Water Organizations in a Changing West (Summer Conference, June 14-16) 1993

6-14-1993

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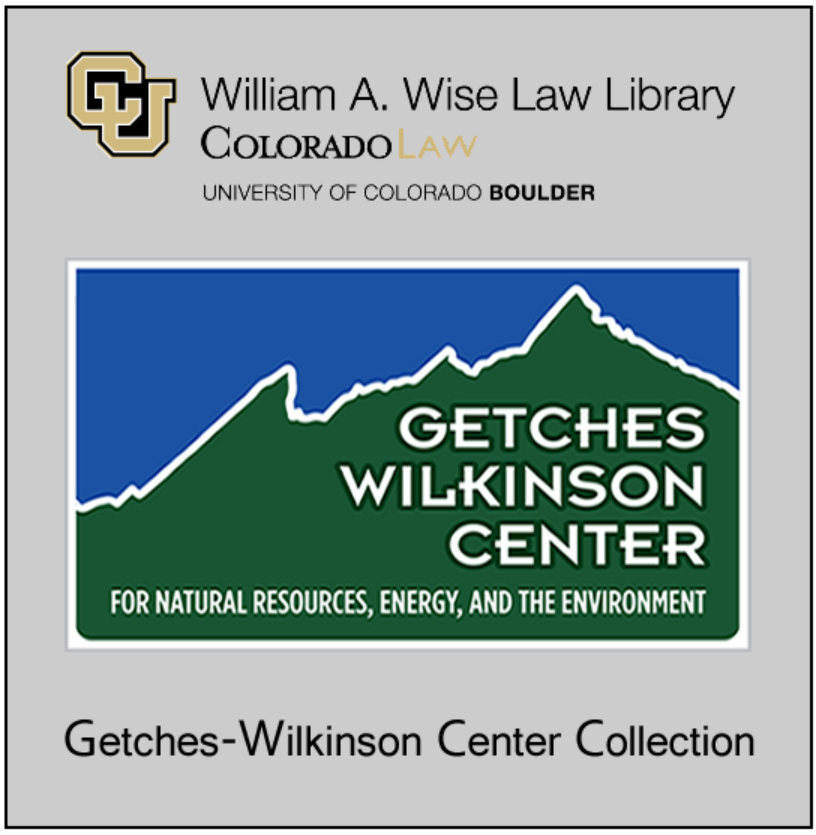

Wayne A. Bossert, *Approaches to Improved Irrigation Water Conservation Under Consideration by Northwest Kansas Groundwater Management District No. 4*, *in* WATER ORGANIZATIONS IN A CHANGING WEST (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 1993).

APPROACHES TO IMPROVED IRRIGATION WATER CONSERVATION UNDER CONSIDERATION BY NORTHWEST KANSAS GROUNDWATER MANAGEMENT DISTRICT NO. 4

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"Water Organizations in a Changing West"

Natural Resources Law Center
University of Colorado School of Law
June 14-16, 1993

I. INTRODUCTION

A. The actual session title is "Innovative Approaches to Irrigation Water Conservation". This session is further qualified by stating that two representatives of local organizations will be describing how their organizations encourage more efficient water use.

B. The conference participants need to understand that the Northwest Kansas Groundwater Management District board of directors has to date only committed to eventually implementing a program designed to improve water use efficiency throughout the GMD. Nothing has yet been done. The board's developing approach is unique in that they are committed to a short-enough time frame that they have already eliminated the possibility of approaching the goal by the more traditional methods of education and demonstration. The board's aggressive posture comes from their belief that early conservation is significantly more valuable than late conservation. So in response, their dilemma seems to be: How can GMD 4 most effectively achieve significant water use efficiency improvements in as short a time as possible?

C. The board began looking at approaches that would effectively drive all irrigators to efficiency up-grades. They eventually want to explore all alternatives, including the use of positive incentives, disincentives, regulation, and any other method that has the potential to bring about the aggressive rate of efficiency up-grades desired. The following are three very different alternatives explored thus far, each covered in a moderate level of detail only.

1) MANDATING A MINIMUM IRRIGATION APPLICATION EFFICIENCY

a) Water in Kansas is a public resource, appropriated by the state for private use so long as that use is in the public interest and is reasonable and not wasteful. The first step of this option is to re-define "public interest" and "reasonable and not wasteful use" for our local GMD in terms of a new minimum standard of water use efficiency.

b) The board must first set, by enforceable policy, a minimum irrigation water use efficiency to take effect at some reasonable time in the future. They are considering an 85 percent minimum

efficiency to become effective 5 years from the policy's passage date.

c) Once the policy requires a minimum irrigation efficiency, a procedure needs to be developed to rate all existing systems against that minimum standard. Those systems that do not have the design capability to meet or exceed the minimum standard are to be notified and will have up to the enforceable policy deadline to either up-grade, stop irrigating, or enroll in the state's water rights set aside program.

d) For any systems physically incapable of up-grading, three alternatives (other than the obvious alternative of abandoning the water right) will be offered so that they too can participate in the goal of lessening irrigation water use. They will be obligated to either: (1) voluntarily reduce their existing inefficient water right to that amount of water that would be needed if the crop was to be irrigated at the minimum 85% efficiency level; (2) purchase irrigation efficiency credits on the open market from neighboring irrigators; or (3) enroll the right in the state's Water Right Conservation Program.

e) To insure that system management decisions maximize the system's designed efficiency capability, annual water use reports (derived from required flow meters) will be evaluated to determine if the system was effectively operated during the year. Any owner/operator that reports using 110% or more of the crop's calculated net irrigation requirement will be expected to justify that additional usage during a follow-up conference. Usage that cannot be justified during these extra sessions will either be required to attend irrigation schooling, be docked a pre-set quantity of next year's water right, be published by name and amount of water used, or some other suitable reward.

f) It will also be important to prohibit water rights from adding additional acres after increasing their irrigation efficiency. Otherwise no water savings will result, which is the goal of the

process. Fortunately this has just been accomplished by the state who on February 11, 1993 has placed a moratorium on such acreage additions.

g) The concept of marketing irrigation efficiency credits should enhance the attainment of the goal by providing an additional tool for the irrigators. Basically this will allow individuals who cannot up-grade to get with individuals who want to up-grade but cannot afford to do so. By purchasing an appropriate number of efficiency credits, the buyer provides capital so that the seller can exceed the minimum standard by a like amount. Together, they at least average the minimum efficiency standard. This concept, when applied to water, probably needs some modification, though. Efficiency credit transactions will need to be restricted in both time and space, and re-sales will probably need to be prohibited. Also the GMD will need to be the coordinating broker for all such transactions - not setting price, but simply monitoring sales and purchases.

h) Finally, the addition of an economic disincentive could prove additionally valuable. The board is also considering a 5-fold increase in the district's water user charge (assessment). The additional money raised could be used to cost-share on underground pipe and other incidentals necessary for converting to pivot sprinkler or higher irrigation technology. This added financial help, contributed by the irrigators as a group, should help the effort along even faster.

2. REDUCING WATER RIGHTS FROM WITHIN AN INTENSIVE GROUNDWATER USE CONTROL AREA (IGUCA)

a) Another way to bring about water use efficiency is to limit district water rights to only that amount of water needed by efficient systems for the acres and crops irrigated. This is a very direct way to reduce water withdrawals, and has precedent because this is essentially how the state approached the Walnut Valley water supply problem (Cheyenne Bottoms).

b) The irrigators then individually decide whether they want to reduce irrigated acres and continue watering less-than-efficiently, invest in system efficiency improvements and continue irrigating all current acres, or change cropping choices. As with the first proposed program, adding acres to existing water rights cannot be allowed and flow meters are a must. Also, increasing the water user charge to create a more reasonable "cost-of-water" should be considered.

c) For our GMD to accomplish this, we would first have to establish an IGUCA. Once this is done, we would recommend to the state engineer a set of corrective control policies that would reduce all existing water rights to efficient quantities of water. Adjusting all irrigation water rights to quantities of water necessary for 85% or 90% irrigation application efficiencies would reduce water withdrawals while leaving most of the decisions to the producers.

d) At this time it would also be possible to re-schedule the reduced rights such that they could have a 5-year allocation rather than an annual allocation. This would allow for additional flexibility for the water users in dealing with abnormal rainfall periods.

e) The drawbacks to this approach are:

(1) Under Kansas law, once a local GMD petitions the state for an IGUCA, all decisions are turned over to the state and there are no direct provisions in the law to discontinue an IGUCA. This process is not well received by the local district members who see it as an opportunity for the state to regain much groundwater management control. As such it may not be politically feasible;

(2) There are no guarantees that any appreciable number of irrigators will invest the up-grade capital needed to continue irrigating the same acreage and growing a similar level of production. If few do, the area still reduces its water use,

but also reduces a substantial portion of its irrigated economy as well.

3. PHASING OUT JUNIOR WATER RIGHTS BASED ON PRE-SET HYDROLOGIC TRIGGERS

a) Another direct way to achieve pumpage reduction is to phase out the appropriate number of junior water right holders, at the appropriate times. This alternative can be designed to achieve any goal desired - from reducing declines by 15% over the next 50 years all the way to completely halting water level declines in just a few years time.

b) Step 1 of this concept is to divide the GMD into Management Areas (MA) based on some logical sub-unit (legal township, small hydrological basin, well density areas, or other) and decide on a methodology for obtaining water level data. Accurate water level data are important in establishing all triggers critical to this process. Our board is considering a legal township as constituting a MA, and allowing the well owners within the MA to either accept the existing mapping and monitoring data for water levels in their MA, or pick a minimum of 5 existing wells which they agree to annually measure and report.

c) Each MA would next be assigned a "buffer depletion value" based on its starting saturated thickness. This value would dictate when regulation would begin. A weighted formula would be used ((Ave S_t^2) (.00075)) to determine this value so that the full range of saturated thicknesses across the GMD are more fairly considered. This formula means that a MA with an average saturated thickness of 60 feet would get 3 feet of additional decline following program start-up, before regulation begins. A MA with 125 feet of water would get 11.7 feet of additional decline before regulation begins.

d) This buffer depletion value (interim trigger) is the MA's call for local action, and when viewed in terms of the MAs annual decline rate, will give the water users of that MA an indication of when

regulation would begin. It is to the MAs advantage to self-regulate at this point in time in order to reduce area water level declines to the lowest rate possible. The GMD will provide management assistance to any MA wanting to make such an attempt at self-management, but will not officially get involved until the buffer depletion decline has been realized. If this initial trigger is never reached, no regulation would occur. However, once the interim trigger is reached, each MA is then classed based on its average annual decline rate. Class I MAs would be those with average decline rates less than .5% per year based on the previous 3-years data. Class II MAs would be those declining between .6% and 1.75% per year. Class III MAs would be those declining faster than 1.75% per year.

e) Township goal quantities would next be determined for each MA depending on how that MA is classed. The formula would be: (Ave S_t^2) X (class factor). Class I MAs would get a more lenient goal quantity (class factor of .0025) while Class III MAs would get the most stringent goal quantity (class factor of .0018). The goal quantity is an expression of how much water is going to be pumped out of the MA before junior rights are prohibited from pumping in order to protect senior rights (water table stabilization). The larger the class factor, the larger the MA goal quantity.

f) The long-term recharge amount would then be apportioned to the most senior rights as far as it would go - thus determining the set of sustainable, senior rights. Next the entire goal quantity would be divided up among the non-sustainable right holders in 20 percentile groups - the first 20% group (most senior of the non-sustainable rights) would get 30% of the goal quantity, the next 20% group would get 25%, the next 20% group would get 20%, the next 20% group would get 15% and the last 20% group (most junior) would get 10% of the goal quantity.

g) The non-sustainable water right goal quantities are then converted to acrefeet quantities for each water right. This amount is then that right's portion of the allowable withdrawal based upon

its seniority and hydrologic location. With each right now having a specific acrefeet of water allocated to it, from here on out it becomes an accounting process simply deducting each year's use from the remaining account balance until all of the allocated water is pumped. In years where the water table does not decline within an MA, all water use would be exempted from the accounting process for that year. Also, the board is currently proposing a minimum individual well quantity that would provide at least 10 years of continued pumpage for all water rights. Under the actual proposal, there are junior rights that would be prohibited from pumping in as little as 3 years.

h) Other side-programs would also be expected to be run with this alternative. Mandatory metering, for example, would be a necessary activity for the water right accounting process. Also a more strict administration of existing water rights laws (tailwater control, overpumpage, abandonment for non-use) would be advised in order to maximize program efficiency and equity. Finally, increasing the water user charge to effectively create a cost-of-water should also be considered.

i) This option, as presented, would result in an average of 78% of the GMD's current saturated thickness remaining when all final triggers were reached and all junior water rights were finally regulated. Regulation would begin as early as 10 years and would not completely cease until, in a few cases, 150 years later.

j) This option provides:

(1) Three separate incentives for the local water users to reduce declines to their lowest possible rates as early as possible: (a) before their MA reaches the regulation trigger; (b) At the time their MA is classed (lower classes get a better goal quantity); and (c) because any year during regulation that the water table does not decline, the accounting procedure is suspended.

(2) An ability to save ones allocation for future use or sale. It does not promote the "race to the well" scenario that would be a significant negative factor in all other programs that are driven by a "systems" or "trigger" approach. Additionally, once each right is quantified, the owner immediately realizes the finality of his or her non-sustainable rights. This will undoubtedly result in significant personal conservation decisions.

(3) An ability to establish any final goal level locally desired. By adjusting the factors and formulas the water levels can be stabilized at any level desired. In other words, the program can be designed as aggressively or passively as desired.

(4) A method whereby existing water right priority is taken into account. The more senior non-sustainable rights in any MA end up with a larger share of the MA goal quantity.

k) Applied Example:

TRIAL TOWNSHIP, CHEYENNE COUNTY
Management Area recharge quantity = 1083 acft/yr
Total water rights appropriated in MA = 7000 acft
MA Average Saturated thickness = 100 feet
Average annual decline rate = 1.0 feet per year (1.0%)

The Buffer depletion value would = $(St)^2$ (.00075) = 7.5' of additional decline before regulation began. At an annual decline rate of 1 ft/yr, the MA could expect 7-8 years of continued pumpage before any policy implications.

At the buffer depletion trigger, with a decline rate of 1.0%, the MA would be classed as a Class II MA, and would at that time have 92.5 feet of saturation remaining.

The Depletable quantity would then be set based on the MA being a Class II MA. It would equal $(St)^2$ (.002), or 17.11 more feet of decline. This final decline goal of 17.1 feet represents 59,130 acft, which is the amount of water that would be allowed to come out of the entire MA before all non-sustainable (junior) pumpage would be prohibited and the water table would stabilize.

Based on 1083 acft of long-term annual recharge (sustainable water rights) and 7000 acft of total water rights appropriated in the MA, there remains 5917 acft of non-sustainable water rights that must share the depletable quantity of 59,130 acft.

The 1st 20% of the 5917 (1183 acft) would get 30% of the total, or 17,739 acft;
The 2nd 20% (1183 acft) would get 25% of the total, or 14,782 acft;
The 3rd 20% (1183 acft) would get 20% of the total, or 11,826 acft;
The 4th 20% (1183 acft) would get 15% of the total, or 8,869 acft; and
The 5th 20% (1183 acft) would get 10% of the total, or 5,913 acft.

The final step would be to convert each water right into a total quantity. To do so, each group's total acft quantity needs to be divided by their percentage of the non-sustainable quantity to obtain a group multiplier.

1st 20% group would get a multiplier of 15.0 - (17,739/1183)
2nd 20% group would get a multiplier of 12.5 - (14,782/1183)
3rd 20% group would get a multiplier of 10.0 - (11,826/1183)

4th 20% group would get a multiplier of 7.5 - (8,869/1183)
5th 20% group would get a multiplier of 5.0 - (5,913/1183)

If an individual had a 200 acft water right that was in the first 20% group of the non-sustainable rights, he or she would then be allocated a total of 3000 acft of water (200 x 15) for their total use - to use or save as desired. This would represent their share of the total depletable quantity, based on their specific hydrological circumstance and relative priority date to other water rights in the MA.

I) EARLY MANAGEMENT IMPACTS

If the above sample MA got serious and slowed their decline rate to .5 ft/yr early in the process (while still in the buffer depletion stage) they would get classed as a Class I MA and would end up with 73,958 acft to share. This would in turn result in the 200 acft water right above getting a multiplier of 19, or 3,800 acft of water.

V. SUMMARY

A. Even though nothing has yet been done officially by the GMD board to mandate improved irrigation water use efficiency, local water users have begun to react to the possibility of local action. For example, the conversion rate from flood to sprinkler since the issue first began to be publicly discussed has increased fairly dramatically - in excess of 10,000 acres being converted each year over the past three years. The only down side to this increased conversion rate thus far is that much of it has been converting one flood quarter to two pivot circles, resulting in more irrigated acres with the efficiency increase and little if any reduction of water usage. Fortunately, as discussed earlier, this has been corrected for us with the recent state moratorium on adding new land to existing water rights.

B. It must also be recognized that regardless of how the board ultimately decides to bring about increased water use efficiency, this issue represents only one of

several programs the board is planning on designing and implementing in order to solve the decline problem with as little economic and social disruption as possible. Unless the board opts for the hydrologic trigger method (option 3), there is no single answer to the declining water level problem. And even if they do opt for this method, applying other programs that will reduce pumpage will likewise forestall triggers and translate into a less onerous regulatory program as proposed.

C. Finally, it may seem that the GMD is singling out irrigation users for the regulatory fix, but all use types will eventually be addressed. The fact that 97.7% of our annual usage is irrigation seems to compel the board to start there.

VI. REFERENCES

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