TRANSBOUNDARY WATER QUANTITY: THE EFFECT OF ARIZONA AND MEXICAN GROUNDWATER LAW ON ARIZONA'S AGRICULTURE

"We never know the worth of water until the well is dry."

Thomas Fuller, *Gnomologia, 5451*

Groundwater is the lifeblood of Arizona agriculture. Each year, Arizona consumers use approximately 5 million acre-feet of water, 2.5 million more than is being replaced.[1] In contrast, the Arizona Water Commission has estimated that the total dependable groundwater supply is 2.8 million acre-feet per year, and only 300,000 acre-feet of that supply is being recharged annually.[2] This severe overdraft of groundwater threatens the vitality of the Arizona economy, the most vulnerable aspect of which is agriculture. In the future, competition among water users in Arizona and Mexico for valuable shared water resources may cause serious problems within Arizona and perhaps across its borders.

This comment begins by summarizing current Arizona and Mexican law regarding restriction of groundwater use applicable to agriculture. Both the Arizona and Mexican approaches encourage groundwater shortages and potentially prejudice Arizona farmers. As of yet, no cooperative effort exists to remedy the situation. Such bilateral action is needed to solve the potentially critical problems. The comment concludes by offering a possible regulatory scheme in answer to the current problems in groundwater use regulation between Arizona and Mexico.

WATER USE IN ARIZONA

Although agriculture is the major water user in Arizona, there is competition for that resource. In 1984, about 78% of the approximately 3.3 million acre-feet of groundwater withdrawn in the four Active Management Areas in Arizona was consumed by agriculture, 18% by municipalities, and 4% by industry.[3] Municipal use

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[1]Connall, *A History of the Arizona Groundwater Management Act*, 1982 Ariz. St. L.J. 313. An acre-foot is the amount of water necessary to cover an acre to one foot, or 325,890 gallons.

[2]Higdon & Thompson, *The 1980 Arizona Groundwater Management Code*, 1980 Ariz. St. L.J. 621, 623.

[3]Arizona Department of Water Resources, 1984-1986 Annual Water Withdrawal and Use Summary.

is increasing, and despite the addition of Colorado River water from the Central Arizona Project, cities will increasingly compete with agriculture for use of groundwater. In 1986, agricultural use diminished to 69%, and municipal use increased to 26% of the total consumption.[4] Already, Tucson is the largest city in the world to rely exclusively on groundwater for public water supply.[5] The population in Arizona, which increased 21.3% from 1980 to 1986 and continues to grow, places a heavy burden on the groundwater supply available for agriculture.

The state has dealt with this problem of diminishing supply by enacting the Arizona Groundwater Management Code (Code).[6] Perhaps the most comprehensive groundwater code in the nation, the Code is administered by the Department of Water Resources (DWR), which has broad powers for issuing permits, monitoring consumption, and enforcing Code provisions. The distinctive feature of the Code, as well as the most effective, is the establishment of four Active Management Areas (AMAs) in depleted locations. These areas are named the Tucson, Phoenix, Prescott, and Pinal AMAs. The boundaries of the AMAs were established based on hydrological data which indicated critical areas in need of immediate groundwater management.[7] In these areas, the Code severely limits groundwater consumption through a new comprehensive system of groundwater rights and permits.

Reasonable Use Doctrine

The Code is the culmination of Arizona legislation which gradually had replaced the common law rule of groundwater consumption, known as the doctrine of reasonable use.[8] Under the doctrine, a landowner had ownership rights to any water below his land, and could pump all the groundwater that he could reasonably and beneficially use. This was, in effect, no restriction at all. Since aquifers usually service many landowners, all of whom had equal rights in the water, the doctrine encouraged each owner to use the groundwater as quickly as possible to avoid capture by the others. In short, the doctrine of reasonable use discouraged conservation and promoted exhaustion.

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[4]*Id.*
[5]Pontius, *Groundwater Management in Arizona: A New Set of Rules*, 16 Ariz. B.J. 28 (October 1980).
[6]Ariz. Rev. Stat. § 45-401 *et. seq.*
[7]Higdon & Thompson, *supra* note 2, at 632.
[8]*See*, Bristor v. Cheatham, 75 Ariz. 227, 255 P.2d 173 (1953).

With one limited exception regarding transportation of groundwater, the doctrine of reasonable use still controls groundwater withdrawal in areas outside the AMAs.[9] Under the original doctrine, transportation of groundwater from source to point of irrigation was not prohibited unless it adversely affected a neighboring landowner. However, the Code has provided that transportation of groundwater outside of an AMA which occurs between "sub-basins" or away from a groundwater basin is subject to payment of damages.[10]

Code Provisions

In contrast to the doctrine of reasonable use, the Code limits the withdrawal of groundwater by Arizona farmers in several ways, the following of which are illustrative examples. First, each agricultural user in an AMA must have grandfathered water rights[11] in order to withdraw groundwater, and in theory is limited in pumping to a "water duty," or the amount of groundwater determined by the DWR to have been historically used in the area.[12] Second, ordinarily no new acreage in an AMA not previously irrigated from 1975 to 1980 can be irrigated

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[9]Ariz. Rev. Stat. § 45-453:

> In areas outside of active management areas, a person may:
> 1. Withdraw and use groundwater for reasonable and beneficial use.
> 2. Transport groundwater pursuant to article 8 of this chapter [Ariz. Rev. Stat. § 45-541 *et. seq.*].

[10]Ariz. Rev. Stat. § 45-544:

> In areas outside active management areas, groundwater may be transported:
> 1. Within a sub-basin of a groundwater basin or within a groundwater basin, if there are no sub-basins, without payment of damages.
> 2. Between sub-basins of a groundwater basin or away from a groundwater basin, subject to payment of damages.

See also, Town of Chino Valley v. State Land Department, 119 Ariz. 243, 580 P.2d 704 (1978). A sub-basin is defined as an area which encloses a relatively hydrologically distinct body of groundwater within a groundwater basin. Ariz. Rev. Stat. § 45-402(28).

[11]An irrigation grandfathered right accrues to a person who had irrigated land located within an AMA during the five years preceding January 1, 1980. Ariz. Rev. Stat. § 45-465(A). A farmer who has used groundwater for the irrigation of specific acres within an AMA in the preceding five years may continue to withdraw groundwater for the irrigation of those acres.

[12]Ariz. Rev. Stat. § 45-465. "Water duty" is the acre-feet amount of water reasonably required to irrigate the crops historically grown on a farm. Department of Water Resources, Management Plan for First Management Period: 1980-1990, Tucson Active Management Area, December 1984. The water duty assumes the adoption of reasonable conservation measures on the farm. Ariz. Rev. Stat. § 45-564(A). It should be noted that Ariz. Rev. Stat. § 45-467 somewhat undermines the effectiveness of the water duty provision by allowing farmers to accumulate water credits, which may be used to allow the farmer to exceed his water duty by up to 50%. *See infra* note 17 and accompanying text.

with any water, ground or surface.[13] Third, an eligible irrigator may trade groundwater rights for rights to Central Arizona Project (CAP) water. The acres irrigated by CAP water are then considered permanently retired from groundwater use.[14] However, the high price of CAP water may make this alternative unattractive. Finally, the Code provides fine tuning mechanisms such as allowance for the creation of subsequent AMAs to further protect groundwater quantity and quality,[15] and flexible implementation of sequentially more rigorous conservation requirements in five consecutive management periods from 1980 to 2025.[16]

The policy underlying the limitation on groundwater use by agriculture is frustrated by another Code provision that allows farmers with irrigation grandfathered rights to "bank" water credits in an "operating flexibility account."[17] Due to the existence of federal farm price support programs which in effect reward farmers for not growing crops,[18] farmers are financially able to decrease planted acreage, which reduces the need for irrigation and allows the farmers to accumulate substantial groundwater "credits." The mitigating impact of this practice on the Code's effectiveness may be counterbalanced by the other measures in the Code designed to encourage the abandonment of irrigated acreage and by the reduction in overdraft due to the replenishment of aquifers from lessened irrigation.

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[13]Ariz. Rev. Stat. § 45-452(A). Acreage which was not irrigated but for which substantial capital had been invested for irrigation may be deemed to have been irrigated. *Id.*

[14]Ariz. Rev. Stat. § 45-452(B). To be eligible for CAP water, an irrigator must have irrigated the acres from 1958 to 1968 and be within an irrigation district which has agreed to receive CAP water.

[15]Ariz. Rev. Stat. § 45-412(A):

> The director may designate an area which is not included within an initial active management area, pursuant to § 45-411, as a subsequent active management area if the director determines any of the following exist:
> 1. Active management practices are necessary to preserve the existing supply of groundwater for future needs.
> 2. Land subsidence or fissuring is endangering property or potential groundwater storage capacity.
> 3. Use of groundwater is resulting in actual or threatened water quality degradation.

[16]Ariz. Rev. Stat. § 45-563 *et. seq.*

[17]Ariz. Rev. Stat. § 45-467. This account allows farmers to use less groundwater and receive credits for the unused amount for use in succeeding years.

[18]The first Payment-In-Kind ("PIK") programs were initiated in 1983 for wheat, feed grains, cotton, and rice, and allow farmers to be reimbursed for diverting land to conservation uses with crops that would otherwise have been grown on the land. 7 U.S.C. § 1441 *et. seq.*, 7 C.F.R. § 770.

WATER USE IN MEXICO

Since aquifers in the U.S.-Mexico border region do not obey cartographic delineations, the groundwater supply problem in Arizona is compounded by the use of the aquifers that hold the groundwater by Mexican consumers. For example, wells that service the city of Nogales, Arizona, have been reported to fluctuate from thirty to eighty feet in response to water use in Nogales, Sonora.[19] Relative to the size of the countries, Mexico depends more heavily on groundwater for crop production than does the United States. Based on available statictics, it can be estimated that 22% of Mexico's farmland is irigated, compared to 9% in the United States.[20] In addition, Mexican irrigation is increasing more quickly than that in the United States.[21] Further, two-thirds of the entire 1900-mile U.S.-Mexico border overlies aquifer areas.[22] Due to a combination of these factors, Mexican groundwater use will have an increasingly greater impact on Arizona in the near future.

The same population increase being experienced in Arizona is also occurring in northern Mexico, largely for two reasons. First, the northern border is a point of population concentration for migrant workers in transit to, and returning from, the United States. In addition, those who cannot gain entrance may wait there, some with families, for a better opportunity to cross. Some of these people may relocate permanently in the north. Second, the border region has the advantage of cheap labor and convenient control from the United States, which attracts international firms that benefit from the disproportionately lower wages, drawing Mexican workers from the interior labor force to the border.[23]

These factors, plus a high birth rate symptomatic of poor, rural countries, have resulted in a dramatic increase in population. In the forty-year period from 1930 to 1970, the population of the border region rose from a few thousand to 2.35 million.[24] Although that number is not large enough in itself to seriously threaten the available

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[19]International Groundwater Law 158-59, n.8 (Teclaff & Utton ed. 1981).

[20]Smerdon, *Water — Its Role From Now to the Year 2000*, 22 Nat. Resources J. 907, 910 (1982); [1985] 39 FAO Production Yearbook, Table 1 (Food & Agriculture Organization of the United Nations, Statistics Series No. 70, 1986).

[21]Smerdon, *supra* note 20, at 910.

[22]Clark, *Institutional Alternatives for Managing Groundwater Resources: Notes for a Proposal*, 18 Nat. Resources J. 153, 155 (1978).

[23]Alba, *Mexico's Northern Border: A Framework for Reference*, 22 Nat. Resources J. 749 (1982).

[24]*Id.* at 751.

water supply, the combination of heavy water use in the United States and present Mexican water law may be a potential source of injury to farmers who depend on transboundary aquifers.

Mexican Law

There are no Mexican statutes which expressly limit the withdrawal of groundwater. However, the highly centralized Mexican government has the constitutional authority to enact such statutes; Article 27 of the Mexican Constitution vests all subsoil rights in the state. Based on this provision, the 1956 Law of Groundwaters established a limited permit system and defined restricted zones to regulate the development of groundwater sources. Further, there is a government entity, the Secretariat of Agriculture and Water Resources, which is charged with the administration of water resources.[25]

Despite this infrastructure, no statute prevents Mexican landowners from pumping an unlimited amount of groundwater. Politically and economically, such a limitation may be infeasible, since Mexican agriculture depends heavily on groundwater. For example, well over one-third of water used by Mexican farmers in the Colorado River delta and the Rio Grande valley is groundwater, compared to one-tenth for U.S. farmers.[26] Moreover, despite the ability to control groundwater use, the Mexican Constitution does not specifically vest groundwater ownership in the state, so the possible extent of restrictions may be limited.[27]

In the absence of a specific constitutional provision, the degree of state regulatory power is unclear as Mexican common law does not restrict groundwater use. Like the doctrine of reasonable use adopted by the western U.S. states, the Mexican groundwater law vests absolute ownership of the groundwater in the superjacent landowner.[28] The same implications from the presence of this doctrine in the United States are found in Mexico. However, Arizona's adoption of the Code complicates the competition for shared transboundary aquifers, giving an edge to Mexican farmers, who are under no use limitations, and allowing for an increased drain on groundwater available for Arizona agriculture.

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[25]Mumme, *The U.S.-Mexican Conflict over Transboundary Groundwaters: Some Institutional and Political Considerations*, 12 Case W. Res. J. Int'l L. 505, 518 (1980).
[26]*Id.* at 519.
[27]Hayton, *Institutional Alternatives for Mexico-U.S. Groundwater Management*, 18 Nat. Resources J. 201, 203 (1978).
[28]International Groundwater Law, *supra* note 19, at 160.

The combination of the Arizona Groundwater Code and Mexican groundwater law is especially problematic for southern Arizona agriculture. While Arizona farmers are limited in theory to their water duty, Mexican farmers are similarly unrestricted. Copious pumping on the Mexican side can conceivably reduce levels of groundwater in the United States, resulting in less water yield, increased withdrawal costs, and decreased water quality on the U.S. side.

The lack of statutory and common law control, along with pressure from an increasing population, compels the need for some limitation on groundwater use in Mexico. Although not likely to occur from within, the time may come when a critically diminishing water supply forces the establishment of a transboundary water treaty or other regulatory scheme.

TRANSBOUNDARY REGULATORY SCHEMES

Minute 242

Currently there is one treaty between the United States and Mexico regarding quantity of shared water resources. Entitled "Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River," and known as Minute 242, the treaty is an attempt to ensure to Mexico a guaranteed flow of Colorado River water with acceptable levels of salinity.[29] In addition, provisions of Minute 242 address the groundwater issue.[30]

At this time there is no comprehensive agreement on groundwater, nor is there a system for bilateral consultation on development of groundwater resources. Since there is no framework for such agreement or consultation, either of which would be necessary to establish binding water use limitations, Minute 242 is inadequate as an enforceable groundwater treaty.

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[29]For text of Minute 242, see 15 Nat. Resources J. 2 (1975).

[30]Resolution 5 of Minute 242 reads:

> Pending the conclusion by the Governments of the United States and Mexico of a comprehensive agreement on groundwater in the border areas, each country shall limit pumping of groundwaters in its territory within five miles (eight kilometers) of the Arizona-Sonora boundary near San Luis to 160,000 acre-feet (197,358,000 cubic meters) annually.

Resolution 6 is a more encompassing provision:

> With the objective of avoiding future problems, the United States and Mexico shall consult with each other prior to undertaking any new development of either the surface or the groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country.

The spirit of Minute 242 may, however, provide a vehicle for continuing negotiations toward a more comprehensive water treaty. Since the authority for such a pact is now established, extension of the agreement should be easier than its initiation. Of course, enforcement of such a program would require a neutral administrating body. The International Boundary and Water Commission, an existing agency supervising the use of surface water along the border, could expand naturally into this role.

International Boundary and Water Commission

The International Boundary and Water Commission (IBWC) was established by the "Treaty on Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande," more commonly known as the Water Treaty of 1944, to manage surface water use along the U.S.-Mexico border.[31] According to the Treaty, the IBWC is authorized to settle all differences that may arise between the U.S. and Mexico with respect to the interpretation or application of the Treaty, subject to the approval of the two governments.

To accomplish this end, the IBWC was given powers to oversee water storage, diversion, flood control, and channel rectification of rivers in the border region. Since 1944, the IBWC has also assumed power over sewage and sanitation control, hydroelectric power production, and salinity control projects near the border.[32] The responsibility for keeping records of quantities of surface waters belonging to each nation and maintaining measuring stations to calculate consumption also rests with the IBWC.[33]

The IBWC is divided into two Sections, U.S. and Mexican, each headed by an Engineer-Commissioner who has diplomatic status. The two Commissioners meet formally and informally to promulgate policy and handle problems as they arise. In contrast to the changing governments in the United States and Mexico, the administration of the IBWC has been unusually stable. At one point, the U.S. Commissioner had been with the IBWC for 40 years, his counterpart 50 years.[34]

The experience, structure, and stability of the IBWC, along with the acceptance it has received as a regulatory and dispute-resolving body,

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[31]Utton, *An Assessment of the Management of U.S.-Mexican Water Resources: Anticipating the Year 2000*, 22 Nat. Resources J. 1093 (1982).

[32]Minute 242, which required salinity control along the Colorado River, was largely attributable to the IBWC.

[33]Mumme, *supra* note 25, at 510.

[34]*Id.* at 511.

support a natural progression into the administration of transboundary groundwater use. The IBWC has already attempted to fill this role by the inclusion of paragraphs 5 and 6 in Minute 242. Should a comprehensive bilateral groundwater treaty evolve, the IBWC will be in the forefront to assume the duties required of its administration.

Character of Treaty

Assuming the need for groundwater regulation between the United States and Mexico, a question as to the nature of the treaty and regulatory scheme it imposes still remains. Several models have been proposed, each giving extensive power to the administering body.[35] However, all share similar characteristics, and, coincidentally, share them with Arizona's Groundwater Management Code as well.

The two governments could do much worse than adopt the structure of the Code, with incidental modifications, as the management tool to be employed by the IBWC. The need for a strong administrative agency exists in both situations, and the IBWC enjoys power and performs functions similar to the DWR.

In addition, the substantive provisions of the Code would not be unduly harsh on Mexican farmers. Most importantly, the restrictions would only affect critical areas in Mexico, probably around Nogales in the Arizona border region, and Juarez, Tijuana, and Mexicali in others. In critical areas, the historic use measure would allow farmers to continue as before, limiting only the prospect of expanding groundwater consumption. Adoption of the Code and its conservationist overtones would also encourage more careful consumption by Mexican farmers.

The restrictions could be limited to the Arizona-Mexico border, or they could be extended along the entire U.S.-Mexico border. The latter alternative would be more complicated, involving the states of California, New Mexico, and Texas in the process. However, the alternative is not unreasonable, as interstate water compacts, which to some extent involve complex considerations of independent sovereignty, are common in the United States.[36]

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[35]*See, e.g.*, Clark, *supra* note 22; Hayton, *supra* note 27; Utton, *supra* note 31. For example, Professor Clark advocates a strong international agency such as the IBWC with broad authority to oversee a system of measurement of groundwater withdrawal, to plan a "safe yield" for groundwater use, to keep records of withdrawals by irrigators in both countries, and to enact allocation procedures for making the system feasible.

[36]For example, the Colorado River Compact required the cooperation of 7 states: Wyoming, Colorado, Utah, New Mexico, California, and Arizona. Meyers & Tarlock, Water Resource Management 435-444 (1980).

CONCLUSION

Although the groundwater depletion along the U.S.-Mexico border has not yet reached a critical stage, increased groundwater use in the region caused by pressures from a growing population, intensified farming, and new industry threatens the depleting supply. The heightened awareness in Arizona and elsewhere of the fragile nature of groundwater aquifers, and recognition that groundwater is a finite resource, should motivate more active protection of the underground water supply in the United States, as well as in Mexico. If the Mexican government takes no steps in the near future to introduce conservation measures, the United States government should bring external pressures by initiating the formation of a treaty to limit extraction of groundwater in sensitive areas.

For Arizona agriculture, failure to form such a treaty will have several detrimental effects. First, as aquifer water levels consistently decline due to increasingly heavy use, irrigated acreage will continue to be retired to slake the thirst of agriculture's greatest competitors, the growing cities. Second, for those farms that remain, especially those near the Mexican border, there will be additional competition for the shared aquifers from farmers in northern Mexico. This translates into higher production costs in the form of deeper wells, poorer water quality, and less crop yield for farmers on both sides of the border. Marginal farmers may find this competition fatal. Finally, more farmers may be driven out if the cost of water makes it unprofitable to grow crops such as cotton, alfalfa, and pecans, which are attractive to Arizona farmers now, but which demand a relatively high water duty.[37]

As a final note, the effect of depletion of the transborder aquifers could reach far beyond the border region. For example, as Tucson continues to grow past its water service capabilities, it looks to other regions in the quest for water supply. As Tucson reaches north in its expanding sphere of water hegemony, it impinges upon the very same quest of Phoenix and Scottsdale, which already must look elsewhere

[37]For example, alfalfa may consume 4.25 acre-feet per acre of crop, compared to 1.75 acre-feet of native pasture. *See*, Arizona Department of Water Resources, *Tucson Active Management Area Management Plan, First Management Period: 1980-1990*, December 1984, at 126-129.

to satisfy their thirsty inhabitants. For example, Scottsdale's search currently ends at Planet Ranch, a farm near the Colorado River on the western Arizona border. Thus, ripples from water depletion in a transboundary aquifer in southern Arizona reach over 300 miles to the source of CAP water, which will ultimately flow back to Tucson.

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