980, representatives of agriculture argued that if municipalities wanted to address the overdraft problem then municipalities should go where most groundwater is used, agriculture, and purchase and retire farmland. Municipalities refused this offer arguing that farmers caused the overdraft problem and farmers should not be rewarded for resolving the problem. The issue of retiring agricultural land will once again have to be revisited by municipalities if safe yield is to be achieved by 2025. Only if all agricultural land is retired in the Tucson Active Management Area by 2025 will the overdraft problem be resolved. Irrigated agriculture is estimated to use 99,000 acre feet of water in 2025 (ibid). Retiring agricultural land is only a temporary fix. With an increasing population, Tucson will once again find itself in an overdraft situation shortly after 2025.

There is no reason to believe that the implementation of the AGWMA will achieve safe yield. At best it slows the depletion, the mining, of Arizona's groundwater basins. Whether the process used to slow groundwater mining is worth it is unknown. Thus, from a pure policy analysis point of view, the AGWMA could have the effect of making the citizens of Arizona worse off than before it was adopted. Or, then again, the AGWMA could have the effect of making the citizens of Arizona better off than before it was adopted.

In addition to the explicit goal of achieving safe yield, there were a number of implicit goals for the AGWMA. Some of these goals may be gleaned from the description of the adoption of the Act in Section II, such as the building of the CAP, providing a dependable and affordable supply of water to Arizona's growing cities, and to transfer groundwater from agriculture, a lower valued use, to municipalities, a higher valued use, without enriching farmers. Since 1980 these goals, to a greater or lesser extent have been achieved.

First, the CAP was built. In 1993, the Secretary of the Interior, Bruce Babbitt, declared the canal complete. At a cost of $4 billion, the CAP has the capacity to deliver 1.5 million acre feet of water to the central and south central regions of Arizona each year. The cost of the CAP to Arizona will be just under $2 billion, with the remainder being paid by federal taxpayers. The CAP represents a relatively dependable, and thus far, low cost source of water for municipalities and developers. In 1993, municipalities paid, on average, $50.68 for one acre foot of CAP water (CAWCD 1994). This low cost water is supporting a development boom in Arizona whose population is increasing by almost 30% each decade.

Second, the CAP has not been as kind to agriculture as it has been to municipalities and developers. In the 1970s, irrigation districts were formed to contract for CAP water and to build distribution systems. The contracts the districts signed with the Bureau of Reclamation, the builder of the CAP, were based on overly optimistic projections of irrigated acres, high value crops, and farm income (Wilson 1992). In addition, the cost of CAP water was underestimated. Most irrigation districts could not meet their repayment obligations, nor could they afford CAP water at its real cost, and declared bankruptcy.

This turn of events, as several representatives of agricultural organizations stated, has weakened the political influence of agriculture. Many farmers and irrigation districts now find themselves in the unenviable position of asking the CAWCD and non-agricultural CAP users, i.e., municipalities, for assistance. The CAWCD and CAP users responded by heavily subsidizing agricultural water. They did this for one reason. The repayment of the portion of the CAP and CAP water devoted to agriculture is not subject to interest charges. The CAWCD and its customers save tens of millions of dollars in repayment costs if agriculture remains a substantial user of CAP water. Even though agriculture is now charged approximately $17 an acre foot of CAP water, the savings in interest still outweigh the costs of the subsidy (CAWCD 1994).

A third reason for adopting the AGWMA was to:

> provide the means for allocating Arizona's limited groundwater resources to most effectively meet the state's changing water needs (ADWR no date:2).

In other words, non-agricultural groundwater users wanted to at least prevent agriculture from worsening the overdraft problem, and if possible, transfer agriculture groundwater to higher valued uses in the municipal sector, without enriching farmers. The initial goal was achieved through the structure of the AGWMA. The number of irrigated acres and the amount of groundwater than can be pumped to serve those acres are strictly limited. The second goal has met with much more limited success, and only because of propitious circumstances. Agricultural groundwater use is declining at about the same rate that municipal groundwater use is increasing (ADWR no date). The decline in agricultural groundwater use and in irrigated acres is not due to the AGWMA, but to declining output prices. It doesn't pay to farm as much (Wilson 1992).

Evaluating the AGWMA is a difficult task. It is not at all clear that the benefits provided by the Act are produced in a cost effective manner, or that net social benefits are even positive. If the Act's success is be based on achieving the stated goal of safe yield, then the Act must be deemed a failure. If the Act is to be evaluated on the basis of achieving the larger political goals of the dominant water users then it must be deemed a success. The clear winners are the municipal and industrial users, who have gained access to a dependable and inexpensive source of water (subsidized by federal taxpayers), that both supports high population growth rates and the extension of the time horizon over which Arizona will mine its groundwater basins. The clear losers are farmers who have had their water rights severely curtailed without recompense, whose existing water rights are slowly being regulated out of existence through increasingly onerous conservation requirements, and who have been forced into bankruptcy as a result of poor planning around a project that is now providing inexpensive water to municipalities and developers.

V. Conclusion (yes, finally)

A general consensus is developing in the common property literature that state-centered institutions are limited in their capacity to effectively govern local level common-pool resources. Successfully managed common-pool resources require a component of self-governance or co-management. At the very least users of a CPR should share in its governance with state officials, and in some instances, users should exercise exclusive control over a CPR. In other words, state-centered institutions are not going to go away, but their performance in governing CPRs can certainly be improved upon by devolving authority to the local level.

The devolution of authority to local level participants in CPRs is crucial for effective governance because of the unique position of the participants. In most cases, through decades of experience with a particular CPR, they possess unequaled time and place information which they can call upon in designing institutions that fit their particular circumstance. Not only can they design institutions particularly well-fitted to their CPR, but they can also design institutions particularly well-fitted to their community's culture and customs. Thus, there are two general themes in the common property literature: 1) the necessity to devolve authority to the local-level,

and 2) the efficacy of local level participants in designing effective, and implicitly, efficient institutions.

The case of Arizona groundwater policy presents an exception to these two assumptions, and in this exception there are lessons to be learned. Arizona groundwater governance structures did not emerge from state officials handing over management authority to local level groundwater users. It was quite the opposite. Local and regional level interests ceded some authority to the state in the form of the AGWMA in order to restrain themselves from rapidly deplenishing groundwater aquifers. In other words, local level interests devised the groundwater code and the state enforced it against all relevant parties. The ADWR, the enforcer of the code, far from acting as a water czar, is limited in the scope of its authority and is tightly constrained by the organizations that represent local level interests, particularly municipalities, developers, and farmers.

Second, it is difficult to argue that the rules supplied to govern the use of groundwater are efficient, or effective, at least for their stated purpose--resolving the severe overdraft of groundwater basins. At best the AGWMA simply extends the time horizon over which Arizonans can mine their groundwater. In terms of addressing some thorny political issues confronting one of the powerful users of groundwater--M&I users--the Act has been moderately successful. It has provided M&I users with a dependable and inexpensive source of water, subsidized by all U.S. citizens, and it has substantially weakened the major political opponents of M&I users--farmers.

Thus, the case of Arizona groundwater policy is not an example of local level governance of CPRs at its finest. Instead, it provides a warning. Public authority can be put to good uses or to questionable uses regardless of who exercises it--state officials or local level participants. While local level participation is a critical component of the governance of CPRs, before it is made a general policy recommendation, careful attention must be paid to the means by which local level participants intend or do exercise public authority.

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