Texas Water Resources Institute

Texas Water Resources

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New Perspectives About Water Supply Issues

1998 Water for Texas Conference Speakers Address SB1-Related Planning, Efforts

By Ric Jensen
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As a result of Senate Bill 1, Texas has embarked on an ambitious program to better manage its water supplies. The efforts, spurred on by recent droughts as well as concerns about higher water demands created by an ever-increasing population, are comprehensive. They run the gamut of water resources management issues and tackle such potentially thorny problems as how to manage water supplies and demands as well as how to prepare for and deal with droughts.

In December 1998, the Texas Water Resources Institute (TWRI), the Texas Agricultural Extension Service, and the Texas Water Conservation Association sponsored the 25th Water for Texas Conference in Austin. The theme of the conference centered around "Water Planning Strategies for Senate Bill 1."

The next three issues of *Texas Water Resources* will present many of the major issues presented at the conference. This issue will examine water supply management. Upcoming issues will discuss water demand issues as well as drought planning and response.

It should be noted that these newsletters, because of limits in how much information they can contain, will only scratch the surface of these important issues. It also needs to be stated that, when we summarize individual talks, we are only presenting the name of the lead author, in an effort to conserve space.

If you want more detailed information, copies of the proceedings from this Conference can be purchased for $25 by contacting TWRI at twri@tamu.edu or (409) 845-1851. The text for most of the papers presented at this Conference are posted on the TWRI World Wide Web site (http://twri.tamu.edu). In most cases, the on-line versions do not contain all the tables and figures which were included in the original presentations.

Views from State Agency Leaders

To obtain the "big picture" about major efforts related to SB1, TWRI invited leaders of key State agencies to speak at the Conference, including Bill Harris of the Texas A&M University (TAMU) System, Larry McKinney of the Texas Parks and Wildlife Department (TPWD), Ken Petersen of the Texas Natural Resource Conservation Commission (TNRCC), and Craig Pedersen of the Texas Water Development Board (TWDB).

Hiler emphasized how the Texas Agricultural Extension Service (TAEX) and other parts of the TAMU System are carrying out a diverse array of education programs related to SB1. This includes efforts specifically geared towards assisting in the formation of groundwater districts, work to educate people living in priority groundwater management areas, water conservation monitoring and education efforts (including TWRI's *Texas Water Savers* newsletter), and programs to foster wastewater reuse.

Pedersen updated Conference attendees about the progress of TWDB in performing its role as the lead agency which implements SB1. He reported that the agency is "ahead of schedule" in designating regional water planning areas and that all regional planning groups are now up and running. Pedersen also noted that scopes of work and budgets are nearly complete for all of the regional planning groups. Still, he cautioned that there is a limited amount of time (less than 2 years) to accomplish many complex water planning tasks, including gathering technical data, conducting hearings and taking comments, and making needed revisions.

In his presentation, McKinney described TPWD's "Water for Wildlife" program goals. This includes seeking a more defined balance between all interests that need water, including the environment, ensuring the protection of such critical habitats as rivers, lakes, and riparian corridors, and protecting water resources so that they can continue to support fishing and other recreational activities. He also reminded Conference attendees that SB1 enables regional water planning groups to identify and protect river and stream segments which exhibit "unique ecological value." McKinney voiced concerns that we need to make sure that such innovative strategies as water marketing and interbasin transfers do not dewater rivers or destroy estuaries.

How provisions of SB1 affect the operations of the TNRCC was the emphasis of Petersen's talk. He noted that this legislation allows the agency to designate priority groundwater management areas and to foster the creation of groundwater conservation districts. Petersen stressed the importance of developing approved regional water plans by the year 2001. If such plans are not finalized by then, water rights for municipal purposes cannot be approved without a waiver, according to the terms of SB1.

Water Availability Modeling (WAM)

A key provision of SB1 is the requirement that water availability be analyzed in each of the major river basins in Texas (except the Rio Grande) through the use of computer simulation models. The purpose of the modeling effort is to determine how much water may actually be available to specific users within a river basin or watershed, the extent to which cancellation of unused water rights can free up additional water supplies, and how widespread water reuse in upstream areas may affect the amount of water flowing downstream. Because of the importance of this issue, a panel discussion was dedicated to this topic.

Kariann Sokulsky of the TNRCC led off this session and provided a broad overview of the water availability modeling (WAM) process as well as the agency's progress in coordinating and implementing this effort. Sokulsky updated attendees about progress being made by the WAM Project Management Team, which is coordinated by the TNRCC. She reported that the TNRCC hopes to complete WAM studies for eight major river basins by December 2001. She noted that TNRCC has hired a coordinator for WAM efforts and said that efforts are underway to determine naturalized streamflows in areas without stream gages.

Jim Patek of Parsons Engineering then spoke about efforts to evaluate various water availability models and select the simulation tool that should be used in Texas. Patek described how an independent review panel compared and ranked the capabilities of two WAM models — the Water Rights Availability Package (WRAP) which was developed at TAMU and MIKEBASIN, which was created by the Danish Institute of Hydrology. Results of this evaluation suggest that WRAP was superior to MIKEBASIN in many respects, including its low cost, the way in which it accounts for reservoir operations, the manner in which water rights with different priorities are processed, and the ability to easily modify the source code. Patek discussed the method utilized to evaluate and select the graphical user interface (GUI) which will be used in Texas as part of the WAM process. He elaborated on why PrePro, a package developed by the Center for Research in Water Resources at the University of Texas at Austin, was chosen over three other competitors (MIKEWRAP, WRAPView, and VW Wrap). Reasons that PrePro was preferred, Patek says, include its low cost, ease of use, and flexibility.

The authors of WRAP and PrePro, Ralph Wurbs of the TAMU Civil Engineering Department, and David Maidment of the Center for Research in Water Resources at the University of Texas at Austin, concluded the panel discussion.

Wurbs focused on research now being carried out to expand the ability of WRAP to meet the needs created by SB1. Some of the most recent activity involves enhancing the model so it can meet designated targets for instream flows and environmental purposes, enhancing WRAP's ability to incorporate wastewater return flows into its analyses, and improving how the model treats channel losses. Wurbs told attendees that a new WRAP manual is now being developed. When it's ready, TWRI will make printed copies available and will post the manual on its WWW site.

Maidment described research he is now conducting to create graphical user interfaces (GUIs). He discussed how digital elevation models can be merged with stream networks, flow gaging stations, water rights data, precipitation information, and erosion values to create electronic maps in a geographic information system (GIS) format. The resulting GIS databases (which in reality are computer-generated, interactive maps) can be utilized to delineate watershed boundaries, to view the locations of water rights, and to estimate how water flows across a watershed.

Strategies for Improved Water Supply Management

• State of the art water availability models will more accurately reflect how much water is actually available in rivers and streams.

• Wastewater reuse is "drought-proof" and automatically increases with population growth

• Recent research provides more evidence that cloud seeding may be a proven method to increase precipitation.

• Water markets are emerging in many regions of Texas and may become more important in the near future as an additional source of supply.

• Conjunctive management projects show promise for extending limited water supplies and improving poor quality waters so they can be more usable.

• Aquifer storage and recovery (ASR) is now being implemented in El Paso and Kerrville as a way to efficiently store excess surface waters for later use. Such areas as Brownsville, Laredo, San Antonio and Austin are now studying its use.

• New data on brush management provides additional information on specific features which are needed in order for range clearing projects to yield significant amounts of water. Recent research projects have also provided detailed information on the cost and benefits of specific brush control methods in site-specific circumstances.

Alternative Supplies — Weather Modification, Wastewater Reuse

Although supply management typically centers around managing existing water resources, speakers in this section dealt with the prospect of taking advantage of alternative sources of water.

George Bomar of TNRCC presented a compelling argument about the potential benefits of cloud seeding and weather modification to increase precipitation. According to Bomar, recent research has resulted in the development of the first conceptual framework to understand and predict how to increase the amount of rainfall that can be captured from cumulus cloud formations. Much of the increased understanding stems from efforts to send instrumented aircraft into the cores of growing cumulus clouds throughout Texas. "It is now increasingly clear," Bomar says, "that the timely seeding of convective clouds with silver iodide increases the rain production by enabling these clouds to live longer, spread laterally to cover more ground, and grow slightly taller."

Bill Hoffman of TWDB asked this intriguing question — "What's the only source of water that is 'drought proof' and automatically increases with economic and population growth?" The answer, he says, is treated wastewater. Hoffman explained how various facets of reuse can extend limited water supplies. He described many types of projects including the use of wastewater from septic tanks and drainfields for landscape irrigation, expanded use of greywater from washing machines, and large scale efforts in San Antonio, Austin, and other cities to deliver high volumes of effluent for irrigation. Hoffman noted that SB1 recommends wastewater reuse as an important water management strategy that should be considered by regional planning groups.

Timothy Brown — an attorney who represented the City of Corpus Christi — discussed a water supply option that may have been made more difficult by SB1. Brown described efforts by Corpus Christi to obtain water from Lake Texana and the Garwood Irrigation Company through an interbasin transfer, which SB1 discourages. "Had the new SB1 provisions on interbasin transfers been applied to Lake Texana and Garwood, there is no doubt the people of Corpus Christi would still be looking at tremendous uncertainty with respect to their future water supplies," Brown said. "Because these applications were considered under pre-SB1 requirements, the Corpus Christi region can now look forward to having dependable, affordable, water supplies for the next 40 to 50 years."

A.T. Hebert, Jr., of the Lower Neches Valley Authority echoed Brown's concerns about whether limiting interbasin transfers is necessarily a positive development. Hebert noted that interbasin transfers may become a more important water source in the future because it is now more difficult to build new dams and reservoirs. He suggested that policy makers may want to consider revising restrictions placed on interbasin transfers by SB1 that designate waters acquired through this method as junior water rights. He recommended that more attention be paid to considering replacement costs when judging if interbasin transfers should be approved.

Water Policy, Wastewater Reuse, and Water Rights

Many speakers addressed issues relating to a diverse array of water policy issues, including wastewater reuse and water marketing.

Martin Rochelle and Michael Booth, who are both Austin attorneys, provided perspectives on wastewater reuse.

Rochelle noted that current State policy may send out mixed signals as it relates to this issue. The TNRCC takes return flows into account when it analyzes whether water is available. However, most permits issued by the agency do not require that specific amounts of wastewater flows be returned to a river or stream. "As a result," he says, "many downstream water rights are dependent on return flows as the source of their appropriations and conflicts over this issue may arise." Rochelle also cautioned that, as wastewater is treated to a higher quality, there may be increased demands on its reuse, thereby exacerbating the problem.

Booth explained the difficulties that might arise if the TNRCC adopts a policy that may give downstream permitholders a water right which is "superior" to upstream interests which may be developing reuse projects. "Since most Texas rivers are fully or over-appropriated," Booth said, "groups seeking to reuse wastewater may not, in many cases, be able to get a permit." Booth recommends that many projects be undertaken to learn more about this issue including identifying areas where it makes sense for reuse to occur and evaluating the impact of reuse on downstream water rights and the environment.

Potential benefits and pitfalls of water marketing were assessed by Ron Kaiser of the TAMU Recreation, Parks, and Tourism Sciences Department and Bruce McCarl of the TAMU Agricultural Economics Department.

Kaiser presented a broad overview of water marketing in Texas. He pointed out that many factors now exist in Texas that may facilitate such markets, including undervalued water uses (primarily irrigation), a critical mass of buyers and sellers, reasonable transfer costs, and minimal transfer restrictions. "The future of water marketing in the State," he said, "lies in the area of agricultural to urban transfers, the sale of conserved water and treated wastewater, groundwater marketing and interbasin transfers."

Case studies of water marketing in the Lower Rio Grande Valley was provided by Bart Hines of McAllen Public Utilities, while Bruce McCarl of the TAMU Agricultural Economics Department spoke about the emerging water market in the San Antonio region.

Hines addressed some of the challenges facing his region, including anticipated higher water use brought about by a rapidly expanding population. He notes that virtually all of the water rights in the Valley are owned and managed by irrigation districts, not individuals. Therefore, it is difficult to sell water rights, unless agricultural lands have been converted to urban uses. Hines did point out that a water market has developed in the Valley which consists of selling temporary water rights during droughts and other times of need.

McCarl's presentation attempted to answer the question of whether recent Texas legislation (SB 1477) has created an environment in which a market can develop to sell water rights in the Edwards Aquifer Region. He noted that three conditions must exist before a market can flourish — rights must be established and quantified, the market must include all willing buyers and sellers, and waters must be treated as a homogenous commodity. McCarl's research suggests that it is likely that a water market will arise in the region, although the guarantee of set amounts of water to agricultural irrigators may limit the ability of the market to function as economically

efficient as possible.

Making Water Supplies More Dependable

How can we make sure that water supplies are as dependable as possible? That was the focus of talks given by Robert Brandes, Quentin Martin, and James Dwyer.

Brandes, an Austin engineer, described efforts to analyze the extent to which two major reservoirs on the Texas portion of the Rio Grande — Amistad and Falcon — are likely to be able to meet water demands in the near future. He discussed efforts to model the operations of these reservoirs, utilizing conventional methods and "conditional probability" techniques. Results of this analysis suggest that, under normal hydrologic conditions, this system should be able to meet water demands 61% of the time. During droughts, conservation measures would likely be needed 27% of the time.

Quentin Martin of the Lower Colorado River Authority (LCRA) presented an overview of some of the most promising methods to extend water supplies from reservoirs. Martin identified two innovative, relatively new strategies which the agency is now exploring. LCRA is now developing a conjunctive use system for rice irrigators along the Gulf Coast. This management scheme involves overdrafting aquifers during drought years. However, during normal or wet periods, irrigation needs would be almost entirely supplied from reservoirs in the Highland Lakes near Austin and little groundwater would be pumped. At the same time, the Trinity River Authority is blending salty water from Lake Texoma (sited on the Red River) with fresh water from Lake Lavon (in the Trinity River basin). The blending expands the ability of the agency to utilize additional water from Lake Texoma.

The blending of ground and surface water to maximize water supplies was discussed by John Williams of the Canadian River Municipal Water Authority. Williams discussed how the District is implementing a "conjunctive use groundwater supply project." In this effort, groundwater is pumped from a well field north of Pampa and is transmitted to Lake Meredith via an aqueduct. There, this groundwater is blended with salty surface water from the lake, where chloride levels have been as great as 475 parts per million. At the same time, a project is under way to divert salty brines in eastern New Mexico, which would otherwise flow into the lake. The net effect of this project is that the usable amount of water that can be utilized from the lake is expected to increase from current levels of roughly 65,000 AF per year to as much as 76,000 AF annually.

The feasibility of aquifer storage and recovery (ASR) projects in Texas was the theme of James Dwyer's message. Dwyer, who is with CH2M Hill, promoted ASR as a cost-effective way to store excess surface waters in aquifers. Later, this surplus groundwater can be pumped when needed. Dwyer provided details about current ASR projects in El Paso and Kerrville as well as feasibility studies now being carried out in Brownsville and Laredo. He also mentioned that Austin, San Antonio and Leander are now contemplating the use of ASR to augment water supplies.

How SB1 May Influence Water Supply Management

• Changes the emphasis of Texas water planning from a centralized effort performed by TWDB to regional efforts created by local planning groups.

• Requires that regional water plans be developed by 2001.

• Includes provisions for developing water management strategies during normal and drought years.

• Encourages the formation of groundwater districts in priority groundwater management areas.

• Makes it more difficult to implement interbasin transfers

• Protects river and stream segments with "unique ecological value."

• Promotes wastewater reuse as an alternative water supply.

• Creates the Texas Water Trust which may be used to reserve canceled water rights for environmental purposes.

• Designates targets for the instream and coastal freshwater inflow needs, based on hydrological conditions (excess, normal, or low flows).

• SB1 may have to clarify the ownership of wastewater designated for reuse projects, in order for significant reuse projects to be developed.

Can Brush Control Free Up Water Supplies?

For some time, scientists and policy makers have contemplated whether widespread brush management — the removal of large concentrations of "undesirable" species such as mesquite and juniper — may be a desirable way to free up additional water supplies from rangelands. Three speakers addressed this issue — Thomas Thurow of the TAMU Rangeland Ecology and Management Sciences Department, John Walker of the TAMU Agricultural Research and Extension Center in Temple, TX, and Richard Conner of the TAMU Agricultural Economics Department.

Thurow laid out some broad parameters for situations in Texas where brush management is most likely to be successful, based on his research. Thurow suggests that such factors as climate, vegetation, soils, and slopes all need to be considered when evaluating the potential success of a brush control project. The most important requirement, he suggests, is that areas designated for brush management should receive an average of at least 18 inches of rainfall annually. His research also suggests that it may be necessary to remove much of the brush from watersheds to achieve significant water yields.

Walker discussed recent TAES research which utilizes a computer simulation model, the Soil Water Assessment Tool (SWAT), to determine how brush control may impact water yields in the Edwards Aquifer Region and in the North Concho River watershed in West Texas. The research shows that brush clearing in the Edwards Aquifer region may free up 33% more water than current average streamflows, which in turn would replenish streams and aquifers. Although less water could be created through brush control on the North Concho, the research suggests that these efforts are comparable to other methods of development (building dams), both in terms of costs and the amount of water produced.

Is brush control really cost effective? That's the issue Conner spoke about. Conner explained efforts to quantify the specific expenses associated with removing different brush conditions. Some of his research explored the cost of such methods as herbicide treatments, bulldozing, and prescribed burns to manage light, moderate, and heavy buildups of mesquite and cedar. Conner explored the benefits brush control might bring to ranchers (would it also allow them to graze more cattle or improve conditions for hunting?) as well as the amount of money the State may need to contribute in cost-sharing, and how developing water resources through brush clearing compares economically to other methods. Conner's studies of the North Concho Basin show that as much as 27,671 acre-feet (AF) of water could be produced for a cost of $30 per acre. These findings are based on including all of the watershed (roughly 365,440 acres) in such a program.

Protecting the Environment and Natural Resources

How might SB1 influence environmental issues and does the legislation contain provisions that may actually benefit ecological concerns?

Ken Kramer of the Lone Star Chapter of the Sierra Club, Gary Powell of TWDB, Robert Spain of TPWD, and Tom Ray of the Brazos River Authority offered perspectives on these issues.

Kramer noted that SB1 requires regional planning groups to assess environmental needs and to consider the likely impact of development on environmental resources. He also identified opportunities presented in SB1 to benefit the environment, including the designation of ecologically unique streams (which may restrict the construction of dams along those reaches), the Texas Water Trust (which is intended to be a way to dedicate water rights for environmental purposes), and the potential for widespread cancellation of unused water rights and reserving those, instead, to protect natural resources.

Powell offered insights into how environmental water needs are integrated into Statewide planning efforts brought about by SB1. Powell discussed how SB1 requires that different volumes of freshwater inflows be passed along to rivers and bays, depending on hydrological conditions. During normal or high flows, the goal might be to provide sufficient inflows to promote the long-term health of an ecosystem while only enough flows to protect water quality might be required when a region suffers a drought. He also described how TWDB calculates inflow needs and updated attendees on the progress of the Board's bay and estuary studies. Powell reported that analyses of San Antonio Bay, Matagorda Bay, Corpus Christi Bay, and Aransas Bay were recently completed.

Spain spoke about the role of TPWD in water planning. Specifically, he explained how the agency provides comments and recommendations about the potential effect of water development projects on such aquatic resources as wetlands, bottomland hardwoods, riparian corridors, and endangered species. Spain also mentioned many ways in which TPWD is assisting in the implementation of SB1, such as providing natural resources information to regional planning groups, offering guidance to other agencies about which stream segments need special protection, and assisting TNRCC with developing rules to deal with the return of "surplus" waters.

Ray discussed the extent to which SB1 may result in a need for more detailed, and possibly more expensive, environmental studies in association with water development efforts. Specifically, he spoke about language in SB1 that urges regional planning groups to "consider" environmental needs. This may include evaluating the effect of a project on endangered species and wildlife habitats as well as instream flows in inland and coastal areas. Ray suggested that it may be desirable to only estimate and summarize environmental impacts when water supply projects are initially reviewed. In situations where environmental compliance costs are likely to be high or for projects that need to be developed quickly, more detailed and site-specific analyses may be warranted. Ray recommended that it is vital that local concerns be reflected in the regional water planning process in order that a proper level of environmental review be provided.

Groundwater Management

Although much of SB1 prescribes ways to manage surface waters, speakers at the Conference also spoke about the effect of the legislation on groundwater resources.

Bruce Lesikar of the TAMU Agricultural Engineering Department explained how SB1 charged TAEX to work with TNRCC, TPWD, and TWDB to provide educational programming in designated priority groundwater man-

agement areas. The goal of these educational efforts is to explain why residents may want to consider creating groundwater districts. Some of the materials created as part of this educational programming includes a fact sheet titled "Managing Texas' Groundwater Resources," other publications, and providing site-specific programming to meet local needs.

A. Wayne Wyatt of the High Plains Underground Water Conservation District No. 1 in Lubbock discussed how management efforts helped lower water use and offset potentially adverse impacts of the 1998 drought on groundwater supplies. Wyatt noted the region received only 60% of average annual rainfall last year, resulting in a shortage of more than 6.1 million AF throughout the District's service area. However, thanks to the widespread use of low energy precision application (LEPA) irrigation systems, agricultural efficiency increased markedly and the amount of groundwater farmers needed to pump dropped in some cases by as much as 45%. Wyatt reminded the audience that most irrigation systems in his region are designed to supplement precipitation — not to meet the total water demands of crops.

Summary

Obviously, SB1 will focus more attention on how Texas manages and develops water supplies. If there was one recurring message from this Conference, it is that SB1 will influence the way in which water resources management is carried out including such diverse themes as determining the amount of water that is actually available in stream segments, maximizing the amount of usable water that is generated from many operations, the environmental impact of development, the need to create groundwater districts, the development of alternative water supplies, and many others. If there is a second theme from this gathering, it is that there is a tremendous need to educate water resources professionals, as well as the general public, about how they must adjust their water management efforts to comply with SB1.

Finally, the Conference also showed that there can be tremendous benefits in bringing together policy makers, researchers, and the general public. Conferences and meetings like this are often invaluable tools to promote dialog, discussion, and understanding about complex issues like those discussed at this meeting.

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News from TWRI

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Thanks to recent changes in the National Institutes for Water Research (NIWR), which partially funds TWRI and similar institutes, the Institute is now able to again administer a small competitive grants program and award seed money for a few research projects. TWRI recently issued an RFP and will soon award two studies.

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Marty Matlock of the TAMU Agricultural Engineering Department was recently awarded a grant from the U.S. Environmental Protection Agency to study water quality in the San Antonio region. Seed money from TWRI helped Matlock develop this grant proposal.

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