Conj Use Plcy in NE
and Other States

IX. CONJUNCTIVE USE POLICY IN NEBRASKA AND OTHER STATES

DWR memorandum

March 21, 2000

TO: Ann, Susan, ~~Jim Cook~~, Steve Gaul, Jeff Shaffer

FROM: Roger

SUBJECT: Ground Water Management

Attached for your information are brief descriptions of ground water laws/management in Nevada, North Dakota, Colorado and Texas. These were prepared for Western States Water Council (other states are working on write ups, so more should be coming).

Two things I think we should do:

1. Distribute these to the Republican River Council.

2. Prepare something similar for Western States Water Council on Nebraska water law.

Other states think we have no law on ground water - which is not the case. We could do ourselves some good by preparing a summary for Western States Water Council.

pjb
Attachment

clrshare\patterson

Conjunctive Use In North Dakota

Conjunctive use of surface water and ground water is very limited in North Dakota because major ground-water withdrawals are from relatively small-scale aquifers of glaciofluvial origin which, in most cases, are not hydraulically connected to surface water bodies. The Missouri is the largest river in the state with an average annual discharge of 15 million acre-feet. The other rivers in the state are comparatively small with most of the discharge occurring during spring snowmelt and heavy rainfall.

Most of the aquifers hydraulically connected to rivers in the state are associated with ancestral stages of present day rivers. These aquifers generally are local in areal extent (patchy) and are associated with abandoned river channel meanders and terrace deposits comprised primarily of sand and gravel.

The volume of ground water in storage in aquifers associated with abandoned meanders and terrace deposits of the Missouri River is relatively small in relation to the average annual Missouri River discharge. Missouri River discharge in North Dakota is regulated in large part by releases from the Garrison Reservoir. As a result, large-scale ground-water withdrawals from these localized aquifers will not significantly affect Missouri River discharge. Ground-water withdrawals from aquifers associated with smaller rivers in North Dakota can affect decreases in river discharge, particularly during the summer growing season when the ground-water contribution to stream flow is significant.

The allocation of water in North Dakota is accomplished under the Prior Appropriation Doctrine. State law requires that a water permit be obtained for all uses with the exception of individual domestic or livestock. The permit is obtained by filing an application with the State Engineer that is processed in accordance with prescribed procedures. They include the notification of landowners within a one-mile radius of the designed point of diversion, legal notice in the official county newspaper, and a comment period during which those who may have an interest in the application may state their views.

After the statutory procedures have been completed, the State Engineer must evaluate the application in accordance with a four statutory criteria. A key criterion is, "The rights of a prior appropriator will not be unduly affected."

The State Engineer recognizes a hydraulic connection can occur between an aquifer and a surface water body and that ground-water withdrawals from an aquifer may unduly affect the rights of a senior surface water appropriator. The State Engineer has the statutory authority to restrict and/or temporarily curtail ground-water pumping by a junior appropriator to protect the rights of a senior surface water appropriator. To date, the State Engineer has not been required to take such actions.

With regard to new water permit applications in areas where aquifers are hydraulically connected to rivers, the State Engineer may deny a permit request from the aquifer or condition the ground water permit to protect the rights of senior surface water appropriators. An

example of the latter involves the allocation of ground water from the LaMoure aquifer in southeastern North Dakota. The LaMoure aquifer is hydraulically connected to the James River. The lower James River is heavily appropriated for irrigation use. To protect senior surface-water appropriators, the State Engineer placed the following condition on a junior ground-water irrigation permit from the LaMoure aquifer: "An aquifer test shall be conducted using the irrigation well to determine the hydraulic connection between the LaMoure aquifer and the James River. Depending on the nature of the hydraulic connection, the State Engineer may establish a minimum James River stage near the permit area as a prerequisite to operation of the irrigation well."

As previously stated, other than the Missouri River, rivers in North Dakota are comparatively small with most of the discharge occurring during spring snowmelt and heavy rainfall. The major water use from these rivers is for irrigation resulting in demand for water during the growing season when river discharge is well below spring peak levels. There are only two permitted diversion projects in North Dakota (one municipal, and one irrigation) that involve capturing surface waters during peak discharge periods and diverting the water to nearby aquifers using infiltration basins. The total permitted maximum annual diversion from these two projects is 7,606 acre-feet.

Given the nature of the hydrologic system in North Dakota, wide-spread conjunctive use of surface and ground water is not likely. The State Engineer has the statutory authority to manage conjunctive use within the framework of the Prior Appropriation Doctrine. As the need

develops, the State Engineer can make use of computer models such as MODFLOW to provide the basis for regulatory action in highly competitive groundwater/surface water settings.

Conjunctive Use and Management of Surface and Ground Waters in the State of Nevada

Introduction

The Nevada State Engineer is synonymous with the Administrator of the Division of Water Resources within the Department of Conservation and Natural Resources. The Nevada State Engineer's office was created in 1903. The 1905 Session of the Legislature adopted an appropriation process by passing a series of statutes that amended the process from simple diversion and placement of water to beneficial use to administration by the State Engineer in the form of receiving an application, granting a permit, requirements for proof of completion of work, proof of beneficial use and the issuance of a certificate. Water resources in the State of Nevada are fully developed in the areas of the high population centers, i.e., the areas around Las Vegas and east slope of the Sierra Nevada Mountains in western Nevada from Douglas County, north through Reno and Sparks including Carson City. Nevada is the fastest growing state in the nation and the driest state in the nation, therefore, water management is critical.

Summary of state water law

The Nevada State Engineer has had exclusive jurisdiction over the appropriation of surface water since 1905 and to a limited extent over ground water since 1913. The Nevada State Engineer acquired exclusive management of ground water in 1939. Within his jurisdiction is administration of surface water, all ground water, all effluent, and all geothermal resources in the case of consummation of water from the geothermal reservoir.

For all practical purposes the surface waters of the State of Nevada are fully appropriated. The ground water basins in the highly developed areas are fully appropriated, however, there are many ground water basins in eastern and central Nevada which still have water available for appropriation. The State Engineer in cooperation with the U. S. Geological Survey has outlined 230 separate ground water basins of which less than a dozen are in an overdraft situation. The only exception to the State Engineer's administration of ground water usage is for single family domestic wells. Some of the basins that are in an overdraft situation are as a result of high concentrations of single family domestic wells. In some cases where single family domestic wells are associated with individual septic systems, water quality problems in the ground water reservoir have developed. By policy the State Engineer administers the ground water basins on a perennial yield basis, that is, only allowing appropriation, pumpage, and usage to the extent they not exceed the amount that is replenished by recharge.

Nevada subscribes to the prior appropriation doctrine and has since shortly after statehood in 1864. Included in Nevada's ground water law is the authority for the State Engineer to "designate" ground water basins or parts thereof in need of additional administration. Within these designated areas the State Engineer can designate preferred

uses and adopt regulations or issue orders for the benefit of the hydrologic health of the basin. These may include spacing requirements, multiple points of diversion for mine dewatering, and require measuring devices be installed. The State Engineer in Nevada conducts pumpage inventories in about 50 of the 230 ground water basins and in many basins, also establishes water level measuring networks. He utilizes both flow meters and power conversion methods to estimate pumpage depending on the nature of the ground water usage, whether it is for municipal, agricultural, or mining use.

In his management of effluent the State Engineer encourages these waters to be put to beneficial use and in many cases has required effluent use to replace uses that have historically been on a potable supply, i.e., golf courses, parks, cemeteries, etc. Most of the sewage treatment plants in Nevada that supply adequate quantities of effluent are reused in some fashion and in some cases to create wetlands. The Nevada State Engineer works closely with the administrator of the Division of Environmental Protection when water quantity/water quality issues arise.

Historically Nevada has had wide swings in surface water supply from year to year in some cases as high as 300% of average precipitation and runoff in one year to 25% of average the next. Many of the surface water streams have little if any above ground storage, therefore, the Nevada State Engineer urges conjunctive use and in many cases has required conjunctive use to optimize surface water supplies when they are available in order to be more flexible on pumpage of ground water and uses of effluent.

In addition, Nevada has had an artificial recharge program since 1989. Out of a dozen artificial recharge projects, there have been a few that have been very successful, the largest of which is in the Las Vegas Basin. The water purveyors in Las Vegas have been able to bank 190,000 acre-feet of water by treating and pumping Colorado River water during the off peak season and injecting it into the ground water reservoir for future use. The State Engineer encourages and in some cases requires water resources plans wherein a particular water purveyor must demonstrate how he is going to optimally use the water resources available to that particular entity.

Water Conservation

Nevada has prohibitions against waste of water in both the surface water law and the ground water law. In the State of Nevada conservation is significantly influenced by the case of surface water - drought, and in the case of ground water - the cost of energy to pump wells. Extended droughts in Nevada has caused surface water irrigators to line ditches, laser level fields, switch from flood irrigation to sprinkler irrigation or center pivot irrigation and in some cases to grow less water consuming crops. Rural parts of Nevada historically received their electrical power from an REA or Coop in the 1950's with relatively inexpensive power whereas today that cost of electricity has escalated dramatically and has forced ground water users to become more efficient in their water application practices.

State Water Planning and Management

The Nevada State Engineer does not administer a financial assistance program, however, the Division of Water Planning does administer a program of grants and loans and cost sharing for various water management options. The State Engineer on the other hand participates in water management decisions and through cooperation with the U.S. Geological Survey performs many interpretive studies to supply data and good science in order to make informed decisions. In addition, the Nevada State Engineer in cooperation with the U.S. Geological Survey funds a stream gauging and water level network.

Water Transfer and Import/Export Issues

Nevada developed in its infancy as a mining state. In many cases the water resource was not near the ore body which resulted in many historic diversions being constructed in order to bring water to a mining operation. Interbasin transfers are part of Nevada's heritage and there are several in the State. With the advent of the huge population expansion, the Nevada Legislature has become more concerned about interbasin, intercounty transfers of water and, therefore, has enacted legislation giving the State Engineer the authority to look at future in-basin uses and the hydrologic/environmental health of basins of origin.

Historic Versus Modern Day Uses

The original Nevada statutes described beneficial uses for mining, municipal, agricultural, and stockwatering. In more recent legislation (the last 30 years) the Nevada Legislature has recognized other beneficial uses including instream flows, water for wetlands, and water for wildlife that have customarily used springs and seeps. Water rights in Nevada are not necessarily tied to lands and can be severed from the lands where they have historically been beneficially used. The free market system allows for the sale of a water right to satisfy new uses at new places of use. The State Engineer tries to balance concerns between historical beneficial uses of water and allowing water to be transferred to instream flows for environmental uses.

In conclusion, since Nevada is the fastest growing state and the driest state in the Nation, conjunctive use and water management programs are not an option, they are a must. It will be in Nevada's best interest to optimize all uses of water, no matter what the quality, in their most beneficial manner, not just for historic beneficial uses but for all public and private uses. Conjunctive use of water resources in Nevada includes optimal use of surface water, ground water, effluent, water banking, geothermal water, and water of poor quality.

If there are any questions about conjunctive management of water resources in Nevada, persons should contact the Nevada State Engineer's office at (772) 687-4037.

Conjunctive Use Management of Surface and Ground Water in the State of Texas

I. Introduction

Ensuring adequate water supplies for the future of Texas is one of the most urgent and serious challenges facing Texas. With continuing population and economic growth has come an increasing demand for finite ground and surface water supplies. According to the 1997 State Water Plan, since 1930 the state's population has more than tripled while statewide water demand has increased nearly fivefold. The Plan further states that the population of Texas is projected to nearly double over the next fifty years, with the water needs of municipalities, manufacturing, and the electric power industry in particular expected to increase considerably.

The availability of sufficient amounts of usable groundwater will become increasingly important in meeting the state's future water needs. According to the 1997 State Water Plan, groundwater supplied approximately 57% of 1994 water use in Texas, of which 15% was for municipal purposes. As land goes out of irrigated, agricultural production, the percentage share of groundwater use by cities will likely more than double. Of serious concern, according to the Plan, is that water from 32% of the wells sampled around the state contain contaminants in excess of state drinking water standards, including total dissolved solids, chloride, nitrates, and fluorides.

Conjunctive management of surface and ground water will be critical to meeting the state's future water needs. Although the hydrological connection between surface and ground water is well known, Texas law continues to treat surface water differently than ground water. As long as the Rule of Capture prevails in Texas, significant opportunities for conjunctive management will be limited. Senate Bill 1 (1997) attempted to increase and improve groundwater management, primarily through the existing mechanism of groundwater districts. It also put a new emphasis on the hydrological connection between surface and ground water, the conjunctive aspect of surface and ground water in regional planning, and coordinated management plans that reflect the interrelationship between groundwater and surface water. However, it avoided tampering with the Rule of Capture.

In addition, new requirements imposed by Senate Bill 1 on the interbasin transfer of water has created additional pressure on limited and less renewable groundwater resources. The bill amended §11.085 of the Texas Water Code to provide that amendments to existing water rights for the authorization of an interbasin transfer be made junior to all other existing water rights in the basin of origin, regardless of whether such amendment would affect these water rights under the traditional "no injury" test. This means that this water would not be available to the receiving basin during times of low flows, when it would be needed the most. Thus, there is little or no market for such water. This new limitation on interbasin transfers has had a domino

effect by increasing pressure on groundwater supplies which has, in turn, led for a call for more protectionist measures to limit the export of groundwater. If prohibitive measures on the transfer of surface water or the export of groundwater are maintained in the long-term, many believe that Texas will not meet its projected water supply needs and will be at a significant economic disadvantage *vis a vis* other states as well as in the world market.

Drought, major pumping and exporting of water by a city from an aquifer that negatively impacts rural landowners, or positive outcomes in the management of the Edwards Aquifer may furnish the catalysts to change the Rule of Capture. Planning efforts and activities under Senate Bill 1 may provide the necessary documentation of the impacts and effects of the surface-groundwater nexus. But until the law coalesces around a unified allocation framework, effective conjunctive management will be difficult.

II. Texas Water Law

Surface Water - State Ownership and the Prior Appropriation System: The location and characteristic of water in Texas determines its ownership and control. The State of Texas hold title to the surface water in trust for the public welfare. Water owned by the state includes the flow and underflow of every stream, river, and lake in Texas. Texas, like most western states, has adopted the prior appropriation doctrine of "first in time, first in right" as the basis for allocating surface water. This is done through a water rights permitting system administered by the Texas Natural Resource Conservation Commission (TNRCC).

When reviewing an application for a new or amended water right, the TNRCC is to determine whether there is sufficient available unappropriated water to grant the requested appropriation. In making its determination, the TNRCC os also to consider the conservation and waste prevention practices and measure of the application A conservation and drought response plan is required of most applicants. The TNRCC is also to consider to consider the impacts to water quality, instream uses, aquatic and wildlife habitat and freshwater inflow needs for bays and estuaries. It may not grant a water right that impairs an existing water right.

Groundwater - Private Ownership and the "Rule of Capture:" State water does not include "percolating" groundwater. Texas has adopted the English common law doctrine of ownership of groundwater by the overlying landowner, subject to the "Rule of Capture." This doctrine provides that the surface owner may withdraw groundwater for use without limitation or any liability to neighboring owners for any harmful effects resulting from the withdrawal. Texas courts have added the following limitations: the use must be beneficial, non-wasteful, and cannot be done maliciously with the purpose of injuring a neighbor. Since 1978, an action for damage will lie for negligent pumping of groundwater that results in the subsidence of neighboring land.

The Rule of Capture is based on an 1843 English court decision and reflects a Nineteenth Century lack of understanding of groundwater hydrology. In that case, the court considered groundwater occurrence and usage effects a mystery, which justified a no liability rule because

the effects of a person's groundwater use on another's property was unknowable. While this doctrine originally was followed in many states, today Texas may be the last, remaining state adhering to the English rule

Texas groundwater law has often been called the "law of the biggest pump;" the deepest, largest well and most powerful pump gets the water. Texas has established local groundwater conservation districts (see below) to manage groundwater through a number of powers they can invoke. Landowners outside of conservation districts have little recourse in protecting local groundwater or in limiting groundwater pumping impacts be neighbors.

Recognition of Hydrologic Connection Between Surface and Ground Water in Permitting Actions: Previous law did not recognize the hydrologic connection between surface and ground water, even though surface water diversions may lessen aquifer recharge, thus impacting groundwater use. This also sometimes resulted in conflicting management schemes and unintended impacts. Senate Bill 1 (1997) addressed this issue, in part, by amending §11.151 of the Texas Water Code to provide that the TNRCC, when considering a surface water permit application, to assess the effects, if any, on groundwater.

The amendment did not give any specific guidance as to what conditions may be placed on a new water right in response to the assessment. However, a preference to protect existing water uses over new uses has been inferred by the TNRCC. In addition, the agency has sought to harmonize the provision with other Senate Bill 1 initiatives, including changes to groundwater district planning and permitting requirements as well as the designation of Priority Groundwater Management Areas.

Accordingly, TNRCC rules implementing this law provide that in the TNRCC's review and action on an application for a new or amended water right, the TNRCC shall consider the hydrological connection between surface and groundwater and the effects, if any, from the granting of the application on groundwater use, quality, or recharge. In its assessment, the TNRCC shall consider whether the proposed diversion is from: 1) a stream that provides significant recharge to a "sole source" aquifer as designated under the federal Safe Drinking Water Act; 2) an aquifer for which there is a certified groundwater management plan developed by a groundwater district; or 3) an aquifer that is located within all or part of a Priority Groundwater Management Area. If the TNRCC determines that the granting of the water right would significantly impair existing uses of groundwater, groundwater quality, or springflow upon which existing surface rights, water quality, aquatic and wildlife habitat, or bays and estuaries depend, the TNRCC may deny the application or place restrictions and limitations in the water right necessary to prevent or mitigate such impacts.

Conversely, Senate Bill 1 also amended §36.113, Texas Water Code, to provide that in its consideration of an application for a well permit, a groundwater district shall consider whether the proposed use of water "unreasonably affects" existing groundwater and surface water resources. It is not known at this time how, or whether, groundwater districts are performing and

acting upon this assessment.

Groundwater Districts: The "Rule of Capture" may be limited to some extent in an area under the jurisdiction of a groundwater district. In 1949, the Texas Legislature authorized the voluntary creation of underground water conservation districts with discretionary and limited power to regulate groundwater withdrawals as long as the landowners did not lose their "ownership" of groundwater. This statute, now codified as Chapter 36 of the Texas Water Code, allows the creation of a district through local initiative and confirmation election, or through state initiative through the "priority groundwater management area" (previously known as "critical area") designation process. The latter process, however, still requires local voter approval to confirm district creation. Finally, special districts with special powers may be created by legislation pursuant to Article XVI, Section 59, of the Texas Constitution.

Groundwater districts are charged to manage groundwater by providing for the conservation, preservation, protection, recharging and prevention of waste of the groundwater resources within their jurisdictions. Groundwater districts have required duties that must be performed, as well as a number of authorized powers that may be invoked.

Some of the required duties of groundwater districts include:

- develop and adopt a comprehensive management plan for the most efficient use of groundwater, for controlling and preventing waste of groundwater, and for controlling and preventing land subsidence; and

- require permits for drilling, equipping or completing wells that produce more than 25,000 gallons per day or for alterations to well size or well pumps (all wells producing at least 25,000 gallons per day in existence prior to the district's creation must be automatically granted a permit).

Regulations also specify requirements on the organization and operation of groundwater conservation district, such as operating on the basis of a fiscal year, holding regular meetings, etc. Authorized powers and optional duties of a district include:

- adopt rules to conserve, preserve, protect, recharge, and prevent waste of groundwater and control land subsidence;

- provide for the spacing of water wells and regulate the production of wells;

- acquire land to erect dams or to drain lakes, draws and depressions and establish sites for groundwater recharge;

- purchase, sell, transport and distribute surface or ground water for any purpose;

- carry out research projects and collect information regarding the use of groundwater, water conservation, and the practicability of recharging a groundwater reservoir; and

- promulgate rules to require permits for transferring groundwater out of the district.

Groundwater conservation districts can be created by one of three procedures: legislation action; petition by landowners, state action through the Priority Groundwater Management Areas process (see below). Upon landowner petition, an area of land may also be added to an existing district. Most districts have been created by the Legislature, where the local state representative or senator carries the bill on the district.

All groundwater district creations with authority to levy ad valorem taxes are subject to a confirmation election by voters within the proposed district. Voters also elect directors and approve the ad valorem tax rate to finance the district.

As of January 1999, 45 groundwater districts exist in Texas. The rationale supporting the local creation and control of groundwater districts is related to the large diversity of climatic conditions, water use patterns, growth projections and aquifer characteristics across the state. This diversity would make it difficult to formulate and administer laws and regulations to govern the develop and use of groundwater statewide. Locally controlled districts, with rules, programs and activities specifically addressing the local problems and opportunities, is perceived as the preferred method in Texas.

The Edwards Aquifer Authority: A unique groundwater district in Texas is the Edwards Aquifer Authority. It is another - although reactive - example in Texas where conjunctive management of surface and ground water can be effectively achieved. The Authority was created by special legislation in 1993, in part, to respond to a lawsuit filed under the federal Endangered Species Act to protect several listed species that rely upon springflow from the Edwards Aquifer. Prior to this lawsuit, there was a pending lawsuit in state court brought by surface water right holders (primarily the Guadalupe Blanco River Authority) downstream of springs that significantly contributed to surface streams. This latter lawsuit sought to have the aquifer declared an underground stream and, thus, state water subject to state water right permitting so that the affected surface water right holders could be on a more equal legal footing with aquifer users.

The dispute over management of the aquifer goes back to before the creation of its predecessor Edwards Underground Water District, created in 1957 in response to the worst drought of record. This drought lasted approximately eight years and dropped aquifer levels to record lows and dried up related springs. The aquifer has been designated a sole source aquifer under the Safe Drinking Water Act and provides water to over 1.5 million people in Central Texas, including

the City of San Antonio. A significant recreational economy is also dependent upon the springflows as well as downstream surface water right holders.

The Authority has been granted the ability to adjudicate historical claims of groundwater use from the Aquifer, subject to a maximum amount in order to maintain adequate springflow. To accomplish this, the Authority may deny or condition existing as well as new uses. The Authority must also develop and implement water conservation and drought contingency plans as well as develop a long-term water management plan for the region. A regional planning committee has been established to assist with the latter, including representatives from springflow interests and affected downstream surface water users.

Other features of the law include a minimum allocation for irrigation use of two acre feet per acre and a limited prohibition on the transfer of irrigation water rights to only 50% of the right in order to protect the local agricultural economy. A funding mechanism has also been established to help retire existing groundwater rights in order to achieve the Authority's long-term water management goals. This funding is based, in part, on fees assessed aquifer users as well as downstream surface water right holders who benefit from continued springflow. The Authority has also been granted the ability to protect the water quality of the aquifer as well as construct recharge projects and develop or purchase alternative surface water supplies for the region. A credit system has also been established where reductions in authorized withdrawals from the aquifer may be credited to a surface water right downstream of the springs.

The creation of the Authority has so far withstood legal challenges based upon a "takings" argument. The court ruled that the enabling legislation on its face did not constitute an unconstitutional takings of private property. However, the court may have left open the possibility of a subsequent lawsuit on those grounds by limiting its decision based upon the law on its face, and not on how the Authority may eventually implement its powers and duties.

Aquifer Storage and Recovery (ASR): Texas law authorizes the permitting of aquifer storage and recovery projects. Such authorization will be granted by the TNRCC only if the water is injected into a confined aquifer and it can be demonstrated that the water can be withdrawn at a later time for application to a beneficial use in accordance with the permit. This permit authorization may be combined with any necessary water right and water quality permitting authorization procedures.

The best, although sadly one of the few, examples of a pro-active effort in Texas to conjunctively manage surface and groundwater may be the ASR project that was recently permitted to the Upper Guadalupe River Authority (UGRA) for the City of Kerrville. This project consisted of the diversion of surface water from the Guadalupe River by UGRA during times of normal and high flows for injection into a confined aquifer for subsequent withdrawal and use when river flows were low. This subsurface storage of water not only prevented the evaporative loss of water, but also optimized the use of available water and avoided the environmental impacts associated with the costly construction of a surface reservoir.

Ironically, the permit was challenged by an environmental and recreational interest group, the Texas Rivers Protection Association. It challenged the surface water diversion for having insufficient conditions to protect instream uses such as canoeing and river rafting. It also challenged the retrieval of water from storage in the aquifer as unlawful state control over groundwater. The court found that the state had properly set streamflow conditions. But more importantly, in a decision that was critical to allowing future ASR projects to go forward, the court found that surface water injected into the ground for purposes of ASR retained its characteristic as state water. This was a necessary finding, the court concluded, for the state to ensure that such water would be used for a beneficial purpose.

Groundwater Export - Another, although controversial, example of the conjunctive use of surface and ground water in Texas involves the import and use of groundwater by cities as a supplemental water supply. For example, the City of El Paso has purchased land approximately 150 miles to the east for the purpose of establishing a well field. This may be needed as local groundwater supplies become depleted and as a contingency to the uncertainty of surface water supply from the Rio Grande. In addition, the Canadian River Municipal Water Authority has established a well field in Roberts County to supplement supplies in Lake Meredith. However, such measures by distant cities has had negative reaction by local, rural groundwater users.

III. State Water Planning

Public education, involvement and political support: In June 1997, comprehensive water legislation known as Senate Bill 1 (SB1) was signed into law. SB1 was an outgrowth of increased awareness of the vulnerability of Texas to drought and to the limits of existing groundwater and surface water supplies. The legislation called for a "bottom up" water planning process that involved increased public participation. In February 1998 after extensive review and public comment, the Texas adopted state and regional water planning rules, delineated 16 regional planning areas and selected individuals to serve as initial members of Regional Water Planning Groups (RWPGs). These RWPGs will prepare 50-year regional water plans for their respective areas to be updated every 5 years. Once approved, these plans, which address both surface and groundwater, will be combined into a single state water plan that will serve as the guide to water conservation, water development, and drought response in the 16 planning areas. The planning process includes a significant public outreach effort, is largely funded by state planning grants (approximately $20 million), and supported by state agency staff.

Public involvement in groundwater conservation districts: The TWDB municipal water conservation unit provides free services to help utilities establish effective water conservation programs including water audit and leak detection programs, on-site technical assistance, training/workshops, the loan of leak detection equipment and assistance to local governments controlling water waste in their facilities.

TWDB staff in the agricultural water conservation unit, working in conjunction with the U.S.D.A. Natural Resources Conservation Service and/or underground water conservation districts, provide free training for evaluations of irrigation systems to agricultural producers. Using water-use efficiency evaluation units, staff can provide recommendations for improving water-use efficiency.

The Texas Agricultural Experiment Station (TAES) performs outreach in efforts to enhance environmental quality, conserve natural resources and develop sustainable production systems. In precision crop production, scientists are using geographic information systems to pinpoint planting and irrigation timing. Agency researchers also work in urban areas to help cities, homeowners and industry conserve and protect the water supply.

The Texas Agricultural Extension Service (TAEX) provides educational programs such as Water Supply and Conservation programming which is a comprehensive program being delivered by TAEX which addresses the critical issue of wise use of the water supply. Funding through Senate Bill 1 provided an opportunity to enhance water conservation programming efforts and to focus on ground water management issues. The water supply and conservation programs address both urban and rural audiences.

The Texas Department of Agriculture performs outreach work to encourage conservation and manage water resources better.

The Texas public education system includes water awareness and conservation in its curriculum.

The Texas Environmental Education Partnership is a coalition focused on building a framework of environmental education (EE) for Texas. Recognizing the diversity of Texas citizens, a broad-based steering committee was created to guide the effort. The TEEP includes representatives from business and industry, the environmental community, academia, governmental agencies, school teachers and administrators, and parents. The committee has developed a vision, mission, and goals that provide the overall direction for the effort.

The TNRCC Education team, a winner of the EPA Region 6 Regional Administrator's Environmental Excellence Award for Outstanding Commitment to Furthering Environmental Education in the State of Texas, serves as the clearinghouse for TNRCC's education projects for teachers in kindergarten through 12th grade. The team develops and coordinates K-12 resource materials and training programs. One of the goals of the program is to increase teachers' understanding of environmental concepts and principles regarding air, water, and waste management, and a clean and healthy environment.

State water agencies give presentations on various water issues throughout the year. These presentations on subjects such as groundwater resource planning or the State water planning process, are frequently made for planning groups, public meetings and legislators.

Texas water resource agencies are supported politically by a wide range of constituents. Surface water districts, groundwater districts, irrigation districts, municipalities, chambers of commerce, environmental organizations, agricultural interests, recreation interests, and industry all take an active interest in conjunctive water issues, water planning and regulation programs. As required by legislation, most of these groups are represented by at least one individual on each Regional Water Planning Group.

Since many of the near-term water planning decisions are made at regional and local levels that have widely varying hydrologic character, the relative levels of risk-aversion and the associated approaches to water planning activities varies across the state. Texas has not, for example, designated 'preferred' water resources to be used first. Instead, regional preferences between water source use (e.g. ground vs.

surface) will be reflected in the regional water plans. The current state-wide trend in water management focuses, more generally, on developing 50-year plans capable of maintaining adequate water supplies throughout a repeat of the drought-of-record.

The state often plays a larger role in major long-term water management decisions, particularly when the decisions involve major infrastructure investments. State Participation Funds play a significant role in state efforts to guide these regional investments, for example, toward providing surplus capacity that will eventually benefit a broader area.

Water information management: State-wide information regarding groundwater and surface water use and availability is obtained largely through reporting requirements under surface water rights, drinking water system requirements, water districts, and voluntary survey responses. There is little metering or other measurement of groundwater use in the State of Texas outside of groundwater districts. In addition to historic data, regional planning groups established under Senate Bill 1 (1997) must prepare 50-year population and water use data projections based on initial state projections to be used for planning purposes. The final regional population projections must be approved by state.

Technical Assistance: Much of the state water data available is made available to the public via state agency websites.

Extensive Historic economic uses Data

Annual water use data are gathered via voluntary survey responses from surveys that are distributed annually to approximately 7,500 water users. These surveys produce:

- Historical population and water use data
- Lists of municipal and industrial water users
- Summary of annual groundwater pumpage by county and major city
- Summary of annual manufacturing water use for both ground and surface water.
- Detailed annual summaries of historical municipal water use (1980-1996) by entity, water type, and water source.

- There is limited data with which to track water from its original source to its final destination/user via wholesalers, transfers, and resale. This is due both to the voluntary nature of survey responses and the often complicated nature of wholesale water transactions and distribution.

Historic environmental uses

- Texas initiated studies in 1987 to determine the effects of and needs for instream flows below water development projects identified in the State Water Plan. The primary objective is to minimize the impacts of the water supply structures and practices on the living resources by (1) determining instream flow needs for maintenance of ecological health, and (2) providing information for watershed management to meet the needs.
- Texas also conducts estuarine hydrographic surveys and ambient water quality monitoring of estuaries.
- Currently, Texas is working to collect data and conduct studies on the needs for instream flows and freshwater inflows to the estuarine systems.

Drought Monitoring Information

- The Texas monitors water conditions throughout the state monthly at selected reservoirs, streamflow sites, and ground-water wells.

Is adequate data available on aquifer levels, streamflows, water uses, etc.?

- Streamflows - There is a significant amount of daily data on historic stream flows as a result of existing USGS stream gages partially funded by the state. The amount of data on naturalized stream flows, however, is limited. The current surface water availability modeling (WAM) program is improving the available monthly naturalized streamflow data sets although daily naturalized flow data sets will remain extremely limited.

  Continued cutbacks in federal funding continue to adversely affect the state's streamflow monitoring program. The number of sites where streamflow is measured is approximately 40% smaller than 25 years ago.

- **Groundwater** – In general, there is a good state-wide data set on aquifers although the resolution of well level coverages and the historic frequency of measurements varies by aquifer and region. Most well monitoring data collection began after 1930 and data quality and quantity is significantly improved after 1988. Groundwater data availability is best in areas with groundwater conservation districts. Of the approximate 1,000,000 water wells drilled in Texas in this century, approximately 120,000 are registered in the state ground-water database. As of May 1998, more than 67,700 wells in the database had miscellaneous measurements and some 7,100 were classified as current observation wells with at least one yearly measurement. Ground water-quality data includes more than 92,500 total analyses from 50,800 ground-water sites are entered in the database; close to 287,000 infrequent constituents have also been entered.

-State Data Coordination

The Texas Water Development Board (TWDB) performs extensive water use surveys and collects water well and reservoir data, all of which is available at its website.

The Texas Natural Resources Information System (TNRIS) which is part of TWDB, is the gateway to natural resources data for the state of Texas. Its primary purpose is to either make data available to users quickly and reliably or to refer users to the data holders. TNRIS serves as a distribution center for U.S. Geological Survey maps and has numerous other map collections available for in-house use or reproduction. Digital data available through TNRIS pertain to water resources, geology, Census, and other natural resources spatial data.

TNRCC provides Surface Water Quality Monitoring (SWQM) Reports - Data files and reports from surface water quality monitoring samples throughout Texas.

Texas has had a formally established Water Monitoring Council for just over a year. Forces driving its formation included the increasing cost of collecting water data in the face of flat or declining funding and the often disparate efforts of many agencies to collect similar, if not redundant, data - data, which in turn, were limited in availability to external entities. The council came out of discussions on ways to work more efficiently together to improve the status of data collection and the usefulness of water information. The Texas Water Monitoring Council is composed of representatives from various entities at the federal, state, regional, and local levels with mission responsibilities for water data and water resource information.

USGS in Texas collects and disseminates recent water data including stream discharge, water levels, precipitation, and parameters from water-quality monitors

Resource assessments and surveys

Are investigation staff and resources adequate?
Continued cutbacks in federal funding continue to adversely affect the state's streamflow monitoring program (e.g. loss of stream gauges) while simultaneously resulting in increased reliance on state funding shares.

Financial Assistance: Types of State Grants and loans, and cost sharing programs administered by Texas and potentially available for conjunctive water management include (see descriptions following list):

- **Texas Water Development Fund**
- **Economically Distressed Areas Program (EDAP)**
- **Clean Water State Revolving Fund (SRF)**
- **Drinking Water State Revolving Fund (DWSRF)**
- **Water Assistance Fund**
- **Agricultural Water Conservation Fund**
- **Agricultural Soil and Water Conservation Fund**

The Texas Water Development Fund is used to provide loans to eligible applicants for the construction of local or regional water supply, wastewater treatment, flood control, and municipal solid waste management projects. This includes such facilities as water wells, transmission mains, storage tanks, and water and sewage treatment plants.

Economically Distressed Areas Program (EDAP) The program provides financial assistance in the form of a grant, a loan, or a combination grant/loan to bring water and wastewater services to economically distressed areas where the present water and wastewater facilities are inadequate to meet the minimal needs of residents. The program includes measures to prevent future substandard development.

The Clean Water State Revolving Fund (CWSRF)
Wastewater treatment, stormwater pollution control, and nonpoint source pollution control projects financed with a combination of federal capitalization grants and state funds. Provides loans at interest rates lower than the market can offer to any political subdivision with the authority to own and operate a sewage system. Nonprofit water supply corporations are not eligible to receive assistance from the CWSRF wastewater loan program. A water quality based priority system is used to rank potential applicants and fund projects with the greatest environmental benefits.

Drinking Water State Revolving Fund (DWSRF) provides loans at interest rates lower than the market offer to finance projects for public drinking water systems that facilitate compliance with primary drinking water regulations or otherwise significantly further the health protection objectives of the federal Safe Drinking Water Act (SDWA). Applicants may be a political subdivision of the state, a nonprofit water supply corporation, privately-owned water system and state agencies.

Loans can be used for the planning, design, and construction of projects to upgrade or replace water supply infrastructure, to correct exceedences of SDWA health standards, to consolidate water supplies and to purchase capacity in water systems. DWSRF loan proceeds can also be used to purchase land integral to the project.

Under the Source Water Protection Program, an applicant may apply for a loan to purchase land or conservation easements, if the purpose of the purchase is to protect the source water of a public system from contamination and to ensure compliance with national primary drinking water regulations.

Water Assistance Fund(s)
The Water Loan Assistance Fund provides loans to eligible applicants for water supply and treatment projects, wastewater treatment projects, and flood control projects.
The Storage Acquisition Fund is used to purchase an interest in reservoirs.
The Research and Planning Fund provides grants for up to 100 percent of funding for water research, and matching grants for feasibility planning for flood protection and regional water supply and wastewater projects. Applications are submitted in response to annually published requests for proposals. Anyone is eligible for water research grants, and political subdivisions or nonprofit water supply corporations are eligible for flood protection and regional planning grants.

Agricultural Water Conservation Fund provides loans to borrower and lender districts, such as soil and water conservation districts, irrigation districts and underground water conservation districts. Lender districts make loans to individual borrowers to purchase and install more efficient irrigation equipment on private property for agricultural water conservation purposes. Borrower districts use loan proceeds for district irrigation system improvements.

Agricultural Soil and Water Conservation Fund consists of funds transferred from the Agricultural Trust Fund, direct appropriations, and other revenues required by law to be deposited in the fund. Funds assigned to the Board are used for the 75 percent matching grant program to allow local water conservation districts and irrigation districts to purchase equipment to evaluate or demonstrate efficient agricultural water uses; measure, test, and evaluate water quality and suitability of water supplies for agricultural uses; and demonstrate and evaluate systems which prevent contamination of water from chemicals or other substances used in agriculture. This fund can also provide funding to other state (Texas) agencies for agricultural water conservation programs.

State-wide Modeling Efforts: Both surface water and groundwater availability models are currently

being updated and/or developed as a result of implementation of recent legislation. While the two sets of models are not directly linked, they will be used in parallel to address conjunctive water management issues. These models are currently under development by aquifer or river basin and will be available via Internet to any interested organization or individuals. The updated models will be used for permitting purposes and to support preparation of regional water plans. The models will be capable of simulating policy impacts, for example, how various groundwater-mining rates may impact future availability.

Groundwater Availability Models (GAMs) One model will be developed for each of Texas' aquifers. GAMs will:

- Incorporate, at all levels, input from the public and private sector through a variety of technical advisory groups, public meetings and technical forums.
- Be based on a standardized approach using state-of-the-art, universally accepted, numerical groundwater flow models and computer capabilities.
- Provide reliable, timely data on groundwater availability to the citizens of Texas to ensure adequacy of supplies or recognition of inadequacy of supplies throughout the 50 year planning horizon.
- Evaluate interrelationships between groundwater systems and the protection of environmental resources

Surface Water Availability Models (WAMs) – One model will be developed for each of Texas' 23 river basins. WAMs will:

- Provide reliable, timely data on surface water availability to the citizens of Texas to ensure adequacy of supplies or recognition of the inadequacy of supplies throughout the 50 year planning horizon, as required for permitting process.
- These models, which will replace the outdated models that exist for eight out of the state's 23 river basins and will allow all other river basins to be modeled. The models will all be based on a standardized approach and provide a vast array of data analysis capability necessary for sound resource management and planning.
- The models will not only allow Texas to more accurately determine whether sufficient water is available for issuing new water right permits, but they will also allow planners to determine the amount of water available for each water right and the percentage of time it is available. The models, which are being developed based on stakeholder input and other expertise, will also facilitate water planning efforts by allowing planners to better account for all needs and uses in a basin. This will help protect existing water rights and the environmental needs of a river basin, as well as provide information for developing water supply alternatives.

IV. Conjunctive Management Issues Addressed by Senate Bill 1 (1997)

Coordination Between Surface and Ground Water Planning: Prior to Senate Bill 1, state water planning was centralized under the Texas Water Development Board. Senate Bill 1 established a "bottom up" approach by establishing regional water planning groups of affected stakeholders that would develop options to meet future water supply needs for the region. In turn, these regional plans are

submitted to TWDB for approval and incorporation into the state water plan. If there is a conflict between regional plans, the TWDB is to mediate the dispute and resolve the conflict. Once the plans have been approved by the TWDB, the TNRCC must consider them in its water right permitting decisions.

To assist coordinated, comprehensive surface and ground water planning, Senate Bill 1 also provided for the participation of groundwater districts in the regional planning process. Furthermore, Senate Bill 1 required that groundwater management plans developed by groundwater districts be done in coordination with the regional planning groups, to address water supply needs in a manner that is not in conflict with the applicable, approved regional management plan, as well as to specifically address conjunctive surface water management issues.

Many areas in the state that rely significantly on groundwater saw these changes to the law as threats to their groundwater supplies. The fear was that the regional planning groups would be dominated by the large municipalities that were in need of additional and alternative water supplies, such as unregulated groundwater in other areas of the state. Since the initial regional plans were not due to be submitted to the TWDB until the year 2001, almost two dozen bills were introduced in the 1999 legislative session seeking to create groundwater districts - many on only a countywide basis and with special powers to prohibit the export of groundwater. In a legislative compromise, the bills were allowed to pass, but with interim limits on the export authority of the new districts and with provisions indicating that the new district may be combined with one or more other districts or annexed onto another existing district if necessary for the more effective management of a common groundwater resource.

Aquifer Storage and Recovery (ASR): Previous law prevented the TNRCC from issuing permits for ASR projects until June 1, 1999, except for temporary pilot projects. This prevented many needed projects with an already proven feasibility to proceed on a long-term basis. Senate Bill 1 amended §11.153 of the Texas Water Code to allow the TNRCC to issue permits or permit amendments authorizing the storage of water in aquifers on a long-term basis where completed pilot projects or historically proven projects had been shown to be feasible.

Reuse of Groundwater Discharged to a Surface Stream: Prior to Senate Bill 1, the law had been unclear as to the right of someone to discharge privately-owned groundwater into a stream and subsequently divert this water from the stream for reuse. Without specifically addressing the issue of whether this water remained privately-owned water once it had been introduced into a state watercourse, Senate Bill 1 amended §11.042 of the Texas Water Code to generally provide that a person may obtain a "bed and banks" permit from the TNRCC for the discharge and subsequent diversion and reuse of this water in the amount of the discharge, less carriage losses. However, the TNRCC was also granted the authority to put special conditions on the permit as necessary to protect downstream water rights and environmental flow needs. With regard to the new reuse of historically discharged groundwater such as groundwater-based effluent, Senate Bill 1 specifically provided that protection was to be given to downstream water right holders whose rights may have been granted based upon the availability of historical discharges. However, no requirement for the continued discharge was imposed nor any restriction placed on the reuse of the groundwater prior to its release to the stream.

V. Other Groundwater Management Issues Addressed by Senate Bill 1 (1997)

Guidance To Groundwater Districts on Developing Long-term Planning or Performance Goals: Prior to the 1997 enactment of Senate Bill 1, districts that had been created had not, for the most part, been aggressive managers of groundwater. Exceptions included the two coastal subsidence districts mentioned earlier, the Edwards Aquifer Authority (described above), and districts over the Ogallala Aquifer in the High Plains. For example, the High Plains Underground Water Conservation District No. 1 was able to slow groundwater development largely through well-spacing requirements and conservation programs. Other districts such as the North Plains Ground Water District No. 2 and the Panhandle Ground Water Conservation District No. 3 have combined well spacing requirements with limits on the amount and diversion of withdrawal based upon irrigated acreage. However, few districts have made an attempt to control groundwater production in a way that extends the life of the aquifer on a "safe yield" or sustainable use basis. State law did not provide any guidance as to long-term planning and management goals and strategies, nor provide any minimum plan content or performance requirements.

Senate Bill 1 amended Chapter 36 of the Texas Water Code to provide minimum content requirements for district management plans. Specifically the plans are to identify the performance standards and management objectives under which the district will operate to achieve the management goals of: providing the most efficient use of water; controlling and preventing waste of groundwater; controlling and preventing subsidence; addressing conjunctive surface water management issues; and addressing natural resource issues.

Additionally, the district plans are to specify in as much detail as possible, the actions, procedures, performance, and avoidance that are or may be necessary to effect the plan, including specifications and proposed rules. To help formulate management goals, the plan is to also include: estimates of the total usable amount of groundwater in the district; the amount of groundwater being used annually in the district; the annual amount of recharge, if any, to the groundwater resources within the district; how natural or artificial recharge may be increased; and the projected water supply and demand for water within the district.

District Accountability and Oversight: The creation of districts by local initiative or special legislation has proliferated anytime local control - or non-control - of groundwater has been threatened. Many districts have been created on a single county basis or less, rarely corresponding to aquifer or management area boundaries. Some districts existed on paper only. A few were created to simply prevent possible attempts at state control. Although districts were required to develop and implement management plans and corresponding rules, many did not. In addition, there was no state oversight or other means to hold the districts accountable for protecting and managing the resource. For example, districts were required to develop and submit their plans to the state, but for review only. Despite this limited requirement, the submission of plans and related rules was rare. In addition, the statute did not provide any minimum standards that a district must follow in the development of plans.

Senate Bill 1 amended Chapter 36 of the Water Code to require the submission of plans to the TWDB for review and certification as meeting the requirement of state law. Plans are then required to be reviewed and submitted every subsequent five years. All districts were given until September 1, 1998, to submit their initial plans to the TWDB. Failure to timely submit a plan or plan amendment subjects the district to enforcement action by the TNRCC, including the issuance of orders requiring remedial actions, dissolving the board, removing the board's taxing authority, or dissolving the district.

In addition, groundwater districts are subject to a performance audit by the State Auditor's Office. If a district is found not to be "actively engaged in achieving the objective's of the district's management plan," the State Auditor shall report their findings to the Texas Legislature as well as to the TNRCC. If it is determined that the district is not operational, the TNRCC is required to take appropriate enforcement action, including those actions mentioned above.

Guidance on Groundwater Export: The export of groundwater is of particular concern in areas of the state where there are limited or diminishing water supplies and no alternatives to supply existing uses. Prior to Senate Bill 1, Chapter 36 did not provide districts with any guidance on how to properly address groundwater transfers. Districts may wish to prevent a distant city or water supplier from transferring large quantities of groundwater from their district. However, if controls or prohibitions on transfers are discriminatory and without proper legal basis, they could be successfully challenged on constitutional "takings" or "Commerce Clause" grounds. In addition, unjustified controls or prohibitions on export would not be conducive to a regional and conjunctive planning approach in order to meet the state's future water needs.

Senate Bill 1 amended §36.104 of the Texas Water Code to authorize districts the ability to limit export of groundwater if there is an existing and foreseeable need for the water in the district that is identified in the district's management plan and there is no alternative water supply in the district. However, Senate Bill 1 also amended Chapter 36 of the Texas Water Code to require that district plans, rules, and permitting actions be consistent with approved regional water plans.

Insufficient Funding Mechanisms for Districts: Some areas of the state which may desperately need groundwater protection may not have a sufficient tax base to support a district. This problem is most acute in the sparsely populated areas of West Texas. Chapter 36, however, limited the ability of districts to rely on a fee based program.

Senate Bill 1 amended §36.206 of the Texas Water Code to allow districts to assess fees for the creation and initial operation of a district. Special districts were also given the authority to use funds obtained from permit fees for any purpose consistent with their certified management plans. Additionally, the TWDB was authorized to allocate funds to a district to conduct initial data collections, develop and implement long-term management plans, and to participate in regional water planning efforts.

Platting Requirements (Assured Supply): Prior to Senate Bill 1, counties did not have the authority to require a developer to demonstrate that adequate water supplies existed to sustain the proposed development. This was a particular problem in the state's Hill Country, where the natural beauty and relative proximity to cities such as San Antonio and Austin were fast attracting residential development, but where the main source of water supply was from aquifers with varying production capacity and quality. This led to development in these rural areas that soon began to overtax existing groundwater supplies.

In response, Senate Bill 1 granted counties in priority groundwater management areas the authority to require as a part of the plat application a demonstration that sufficient groundwater supplies were available to support the proposed development. The authority was later extended to cities during the 1999 legislative session and the TNRCC was directed to prescribe the form and content of a certification to be made by a professional, registered engineer as a part of the plat application.

Drought Response Plans - Prior to the passage of Senate Bill 1, there was no requirement for a public water supply entity or an irrigation district to development and implement a drought response plan. When the 1997 drought hit, many water supply systems and districts were caught unprepared. Agricultural losses were in the millions of dollars. In addition, many small cities were only weeks away from completely exhausting available water supplies. Senate Bill 1 amended the Texas Water Code by adding §11.1272 to require that these entities develop and implement such plans. Additionally, the Legislature appropriated funds to the Texas Water Development Board to provide financial and technical assistance to these entities to assist in the development of such plans.

VI. Remaining Issues:

Rule of Capture: Although raised as an issue during the 1997 and 1999 legislative sessions, no legislative proposal has been offered so far to challenge the Rule of Capture. Rather, Senate Bill 1 simply declared that it is state policy that groundwater conservation districts are the state's preferred method for the management of groundwater resources. This left the Rule of Capture untouched in most areas of Texas.

One reason for its survival is the strong support it has among private property rights proponents. It is ironic, however, that the Rule of Capture has become synonymous with the protection of private property. It does not protect the individual user's right, nor does it protect the resource. It fails to address the need to manage a commonly-shared, limited resource that is subject to increasing, competing and unlimited demands. For example, it cannot prevent the "mining" or overrating on an aquifer. This typically happens when more water is being withdrawn from the aquifer than is replenishing the aquifer. The results of this may include aquifer levels dropping to such levels as to be economically or technically impossible to withdraw the water. It may, over time, deplete the aquifer. Overrating may also lessen hydrostatic pressure within the aquifer, thus allowing the intrusion of miserably laden "bad" water. Overrating may also dry up hydroponically connected springs and surface streams. It is a law where the biggest pump wins to the detriment of its neighbors. There are no safeguards against new users who wish to take more water that the resource can sustain or take the water and use it far from the overlying region, thus potentially crippling the local economy and impacting the region's future growth.

Another ironic twist is that proponents of groundwater districts as the state's preferred method of groundwater management also believe that this method best preserves private property rights under the Rule of Capture. However, district groundwater management and permitting in Texas more closely resembles the Reasonable Use Doctrine or American Rule which seeks to allow beneficial use as long as it does not unreasonably interfere with a neighboring well. In addition, these same private property advocates and proponents of the unfettered Rule of Capture also see districts as the primary means to limit private property rights when it comes to the export of water outside the district.

The Rule of Capture has been challenged in Texas courts based on the argument that the underlying facts and science concerning the effects of groundwater withdrawal are now well known or discernable. The most recent challenge was considered by the Texas Supreme Court in 1999 and involved the alleged impacts to neighboring wells caused by the new withdrawal of water by the Ozark Natural Spring Water Company. Although the Court recognized that hydroponic effects of groundwater withdrawal were now well known, the Court upheld the Rule. In doing so, the Court recognized that the Texas Legislature had recently reassessed groundwater management issues with the recent enactment of Senate Bill 1and stated

that this process should allow to be continued. Although deferring to the Legislature, in its opinion the Court also practically invited the Texas Legislature to reassess the Rule of Capture.

Another case worth noting involves the transfer of water from wells owned by Alcoa to San Antonio. Alcoa owns several wells used for depressurization for its lignite coal operations. In its surface mining permit from the Texas Railroad Commission (RBC), Alcoa is required to mitigate any impacts its wells cause to neighboring wells. This mitigation could include drilling a deeper well for the impacted well owner, or drilling a well into another aquifer, or otherwise maintaining a water supply for the impacted well owner. Alcoa has recently reached an agreement to sell and export the water from its well field to the San Antonio Water System (SAWS). At the time of the agreement, the wells were not within a groundwater district. However, as a part of the agreement with SAWS, Alcoa has agreed to maintain the same mitigation standard as is contained in its RBC permit. Such creative "win-win" agreements should also be considered in looking at ways the Rule of Capture could be amended.

It is likely that the private right to groundwater in Texas will be maintained. However, there are common law doctrines based upon private ownership of groundwater that provide more protection to the user as well as to the resource. These may include, but are not limited to, the American or Reasonable Use Doctrine (which Texas groundwater district management closely resembles), the Correlative Rights Doctrine practiced in California, or the Restatement of Torts (2d)/Eastern Correlative Rights Doctrine. These and any others should be thoroughly examined and, if appropriate for Texas, adopted to replace the archaic and ineffective Rule of Capture. Such doctrine should accommodate aquifer-wide management of a sustainable basis. This could be done by allocating water among existing users based upon historical and beneficial use principles and limited, as necessary, by the "safe yield" of the aquifer to provide for the long-term sustainable use of the aquifer. "Safe yield" would be determined, in part, as that amount of water that could be withdrawn from the aquifer without creating problems such as lowering the water table to levels where economic use of the water cannot be made, allowing subsidence or the intrusion of "bad water" to occur, and providing for the balancing of impacts of groundwater withdrawals to existing uses of hydroponically connected springflow and surface streams.

New uses may or may not be allowed, were necessary to protect existing uses of the aquifer's safe yield. In the absence of a local groundwater district, groundwater rights may be adjudicated by the state and the courts, similar to the adjudication of groundwater rights to the Edwards Aquifer or the rights to surface water. However, the private right to groundwater would be maintained. Such adjudication may be instituted by a petition of an affected groundwater right holder.

The adjudication of private groundwater rights would mean that withdrawals would have to be quantified, measured, and clearly defined. But it would also provide well owners with better legal protection of their existing uses of groundwater. Additionally, increased certainty as to the measure and protection of these rights would facilitate marketing of groundwater to help meet the alternative and future needs of the state.

Threat of Legal Challenges to Control of Private Property: The reluctance of districts to fully exercise their authority may be due to the fear of constitutional challenges to the alleged "takings" of private property. However, this has been overcome in a case involving the ability to curtail pumping by a subsidence district. The exercise of this "police" power to control private property was necessary, the court ruled, to protect the public health, safety and welfare. The ability to control groundwater withdrawal and use under the state's police powers to protect and manage this vital resource should be

clearly established under state statute and constitution to address the threat of legal challenges. This should include the ability to deny new uses, if necessary.

Management Is Not Required To Correspond to the Aquifer Boundaries: There exists no requirement that a district's boundaries correspond to the extent of the underlying aquifer for the purpose of the comprehensive management of the resource. This has resulted in multiple districts attempting to manage the same resource. This could result in the piecemeal, ineffective or conflicting management of the resource. However, districts that overly the same resource are required to coordinate with one another in the develop of their respective management plans.

Interstate Compacts: A lawsuit has been filed by the U.S. Bureau of Reclamation (BuRec) to quiet title to project waters in the Elephant Butte Reservoir in New Mexico. The reservoir stores water allocated to New Mexico and Texas under the Rio Grande Compact. The State of Texas is currently in mediation with New Mexico, Colorado, the U.S. Bureau of Reclamation and local irrigation districts and cities that rely upon project waters. A part of those negotiations include how to account for the impacts of groundwater withdrawals on stream flows, including reservoir releases, intended to meet downstream compact allocation requirements. Differing groundwater laws and abilities to limit the control over groundwater withdrawal have made an equitable and enforceable agreement difficult to achieve.

Threat of De-Annexation: The reluctance by many districts to exercise full authority may also have been based on the ability of any county to exclude itself from a district's jurisdiction through a landowner petition and voter-approved de-annexation process. With that option available to local pumpers, districts were not likely to pursue management practices (assuming they had the desire) that imposed significant limitations on its constituents.

Permit Exemptions: Although the powers of groundwater districts can provide significant management tools to a district willing to use them, they still fall short in many respects. Because of the many permit exemptions provided to certain wells and groundwater uses, a district may be unable to comprehensively manage withdrawals and resulting impacts to the aquifer. For example, exemptions currently exist for domestic wells of 25,000 gallons per day or less; water supply wells for ten families or less; wells used to provide water for livestock and poultry connected to farming, ranching or dairies; and wells used for oil, gas or mineral production prior to September 1, 1997. Nor may a district limit the number of new users or balance competing demands and purposes of use on a limited resource. Districts should be provided the discretionary authority to grant exemptions, depending upon whether the exemption was not in conflict with meeting the district's management goals.

Insufficient Water Quality Protection Authority: Additionally, most groundwater districts are not provided any express authority to prevent or control pollution of the aquifer from surface activities, nor were they expressly provided authority to consider the adverse effects of withdrawal on groundwater quality by the intrusion of "bad" water. This authority should be clearly and expressly provided. A few districts, however, have sought to act on water quality issues under their general authority and have achieved some results.

District Creation Hampered in Critical Areas: Prior to Senate Bill 1, state law made the creation of districts initiated by the state through the "critical area" designation process difficult and time-consuming. The designation was made by the state in response to information that the area was

experiencing critical groundwater supply and/or quality problems that warranted management. However, the process included a minimum of three hearings, including an evidentiary hearing, rulemaking, and a two-year waiting period after the designation and prior to the calling of a local confirmation election to see whether the legislature wished to address the issue. Additionally, if the election were held and failed, then the area within the proposed district was ineligible to receive state financial assistance for water and wastewater projects. This possibility, as well as the fear of groundwater regulation and additional taxes, created enormous political pressure on the Commission when it determined to designate a critical area or call a confirmation election.

Although Senate Bill 1 achieved some procedural efficiencies and eliminated the financial penalty for an unsuccessful confirmation election, the process still requires substantial and redundant notice and hearing requirements, including the requirement for an evidentiary hearing

VII. Conclusion

It is time for Texas to take a more pro-active approach toward groundwater and conjunctive management. Realistic water planning must acknowledge and account for the interrelationship of groundwater and surface water. Conjunctive use of groundwater and surface water is mandatory if Texas is to extend the use of its aquifers and, thus, meet its future water needs.

Senate Bill 1 went a long way to address these issues, but did not go far enough. Its continued reliance on groundwater districts to effectively manage groundwater still leaves most of the state vulnerable to groundwater depletion and degradation. In these areas, an alternative to the existing Rule of Capture is needed. In addition, the power of local districts controlled by locally elected boards over groundwater may need to be balanced in determining issues such as groundwater export. It is yet to be seen whether the coordination and consistency requirements between groundwater district and regional water planning efforts established under Senate Bill 1 will help solve this issue, or widen the gulf between rural and urban areas of the state.

It is anticipated that before the next legislative session, one or more interim committees will be created to continue to take up the issues of groundwater management in Texas. The three issues that have been identified so far are the creation of districts, their powers and duties, and the export of groundwater. It may take a much longer process or a significant water crisis for the state to finally come to grips with the Rule of Capture.

Conjunctive Use and Management of Surface and Ground Waters in the State of Colorado

February, 2000

Introduction

The first evidence of irrigation in Colorado is credited to the Anasazi Indians that lived in the southwestern corner of the state in the years 1000-1300 AD. The "ancient ones" built a series of small check dams that diverted spring runoff and sporadic storm events from the ephemeral streams in the Mesa Verde area to irrigate bean and maize fields. They also developed an intricate communal water delivery system to provide water for domestic uses. The Anasazi subsequently abandoned their elaborate cliff dwellings and their irrigation and farming practices without a trace. Speculation for their demise ranges from warfare with neighboring tribes to the predominant theory that a prolonged drought drove them from their homes.

At the forefront of western expansion, early trappers and traders established trading posts on the lower Arkansas River beginning in 1832. To support their need for stockwater and to grow crops necessary to support themselves, they constructed local river diversion and irrigation systems. Migration was not limited to settlement east of the Rocky Mountains from those coming from the American Midwest. Settlers and missionaries from the Republic of Mexico extended their territory in northern New Mexico to cross into a new frontier that is presently known as the San Luis Valley in southern Colorado. These families established the first town in Colorado, San Luis, and also constructed the cooperative People's Ditch on the Culebra River on April 10, 1852 - which is still in use today.

The genesis for Colorado's water allocation system is coincident with the California gold rush in 1849. Prospectors on their way to the famed Sutter's Creek, or on their way back home passed through the mineral-rich Rocky Mountains. It was during this time from 1850 to 1870 that the limited surface water supplies were depleted among different and diversely located mines using the water-intensive placer mining process that diverted water through a sluice box to separate the precious metals from the overburden. The water diversions for mining competed with irrigation, domestic, and stockwater diversions necessary to sustain the mining camps. In order to institute a fair, defensible, and effective water allocation system, the Colorado Constitution adopted the miners creed of "staking" a claim into the water allocation system known as the Doctrine of Prior Appropriation or informally as "first in time, first in right" or the priority system. Colorado initiated the first judicial adjudication of irrigation rights by priority and quantity in the Adjudication Act of 1879. It is interesting to note that the first judicial decree proceedings identified irrigation water rights only.

Distribution of available surface waters in accordance with the priority system in Colorado continues to date. Although groundwater wells were used since the late 1800's to provide limited domestic and stockwater supply, it was not until 1957 that the Colorado legislature first passed legislation regarding the orderly identification and permitting of groundwater wells. Enactment of Senate

Bill 113 required anyone seeking to construct a new water well or to increase the supply of an existing well to submit a well permit application to the Colorado State Engineer. This same act provided an exemption from the registration and permitting requirements for wells used exclusively for domestic or stockwatering purposes that had discharge pipes of two inches or less. Subsequent legislation in 1965, referred to as the Colorado Ground Water Management Act, created designated groundwater basins and established material injury standards against other water rights for non-exempt wells located both within and outside of the designated basins. In 1967, House Bill 1006 provided necessary refinement and clarification of the definitions of exempt wells and the standards of injury for the State Engineer's Office to use in the evaluation of pending non-exempt well permit applications.

The Colorado General Assembly created the conceptual framework to appropriate and administer tributary groundwater as a conjunctive supply with surface water in the 1969 Water Rights Determination and Administration Act. Groundwater appropriations in the designated basins, considered to be designated groundwater, or water not available to either surface water rights or adjacent to a continuously flowing stream, continue to be evaluated pursuant to provisions contained in the Ground Water Management Act.

Water Supply and Demand

Use of groundwater was limited in Colorado to small municipal wells serving rural communities and for on-farm domestic and stockwater wells until the early 1950's. Three concurrent events led to the expansive use and development of groundwater supplies - the drought of the mid-1950's that prompted surface water irrigators to look for alternative supplies to supplement declining streamflows, increased mechanical efficiency offered by advancements in turbine pump technology, and the availability of inexpensive electric energy provided by rural electric associations. Today, there are approximately 264,057 permitted groundwater wells in Colorado. Of that amount, the majority or 189,411 are used to provide domestic water for individual homes and businesses. However, approximately 15,000 are large-capacity wells typically permitted for flow rates of 100 to 5000 gallons per minute that are often used in center-pivot irrigation sprinklers. For the past five years, the State Engineer's Office receives, evaluates, and takes action upon an average of 10,500 well permit applications per year.

Groundwater in Colorado is divided into four classifications: tributary, non-tributary, not non-tributary and designated. Tributary groundwater is defined in the context that it is hydraulically connected to a flowing river or stream and it has a direct or tangible impact upon surface water rights. Stream systems in Colorado are classified as either under or over-appropriated. The term over-appropriated as applied within Colorado water administration is defined as a regular condition that occurs when there are insufficient waters available in time or amount to meet the demand of a water right owner/user. Most of the State of Colorado, with the exception of a few stream systems on the western slope, is considered to be over-appropriated. For the Arkansas River and Rio Grande River Basins, the demand by very senior water rights (priorities dating to the 1850's and 1860's) and interstate river compact delivery obligations in concert with marginal annual water supplies places these river systems on active river administration and curtailment of junior priorities on a constant basis throughout

the calendar year. For these and other over-appropriated stream systems, new groundwater wells that seek to pump tributary water from non-exempt structures (large capacity wells) must either provide augmentation water to replace their out-or-priority depletions or they are denied - even though they typically divert from the renewable groundwater alluvium.

Non-tributary groundwater is water that is not hydraulically connected to a surface stream and has a definition set in statute. If the depletion to the nearest stream or aquifer after 100 years of pumping is less than 0.1 percent of the annual rate of withdrawal then it is non-tributary groundwater. Furthermore, the annual appropriation is limited to 1 percent of the water in storage under the land owned or controlled by the applicant. In other words, overlying land ownership determines the right to use this groundwater.

Designated groundwater is somewhat different than tributary groundwater. To effectively administer these waters that are considered finite, the Colorado Groundwater Commission created eight designated basins that recognize the unique and distinct hydrologic/geographic regions. The eight designated basins are generally located on the eastern high plains of Colorado and encompass alluvial, Ogallala, and certain bedrock aquifers where groundwater has been the primary source of water and is not needed to supply senior surface water rights.

The fourth, and somewhat peculiar, type of legally recognized groundwater in Colorado is not non-tributary groundwater. By definition, "Not non-tributary groundwater means ground water located within those portions of the Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers that are outside the boundaries of any designated groundwater basin in existence on January 1, 1985, the withdrawal of which, within one hundred years, deplete the flow of a natural stream at an annual rate of greater than one-tenth of one percent of the annual rate of withdrawal" (reference: Colorado Revised Statute 37-90-103 (10.7)). Again, the amount of water available to a water user is based upon overlying land ownership and site-specific aquifer conditions.

Purpose of conjunctive surface and groundwater management

The purpose of conjunctive use in water management is simple in concept, but complex in practice. In the arid west, streamflows are typically highest in magnitude and extended in duration during the spring runoff. In an attempt to capture a fraction of these temporarily high flows, the historic water management practice was to build dams and storage reservoirs. A limitation to reservoir storage is their confined service area that can provide supplemental water to only those users that lie downstream from their outlet structures. Groundwater diversions offer the distinct advantage of extended geographic availability because they are not restricted to natural streams or topographic gradients. In a similar context to reservoir storage behind dams, groundwater aquifers provide a natural storage vessel that is recharged during the spring runoff season as well as during the irrigation season. In contrast to reservoir storage, groundwater aquifer storage encompasses a much broader geographical perspective and obtains late-season recharge through percolation from surface water irrigation. As an additional benefit, aquifers do not experience the depletive effects of evaporation and they also provide a cleaner source of water by natural filtration through porous materials. Therefore, the combined use of surface water (streamflows and reservoir storage) with

groundwater serves effectively toward providing a full and clean water supply throughout the period of demand by irrigators, municipalities, industry, etc.

While conjunctive use is desirable and is a way to maximize beneficial use, it must be done in a way to protect senior water rights. If a stream system is over appropriated and a senior water right is calling for its entitlement, depletions by junior wells must be replaced or the well should not be allowed to operate. In some stream systems such as the South Platte River, the call period by senior water rights is limited to 3 to 4 months per year. Thus the amount of replacement water could be much less than the total annual depletion depending on the distance of the well from the stream and aquifer characteristics.

The conjunctive use of groundwater as a supplemental source of supply, particularly in drought conditions, continues to garner favor among water resource managers. As a poignant example, the Denver Water Board recently sought to expand its water supply/ storage infrastructure by building a large on-channel dam that would impound waters from the South Platte River. Fraught with controversy from the start, the Two-Forks Reservoir Project met its demise in the form of a federal permit denial by the Environmental Protection Agency. Interpretation of the federal permitting process and inherent litigation in the Two-Forks Project led Colorado water managers to the conclusion that the historic practice of building large dams to capture excess flows during the spring runoff is often not a realistic option in today's political environment. Although large-scale reservoir projects were deemed impractical, is was still critical for water utilities to conduct long-range planning efforts and work toward providing adequate water supplies necessary to satisfy the anticipated domestic and municipal demands. Development of supplemental water supplies is not exclusive to municipal interests. Agriculturists continue to seek cost-effective and reliable sources of water to supplement the seasonal streamflows and limited reservoir storage to provide additional water during the late irrigation season. Learning from the Two-Forks Project, recharge projects that utilize the aquifer storage properties of the Denver Basin aquifers as a temporary storage vessel have gained considerable attention and favor in Colorado. Excess water that is both legally and physically available, typically during the winter and spring runoff seasons, is diverted, measured, and subsequently stored in groundwater aquifers for withdrawal at a later date. The advantages of recharge projects and conjunctive use of groundwater storage include: negligible or non-existent evaporation losses, increased water quality obtained through the natural filtration process of recharging and subsequent withdrawal of water through the porous medium of the aquifer; and enhanced drought protection afforded through an additional and often very large storage vessel.

The conjunctive use of groundwater through recharge, storage, and eventual diversion provides other important benefits to a water supply project. Recharge projects have proven to be a cost-effective alternative to the traditional surface water developments of importing water or building dams. Groundwater storage or recharge projects typically cost a fraction of surface/storage water development due to a combination of less capital-intensive structural requirements and fewer permitting requirements that are litigation intensive. These projects also garner environmental favor by the complementary effects of increasing the shallow water table that promotes the development and viability of wetlands and by the lack of inundation of a natural stream or surface lands by construction of dam that impounds surface waters.

A Summary of State Water Law

The foundation for Colorado State water law rests in Sections 5 and 6 of Article XVI in the Constitution that provides:

> Section 5: The water of every natural stream, not heretofore appropriated, within the State of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as herein provided.
>
> Section 6: The right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using water for the same purpose; but when the waters of any natural stream are not sufficient for the service of all those desiring to use of the same, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have preference over those using the same for manufacturing.

The interrelationship between tributary groundwater and surface waters has been long recognized in Colorado, but there is an important distinction between physical and legal interpretation. Groundwater wells in the river alluvium are easily observed and have a direct correlation with the amount of water in the stream system that rises and falls in a near- simultaneous fashion with changing river flows. For groundwater wells developed in the bedrock aquifers, the nearest stream may be many miles away and the delayed impacts of groundwater pumping to the stream may take days, weeks, months, or years depending upon the site-specific geographic and hydrogeologic conditions.

The State Engineer is vested with exclusive jurisdiction to administer, distribute, and regulate all tributary waters in Colorado. In terms of the conjunctive use of groundwater with surface water supplies, the State Engineer also has authority to promulgate rules and regulations that are necessary to administer tributary groundwater wells within the priority system and to assure compliance with interstate river compact obligations. The State Engineer's Office serves a parallel function of conjunctive water administration/ authority through the analysis and issuance of all groundwater well permits. It is within this realm that the State Engineer exercises administrative authority over Not non-tributary wells that seek to divert water that is non-tributary and not located within the legally-created designated groundwater basins. For designated groundwater that is located within the eight designated groundwater basins in the eastern high plains of Colorado, the General Assembly established a twelve member oversight board called the Colorado Ground Water Commission. The intent for creating this quasi-judicial entity was to provide a measure of local control and management in terms of protecting existing groundwater appropriators, to limit excessive depletions to the underground aquifers, and to consider the prevalent economic conditions for withdrawal of finite groundwater resources within the basins. The State Engineer serves as Executive Director of the Ground Water Commission and assumes all administrative and enforcement responsibilities for the permitting of groundwater wells in the designated basins.

As anticipated, the development of large-capacity irrigation wells since

the 1950's has significantly mined or depleted the amount of groundwater available in designated groundwater basins. For example, the Ogallala Aquifer provides significant groundwater supplies for eight states that in the high plains that stretch from Montana to Texas. Since 1965, the average annual water level decline in the Ogallala aquifer located in eastern Colorado is 0.5 feet. As a measure of dynamic groundwater management, in 1965 the Colorado Ground Water Commission allowed groundwater wells to deplete the calculated water availability by 40 percent in 25 years. Upon review of a comprehensive water level monitoring program, the actual depletion from 1965 to 1990 was 20 percent. Even though the rate of groundwater depletion was less than allowed, the Ground Water Commission adopted a more stringent policy to protect and sustain the aquifer by limiting new wells to a 40 percent depletion in 100 years. The effect of this new policy was the elimination of new well permits in the Northern High Plains Designated Groundwater Basin that encompasses 9200 square miles in northeastern Colorado.

Tributary groundwater wells must be permitted by the State Engineer's Office and may be adjudicated by the water court for that river basin. The basis, measure, and limit of a water right (surface or groundwater) is the application of water to a beneficial use. Ground water rights are limited to a reasonable amount that is necessary to accomplish the means of intended beneficial use, without waste. There is no "fixed" limit, but general principles are applied - such as 15 gallons per minute from a domestic groundwater well to serve a single-family home or commercial business. In a similar context, there is no restriction on the construction of the groundwater diversion structure (infiltration galleries or wells) or the size and type of pumps that may be installed. The conjunctive use of groundwater operates in accordance with the two tenets of Colorado water law - maximize the beneficial use of water and protect senior water rights from injury. To promote the beneficial use of conjunctive water supplies, groundwater wells may be legally and physically recognized as alternate points of diversion to surface water diversions. For example, a well located in the river alluvium may provide a supplemental or alternate point of supply to an irrigate field that historically was provided water from a ditch. Upon receipt of an adjudicated alternate point of diversion, Colorado water law will allow the water user to divert at either the ditch headgate, the well, or both to irrigate as long as the total diversions do not exceed the original amount decreed, and provided that there will not be injury to senior water rights.

Protecting Senior Surface Water Rights from Injury

Protection of senior water rights from injury, both surface and groundwater is more complex and difficult when groundwater diversions or water rights are involved. Contrary to the apparent and instantaneous measurement of surface water diversions, the impact caused from groundwater well diversions may take significant amounts of time to impact down-gradient water rights. For new water right applicants seeking to use groundwater that is located more than 100 feet from a flowing river, it is necessary for the applicants provide a Glover or Theis analysis to address delayed pumping impacts to the stream system. This burden is necessary to administer the groundwater diversion effectively within the priority system and to provide evidence to the court that an out-of-priority depletion replacement plan will provide perpetual protection to downstream vested water rights - even if the well ceases to divert. It is important to note that Colorado water law does not recognize a de minimus standard. Deprivation of any amount of water to a senior water right is considered to be injurious, regardless of the

source of supply.

Water administrators recognize the universal truth that effective and timely management of water resources is dependent upon accurate measurement. However, the quantification of water availability and its movement through subterranean aquifers is much more difficult than computing the amount of surface streamflows. Groundwater availability is usually determined through an interpretation of hydrogeologic information available through geologic maps and site specific well-bore samples. The rate and direction of flow through an aquifer may be approximated through groundwater modeling. Measurement of groundwater withdrawal is a much more tangible and defensible exercise. In Colorado, both totalizing flow meters and the use of power conversion factors have proven to be effective and accurate procedures to administer groundwater within the priority system. Flow meters offer the advantage of being able to instantaneously determine the amount of diversion as well as record the volumetric amount of pumping that has occurred between two observations. Dependent upon site-specific conditions, flow meters often succumb to the disadvantage of becoming inaccurate or ineffective if the well water carries an inordinate amount of sand. As an alternative, power conversion measurement has proven to be accurate and cost-effective. Employed in the Arkansas River Basin, this method has gained wide acceptance for its accuracy and ability to track monthly diversions from 2000+ irrigation wells. The total amount of water pumped can be calculated by dividing the change in electric meter readings by the discrete pump's power consumption coefficient. Although site-specific inspections continue to assure compliance, this method provides local water administrators with basin-wide groundwater pumping information in the form of power consumption data that is forwarded on a monthly schedule by local utilities to staff of the State Engineer's Office in an electronic format.

Companion to the administrative duties for the allocation and distribution of groundwater supplies, the Colorado General Assembly recognized the need to protect the source of supply against direct contamination by improperly constructed wells. To accomplish their intent to safeguard the health of the public and protect the quality of groundwater, the legislature created an oversight entity referred to as the State Board of Examiners of Water Well Construction and Pump Installation (Board). This is a five-person board that is composed of representatives from the well driller and pump installation contractor industry, a representative from the Department of Health and the Environment, and the State Engineer who serves as Executive Director. Staff from the State Engineer's Office work in concert with the Board to promulgate rules and regulations for the construction of water wells and installation of pumps. Enforcement of the Rules is accomplished through the State Engineer's Office who is responsible for investigating allegations of improper construction techniques or violation of licensing requirements that are may subsequently be brought before the Board for possible discipline or legal action(s).

State water planning and management

The need for water planning and effective management of this precious resource is both paramount and perpetual. The foundation for both planning and administration is the inextricably intertwined demand for the application of good science and engineering principles, accurate data, and the development of effective tools to aid the water resource mangers. Seeking to incorporate all

three, an effective form of technical assistance is afforded from decision support systems. Decision support systems that model the conjunctive use and demand of surface and groundwater supplies and provide optimal operating and water administration tools continue to gain value and implementation in water administration. Concentrated efforts by the State Engineer's Office and its sister agency the Colorado Water Conservation Board have resulted in a comprehensive decision support system for the Colorado River Basin. The State Engineer's Office and Water Conservation Board are extending the benefits of the Colorado River basin effort into other areas of the state. Specifically, the Rio Grande Decision Support System is currently being developed as a comprehensive river planning and administrative tool that incorporates the complex conjunctive use and supply from two distinct groundwater aquifer systems with the available surface waters.

To complement the advances offered through technology, it is necessary to continue efforts to advance the knowledge and competence of staff that are responsible for carrying out the conjunctive administration of water resources. To retain an effective and professional workforce, the State Engineer's Office strives to fund and implement a comprehensive training and education program. The range and scope of education varies from technically oriented GIS applications and groundwater modeling to promoting supervision skills through empathic listening. Succinctly, the staff of the Colorado Division of Water Resources are recognized as the most valued asset to the agency and accomplishment of its objective to perform the highest level of water administration and service to the citizens of Colorado is dependant upon their expertise.

Conclusion

The conjunctive use of groundwater with surface waters continues to advance in Colorado. Most of the state, including the designated ground water basins on the eastern high plains, are considered to be over-appropriated - which means new groundwater well diversions or underground water rights will not be allowed unless a water user provides other waters to replace their out-of-priority depletions. Conjunctive use management of water in Colorado has matured beyond the simplistic approach of exploiting new water supplies by drilling groundwater wells to supplement diminishing surface water supplies. Water administrators clearly recognize that all sources of water supply and their relevant infrastructure offer both opportunities and obstacles to meet the insatiable thirst of increasing growth and development. Only through the full integration of streamflows, reservoir storage, and groundwater aquifers can the astute water administrator meet current water needs as well as exercise a measure of warranted stewardship for this precious and finite natural resource.

Updated – 7/3/02

CONJUNCTIVE USE AND MANAGEMENT OF SURFACE AND GROUNDWATER IN THE STATE OF NEBRASKA

This purpose of this paper is to provide background information on laws relevant to conjunctive use of surface and groundwater in Nebraska. Included are sections on historical background, Nebraska Water Law, Nebraska Water Law relevant to surface water – groundwater relationships, state water planning and management and potential conjunctive use issues.

I. Historical Background

Irrigation in Nebraska began in the late 1850's, and by 1890 there were about 12,000 acres irrigated in the state. Early irrigation relied primarily on the riparian rights system derived from the common law of England. Legislative bills in 1877 and 1889 included some limited irrigation provisions. However, it was the drought years of 1889-1895 that helped provide the political momentum that ultimately resulted in the legislature's passage of an 1895 act adopting the appropriation system. The 1895 law and resultant *"first in time, first in right"* priority system remain the basis for surface water rights administration in the state.

Surface water use expanded considerably in the ensuing decades with Bureau of Reclamation projects on the North Platte (early 1900's), the Tri-County Project (1941), and projects on the Republican (1949-1962) among the projects that assisted that expansion. Surface water irrigated acreage approached current levels by the mid to late 1960's.

In the 1940's groundwater irrigation in Nebraska began to expand at a rapid rate. Groundwater irrigated acreage was probably less that a tenth of surface water irrigated acreage in 1940 and yet surpassed it by sometime in the early 1950's. Installation of groundwater wells peaked in the mid 1970's and groundwater irrigated acreage has expanded more slowly since that time. Today surface water irrigated acreage accounts for only about 1 million of Nebraska's 7.5 to 8.15 million irrigated acres. Nebraska currently ranks second in the nation in total irrigated acreage and first in the nation in acreage irrigated from wells. Groundwater wells also supply about 81% of the state's public water supply customers and virtually all of the rural domestic supply.

The rapid expansion of groundwater has helped lead to a number of significant changes in the way the state administers water resources and other natural resources. In 1957 bills passed requiring registration of irrigation wells and a 600 foot minimum spacing between irrigation wells. Then in 1969 the Nebraska Unicameral passed a bill consolidating and expanding the duties of Soil and Water Conservation Districts and a variety of other special purpose districts into 24 (now 23) local natural resources districts (NRDs). The responsibilities and authorities of the NRDs have expanded considerably since that time. One of those expansions was passage of groundwater control area legislation in 1975. That legislation has evolved into today's Groundwater Management and Protection Act which serves as the basis for Nebraska's local control approach to groundwater management. One of the major expansions of that act occurred in 1996 when passage of LB 108 provided the NRDs with responsibilities and authorities relating to management of hydrologically connected surface water and groundwater.

Surface water and groundwater relationships are particularly important to Nebraskans in two major instances. Half of the public water supply for the Omaha Metropolitan Area and all of

the public water supply for Lincoln, Nebraska's two largest cities, comes from wellfields inducing recharge from the Platte River. In 1993 the Unicameral passed legislation allowing cities to obtain water rights to the flows needed for induced recharge. Integrated use of surface and groundwater is also a special consideration in portions of the Central Platte region, especially the area of the Tri-County project. Surface water use in the project region has helped lead to build-up of a groundwater mound that can serve as the basis for groundwater irrigation and help sustain flow by seepage in periods of off-peak flow. In addition to these two instances, surface water – groundwater relationships are significant factors on several major interstate lawsuits or agreements – the Platte River Cooperative Agreement and the Kansas-Nebraska lawsuit on the Republican River compact and the Nebraska - Wyoming settlement related to the North Platte Decree.

The groundwater level rises in the Tri-county region are in contrast to groundwater level drops from predevelopment in several areas of the state. Portions of the Upper Republican, Box Butte County, the Blue Basins and some other smaller areas have experienced significant groundwater declines since predevelopment. However, overall Nebraska's generous groundwater supplies are in contrast to many of its neighbors in the High Plains Region and the groundwater level declines experienced in parts of those states. Nebraska has about 38 ½ % of the total area of the high plains aquifer system and about 65 ½% of the drainable water in storage. Ironically, the area of most abundant groundwater supply (up to 1200 feet of saturated thickness) lies under the central portion of the Sandhills, an area generally not suitable for irrigation. Also, well over half of the state's population lives in the eastern 16% of the state not served by the High Plains aquifer system.

II. General Summary of Nebraska Water Law

Surface Water

The foundation for Nebraska's surface water rights system is found in Article XV, Sections 4 through 7 of the Nebraska Constitution, especially Sections 5 and 6 which provide:

> *"Sec. 5. **Use of water dedicated to the people.** The use of the water of every natural stream within the State of Nebraska is hereby dedicated to the people of the state for beneficial purposes, subject to the provisions of the following section.*
>
> *Sec. 6. **Right to divert unappropriated waters.** The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied except when such denial is demanded by the public interest. Priority of appropriation shall give the better right as between those using the water for the same purpose, but when the waters of any natural stream are not sufficient for the use of all those desiring to use the same, those using the water for domestic purposes shall have preference over those claiming it for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes. Provided, no inferior right to use the waters of this state shall be acquired by a superior right without just compensation therefor to the inferior user."*

In general, rights to use surface water are obtained by acquiring a state permit. The permit can be denied if there is insufficient water or if it is not in the public interest. Administration of the water right in times of shortage is based upon the *"first in time, first in right"* principle, with senior rights receiving priority. In practice, the preferences listed above in Article XV Section 6 have limited value. Three different major types of appropriative rights are issued – natural flow, storage, and storage use. Permits are also issued for wells for irrigation that are located within 50 feet of a stream (such wells are considered to be surface water uses) and for pumping from a natural lake.

Rights are lost by non-use, but specified excuses for non-use are allowed. For natural flow rights quantities allowed for irrigation are limited to 1 cubic foot per second per 70 acres irrigated and 3 acre feet per year. Instream appropriations may be obtained for recreation, fish and wildlife purposes. Only natural resources districts or the Nebraska Game and Parks Commission may file for streamflow rights and such rights do require that the Director of Natural Resources make additional findings beyond those associated with most other types of water rights.

Surface water right transfers are allowed, subject to a variety of public interest and other requirements. Included is a prohibition against transfers that would change the type of use, i.e. agricultural rights can be transferred to another agricultural user, but not to a domestic or industrial use. Although interbasin transfers are allowed, they must be treated the same as other appropriation requests, plus the benefits to the state from the transbasin diversion must be equal to or greater than those from denying it. Nebraska surface water management is also subject to the provisions of the U.S. Supreme Court Decree on the North Platte River and Congressionally approved compacts governing interstate use of the South Platte, Republican, Upper Niobrara and Blue Rivers. Surface water quality is regulated through the Nebraska Department of Environmental Quality through a variety of regulations.

Groundwater

Groundwater in Nebraska belongs to the public, but landowners have the right to make reasonable and beneficial use on overlying lands. That right is subject to the correlative rights of others and public management policies. Preferences somewhat similar to those for surface water apply, but have been little used thus far. In 1957 the Unicameral passed legislation requiring the registration of all irrigation wells. Registration of all water wells drilled since September 9, 1993, including domestic wells is now required. Six hundred foot spacing is required between irrigation wells of different owners. One thousand foot spacing is required between industrial water wells, public supply wells and irrigation wells. Runoff of irrigation water from groundwater sources is regulated by natural resources districts. Transfers of groundwater off the overlying land are allowed for geothermal, large scale industrial, public water supply, and agricultural purposes. Transfers across state lines are also allowed if a variety of specified conditions are met.

Nebraska's 23 natural resources districts play a major role in groundwater quantity and quality management, primarily through the Groundwater Management and Protection Act. That act also has provisions related to the integrated management of hydrologically connected groundwater and surface water. All districts are required to have groundwater management plans that contain information about supply and groundwater quantity or quality problems as well as management objectives, a proposed reservoir life goal, groundwater quality goals and solutions, and proposed controls. Groundwater management areas can be formed to address problems

relating to quantity, quality, or integrated management of surface water and groundwater. Natural resources districts have a variety of potential controls for management areas, including:

Allocations of Withdrawals
Rotation
Reduction of Irrigated Acres
Limit or Prevent the Expansion of Irrigated Acres
Well Spacing
Metering/Monitoring
Use of Best Management Practices
Chemical / Fertilizer Analysis of Water or Deep Soil
Mandatory Education
Moratorium on New Wells
Other Reasonable Rules and Regulations

With a few exceptions, new wells pumping greater than 50 gallons per minute in ground water management areas must have a permit from the natural resources district before drilling. Nebraska currently has 23 natural resources districts, of which 17 have district-wide ground water management areas. Two additional districts have a portion of their district within a management area. All of the management areas are focused on water quality with 7 of the areas also addressing water quantity. There are two management areas which encompass integrated management, one is a district-wide area and one is a subarea of a district-wide management area. Natural resources districts also conduct a variety of education programs, have programs for groundwater level measurement and groundwater quality monitoring, are responsible for chemigation inspections, and can fund studies. The NRDs also administer soil and water conservation incentive monies and have project construction authorities. Their local property tax base and available federal and state funding sources have helped contribute to supplemental water project construction in the state.

The Nebraska Department of Environmental Quality maintains a wide variety of water quality powers. These include regulation of point sources of pollution, source water protection, and coordination of state wellhead protection efforts. State pesticide management efforts are coordinated through the Nebraska Department of Agriculture.

III. Nebraska Water Law Relevant to Surface Water – Groundwater Relationships

In 1997 passage of LB 108 expanded the Ground Water Management and Protection Act to include authorities related to integrated management of hydrologically connected groundwater and surface water. The language of the act indicated that *"Hydrologically connected ground water and surface water may need to be managed differently from unconnected ground water and surface water in order to permit equity among water users and to optimize the beneficial use of interrelated ground water and surface water supplies"*.

The act identifies natural resources districts as the *"preferred entities"* to regulate groundwater related activities that could contribute to conflicts between ground and surface water users. That preference also extends to groundwater management activities that may be necessary for resolving interstate compact or decree disputes or for carrying out state compacts or agreements. The Nebraska Department of Natural Resources is identified as the entity which

should be responsible for surface water activities contributing to such conflicts or providing opportunities for such dispute resolution.

Additional language states:

> *"46-656.06 Conflicts between ground and surface water use: legislative intent. The Legislature recognizes that ground water use or surface water use in one natural resources district may have adverse effects on water supplies in another district or in an adjoining state. The Legislature intends and expects that each natural resources district within which water use is causing external impacts will accept responsibility for ground water management in accordance with the Nebraska Ground Water Management and Protection Act in the same manner and to the same extent as if the conflicts between ground water use and surface water use were contained within the district."*

LB 108 provided three new reasons for establishment of a groundwater management area: 1) prevent, eliminate, or reduce in-state conflicts between ground water users and surface water appropriators, 2) resolve disputes over interstate compacts or decrees, or 3) carry out the provisions of other formal state contracts or agreements. These management areas can be established by any one of three procedures. First, an NRD can create a management area for integrated management of hydrologically connected supplies primarily on its own, in the same manner as it would for other purposes. While this method is the easiest to use, it allows the NRD only to manage groundwater that interferes with surface water use; it does not provide for any comparable surface water management that might help reduce or eliminate the conflict.

For purposes of integrated management only, a management area also can be designated in accordance with either of two independent procedures in the bill. The first can be initiated only by a natural resources district but, once initiated, will involve a partnership effort among the NRDs, the Department of Natural Resources, and surface water users. (Section 46-658.28) Joint action plans can be developed by those parties working together to address the surface water and ground water conflicts. The second independent procedure allows the Department of Natural Resources to initiate designation of a management area on its own. (Sections 46-656.49 to 46-656.60) It can also be used by DNR to require preparation of an action plan for integrated management in an already existing management area. Use of that process is limited to situations where there are disputes over interstate compacts or decrees or *"other formal state contracts or agreements"*.

Even if DNR initiates and establishes a management area under this procedure, DNR is not authorized to implement controls on ground water users unless the applicable NRD(s) refuse to develop an action plan for the management area or if an NRD-developed plan is not approved by DNR. (Section 46-656.60) In the event that DWR would propose to take over actual groundwater management responsibilities, an Interrelated Water Review Committee consisting of the Governor and two members of the Natural Resources Commission selected by the Commission would serve as a buffer between DNR and the NRD(s). DNR could assume jurisdiction and adopt ground water regulations only if the Interrelated Water Review Committee agreed. (Sections 46-656.60 – and 46-656.61)

The statutes also encourage ground water and surface water users to work together to resolve existing or potential conflicts between them. The burden for avoiding or mitigating conflicts does not rest just on the shoulders of the ground water users. If management areas are

designated using either of the two independent procedures, two-part action plans are anticipated. The first part is what the natural resources districts will do to manage groundwater. Those controls were previously mentioned. The second part relates to surface water and how it will be managed differently. (Sections 46-656.28 and 46-656.54) That part of the action plan can include the following surface water related controls:

- increased monitoring and enforcement of surface water diversions
- a moratorium on additional appropriations
- requirements for surface water appropriators to apply or utilize reasonable conservation measures
- other reasonable restrictions on surface water use

The surface water part of the action plan is to be developed by DNR with the assistance of the affected surface water users, including the surface water project sponsors.

Nebraska law also makes provision for the recognition of **incidental and intentional underground storage** of water. The law allows parties to file for new water rights for surface water projects that will result in intentional underground water storage. Those with approved but unperfected rights for use of surface water may also file for a modification of their water right to include intentional underground storage associated with the appropriation. Fees may be assessed on non-domestic wells pumping over 100 gallons per minute for use of **intentional** underground storage water associated with projects not existing before August 26, 1983. Those who have perfected appropriations may file for recognition of the **incidental** underground storage associated with such appropriations, but no fees can be assessed on the users or other beneficiaries of such **incidental** storage. The law includes language noting:

> *"The Legislature finds that uses of water for incidental and intentional underground water storage are beneficial uses of water which contribute to the recharge of Nebraska's aquifers and that comprehensive, conjunctive management of surface water and intentional or incidental underground water storage is essential for the continued economic prosperity and well-being of the state, serves the public interest by providing an element of certainty essential for investment in water resources development, and will improve Nebraska's standing in the event of interstate dispute".*

Public water suppliers may obtain an appropriation for induced groundwater recharge of wells completed prior to September 9, 1993 provided the Director of Natural Resources finds the appropriation is necessary to maintain the well for the uses requested, the rate and timing of flow requested is reasonable for those uses, and the application is in the public interest. For wells drilled after September 9, 1993 additional requirements must be met.

Other important provisions of Nebraska's groundwater law include:

1. An NRD may treat groundwater users differently on the basis of date of drilling, but there are two limitations on that authority. (Section 46-656.25) First, that can be done only for purposes of integrated management and secondly, the date used for such differential treatment can be no earlier that the date of designation of the management area for integrated management purposes.

2. An NRD may treat groundwater users differently on the basis of different hydrologic relationships between groundwater and surface water. (Section 46-656.25) For example, wells in alluvial aquifers could be treated differently from "upland" wells

even if they are also hydrologically connected to surface water supplies, but would affect surface water supplies in a different way.

3. Replacement wells have to be treated the same as the wells they replace. (Section 46-656.25) However, the district does have some authority to define what constitutes a replacement well.

4. For purposes of determining whether conflicts exist between groundwater users and surface water appropriators, surface water appropriators do not include holders of instream flow appropriations. (Section 46-656.25)

IV. State Water Planning and Management

Nebraska's water planning and management take place on several different levels. Each natural resources district has a master plan, a long range implementation plan, and a groundwater management plan. These provide the local direction for water and other natural resource related activities.

The Department of Natural Resources is responsible for directing a state water planning and review process and provides assistance to the NRDs in selected planning and modeling/data manipulation activities. The DNR is also responsible for water rights administration, well registrations, floodplain regulation, dam safety, stream and canal gaging, NRD groundwater management plan approval, maintenance of a natural resources data bank, and representing the state in water compact and decree administration. The DNR also administers a variety of water resources related funds, including a Resources Development Fund for a variety of water related projects, a Soil and Water Conservation Fund, and a Small Watersheds Flood Control Fund.

The Nebraska Department of Environmental Quality is responsible for a variety of water quality regulatory programs and selected water quality planning efforts. The Nebraska Department of Agriculture is responsible for the state pesticide management strategy, and the Nebraska Department of Health and Human Services administers the Safe Drinking Water Act statutes / public water supplies. Other water related agencies include the University of Nebraska Conservation and Survey Division, the UNL Water Center, the Nebraska Game and Parks Commission, and irrigation and reclamation districts.

Overall, regulatory action related to the interrelationship of surface water and groundwater in Nebraska generally falls to either the local natural resources district or the DNR. However, a wide range of state, local and federal agencies can assist in studies or research related to the topic.

V. Potential Issues Related to Surface Water - Groundwater Relationships

Nebraska has a number of tangible existing issues or administrative efforts in which surface water – groundwater relationships are a significant factor. These include the Kansas versus Nebraska lawsuit relating to the Republican River Compact, the Platte River Cooperative Agreement, the Nebraska - Wyoming settlement relating to the North Platte Decree, and potentially threatened and endangered species requirements on the Lower Platte River.

There are a number of general physical situations that current or perhaps future laws may be used to address. These include:

1. Addressing the impacts of groundwater pumping on surface water users, especially prior surface water users
2. The potential use of groundwater to supplement streamflow
3. The impact of streamflow on groundwater recharge
4. Management of water levels in areas subject to higher groundwater tables due to surface water projects
5. Integration of surface water and groundwater use in an optimum manner to increase the effectively usable water supply.

A variety of current research efforts seem likely to add to the physical knowledge of surface water – groundwater relationships in the state. However, the degree to which surface water – groundwater relationship questions are addressed under current law is likely to depend upon the interest level of local NRDs or the degree to which interstate factors or state agreements result in state involvement.

August 2004

Managing Hydrologically Connected Surface and Ground Water: Practices from Other Western States

J. David Aiken, J. Michael Jess, Sandra Zellmer, & Joshua McMahon[1]

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The 2004 Nebraska Legislature addressed this blunt hydrologic fact in adopting LB962. In doing so, Nebraska becomes the first western state to explicitly and meaningfully consider the effects of ground water pumping on streamflows in making water allocation decisions.

Beginning January 1, 2006 the DNR must make annual evaluations of "the expected long-term availability of hydrologically connected water supplies for both existing and new surface water uses and existing and new ground water uses in each of the state's river basins." NRS 46-713(1)(a). For each river basin, subbasin, or reach evaluated, the report shall describe (I) the nature and extent of use of both surface water and ground water in each river basin, subbasin, or reach, (ii) the geographic area within which the DNR preliminarily considers surface water and ground water to be hydrologically connected and the criteria used for that determination, and (iii) the *extent to which the then-current uses affect available near-term and long-term water supplies*. Id (emphasis added).

Based on the information reviewed in the evaluation process, the DNR shall arrive at a preliminary conclusion for each river basin, subbasin, and reach evaluated as to whether such river basin, subbasin, or reach presently is ***fully appropriated*** without the initiation of additional uses. NRS 46-713(1)(b) (emphasis added).

A river basin, subbasin, or reach shall be deemed fully appropriated if the department determines that then-current uses of hydrologically connected surface water and ground water in the river basin, subbasin, or reach cause or will in the reasonably foreseeable future cause

> (a) the surface water supply to be insufficient to sustain over the long term the beneficial or useful purposes for which existing natural flow or storage appropriations

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[1]Professor of Agricultural Economics (Water & Agricultural Economics); Associate Director, Water Center; Associate Professor of Law, and J.D. 2005, University of Nebraska. Professor Aiken was responsible for reviewing statutes and secondary sources, and prepared this written report. Mr. Jess interviewed agency officials, a summary of which is appendix B. Mr. McMahon reviewed materials available over the web, principally statutes and administrative regulations, under the supervision of Professor Zellmer. A summary of this work is appendix A. The short amount of time allowed for the study means that it could not be prepared to meet normal academic standards. Earlier drafts of this report have been reviewed by the entire team, but this final report has been prepared and reviewed solely by Professor Aiken, who takes sole and complete responsibility for any mistakes and omissions.

were granted and the beneficial or useful purposes for which, at the time of approval, any existing instream appropriation was granted,

(b) the streamflow to be insufficient to sustain over the long term the beneficial uses from wells constructed in aquifers dependent on recharge from the river or stream involved, or

(c) reduction in the flow of a river or stream sufficient to cause noncompliance by Nebraska with an interstate compact or decree, other formal state contract or agreement, or applicable state or federal laws. NRS 46-713(3).

Finally, a river basin, subbasin, or reach shall be deemed ***overappropriated*** if, on July 16, 2004, the river basin, subbasin, or reach is subject to an interstate cooperative agreement among three or more states and if, prior to such date, the DNR has declared a moratorium on the issuance of new surface water appropriations in such river basin, subbasin, or reach and has requested each NRD with jurisdiction in the affected area in such river basin, subbasin, or reach either (I) to close or to continue in effect a previously adopted closure of all or part of such river basin, subbasin, or reach to the issuance of additional water well permits in accordance with NRS 46-656.25(1)(k) as such section existed prior to July 16, 2004, or (ii) to temporarily suspend or to continue in effect a temporary suspension, previously adopted pursuant to NRS 46-656.28 as such section existed prior to July 16, 2004, on the drilling of new water wells in all or part of such river basin, subbasin, or reach. NRS 46-713(4)(a).

By September 15, 2004, the DNR shall designate which river basins, subbasins, or reaches are overappropriated. The designation shall include a description of the geographic area within which the department has determined that surface water and ground water are hydrologically connected and the criteria used to make such determination. NRS 46-713(4)(b).

The DNR is required to identify river basins or portions thereof that are either fully-appropriated or overappropriated, taking into account the stream depletion effect of existing wells withdrawing hydrologically connected ground water. In general terms, the DNR must determine whether the stream depletion resulting from pumping hydrologically connected wells will now or in the future interfere with existing surface water appropriations. If so, the basin, subbasin or stream reach is overappropriated. If not, but if stream depletion from new hydrologically connected wells would interfere with existing surface water appropriations, the basin, subbasin or stream reach is fully appropriated. Conceptually, this process involves three major steps: (1) determining what ground water is hydrologically connected, (2) determining the long-term effect of withdrawals from current wells on the ground water supply, including possible stream depletion effects, and (3) the long-term availability of streamflow to meet current surface water rights and uses.

No western states currently makes such "fully appropriated" or "overappropriated" determinations for streams and hydrologically-connected ground water. However, some western states do make similar but more limited determinations, e.g. (1) in defining ground water as being tributary or hydrologically connected, (2) in determining whether "critical" ground water areas should be closed to new uses, or whether unappropriated ground water is available for appropriation; and (3) whether unappropriated surface water is available for appropriation. A brief description of these procedures may assist the DNR in making its fully-appropriated and overappropriated determinations.

Because there are so few useful precedents we will simply describe the relevant authorities and administrative practices of each western state. By way of background, all

western states follow the doctrine of prior appropriation for surface water allocation, and most (but not all) western states follow appropriation for ground water allocation. However the appropriation procedures vary widely among states. Further, appropriation is only a partial basis for surface water allocation in California and Texas, and is not a significant basis for ground water allocation in California, Texas, Arizona or Nebraska. There is also wide variation regarding authority for state appropriation officials to determine that there is no surface or ground water available for appropriation.

Another important issue is the extent to which hydrologically connected surface and ground water are treated as a single source. Some states apply appropriation to both surface and ground water. Some states apply appropriation to surface water but only to some categories of ground water. Two broad categories of ground water relevant to this discussion are (1) water in an underground stream and (2) tributary ground water. Although precise definitions vary from state to state, in very broad terms wells that induce ground water recharge from a surface stream would usually be considered to be pumping water from an underground stream, or from the underflow of a surface stream (for our purposes the two terms are synonymous). Tributary ground water is ground water that would ultimately reach a stream if not first intercepted by a well. Arizona and Texas follow the underground stream/underflow doctrine; California and Colorado follow the tributary stream doctrine. Some states (such as California) recognize the relationship between hydrologically connected and surface water principally through court decisions.

Arizona

Surface water law. Prior appropriation is the rule for surface water allocation. ARS 45-101, -101(A). Prior to 1919, surface water appropriations could be acquired by meeting notice and actual water use requirements. After adoption of the 1919 irrigation code, appropriations were obtained upon application to the state water commissioner. 6 Waters & Water Rights at 214-15 (1994). However, pre-1919 priorities were not adjudicated, and Arizona is currently adjudicating priorities on most of its streams. Id. at 209. Unappropriated water is available for appropriation. NRS 45-151(A). No statutory criteria to aid in determining whether a stream is unappropriated.

Prior appropriation also applies to water "in definite underground channels". 6 Waters & Water Rights at 205-06. Arizona courts have interpreted the "definite underground channel" language to include only the "underflow, subflow, or undercurrent" of a surface stream; this is the only ground water in Arizona that is also subject to appropriation. This subflow/underflow doctrine has recently been affirmed by the Arizona courts. Id. The Arizona Department of Water Resources (DWR) had proposed a test that a well could be considered to be withdrawing surface water if the well's stream depletion was at least 50% of total pumping within 90 days of continuous pumping. Id. at 206. This test was rejected by the Arizona supreme court as not being the subflow of a surface stream. Id. at 207. A narrower test limiting subflow to the "saturated floodplain Holocene alluvium" was subsequently approved by the court. In re Gila River General Adjudication, 9 P.3d 1069, 1080-81 (2000).

Ground water law. Traditionally Arizona has followed the rule of reasonable use, similar to Nebraska. Thus no state permits were required to drill irrigation wells. In 1980 Arizona adopted the Arizona ground water code to control ground water depletion. ARS 45-401 et seq. The 1980 statute designated four active management areas (AMAs) and two irrigation non-expansion areas (INAs). ARS 45-411. A fifth AMA was designated by statute in 1994. A third INA was designated by the Director of the Arizona Department of Water Resources. ARS 45-432(a); 6 Waters & Water Rights at 209-10. Ground water pumping is being gradually reduced

in AMAs and new high-capacity well drilling is severely limited. No new irrigation are allowed in INAs, but existing uses are not regulated. Id. at 210. ARS 45-512. The ground water management goal is to reach safe yield by 2025, taking into account water availability from the Central Arizona Project. ARS 45-562. .

California

Surface water law. California law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 243ff. Since December 19, 1914, new surface water appropriations (including appropriations of ground water in a known and definite channel) are subject to state approval, currently from the State Water Resources Control Board. Id. at 245-46; Cal. Water Code §1225. However, the widespread existence of active riparian rights complicates surface water administration in California. The SWRCB has conditioned new appropriations on maintaining instream flows for environmental purposes. 6 Waters & Water Rights 248. The SWRCB uses a formal "water availability analysis" to help it determine whether unappropriated water is available (for more detailed information, go to www.waterrights.ca.gov/WaterAvailability/default.html#watercode). See Appendix B [Jess] at 3-4.

Ground water law. Ground water is not subject to state permitting, unless the ground water is being pumped from a known and definite underground channel. Only in Texas do ground water pumpers have fewer pumping restrictions than in California. California courts have ruled that tributary ground water is legally considered to be part of the stream and is subject to surface water law (riparian and appropriative). Sax, "We Don't Do Groundwater: A Morsel of California Legal History," 6 U. Denver Water L. Rev. 269 (2003).

Colorado

Surface water law. In Colorado, "the right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied." Colo. Const. art XVI §6; cf. CRS 37-82-101 (waters of natural streams, including tributary ground water, are subject to appropriation). The primary limit on appropriations is that they not harm senior appropriators. CRS 37-82-104. The Colorado state engineer does not grant permits for new appropriations, as is common in other western states. Instead, acquiring new water rights is a judicial process. Applications for conditional water rights are filed with the clerk of the local water court. Once the conditional right is decreed by the court (after notice and hearing), the appropriation must be perfected by application to beneficial use. Then the appropriator may apply to the court for a decree for the perfected appropriation. 2 Waters & Water Rights 15-48 to -52; CRS 37-92-101ff. Clearly there is no administrative process for determining whether unappropriated water is available for surface water or tributary ground water.

Ground water law. Appropriation applies to tributary ground water. 6 Waters & Water Rights 256. The process for obtaining an appropriation of tributary ground water is similar to acquiring a surface water appropriation through the water courts.

Colorado statutes do establish when ground water is not tributary ground water. Nontributary ground water is water (outside a designated ground water basin–discussed below) that, when withdrawn, does not deplete the flow of a natural stream within 100 years greater than one-tenth of one percent of the annual rate of withdrawal." CRS 37-90-103(10.5). For example, a well pumping 200 acre-feet per year for 100 years (20,000 acre-feet total) would be tributary if it depleted streamflow at a rate exceeding 0.20 acre-feet per year within the 100 years. This is one method (very inclusive) for defining what constitutes tributary (or

hydrologically connected) ground water.

The Colorado ground water commission regulates ground water use within designated ground water basins. 6 Waters & Water Rights 256. The commission uses a "three mile test" to determine whether unappropriated ground water is available for new wells. The basic process is that a circle with a three-mile radius is drawn around the proposed well. If the total authorized ground water withdrawals within the circle plus the ground water sought to be appropriated would deplete the ground water within the circle more than 40% in 100 years (formerly in 25 years), the permit for the new well is denied. The formulas implementing this regulation are included in the commission's designated ground water rules, which were emailed to the DNR on August 4, 2004. This is one method for determining whether unappropriated ground water is available for appropriation. It is also a method for allowing new wells in areas that have otherwise been closed to new well drilling where supplies will allow new well develop without violating depletion criteria.

Idaho

Surface water has been subject to appropriation in Idaho since before statehood. 6 Waters & Water Rights 321. State permits have been required for surface water appropriations since 1971. Ground water has been subject to appropriation since statehood, and state permits have been required for ground water appropriations since 1963. Id. 324. Appropriation permits cannot be issued if they would interfere with senior appropriations. ICA 42-203A(a); 6 Waters & Water Rights at 326. See generally ICA 42-103 (unappropriated surface and ground water subject to appropriation). There are no statutory criteria to determine whether surface or ground water is unappropriated.

Because the state permitting process is relatively recent, many appropriations are unadjudicated, Idaho is currently adjudicating appropriations throughout the state. 6 Waters & Water Rights 327.

Kansas

Kansas applied the appropriation doctrine to surface and ground water in 1945. Id. 369. Appropriation permits are obtained from the chief engineer of the Kansas Board of Agriculture. Id. 370; KSA 82a-703 (all surface and ground water are available for appropriation, subject to vested rights). Kansas has a two-mile test similar to the Colorado 3-mile test for determining whether ground water is available for appropriation by a specific well. See Appendix A [McMahon] 23-24.

Montana

Montana applies the appropriation doctrine to both ground and surface water. MCA 85-2-101(1). However, a state appropriation permitting process was not established for ground water until 1961, and was not established for surface water until 1973. 6 Waters & Water Rights 473. Montana is also in the process of adjudicating appropriations throughout the state, including adjudicating of Indian tribal water rights. Id. 478-80.

Nebraska

The issue of whether unappropriated water was available for appropriation was litigated in Central Platte NRD v. Wyoming, 235 Neb. 439 (1994). In that case the Nebraska supreme court ruled that the Nebraska Department of Water Resources (DWR) [now the Department of

Natural Resources or DNR] could use historic streamflows to indicate whether unappropriated streamflow was available for instream appropriation. 245 Neb. at 444-447. Wyoming had argued that historical streamflows should have been adjusted downward to reflect unexercised but authorized appropriations. This "full rights" method was required by the Texas supreme court in Lower Colorado River Authority v. Texas Department of Water Resources, 683 S.W.2d 357 (1984). In the Texas case, the TDWR modeled historic flows and then adjusted the results by assuming that all water rights were exercised to the maximum quantity. This approach, although rejected by the Texas Water Commission, was ratified by the Texas supreme court as being the proper method for determining whether unappropriated surface water was available for appropriation. This method was explicitly rejected by the Nebraska supreme court, at least with regards to instream appropriations. The court noted that irrigation appropriations had two quantities, one explicit and one implicit. The explicit quantity is the maximum amount authorized by statute to be diverted for irrigation purposes, up to three acre feet of water per irrigated acre per year. The second implicit limit is the beneficial use limit; i.e. the often lower amount of water that the appropriator is actually applying to a beneficial use. The beneficial use amount fluctuates with the appropriator's needs, principally the availability of precipitation. The Nebraska supreme court concluded that the historic streamflows method was a permissible method to determine the quantity of unappropriated water that was available for appropriation. 245 Neb. 446-47.

Nevada

Both surface and ground water are subject to appropriation in Nevada. 6 Waters & Water Rights 499-501. NRS 533.030(1) (all waters subject to appropriation); 534.020 (ground water subject to appropriation). Surface appropriations were subject to a state engineer permit requirement beginning in 1905; mandatory ground water permitting was established in 1939. The state engineer must reject applications when there is no unappropriated water available. NRS 533.370(4). Some basins apparently have been closed to appropriation due to court determinations that they are over appropriated. Appendix B [Jess] at 8.

New Mexico

Both surface and ground water are subject to appropriation in New Mexico. 6 Waters & Water Rights 529. NMSA 72-1-1 (surface water subject to appropriation); 72-12-1 (ground wter subject to appropriation). State permitting began in 1907. 6 Waters & Water Rights 529. Courts adjudicate appropriations in New Mexico. Id. 531. In Mathers v. Texaco, 77 N.M. 239, 421 P.2d 771 (1966), the New Mexico supreme court affirmed the decision of the New Mexico state engineer to establish ground water depletion rates of 66% depletion in 40 years. The ground water basin was a closed basin that received little recharge. The state engineer concluded that the remaining 1/3 of the ground water supply would be sufficient to continue economically supplying domestic uses and perhaps some other uses, but irrigation withdrawals would no longer be economically feasible (presumably because of higher pumping costs).

North Dakota

North Dakota applies appropriation to both surface water and ground water. 6 Waters & Water Rights 557. NDCC 61-01-01 (surface and ground water are subject to appropriation). Permits for surface water appropriations were required beginning in 1905. 6 Waters & Water Rights 557; NDCC 61-04-02 (appropriation permit requirements for surface and ground water). The North Dakota water commission requires surface water to be available 80% of the time in order to be considered available for appropriation. Appendix B [Jess] at 11.

Oklahoma

Surface water law. Oklahoma water law has recognized both riparian rights and appropriative rights. 6 Waters & Water Rights. 688-90. Attempts to statutorily limit riparian rights to domestic uses have been invalidated in court. Id. 689. The existence of riparian rights makes the determination of the quantity of water available for appropriation difficult, as new riparian uses can be initiated at any time. OSA 82 §105.9 (appropriation requirements).

Ground water law. Ground water withdrawn from inside the cut bank of a stream is legally considered to be surface water. 6 Waters & Water Rights 694. Otherwise, ground water is allocated on a proportional basis to overlying owners. Id. 694-96. The Oklahoma Water Resources Board uses a 20 year useful life period in making ground water allocations to overlying landowners. Appendix B [Jess] at 11-12.

Oregon

Historically Oregon's 1909 water code applies to both surface and ground water, and state permits are required for all appropriations. 6 Waters & Water Rights 699; ORS 537.120 (surface and ground water subject to appropriation). Surface water permits have been required since 1909. Ground water permits have been required east of the Cascades since 1927, and statewide since 1955. Id. 6 Waters & Water Rights 700. Pre-1909 appropriations are being adjudicated; most surface appropriations have been adjudicated but few ground water appropriations have been. Id. 708. The Oregon Water Resources Department requires that surface water be available 80% of the time in order to be considered available for appropriation. ORS 690-400-010(11)(a)(A); Appendix B [Jess] at 13. Specific computation procedures are contained in the 170 page report, Determining Surface Water Availability in Oregon, Aug. 2002. Appendix B at 13, which was emailed to the DNR on August 4, 2004.

Professor Glennon, in the leading law review article dealing with management of tributary ground water in the West, describes Oregon regulations for determining whether wells pumping hydrologically connected ground water may be a significant source of surface water interference. Glennon & Maddock, The Concept of Capture: The Hydrology and Law of Stream/Aquifer Interactions, 43 Rocky Mountain Mineral Law Institute 22-1, 22-25 to 22-28. If the ground water is hydrologically connected (HC) ground water, the well is presumed to be a significant cause of substantial interference if one of the following conditions exists:

(1) the well is within 1/4 mile of the stream; or

(2) the rate of withdrawal is greater than 5 cfs and the well is less than one mile from the stream; or

(3) the rate of withdrawal is greater than either (a) 1% of minimum perennial streamflow or senior instream appropriation or (b) greater than 1% of stream discharge equaled or exceeded 80% of the time, and (in either case) the well is less than one mile from the stream; or

(4) the ground water pumping would deplete streamflow by more than 25% after 30 days of continuous pumping, and the well is less than one mile from the stream.

These regulations seem to be focused on wells likely to induce recharge from the stream, and would not deal with the long-term depletion effects of tributary ground water pumping.

South Dakota

Surface and ground water have been subject to appropriation in South Dakota since

1955. 6 Waters & Water Rights 744; SDCL 46-1-3 (both surface and ground water are subject to appropriation). Appropriations may be granted only if there is a reasonable probability that there is unappropriated water available. SDCL 46-2A-9. Water rights are currently being adjudicated in South Dakota. 6 Waters & Water Rights 745. Apparently the South Dakota Department of Environmental & Natural Resources requires surface water to be available 50% of the time in order to be considered available for appropriation. Appendix B [Jess] at 15. Ground water permits are denied if the new pumping would cause total pumping to exceed the county's average annual recharge rate. Id.

Texas

Surface water law. Texas surface water recognizes both riparian and appropriative rights. VCTA Water Code 11.022 (surface water subject to appropriation); 11.121ff (permit procedures); 11.131 (application denied if no unappropriated water available). Water right claims are being adjudicated under a 1967 statute, and most river basins have been adjudicated. 6 Waters & Water Rights 771-74. Regarding determination of whether unappropriated water is available for appropriation, see discussion at Nebraska, above. The Texas Natural Resources Conservation Commission requires at least 75% of the surface water sought to be appropriated to be available at least 75% of the time in order to be considered available for appropriation for irrigation. For municipalities, 100% of the water must be available 100% of the time unless the municipalities has a backup source of supply. Appendix B [Jess] at 16-17.

Ground water law. Texas follows the rule of absolute ownership for ground water allocation. 6 Waters & Water Rights 784-85. The state is regulating withdrawals from the Edwards Aquifer near San Antonio to protect municipal water uses and endangered species. Id. 787-92. Texas faces issues similar to those that Nebraska faces on the Platte River.

Utah

Surface water has always been subject to appropriation in Utah, and surface appropriations have been subject to state permitting requirements since 1903. Id. 799-800. Percolating ground water (i.e. ground water not flowing in "underground streams") was not subject to appropriation and state permitting until 1935. Id. 809. UCA 73-3-1 (surface and ground water subject to appropriation). Applications shall be approved if among other things there is unappropriated water in the source of supply. Id. 73-3-8(1)(a).

Washington

Washington water law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 831-35. RCWA 90.03.010 (surface water subject to appropriation); State permits were required for surface water appropriations beginning in 1917. 6 Waters & Water Rights 835-36. The Department of Ecology must find that unappropriated water is available for appropriation before granting an application. RCWA 90.03.290(1).

A state ground water appropriation permitting statute was adopted in 1945. 6 Waters & Water Rights 831-32, 839; RCWA 90.44.040 (ground water subject to appropriation). Ground water appropriations may not be granted beyond the capacity of the supply to yield such water within a reasonable or feasible pumping lift or artesian pressure reduction. RCWA 90.44.070.

Claims for all water uses not evidenced by a state permit were required to be filed by 1985. 6 Waters & Water Rights 838. Basin water right adjudication proceedings have been initiated, and only one major basin adjudication is still in process. Id.

Wyoming

Wyoming applies prior appropriation to both surface water and ground water. Surface water appropriation permits have been required since 1890. Id. 865. State permits have been required for ground water since 1969. Id. 868; Appendix B [Jess] at 20. See WSA 41-4-501 (appropriation permit requirement). Applications must be rejected if there is no unappropriated water available. Id. 41-4-503.

LB962

August 2004

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Beginning January 1, 2006 the DNR must make annual evaluations of "the expected long-term availability of hydrologically connected water supplies for both existing and new surface water uses and existing and new ground water uses in each of the state's river basins." NRS 46-713(1)(a). For each river basin, subbasin, or reach evaluated, the report shall describe (I) the nature and extent of use of both surface water and ground water in each river basin, subbasin, or reach, (ii) the geographic area within which the DNR preliminarily considers surface water and ground water to be hydrologically connected and the criteria used for that determination, and (iii) the *extent to which the then-current uses affect available near-term and long-term water supplies*. Id (emphasis added).

Based on the information reviewed in the evaluation process, the DNR shall arrive at a preliminary conclusion for each river basin, subbasin, and reach evaluated as to whether such river basin, subbasin, or reach presently is ***fully appropriated*** without the initiation of additional uses. NRS 46-713(1)(b) (emphasis added).

A river basin, subbasin, or reach shall be deemed fully appropriated if the department determines that then-current uses of hydrologically connected surface water and ground water in the river basin, subbasin, or reach cause or will in the reasonably foreseeable future cause

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(b) the streamflow to be insufficient to sustain over the long term the beneficial uses from wells constructed in aquifers dependent on recharge from the river or stream involved, or

(c) reduction in the flow of a river or stream sufficient to cause noncompliance by Nebraska with an interstate compact or decree, other formal state contract or agreement, or applicable state or federal laws. NRS 46-713(3).

Finally, a river basin, subbasin, or reach shall be deemed ***overappropriated*** if, on July 16, 2004, the river basin, subbasin, or reach is subject to an interstate cooperative agreement among three or more states and if, prior to such date, the DNR has declared a moratorium on the issuance of new surface water appropriations in such river basin, subbasin, or reach and has requested each NRD with jurisdiction in the affected area in such river basin, subbasin, or reach either (I) to close or to continue in effect a previously adopted closure of all or part of such river basin, subbasin, or reach to the issuance of additional water well permits in accordance with NRS 46-656.25(1)(k) as such section existed prior to July 16, 2004, or (ii) to temporarily suspend or to continue in effect a temporary suspension, previously adopted pursuant to NRS 46-656.28 as such section existed prior to July 16, 2004, on the drilling of new water wells in all or part of such river basin, subbasin, or reach. NRS 46-713(4)(a).

By September 15, 2004, the DNR shall designate which river basins, subbasins, or reaches are overappropriated. The designation shall include a description of the geographic area within which the department has determined that surface water and ground water are hydrologically connected and the criteria used to make such determination. NRS 46-713(4)(b).

The DNR is required to identify river basins or portions thereof that are either fully-appropriated or overappropriated, taking into account the stream depletion effect of existing wells withdrawing hydrologically connected ground water. In general terms, the DNR must determine whether the stream depletion resulting from pumping hydrologically connected wells will now or in the future interfere with existing surface water appropriations. If so, the basin, subbasin or stream reach is overappropriated. If not, but if stream depletion from new hydrologically connected wells would interfere with existing surface water appropriations, the basin, subbasin or stream reach is fully appropriated. Conceptually, this process involves three major steps: (1) determining what ground water is hydrologically connected, (2) determining the long-term effect of withdrawals from current wells on the ground water supply, including possible stream depletion effects, and (3) the long-term availability of streamflow to meet current surface water rights and uses.

No western states currently makes such "fully appropriated" or "overappropriated" determinations for streams and hydrologically-connected ground water. However, some western states do make similar but more limited determinations, e.g. (1) in defining ground water as being tributary or hydrologically connected, (2) in determining whether "critical" ground water areas should be closed to new uses, or whether unappropriated ground water is available for appropriation; and (3) whether unappropriated surface water is available for appropriation. A brief description of these procedures may assist the DNR in making its fully-appropriated and overappropriated determinations.

Because there are so few useful precedents we will simply describe the relevant authorities and administrative practices of each western state. By way of background, all

western states follow the doctrine of prior appropriation for surface water allocation, and most (but not all) western states follow appropriation for ground water allocation. However the appropriation procedures vary widely among states. Further, appropriation is only a partial basis for surface water allocation in California and Texas, and is not a significant basis for ground water allocation in California, Texas, Arizona or Nebraska. There is also wide variation regarding authority for state appropriation officials to determine that there is no surface or ground water available for appropriation.

Another important issue is the extent to which hydrologically connected surface and ground water are treated as a single source. Some states apply appropriation to both surface and ground water. Some states apply appropriation to surface water but only to some categories of ground water. Two broad categories of ground water relevant to this discussion are (1) water in an underground stream and (2) tributary ground water. Although precise definitions vary from state to state, in very broad terms wells that induce ground water recharge from a surface stream would usually be considered to be pumping water from an underground stream, or from the underflow of a surface stream (for our purposes the two terms are synonymous). Tributary ground water is ground water that would ultimately reach a stream if not first intercepted by a well. Arizona and Texas follow the underground stream/underflow doctrine; California and Colorado follow the tributary stream doctrine. Some states (such as California) recognize the relationship between hydrologically connected and surface water principally through court decisions.

Arizona

Surface water law. Prior appropriation is the rule for surface water allocation. ARS 45-101, -101(A). Prior to 1919, surface water appropriations could be acquired by meeting notice and actual water use requirements. After adoption of the 1919 irrigation code, appropriations were obtained upon application to the state water commissioner. 6 Waters & Water Rights at 214-15 (1994). However, pre-1919 priorities were not adjudicated, and Arizona is currently adjudicating priorities on most of its streams. Id. at 209. Unappropriated water is available for appropriation. NRS 45-151(A). No statutory criteria to aid in determining whether a stream is unappropriated.

Prior appropriation also applies to water "in definite underground channels". 6 Waters & Water Rights at 205-06. Arizona courts have interpreted the "definite underground channel" language to include only the "underflow, subflow, or undercurrent" of a surface stream; this is the only ground water in Arizona that is also subject to appropriation. This subflow/underflow doctrine has recently been affirmed by the Arizona courts. Id. The Arizona Department of Water Resources (DWR) had proposed a test that a well could be considered to be withdrawing surface water if the well's stream depletion was at least 50% of total pumping within 90 days of continuous pumping. Id. at 206. This test was rejected by the Arizona supreme court as not being the subflow of a surface stream. Id. at 207. A narrower test limiting subflow to the "saturated floodplain Holocene alluvium" was subsequently approved by the court. In re Gila River General Adjudication, 9 P.3d 1069, 1080-81 (2000).

Ground water law. Traditionally Arizona has followed the rule of reasonable use, similar to Nebraska. Thus no state permits were required to drill irrigation wells. In 1980 Arizona adopted the Arizona ground water code to control ground water depletion. ARS 45-401 et seq. The 1980 statute designated four active management areas (AMAs) and two irrigation non-expansion areas (INAs). ARS 45-411. A fifth AMA was designated by statute in 1994. A third INA was designated by the Director of the Arizona Department of Water Resources. ARS 45-432(a); 6 Waters & Water Rights at 209-10. Ground water pumping is being gradually reduced

in AMAs and new high-capacity well drilling is severely limited. No new irrigation are allowed in INAs, but existing uses are not regulated. Id. at 210. ARS 45-512. The ground water management goal is to reach safe yield by 2025, taking into account water availability from the Central Arizona Project. ARS 45-562. .

California

Surface water law. California law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 243ff. Since December 19, 1914, new surface water appropriations (including appropriations of ground water in a known and definite channel) are subject to state approval, currently from the State Water Resources Control Board. Id. at 245-46; Cal. Water Code §1225. However, the widespread existence of active riparian rights complicates surface water administration in California. The SWRCB has conditioned new appropriations on maintaining instream flows for environmental purposes. 6 Waters & Water Rights 248. The SWRCB uses a formal "water availability analysis" to help it determine whether unappropriated water is available (for more detailed information, go to www.waterrights.ca.gov/WaterAvailability/default.html#watercode). See Appendix B [Jess] at 3-4.

Ground water law. Ground water is not subject to state permitting, unless the ground water is being pumped from a known and definite underground channel. Only in Texas do ground water pumpers have fewer pumping restrictions than in California. California courts have ruled that tributary ground water is legally considered to be part of the stream and is subject to surface water law (riparian and appropriative). Sax, "We Don't Do Groundwater: A Morsel of California Legal History," 6 U. Denver Water L. Rev. 269 (2003).

Colorado

Surface water law. In Colorado, "the right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied." Colo. Const. art XVI §6; cf. CRS 37-82-101 (waters of natural streams, including tributary ground water, are subject to appropriation). The primary limit on appropriations is that they not harm senior appropriators. CRS 37-82-104. The Colorado state engineer does not grant permits for new appropriations, as is common in other western states. Instead, acquiring new water rights is a judicial process. Applications for conditional water rights are filed with the clerk of the local water court. Once the conditional right is decreed by the court (after notice and hearing), the appropriation must be perfected by application to beneficial use. Then the appropriator may apply to the court for a decree for the perfected appropriation. 2 Waters & Water Rights 15-48 to -52; CRS 37-92-101ff. Clearly there is no administrative process for determining whether unappropriated water is available for surface water or tributary ground water.

Ground water law. Appropriation applies to tributary ground water. 6 Waters & Water Rights 256. The process for obtaining an appropriation of tributary ground water is similar to acquiring a surface water appropriation through the water courts.

Colorado statutes do establish when ground water is not tributary ground water. Nontributary ground water is water (outside a designated ground water basin–discussed below) that, when withdrawn, does not deplete the flow of a natural stream within 100 years greater than one-tenth of one percent of the annual rate of withdrawal." CRS 37-90-103(10.5). For example, a well pumping 200 acre-feet per year for 100 years (20,000 acre-feet total) would be tributary if it depleted streamflow at a rate exceeding 0.20 acre-feet per year within the 100 years. This is one method (very inclusive) for defining what constitutes tributary (or

hydrologically connected) ground water.

The Colorado ground water commission regulates ground water use within designated ground water basins. 6 Waters & Water Rights 256. The commission uses a "three mile test" to determine whether unappropriated ground water is available for new wells. The basic process is that a circle with a three-mile radius is drawn around the proposed well. If the total authorized ground water withdrawals within the circle plus the ground water sought to be appropriated would deplete the ground water within the circle more than 40% in 100 years (formerly in 25 years), the permit for the new well is denied. The formulas implementing this regulation are included in the commission's designated ground water rules, which were emailed to the DNR on August 4, 2004. This is one method for determining whether unappropriated ground water is available for appropriation. It is also a method for allowing new wells in areas that have otherwise been closed to new well drilling where supplies will allow new well develop without violating depletion criteria.

Idaho

Surface water has been subject to appropriation in Idaho since before statehood. 6 Waters & Water Rights 321. State permits have been required for surface water appropriations since 1971. Ground water has been subject to appropriation since statehood, and state permits have been required for ground water appropriations since 1963. Id. 324. Appropriation permits cannot be issued if they would interfere with senior appropriations. ICA 42-203A(a); 6 Waters & Water Rights at 326. See generally ICA 42-103 (unappropriated surface and ground water subject to appropriation). There are no statutory criteria to determine whether surface or ground water is unappropriated.

Because the state permitting process is relatively recent, many appropriations are unadjudicated, Idaho is currently adjudicating appropriations throughout the state. 6 Waters & Water Rights 327.

Kansas

Kansas applied the appropriation doctrine to surface and ground water in 1945. Id. 369. Appropriation permits are obtained from the chief engineer of the Kansas Board of Agriculture. Id. 370; KSA 82a-703 (all surface and ground water are available for appropriation, subject to vested rights). Kansas has a two-mile test similar to the Colorado 3-mile test for determining whether ground water is available for appropriation by a specific well. See Appendix A [McMahon] 23-24.

Montana

Montana applies the appropriation doctrine to both ground and surface water. MCA 85-2-101(1). However, a state appropriation permitting process was not established for ground water until 1961, and was not established for surface water until 1973. 6 Waters & Water Rights 473. Montana is also in the process of adjudicating appropriations throughout the state, including adjudicating of Indian tribal water rights. Id. 478-80.

Nebraska

The issue of whether unappropriated water was available for appropriation was litigated in Central Platte NRD v. Wyoming, 235 Neb. 439 (1994). In that case the Nebraska supreme court ruled that the Nebraska Department of Water Resources (DWR) [now the Department of

Natural Resources or DNR] could use historic streamflows to indicate whether unappropriated streamflow was available for instream appropriation. 245 Neb. at 444-447. Wyoming had argued that historical streamflows should have been adjusted downward to reflect unexercised but authorized appropriations. This "full rights" method was required by the Texas supreme court in Lower Colorado River Authority v. Texas Department of Water Resources, 683 S.W.2d 357 (1984). In the Texas case, the TDWR modeled historic flows and then adjusted the results by assuming that all water rights were exercised to the maximum quantity. This approach, although rejected by the Texas Water Commission, was ratified by the Texas supreme court as being the proper method for determining whether unappropriated surface water was available for appropriation. This method was explicitly rejected by the Nebraska supreme court, at least with regards to instream appropriations. The court noted that irrigation appropriations had two quantities, one explicit and one implicit. The explicit quantity is the maximum amount authorized by statute to be diverted for irrigation purposes, up to three acre feet of water per irrigated acre per year. The second implicit limit is the beneficial use limit; i.e. the often lower amount of water that the appropriator is actually applying to a beneficial use. The beneficial use amount fluctuates with the appropriator's needs, principally the availability of precipitation. The Nebraska supreme court concluded that the historic streamflows method was a permissible method to determine the quantity of unappropriated water that was available for appropriation. 245 Neb. 446-47.

Nevada

Both surface and ground water are subject to appropriation in Nevada. 6 Waters & Water Rights 499-501. NRS 533.030(1) (all waters subject to appropriation); 534.020 (ground water subject to appropriation). Surface appropriations were subject to a state engineer permit requirement beginning in 1905; mandatory ground water permitting was established in 1939. The state engineer must reject applications when there is no unappropriated water available. NRS 533.370(4). Some basins apparently have been closed to appropriation due to court determinations that they are over appropriated. Appendix B [Jess] at 8.

New Mexico

Both surface and ground water are subject to appropriation in New Mexico. 6 Waters & Water Rights 529. NMSA 72-1-1 (surface water subject to appropriation); 72-12-1 (ground wter subject to appropriation). State permitting began in 1907. 6 Waters & Water Rights 529. Courts adjudicate appropriations in New Mexico. Id. 531. In Mathers v. Texaco, 77 N.M. 239, 421 P.2d 771 (1966), the New Mexico supreme court affirmed the decision of the New Mexico state engineer to establish ground water depletion rates of 66% depletion in 40 years. The ground water basin was a closed basin that received little recharge. The state engineer concluded that the remaining 1/3 of the ground water supply would be sufficient to continue economically supplying domestic uses and perhaps some other uses, but irrigation withdrawals would no longer be economically feasible (presumably because of higher pumping costs).

North Dakota

North Dakota applies appropriation to both surface water and ground water. 6 Waters & Water Rights 557. NDCC 61-01-01 (surface and ground water are subject to appropriation). Permits for surface water appropriations were required beginning in 1905. 6 Waters & Water Rights 557; NDCC 61-04-02 (appropriation permit requirements for surface and ground water). The North Dakota water commission requires surface water to be available 80% of the time in order to be considered available for appropriation. Appendix B [Jess] at 11.

Oklahoma

Surface water law. Oklahoma water law has recognized both riparian rights and appropriative rights. 6 Waters & Water Rights. 688-90. Attempts to statutorily limit riparian rights to domestic uses have been invalidated in court. Id. 689. The existence of riparian rights makes the determination of the quantity of water available for appropriation difficult, as new riparian uses can be initiated at any time. OSA 82 §105.9 (appropriation requirements).

Ground water law. Ground water withdrawn from inside the cut bank of a stream is legally considered to be surface water. 6 Waters & Water Rights 694. Otherwise, ground water is allocated on a proportional basis to overlying owners. Id. 694-96. The Oklahoma Water Resources Board uses a 20 year useful life period in making ground water allocations to overlying landowners. Appendix B [Jess] at 11-12.

Oregon

Historically Oregon's 1909 water code applies to both surface and ground water, and state permits are required for all appropriations. 6 Waters & Water Rights 699; ORS 537.120 (surface and ground water subject to appropriation). Surface water permits have been required since 1909. Ground water permits have been required east of the Cascades since 1927, and statewide since 1955. Id. 6 Waters & Water Rights 700. Pre-1909 appropriations are being adjudicated; most surface appropriations have been adjudicated but few ground water appropriations have been. Id. 708. The Oregon Water Resources Department requires that surface water be available 80% of the time in order to be considered available for appropriation. ORS 690-400-010(11)(a)(A); Appendix B [Jess] at 13. Specific computation procedures are contained in the 170 page report, Determining Surface Water Availability in Oregon, Aug. 2002. Appendix B at 13, which was emailed to the DNR on August 4, 2004.

Professor Glennon, in the leading law review article dealing with management of tributary ground water in the West, describes Oregon regulations for determining whether wells pumping hydrologically connected ground water may be a significant source of surface water interference. Glennon & Maddock, The Concept of Capture: The Hydrology and Law of Stream/Aquifer Interactions, 43 Rocky Mountain Mineral Law Institute 22-1, 22-25 to 22-28. If the ground water is hydrologically connected (HC) ground water, the well is presumed to be a significant cause of substantial interference if one of the following conditions exists:

(1) the well is within 1/4 mile of the stream; or

(2) the rate of withdrawal is greater than 5 cfs and the well is less than one mile from the stream; or

(3) the rate of withdrawal is greater than either (a) 1% of minimum perennial streamflow or senior instream appropriation or (b) greater than 1% of stream discharge equaled or exceeded 80% of the time, and (in either case) the well is less than one mile from the stream; or

(4) the ground water pumping would deplete streamflow by more than 25% after 30 days of continuous pumping, and the well is less than one mile from the stream.

These regulations seem to be focused on wells likely to induce recharge from the stream, and would not deal with the long-term depletion effects of tributary ground water pumping.

South Dakota

Surface and ground water have been subject to appropriation in South Dakota since

1955. 6 Waters & Water Rights 744; SDCL 46-1-3 (both surface and ground water are subject to appropriation). Appropriations may be granted only if there is a reasonable probability that there is unappropriated water available. SDCL 46-2A-9. Water rights are currently being adjudicated in South Dakota. 6 Waters & Water Rights 745. Apparently the South Dakota Department of Environmental & Natural Resources requires surface water to be available 50% of the time in order to be considered available for appropriation. Appendix B [Jess] at 15. Ground water permits are denied if the new pumping would cause total pumping to exceed the county's average annual recharge rate. Id.

Texas

Surface water law. Texas surface water recognizes both riparian and appropriative rights. VCTA Water Code 11.022 (surface water subject to appropriation); 11.121ff (permit procedures); 11.131 (application denied if no unappropriated water available). Water right claims are being adjudicated under a 1967 statute, and most river basins have been adjudicated. 6 Waters & Water Rights 771-74. Regarding determination of whether unappropriated water is available for appropriation, see discussion at Nebraska, above. The Texas Natural Resources Conservation Commission requires at least 75% of the surface water sought to be appropriated to be available at least 75% of the time in order to be considered available for appropriation for irrigation. For municipalities, 100% of the water must be available 100% of the time unless the municipalities has a backup source of supply. Appendix B [Jess] at 16-17.

Ground water law. Texas follows the rule of absolute ownership for ground water allocation. 6 Waters & Water Rights 784-85. The state is regulating withdrawals from the Edwards Aquifer near San Antonio to protect municipal water uses and endangered species. Id. 787-92. Texas faces issues similar to those that Nebraska faces on the Platte River.

Utah

Surface water has always been subject to appropriation in Utah, and surface appropriations have been subject to state permitting requirements since 1903. Id. 799-800. Percolating ground water (i.e. ground water not flowing in "underground streams") was not subject to appropriation and state permitting until 1935. Id. 809. UCA 73-3-1 (surface and ground water subject to appropriation). Applications shall be approved if among other things there is unappropriated water in the source of supply. Id. 73-3-8(1)(a).

Washington

Washington water law recognizes both riparian and appropriative surface water rights. 6 Waters & Water Rights 831-35. RCWA 90.03.010 (surface water subject to appropriation); State permits were required for surface water appropriations beginning in 1917. 6 Waters & Water Rights 835-36. The Department of Ecology must find that unappropriated water is available for appropriation before granting an application. RCWA 90.03.290(1).

A state ground water appropriation permitting statute was adopted in 1945. 6 Waters & Water Rights 831-32, 839; RCWA 90.44.040 (ground water subject to appropriation). Ground water appropriations may not be granted beyond the capacity of the supply to yield such water within a reasonable or feasible pumping lift or artesian pressure reduction. RCWA 90.44.070.

Claims for all water uses not evidenced by a state permit were required to be filed by 1985. 6 Waters & Water Rights 838. Basin water right adjudication proceedings have been initiated, and only one major basin adjudication is still in process. Id.

Wyoming

Wyoming applies prior appropriation to both surface water and ground water. Surface water appropriation permits have been required since 1890. Id. 865. State permits have been required for ground water since 1969. Id. 868; Appendix B [Jess] at 20. See WSA 41-4-501 (appropriation permit requirement). Applications must be rejected if there is no unappropriated water available. Id. 41-4-503.

Over-Appropriation & In-the-field Regulatory Activities Survey for the Western United States

by
J. Michael Jess, P.E.
Conservation & Survey Division, School of Natural Resources
University of Nebraska-Lincoln
August 11, 2004 (final version)

Arizona
Elizabeth Logan, Arizona Department of Water Resources (SW knowledge)
July 9, 2004

Mark Frank, Phoenix Active Management Area (GW knowledge)
July 16, 2004

Water rights are subject to a bifurcated system that differentiates GW from SW. Because there is no clear distinction, appropriation of GW subflow (to be administered as SW) has been the subject of extensive litigation. In a San Pedro River watershed ruling, the Arizona Supreme Court, *In re the General Adjudication of all Rights to use Water in the Gila River System and Source*, 198 Ariz. 330, 334, 9 P.3d 1069, 1083 (2000), provided guidance and also directed DWR to recommend a practical method to use in resolving subflow disputes.

"Basin-wide adjudications of surface water claims have been ongoing since the 1970s," Logan said. Initially, the adjudications were begun as a means to forcefully quantify Native American claims. Under provisions of the McCarran amendment, adjudication of federal reserved claims was later included. Non-Native/non-federal claims round out the extent of basin-wide adjudications presently ongoing in 7 watersheds. Because existing diversions already make use of available supplies, Logan said the courts do not rely upon assessments of available un-appropriated water when rendering decisions.

When asked if over-appropriation is a substantial consideration when new applications to appropriate water come before the DWR (see Sec. R12-15-703 - "applicant will have sufficient supplies"), her reply was "we don't do that." Very little SW remains undeveloped, and DWR seldom receives applications for new appropriations, she explained. Judging by her remarks, most DWR administrative activities relate to proposed changes in the nature and location of use (agricultural to urban). Neither DWR nor the courts have formally closed a watershed to new SW appropriations.

Logan went on to say DWR staff members do not regulate water rights in the field. If regulation becomes necessary, she said individuals seek assistance from a county sheriff or through the county attorney's office. Generally, she seemed uncertain what actions county officials might implement. To my question regarding a hypothetical dispute among competing water right holders within the same basin but located in different counties, she said regulatory procedures to

deal with such situations have not been established.

To secure federal funding for construction of the Central Arizona Project (approx. $1.2 B) needed to exploit Arizona's share of flow in the Colorado River (1923 Colorado River Compact and *Arizona v California*, No. 8, Orig.), state officials agreed to adopt aggressive ground water management policies in the early 1980s. Among other things the legislation created the DWR which in turn has designated 5 Active Management Areas (AMAs) and 3 Irrigation Non-Expansion Areas (INAs).

Following some "squaring off of the sides and corners," Frank said the AMAs the INAs were created with particular stratigraphic units in mind. The declarations followed accumulation of records demonstrating ongoing and significant GW declines. Several regional investigations indicating pumpage far exceeded natural rates of recharge also were significant in the DWR decisions. At the time there was general acceptance of a need for regulation, and none of the declarations relied upon results of sophisticated mathematical models, he summarized.

Taken together DWR's Web page says "the AMAs include 80% of Arizona's population and 70% of the state's groundwater overdraft." Achieving safe-yield by 2025 is the objective in three AMAs situated in urbanizing locations. Prolonging access to available ground water supplies for as long as possible serves as the goal in another. A fifth AMA was established to address international, riparian and GW/SW issues; safe yield by an unspecified future date is the stated objective.

Frank said recent budget limitations have hampered field enforcement activities. During the past 5 years, the Phoenix AMA's workforce has been reduced by 1/3. Individual water meters are no longer checked routinely, and the AMA's water level measurement program was curtailed substantially. Rather than field checking irrigated acreage, Frank said those efforts are now accomplished with satellite imagery. "Our field services activities are less than desired," he said.

California

In conjunction with preparing this portion, electronic sources were found to be voluminous, and drawing upon them was deemed adequate to fulfill the assignment. – **MJ**

"Mutual Prescription" is the term associated with use of percolating GW [see *Pasadena v Alhambra*, 33 Cal. 2d 908 (1949)]. Such uses are not bound by principles of prior appropriation and not under the supervision of public officials. In contrast uses of underflow and uses of GW found in defined underground streams are handled differently. They are subject to prior appropriation.

In large portions of the state, competition among GW users tapping percolating sources has not become contentious, and regulation is not present. Where disputes have occurred, often in southern portions of the state, litigation has followed. So-called adjudicated GW basins are the

result of individual court rulings. Several date to the 1940s. Safe yield (balancing pumpage & aquifer recharge) is common to each. In some locations Watermasters or those having somewhat similar titles enforce court-decreed restrictions.

Provision for basin-wide, general adjudications is found in Sec's 2500 *et seq.* The so-called "statutory adjudication" proceedings are often initiated as a means of establishing a comprehensive tabulation of appropriations (including federal reserved & Tribal) prior to the State Water Resources Control Board assigning a Watermaster to regulate users. The Superior Court is responsible for the determinations, but its proceedings do not ordinarily involve unappropriated water determinations.

Depending upon where and when SW uses (including underflow and GW found in defined underground streams) occur, both riparian and prior appropriation principles are at work in California. To qualify as a common law riparian, SW uses must pre-date adoption of the 1914 Code, and the location of use must abut the source stream. During times of meager stream flows, available supplies are shared on a correlative basis. There are no un-appropriated water determinations, and exactly who, if anyone, is to enforce the sharing of supplies is not clearly established.

SW uses pre-dating Dec. 19, 1914 which occur at locations not abutting a source stream are bound by principles of prior appropriation. A set of adjudication procedures allows persons claiming such rights to seek official recognition of their appropriations. Assessment of unappropriated water is not a justiciable issue when the Superior Courts considers such claims.

For post-1914 SW users, applications for appropriations are processed by the State Water Resources Control Board (SWRCB). In the context of mandatory requirements, various statutory references [Ex's: Water Code Sec's 1253, 1260(k) & 1275(d)] mention unappropriated water in conjunction with Board actions in deciding whether to grant new applications.

Assessment of unappropriated water is a complex aspect of the Board's permitting process. In addition to selection of appropriate analytical procedures, agency requirements vary for different times of the year and from one watershed to another. By cross-referencing the regulations of other State agencies, Board requirements are truly comprehensive. Seasonal flow needs for anadromous fish, for example, is an important consideration when weighing applications for many streams in northern portions of the state.

Worksheets to accompany all applications effectively place a multi-aspect responsive burden on applicants. Computation of "Bypass Flows" and calculation of a "Cumulative Flow Impairment Index" are specific requirements. To fulfill all of the requirements the Board's Web site suggests individuals seek professional assistance. The Web sites of several California consulting firms prominently mention preparation of assessments needed for water right applications.

On Nov. 19, 1998 the Board cited Water Code Sec's 1205 through 1207 when it unanimously

entered Order WR 98-08. The administrative order updated a previous ruling, and it closed 56 watersheds and stream reaches to further consumptive appropriation. The Board action was prompted by various petitioners and by the urging of its staff members. In summary fashion the Order says evidence demonstrated particular streams are "fully appropriated either year-round or during specified months."

From reading the Order, it can be seen staff members aided the Board in accumulating a large volume of evidence. Staff members organized hearings to gather first hand testimony, made in-the-field surveys and conducted special studies.

In several instances the Order accepted the compromises and agreements negotiated among affected parties and staff members. Arithmetic assessments were cited as justification for closure of several watersheds and stream reaches. In conjunction with hardships potentially falling upon certain domestic users, the Order cites "public interest" considerations as its rationale for barring further access to certain water sources. Elsewhere, the Order notes Legislative intentions for advanced reservation of supplies to fulfill future contractual responsibilities of the Board's sister agency, the Dept. of Water Resources. Where new appropriations would frustrate intentions of the State or federal Wild & Scenic Rivers Act, the Board imposed a moratorium within several stream reaches.

Watermasters enforce water appropriations in some 50 watersheds located mostly in northern portions of the state. Following the SWRCB's grant of a petition from a minimum 15% of the holders of water appropriations (Water Code. Sec's 4000 - 4126), Watermasters are assigned to particular locations. Each works under general supervision of the Board. Agency expenses are reimbursed (presumably on a proportionate basis) by those holding water appropriations from the supply being regulated.

Colorado
Alan Berryman, Northern Colorado Water Conservancy District (former Division Engineer for State Engineers Office in Greeley)
July 30, 2004

Use of SW and GW (which is tributary to surface streams) is governed by principles of prior appropriation. According to the State Constitution (Art. XVI, Sec. 6) water belongs to the public, and the right to appropriate unappropriated water "shall never be denied." As opposed to a state agency, those seeking to appropriate water seek approval in one of the seven Water Courts (the jurisdiction of each generally corresponds to major SW drainage basins). Would-be GW appropriators must first seek a construction permit from the State Engineer before seeking approval from the Water Court. To obtain a decree for new uses (as opposed to existing uses which might include federal reservation claims), the Court must find existence of unappropriated water in the proposed source of supply - albeit even occasionally - and for GW users located outside designated basins, it must also approve a plan for augmentation.

In conjunction with review of GW applications, the State Engineer is responsible for conducting certain geological & hydrological investigations. As a result of those activities, GW underlying many locations is known not to be in hydraulic connection (i.e., statutorily "non-tributary"; 1/10 of one percent in 100 years) with nearby streams. Subsequent State Engineer recommendations to the Colorado Ground Water Commission have resulted in the Commission "designating" eight such GW basins. Use of GW there is governed by a modified prior appropriation system and permission from the Water Court is not required. While the terminology is different, the so-called Denver Basin, which includes four bedrock aquifers, is a ninth formally recognized area. Use of GW there is administered on an allocation basis and subject to authorization by the Water Court.

As a legal matter, pumping from designated aquifers or from those in the Denver Basin will not impact SW appropriations and may proceed without Court approval of a plan for augmentation. Colorado's Constitutional provision is generally considered over riding, Berryman said. Thus, absolute closure of watersheds or GW basins to further new users has not been undertaken. When asked about certain un-appropriated water conclusions* attributed to former State Engineer Jeris Danielson, Berryman could not recall details. For whatever it might be worth, Danielson is reported to have concluded particular streams in two Water Divisions were over-appropriated. How Danielson arrived at his conclusions is unclear. [An effort to contact Danielson was unsuccessful. - **MJ**]

Berryman said employees of the State Engineer's office routinely respond to calls for in-the-field regulation. Under general supervision of the State Engineer, seven Division Engineers, each assigned to particular locations, have responsibility for daily activities. He mentioned the South Platte River watershed when saying year-round regulation is frequently necessary.

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*See Footnote 7 in "The Water Rights Determination and Administration Act of 1969: A Western Slope Perspective on the First Thirty Years," Caloia, Sherry A., *et al*, Univ. of Denver Law Review, Fall 1999.

Idaho

Dick Larson, Idaho Department of Water Resources, was routinely mentioned as the agency's knowledgeable spokesman. We were never able to speak with one another. The summary which follows was taken from electronic and printed sources. - **MJ**

SW and GW uses are governed by principals of prior appropriation. An adjudication process can lead to creation of appropriations for SW uses which pre-date May 1971. At one time similar provisions allowed creation of GW appropriations for uses which pre-dated 1963. Availability of sufficient unappropriated water for established uses is assumed, and analysis to determine its existence is not undertaken in adjudication proceedings.

Post-1971 SW uses can only be established by compliance with Sec. 42-203A which, among

other things, requires the Director of the DWR to consider whether ". . . the water supply itself is insufficient for the purpose for which it is sought to be appropriated . . ." Since March 1963, all would-be users of GW have been subject to the same statutory requirements. According to the statute, applications for SW or GW are to be rejected if the Director concludes sufficient water is not available. With that criteria cited as justification, the agency has considerable experience in rejecting individual applications.

Responsibility for distribution of water according to the terms of individual permits is detailed in Title 42, Chapter 6 of the Idaho Code. Prominently mentioned are water masters who work under the general supervision of the DWR. Water masters are appointed on an annual basis and their salaries are paid proportionally by affiliations of local water users (municipalities, irrigation districts; even individuals).

Under authority delegated to the Director by Sec. 42-1805, moratoriums for certain basins and watersheds have been established in a variety of locations. A poor quality map (see Gerald Sehlke, *An Evaluation of the Conjunctive Management of Surface Water and Ground Water Resources in Idaho*, MS Thesis, University of Idaho, May 2000) is said to illustrate that ". . . in 1994 more than half the state of Idaho was listed as a Critical Ground Water Area, Ground Water Management Area, or was under some other form of moratorium (collectively called Water Management Areas; Figure 3)."

Many of the administrative rulings ordering designation of moratoriums can be examined on the agency Web site. For several, a need to maintain artesian pressure in certain aquifer systems was mentioned. In another situation it was acknowledged a federal court decision, which had awarded "all remaining unappropriated water" to federal reserve claimants (in that case, a National Forest), had effectively stripped the Director of further decision making responsibilities. Upon reaching that conclusion, granting a petitioner's plea to invoke a moratorium was deemed a logical action.

Authority for water masters to effectively enforce measures directed at fair distribution of available supplies is severely hampered in many locations where all claims have not been adjudicated (Sec. 42-604). At least in portions of the Snake River drainage, resolution of that obstacle came though settlement of litigation brought against the DWR. In exchange for dropping the lawsuit, DWR agreed to a moratorium on processing new withdrawal applications. Soon thereafter, the agency promulgated comparible rules designed include other locations where similar circumstances exist.

Kansas
David Barfield, Kansas Division of Water Resources
July 14, 2004

Permits from the DWR to use either SW or GW are required by K.S.A. 82a-711. All SW and many GW applications are filed directly with the Chief Engineer. Within established GW

Management Districts, applications must first be approved by local officials before being forwarded to the Chief Engineer.

When reviewing applications the Chief Engineer is required to consider the demands of existing users, possible impacts upon established minimum desirable streamflow requirements and "the area, safe yield and recharge rate of the appropriate water supply." Interestingly, the Chief Engineer may not issue a permit to use "fresh water in any case where other waters are available for such proposed use and the use thereof is technologically and economically feasible."

Beginning some 25 years ago, Barfield said historical records of monitoring data and increasing calls for enforcement actions "prompted recognition of physical limits in many watersheds and aquifers." More formal conclusions followed several hotly contested administrative proceedings (frequently mentioned was a dispute involving a wildlife refuge near the mouth of Wet Walnut Creek) in which physical limitations were made obvious. As a practical matter, he agency staff members began to recognize issuance of new permits; a) didn't assure water would be available to holders of the permits, and b) would inevitably task the agency with additional and avoidable regulation requirements.

Across the state various regulatory mechanisms have been instituted. In each case Barfield said "safe yield" concepts are employed. A variety of watersheds are now officially closed to the approval of new SW applications. Many geographic areas overlying certain stratigraphic units are also formally closed to approval of new GW applications. In several cases the Chief Engineer has temporarily closed areas pending the outcome of ongoing investigation and assessment.

Water Commissions are headquartered in several locations, and regulation is an extensive agency activity. Besides fulfilling responsibilities for regulation of water users, field staff members perform other tasks (inspection of earthen dams for example) delegated to DWR.

Montana
Curt Martin, Montana Department of Natural Resources & Conservation
July 7, 2004

Key statutes (Sec's 85-2-311 & 85-2-508) stress positive findings of physical & legal availability (as well as third party impacts) of water when the agency reviews applications to appropriate SW or GW on a case by case basis. Statutes place the burden of proof on applicants; appropriations for less than 5 ½ cfs or 4,000 acre-feet/year - - - preponderance of evidence; larger appropriations - - - clear & convincing. The statutes and DNRC rules contemplate contested cases.

Rather than burdening the DNRC with need for continued examinations of individual applications from certain geographical areas, Martin said 30 locations are closed to additional consumptive appropriations:

Number of areas	Description
7	"Controlled Groundwater Areas"
10	"Administrative Rule Closures"
2	"Department Ordered Milk River Closures"
6	"Legislative Closures"
5	"Compact Closures"

Many closures were preceded by investigation and construction of mathematical models. Most locations falling under the first category (Controlled Groundwater Areas) were closed by the DNRC as a means of preventing public exposure to toxic mining waste. Most of the Administrative Rule Closures resulted from citizens and/or other public agency petitions to the DNRC. Agency officials' initiative in pursuing such closures has not been aggressive, Martin acknowledged. Agreements reached in negotiating with Tribes and with the U.S. Fish & Wildlife Service resulted in each of the Compact closures. Within certain portions of the Upper Missouri River watershed, it was said Montana's Compact negotiators opted for a moratorium on new uses instead of initiating administrative procedures to acquire instream flow water rights.

Montana law makers are known for being parsimonious (for a recounting see Sherow, James E., "The Fellow Who Can Talk The Loudest And Has The Best Shotgun Gets The Water, *Montana; The Magazine of Western History*, Vol. 54, No. 1, Montana Historical Society, Spring 2004). Consequently, Martin said "Montana has a weak enforcement process" and "compliance cannot be assured in the field." Given that and the ongoing drought, he said media reports have recently become critical.

Montana has "never had a strong State Engineers office, and we were not allowed to comprehensively manage water rights until some 30 years ago." We're now "trying to catch up," he said.

Nevada
Tim Wilson, Nevada State Engineer's Office
July 12, 2004

Principles of prior appropriation apply to SW & GW. Adjudication of vested rights focuses upon pre-statutory (1905) SW claims and Native American and federal reserved rights. Adjudication of GW uses involves those uses established prior to: 1913 (artesian GW) and (1939 percolating GW). NRS Sec. 533.370 in part directs the State Engineer to deny applications for new water appropriations if " . . . there is no unappropriated water in the proposed source of supply, or where its proposed use or change conflicts with existing rights or with protectible interests in existing domestic wells . . . or threatens to prove detrimental to the public interest . . ."

Basin-wide adjudications have resulted in numerous federal, State and civil decrees which often include formal determinations declaring certain river basins fully or over appropriated. Because

each decree is unique, Wilson was unable to generally describe procedures used in arriving at such all-encompassing conclusions. As a practical matter, stream flows in most watersheds have been declared fully appropriated, he said. Because comprehensive water right adjudications are nearly completed in Nevada's river basins, few applications for new SW appropriations get filed in the State Engineer's office. "If a new application specifies diversions in a fully appropriated basin mentioned in one of the decrees, it is simply rejected," Wilson explained. In such cases, I gathered staff member denial recommendations are not backed up with results from hydrological assessments.

Responsibility for field administration of SW rights is mixed. In several small watersheds Wilson described water users as conciliatory and said they are "self regulating." In others the State Engineer has ordered competing water users to employ a water commissioner. Elsewhere, Wilson said regulation in the field falls to water commissioners employed by the State Engineer's office. Finally, water rights are regulated by federal water commissioners in the Humboldt, Truckee and several other river basins. Judging by what was heard, field regulation is extensive and continuous.

Adjudication of GW rights does not include potential future users; therefore, determinations of un-appropriated water are not included in the proceedings.

Before acting on applications to the State Engineer for new GW uses, Wilson said staff members consult relevant hydrological reports (mentioned were several publications authored by USGS scientists). Also before making "perennial yield" recommendations to the State Engineer, staff members sometimes examine potential impacts by using mathematical models. As described, staff member analysis procedures seemed straight forward. Additional GW withdrawals are permitted only if cumulative withdrawals do not exceed rates of natural recharge. When asked if the staff member analyses amounts to assumption of the burden of proof, Wilson paused and ultimately said he believes it does. Applicants assume the burden of proof if they opt to contest one of the State Engineer's official decisions, he said. Except for several instances where GW contamination threatens public health, the State Engineer has not formally closed an aquifer to further exploitation.

Without being specific Wilson said field regulation of GW users is substantially less intensive than that undertaken for SW users. From what he said, I gathered agency staff members believe satisfactory compliance is achieved through imposition of restrictions placed on permits; Ex's: irrigated acreage limitations, urban service area limitations.

New Mexico
Jay Stein, Stein & Brockmann, P. C. (former chief counsel, State Engineer's office)
July 20, 2004

Principles of prior appropriation apply to uses of both SW and GW. Adjudication procedures (they're still ongoing in numerous locations) permit formal recognition of uses prior to 1907

(SW) and prior to 1931 (GW). Adjudications must be preceded by a Hydrographic Survey prepared by the State Engineer's office. The reports are important in establishing appropriations through judicial processes or by negotiation where the State Engineer's office prepares "offers of judgement." Consideration of un-appropriated water is not a factor in either activity.

Proposed new water uses do not stand for judicial review but must be OK'd by the State Engineer. In such instances statutory provisions (Sec's 72-5-6 & 72-12-3) indicate a permit shall be issued ". . . if applicant has provided reasonable demonstration that: . . . (2) the project is hydrologically feasible . . ." According to Sec. 72-5-7, SW applications are to be rejected if there is no unappropriated water.

The State Engineer is authorized by Sec. 72-12-1 "to declare" particular ground water basins if irrigation development is judged to be excessive, if compliance with interstate compacts cannot be assured or for a variety of other reasons. Some 20 years ago, Stein mentioned a State Engineer-declared moratorium after El Paso, Texas threatened to construct municipal wells in New Mexico. From another source, *High and Dry*, written by G. Emlen Hall (Univ. of New Mexico Press, 2002), it sounds like former State Engineer Steve Reynolds often played it fast and loose when deciding whether additional GW uses could be allowed in particular locations (esp. ground water sources hydraulically connected to the Pecos River).

Judging by what Stein said, reasons for a recent Legislative moratorium (Sec. 72-12-3.1) are similar to those experienced by Reynolds some 25 years ago. The 24-month moratorium is for the Lower Rio Grande watershed where several municipalities from Texas (Stein also mentioned Juarez, Mexico) publically indicated interest in constructing wells in New Mexico. Notably, the Legislature's apparent rationale also suggests elements of a hydrological assessment. In pertinent part it says:

> ". . . the amount sought to be appropriated in pending applications far exceeds available supplies and the allocation of surface water between the states of New Mexico and Texas needs further clarification."

Beyond the recently adopted Legislative moratorium, Stein said there have been no official watershed or ground water basin closures. As a practical matter, however, he said it is generally recognized that diversion of water is likely to be infeasible in many locations. As an example, he mentioned the Pecos River watershed, subject to the amended decree in *Texas v New Mexico*, No. 65 Original 494 U.S. (1988) which mandates compliance with certain state-line delivery requirements. By implication he said severe limitations exist in that watershed.

The State Engineer maintains offices in various locations. Responsibilities vary from one to another, but Stein said Water Masters assigned to some locations are responsible for field regulation of water appropriators. The decree in *Texas v New Mexico* created a special Water Master to supervise water diversions in the Pecos River watershed. As opposed to regulation of water users, Stein said field activities in many locations are limited to data collection efforts. Hall's book (he's on extended leave & could not be reached) generally agrees with Stein's

assessment. They both claim the State Engineer's office has a long history of attempting to avoid priority regulation . . . a politically messy and career-threatening activity.

Finally, the statutes mention County Artesian Well Supervisors. Such officials are to serve in locations where Artesian Conservancy Districts exist. Stein was aware of the Pecos Valley Artesian Conservancy District but was unsure whether field supervisors have been appointed. Hall's book sheds no additional light on the status of such supervisors.

North Dakota
Bob Shaver, North Dakota Water Commission
July 12, 2004

Principles of prior appropriation apply to both SW and GW diversions. A requirement for the State Engineer to consider whether water supplies are sufficient to satisfy proposed uses contemplated in new applications is not explicit, but Shaver said it is routinely inferred from six elements falling under "public interest" criteria specified in Sec. 61-04-06.

Sustainability is the underlying criteria for all GW decisions. "That means extractions must be in balance with natural rates of recharge. Given variations in climate, we review all applications and continue permitting most diversion proposals," Shaver explained. Mathematical models have been developed for most GW aquifers. Receipt of new information (Ex's: annual water-use reports, new test hole & pump test data) permits refinement of agency analytical methods.

SW also is regulated with sustainability as an underlying criteria. Shaver said agency staff recommendations are presently based upon 80% exceedence criteria. He was unaware of Oregon's mathematical procedures, but after hearing them described, he said North Dakota staff members employ a substantially similar methodology when reviewing permit applications. He said the State Engineer has not formally closed any watersheds in North Dakota.

The State Engineer's office is not often called upon to regulate users in the field. Instead, staff members make inspections to verify compliance with specific requirements included in permit application approvals. In response to my question about water meters and maintaining their precision over time, Shaver said agency field personnel do not routinely check their accuracy. If administration of prior rights is requested, the State Engineer's office first requires individuals to make a "reasonable effort to capture" available water (i.e., wells drilled to bedrock, stream channels dredged to direct flows toward headgates, etc.). From his remarks, I gathered priority regulation in the field is not frequent.

Sec. 61-04-31 ("Reservation of waters") creates authority for the State Engineer ". . . to withdraw various waters of the state from additional appropriations . . ." Shaver said the legislation was enacted in the 1970s and was a political reaction to concern over several large-scale industrial pipeline proposals. Reservations contemplated by the statute have never been pursued, he said.

Oklahoma
Mary Bruegger, Oklahoma Water Resources Board
July 14, 2004

Use of SW is subject to prior appropriation requirements. Before granting permits for its use, the 9-member Oklahoma Water Resources Board (OWRB) must find "unappropriated water is available in an amount applied for." For diversion of stream flows, administrative procedures (agency rule Sec. 785:20-5-5) indicate such determinations ". . . shall taken into consideration the mean annual precipitation run-off." Bruegger said agency staff members recently urged adoption of additional analytical criteria. Its approval is pending.

As opposed to closing basins to approval of additional appropriations, OWRB continues to grant new permits. Those unable to divert because their permits are out of priority, must simply "wait in line" until flows increase or until senior rights are relinquished or expire due to non-use, she explained. None of the state's watersheds have been declared over-appropriated, and judging by her remarks, it sounded like such a move has not been considered.

GW is private property subject to reasonable regulation by the OWRB. As described on the OWRB web site, permits for GW use specify annual pumping volumes " . . . based upon the amount of land owned, generally two acre-feet per acre of land: *slightly more or less in basins where detailed hydrologic surveys have been conducted.*" Preparation of the hydrologic surveys is an ongoing responsibility delegated to and given prominence by the agency. Inherent in completion of the surveys is attention given to the "Life of a groundwater basin or subbasin," a term of art defined by agency rule (Sec. 785:30-1-20):

> ". . . that period of time during which at least fifty (50) percent of the total overlying land of the basin or subbasin will retain a saturated thickness allowing pumping of the maximum annual yield for a minimum of twenty (20) year life of such basin or subbasin, provided that after July 1, 1994, the average saturated thickness will be calculated to be maintained at five feet (5') for alluvium and terrace aquifers and fifteen (15') for bedrock aquifers . . ."

Notwithstanding the ultimate conclusion that criteria suggests, Bruegger said she doubted the OWRB would ever close particular geographic areas or stratigraphic units to further exploitation. From her remarks, I gathered recognition of private ownership has everyone "spooked," and it has generally discouraged consideration of such a move.

Despite agency hesitations, an 88-mile pipeline proposal to deliver water supplies to several growing urban areas in southern Oklahoma prompted a recent Legislatively mandated GW moratorium. Pending completion of a special investigation, the moratorium (Senate Bill 288, 2003 Leg. Session) bars OWRB from approving permits to export GW pumped for use outside any county which overlies the Arbuckle-Simpson aquifer.

Besides the emotion associated with exports of large quantities of water, Bruegger said other

local circumstances create additional complications. The Arbuckle-Simpson aquifer is a "sensitive sole source ground water basin" and pumping from it adversely impacts flow in several streams which ultimately pass through the scenic Chickasaw National Recreation Area.

At this juncture, Bruegger said "we are awaiting the outcome of litigation over whether private property considerations make Senate Bill 288 unconstitutional." Regardless of that outcome, she said the special investigation has been ongoing for more than a year.

Bruegger mentioned routine field inspections to verify compliance with permit requirements and only periodic field enforcement of priority rights for SW users. Judging by her remarks, it didn't sound like priority regulation is extensive. When needed, it mostly involves requiring SW appropriators to forego diverting small quantities needed by livestock grazing downstream.

Oregon

Principles of prior appropriation apply to both SW and GW diversions. The statutes set out a 3-step process for obtaining water rights. In seeking WRD approval, the burden of proof is on applicants to demonstrate sufficient water is available at the location and at the time of proposed use.

Richard M. Cooper, Oregon Water Resources Department (SW knowledge)
July 8, 2004

Out-of-stream diversions having origins prior to 1909 (continuous operation is an essential factual determination) are recognized through agency adjudication procedures devoid of water availability assessments. Exempt from more rigorous permit requirements are small-volume water consumption activities (Ex: individual households & commercial establishments), diversions needed for fish hatcheries and several other categories.

Some 12 - 13 years ago, Cooper said WRD staff members informally concluded natural stream flows (i.e., after taking release of impounded supplies into account) in nearly all locations were "fully if not over-committed." In large part that assessment was based upon the experience of agency Water Masters' (similar to game wardens, but instead of fish & game regulations, they are charged with water regulation & distribution responsibilities) routine regulation of stream flow users. In effect "the central office was issuing permits in the morning, and our Water Masters were closing down the same people later that day; it didn't make sense," he said.

Of equal concern with increasing but avoidable agency enforcement expenses was the creation of misleading expectations. "Obtaining a piece of paper (i.e., a water right) from us" became the basis for unintended, unwise investment decisions, he explained.

After sharing their assessment with members of the Water Resources Commission (WRD's policy setting body), staff members' recommendations to develop new procedures and needed

legislative proposals were advanced.

WRD's current policy is now spelled out in ORS 690-400-010 (11)(a)(A):

> Over appropriation means a condition of water allocation in which the quantity of surface water available during a specified period is not sufficient to meet the expected demands from all water rights at least 80% of the time.

With reference to field data collected at measurement sites or by analyses resulting from specific stochastic methods, WRD developed a statistical methodology for determining whether particular watersheds or stream reaches are over-appropriated. The same methodology is used in reviewing individual applications. Decisions are based upon analyses of monthly stream flow data. "Even if the numbers are less than the 80-percent level, applications are sometimes rejected because other factors are over-riding," Cooper said. WRD's computation procedures are laid out in Cooper's technical report (*Determining Surface Water Availability in Oregon*, August 2002). Copies in electronic or hard copy are available from WRD.

For out-of-stream growing season uses (generally April thru October), most watersheds were closed to new appropriations in the 1990s, Cooper said. Additional non-irrigation season diversions could be allowed on a few streams in eastern portions of the state, he added.

Doug Woodcock, Oregon Water Resources Department (GW knowledge)
July 28, 2004

Woodcock provided an internal agency memorandum which briefly outlines Oregon's various regulatory schemes for managing use of GW. The overall objective of his state's regulations is to ". . . maintain ground water resources as stable and renewable water supplies, while at the same time conserving maximum supplies for new beneficial uses." Commission members tend to be pro-active, he said. The statutes describe five distinct mechanisms. At one location or another, each has been implemented:

1. Withdrawal of unappropriated water (ORS 536.410). A stratigraphic/geographic area may be withdrawn if the Commission determines it is necessary to ensure compliance with State water policy or is in the public interest to conserve water. The withdrawal doesn't affect existing users, and it must specify what types of new uses (i.e., industrial, irrigation) are prohibited.
2. Classification of water (ORS 536.340). Upon identifying stratigraphic/geographic boundaries the Commission is authorized to designate the purposes for which remaining unappropriated water may be developed. Woodcock mentioned several high value, specialty crops and said the purpose of this declaration is to assure GW is used for the "highest and best use."
3. Serious water management problem area designation (ORS 540.435). Again after designation of stratigraphic/geographic boundaries the Commission is authorized to require meters and submission of annual reports of GW use. Woodcock said SWMPA

designations have been implemented where long-term GW declines exist, where well interference problems are known to occur and where shortages are periodic.

4. Regulation for substantial or undue interference (ORS 537.775, 537.777 & 537.690). On the surface I found it difficult to distinguish between this authority and that discussed previously. In mentioning well pumping drawdowns as they may intercept nearby streams, the memorandum provided clarity. At least partly under authority of such designations, Woodcock said WRD personnel regulate SW and GW users conjunctively.
5. Critical ground water area designation (ORS 537.730 to 537.742). If conditions are severe the Commission is authorized to order a "cut back on existing uses of GW." Reduced pumpage by existing users can be ordered as a means toward reversing overdraft, reducing interference among well operators, retaining water quality in an aquifer and for variety of other reasons.

Agency personnel assigned to its GW section work closely with USGS scientists. Joint efforts are directed toward data collection & analyses. Studies having a basin-wide scope are most useful for agency purposes, Woodcock said. "We attempt to be forward looking, but with existing budget limitations, it's difficult to be proactive."

From his description in-the-field regulation has been less successful than agency personnel had expected. He mentioned "mixed results" in several locations which have been designated as critical. In reference to budget reductions, he said "We haven't been hit lately," but he said in-the-field regulation was scaled back during previous shortfalls.

South Dakota
Ron Duvall, South Dakota Department of Environment & Natural Resources
July 14, 2004

Principles of prior appropriation were first adopted by the Territorial legislature and now apply to users of SW and GW. Applications for water appropriations can be permitted only after DENR determines there is a ". . . reasonable probability that there is unappropriated water available for the applicant's proposed use . . ." (SDCS 46-2A-9). An exception to the permit procedures is made for small volume domestic uses. The existence of sufficient unappropriated water is inherent in an adjudication process for establishing pre-1955 GW appropriations.

Besides the general requirement mentioned above, an additional provision (SDCS 46-6-3.1) says a new GW appropriation may not be granted if ". . . the quantity of water withdrawn annually . . . will exceed the quantity of the average estimated annual recharge . . ." The latter requirement is not applicable for withdrawals from stratigraphic units older than the Greenhorn Formation (a unit deposited some 63 - 138 M years ago).

The 7-member Water Management Board (sets general policies, hires an agency executive & is responsible for making certain decisions) has not formally closed any watersheds to applications for SW appropriations. And, they "don't have the heart to turn down individual applications,"

Duvall said. As a result, agency files contain many pending applications.

New appropriations in the James River basin may prompt a change in that policy, Duvall said. Board members tentatively agreed cumulative "basin-wide diversion approvals should stop at 300 cfs." New applications for that region have not been received, and whether the Board will actually deviate from its long-standing policy remains to be seen.

On a practical basis, Duvall said most "tributaries coming from the Black Hills are over-appropriated, and we (i.e., staff members) always recommend new applications be denied." When asked for a technical explanation, he mentioned cumulative numbers of permitted diversion rates and contrasted them with statistical parameters obtained from pertinent measuring station data; 50% exceedance was mentioned specifically.

In contrast to their SW decisions, Board members have rejected applications for new wells when staff members report cumulative pumpage exceeds estimated rates of recharge. Staff member recommendations are nearly always based upon individual county investigation reports authored by USGS scientists. It sounded like each report includes a single, county-wide recharge estimate. Generally, staff members take published values at face value. Agency analytical procedures are mathematical and straight forward. If, after the proposed pumping rate specified in an application is added to pumping rates of all existing wells, cumulative pumping from an aquifer is less than published recharge figures, staff members recommend approval of new applications.

Duvall said his agency lacks adequate staff member numbers to fully monitor SW diversion activities. Complaints are routinely handled by staff members issuing written closing orders. Field enforcement is pursued by agency staff members only if complaints persist. The latter activity occurs rarely.

In discussing resolution of GW users' complaints in eastern South Dakota, Duvall said Sioux Falls officials recently agreed to provide water to several individuals who own shallow wells adversely impacted by operation of nearby, large capacity wells owned by the municipality. He said the agency has no history of shutting off GW users as a means a) of enforcing priority rights among well operators or b) to increase flows in hydraulically-connected streams.

Texas

Kellye Rila, Texas Natural Resource Conservation Commission (SW knowledge)
July 26, 2004

Gregg Eckhardt, Edwards Aquifer Authority (GW knowledge)
July 26, 2004

Use of SW (public property) is subject to appropriation under a system of prior rights. Formal authorizations for pre-1967 uses of SW are subject to adjudication procedures largely delegated to the TNRCC. On a state-wide basis the agency Web site says the adjudications are nearly

complete. Assessment of available supplies is not a consideration in such proceedings.

Sec. 11.134(b)(2) instructs the TNRCC to grant post-1967 applications if there is unappropriated water in the proposed source of supply. A seven-member Review Team (Rila is the designated team leader) is charged with making recommendations to TNRCC members. Because water rights are granted on a "first come-first served" basis, the Web site says there are "areas of the state where all of the water available for appropriation has already been permitted." It goes on to say, "There are other areas of the state where water is only available for appropriation for a period of time which may or may not be extended depending on the development of existing senior water rights." In response to questions about the various watersheds, Rila identified only the Rio Grande.

Criteria used by the seven-member Review Team are spelled out on the Web site. Narration contained therein seems more absolute than Rila described, however. She said the TNRCC sometimes ignores recommendations coming from the Review Team. With that in mind (and for whatever it they may be worth) when evaluating individual applications, the Web site claims these "three rules of thumb" guide decision makers in Texas:

- for most users, if the record shows that at least 75% of the water can be expected to be available at least 75% of the time, the TNRCC will usually issue the permit;
- for municipalities, the TNRCC will issue a permit only if the record shows that 100% of the water can be expected to be available 100% of the time, unless a backup source is available;
- for a municipality that has access to a backup supply, the TNRCC may decide to issue a permit to use water that can be expected to be available less than 100% of the time.

Across the state SW shortages are neither common nor universal. According to the Web site, "In most areas of the state, the honor system governs compliance with water rights." Consequently, field regulation is limited to particular locations. Rila said field regulation is "intense in the Rio Grande" watershed.

Mentioned on the Web site are Watermasters for South Texas streams and the Rio Grande River. When necessary, each is authorized to regulate or close down junior appropriators. Those intending to begin pumping from the river "must notify the Watermaster in advance of beginning their diversions," Rila explained.

GW use is a private property right and not generally subject to supervision by public agencies. An exception is use of GW from the Edwards Aquifer. Pumping from the aquifer is known to adversely impact the flow of springs important for endangered species habitat near San Antonio. With claims of an incidental take, the Sierra Club initiated litigation starting in 1991.

The Texas Legislature responded to that situation by creating the Edwards Aquifer Authority in 1993. (NOTE: Perhaps because its provisions are scattered across seven chapters of the Texas

code, making specific references is difficult; Rila and Eckhardt mentioned "the Act" or "Senate Bill 1477" when speaking with me. After spending 45 minutes in an unproductive search, I gave up attempting to identify specific references.) As a means of preserving the magnitude of discharge from large springs which discharge directly into pools inhabited by federally-listed fish, the Authority is charged with limiting GW withdrawals.

The Authority's jurisdiction is limited to the 8-county area overlying the Edwards Aquifer. Among other things Board members have adopted management goals which call for reducing annual aquifer withdrawals to 450,000 acre feet by Dec. 31, 2007. Thereafter, annual withdrawals are to be 400,000 acre feet. Those quantities (but not the target dates) are mentioned specifically in the enabling legislation. Eckhardt said they resulted from extensive field testing and mathematical modeling analysis. Passage of the Legislation effectively created a moratorium which limits cumulative GW extractions from the aquifer, he acknowledged.

The burden for achieving those objectives falls largely to the Authority. To reduce GW withdrawals prior to the end of 2007, it is solely responsible for purchase and permanent retirement of existing uses. After achieving the 450,000 acre feet objective, the expense of further pumpage reductions is to be shared with other users located downstream from the springs.

In pursuit of its objectives, Eckhardt said Board members have adopted a variety of regulations which include meter installation requirements and pumpage limitations. The Authority employs a large staff, including those responsible for enforcement activities in the field.

Utah
Dorothy Bolton, Utah State Engineer's Office
July 15, 2004

All waters are public property, and uses of SW and GW fall under rules of prior appropriation. Applications are made to the State Engineer, who before approval, is required to make an affirmative finding that unappropriated water is available (Utah Code, Title 73, Chapter 03). The statutes contain provisions for filing so-called "diligence claims" for pre-1903 use of SW and "underground water" claims for pre-1935 use of GW. To force quantification of federal reserve rights under provisions of the McCarren amendment (not mentioned was possible adjudication of Native rights), general stream adjudications are ongoing in several watersheds. The State Engineer is delegated certain responsibilities (Utah Code, Title73, Chapter 04) to assist non-federal interests in general adjudication proceedings.

Closing areas to further development started many years ago; first with gubernatorial proclamations and later under rule making authority granted to the State Engineer. According to Bolton, agency decisions to close areas to approval of new applications resulted from regulatory experiences; mentioned were futile calls, increasing numbers of interference problems among GW users and interstate compact limitations. Also, for several watersheds authors of agency-sponsored technical investigations reached specific conclusions which the State subsequently

found persuasive. Closures are formally promulgated in "State Engineer Policies," she said.

Nearly every watershed is closed to approval of SW appropriations. Judging by a map of Utah, approximately 1/4 of the state (central) also appears closed to approval of new GW applications. Elsewhere, the map suggests conditions are less severe; perhaps 30% of Utah (approximately) is labeled "Restricted," a slightly larger portion of the state (west & northwest) is labeled "Open." A Policy requirement in one of the "Restricted" areas allows operation of individually-owned domestic wells until such time as home owners can obtain supplies from nearby municipalities, Bolton explained.

SW use regulations are enforced by River Commissioners who confine their efforts to particular watersheds or stream reaches. Individual water users, districts, municipalities and companies collectively hire and pay their salaries. A few work full-time, but most are employed only during the irrigation season.

Recently, Bolton said GW users in several locations also began hiring Commissioners. Exactly what functions are performed by them was not known to her.

"In large part Utah is a desert," Bolton said. In many locations water is very scarce. When reviewing whether an irrigation water right can be relocated to another location or transferred to municipal use, Bolton said beneficial use considerations include such things as minimum crop water needs (related to specific forage, grain or perennial trees/vines) and efficiency in delivering water to particular fields.

Washington
Doug McChesney, Washington Department of Ecology
Despite periodic exchange of phone messages, I was unable to speak w/McChesney. - **MJ**

Uses of SW and GW are governed by principals of prior appropriation. In situations where uses from both sources are inter-related, referred to as "hydraulic continuity," the policy is one size fits all. The so-called "one molecule theory" is complete and total. GW & SW users are to be jointly regulated no matter how minuscule the physical connection between them and without regard to time delays.

For pre-1917 SW users, a claims registration process leads to acquisition of vested rights; similar procedures are available to pre-1945 GW users. The Water Code (RCW Chapter 90.03) applies to new applications made subsequent to 1917 (SW) and 1945 (GW). Prior to creation of a new water appropriation, the Code directs Ecology to " . . . determine what water, if any, is available for appropriation . . ."

Beginning nearly 20 years ago, Ecology initiated negotiated rule-making activities aimed at preserving flows in streams deemed necessary for salmon and other anadromous fish. By subsequent regulation (WAC Sec's 173-500 *et seq*) the agency specified minimum necessary

instream flow quantities, compared those figures with existing out-of-stream water appropriations and concluded many streams are "totally appropriated." Ten tributary streams and stream reaches in the Walla Walla basin, for example, are closed to new appropriations under WAC 173-532-040. Elsewhere, preservation of artesian aquifer conditions or a desire to maintain certain water table levels has been the subject of additional rule making efforts. Similarly, agency regulations WAC Sec's 173-100 thru 173-136, for example, establish limits for extraction of GW in particular locations. In both SW & GW situations, Ecology's subsequent analyses that particular new applications cannot be allowed due to lack of un-appropriated water was based upon its earlier rule-making activities.

Agency determinations to allow new appropriations are not conclusive, however. In *Rettkowski v Dept. of Ecology*, 122 Wn.2d 219, 858 P.2d 232 (1993), a majority of the Supreme Court cited, among other things, the State's comprehensive statutory procedures in concluding that only the Superior Courts have responsibility to ultimately create water appropriations. Thus, while agency determinations filed with the Superior Courts in such matters are often given significant weight, they are not the last word. Also in *Rettkowski,* the Court said Ecology could not enforce its cease and desist orders in advance of the Superior Courts' concluding basin-wide adjudication proceedings.

Basin-wide adjudications are complete in more than 80 watersheds. Judging by the list, more than half include only SW uses, however. Both SW and GW uses have been adjudicated in the remaining watersheds.

Judging by Ecology's allocation of resources, enforcement is not a high priority. A pie chart seen on one of its Web pages says 3% percent ($1.2 M) of the agency's annual budget ($35.6 M) is spent for in-the-field compliance activities. Attention is said to be focused upon a) attaining 80% compliance with court-ordered measuring device requirements and b) enforcement actions in egregious circumstances, for endangered species protection and in "high water use sectors." Of the 151 persons employed by Ecology, one of the agency Web pages says only nine are assigned enforcement responsibilities.

Wyoming
Depositions of various witnesses in *Nebraska v Wyoming*, No. 6, Original.
1986-1998

Since territorial times SW use has been subject to prior appropriation requirements. A set of adjudication procedures, spelled out in Sec's 41-4-101 thru 41-4-408, delegates responsibility for their execution to the Board of Control. Post-1890 SW uses must be authorized by the State Engineer. According to Sec. 41-4-503 it is the ". . . duty of the State Engineer to reject such application and refuse the permit asked for . . . (if) there is no unappropriated water in the proposed source . . ."

Use of GW is authorized by the State Engineer and falls under somewhat similar requirements.

Since 1969 a permit has been required prior to construction of all water wells. According to Jacobs, Tyrrell and Brosz (*Wyoming Water Law - a summary*, Univ. of Wyo. Agricultural Experiment Bulletin B849R, May 2003), GW permits are "usually granted as a matter of course." Three Control Areas have been established by the Board of Control, and when permit applications are reviewed, Advisory Groups representing the respective areas sometimes make recommendations to the State Engineer. Reportedly, the recommendations sometimes include denial if cumulative GW pumpage is approaching recharge rates or if GW water levels are declining or have already declined excessively.

Among those deposed in *Nebraska v Wyoming*, No. 6, Orig., were former State Engineer George Christopulos and (then) State Engineer Jeff Fassett. Others deposed included Earl Michael (a former member of the Board of Control), Brian Pugsley and Doug Oliver. When asked, none of them said he knew of watersheds or ground water basins having been formally closed to issuance of new appropriations.

After reviewing those depositions and other evidence, representatives for Nebraska also concluded field enforcement of water appropriations was largely ignored by responsible Wyoming officials. After nearly half a day of questioning, for example, Christopulos finally acknowledged having extended no genuine effort regulating reservoirs in the North Platte drainage.

Later, Wyoming officials produced a document which described a complex regulatory scheme supposedly used to guide enforcement activities in the North Platte watershed. On several occasions it became the subject of extensive discussion before the Special Master. Generally, the document indicated enforcement actions would only follow the existence of certain sets of circumstances and be applicable only to particular geographical locations.

Actual in-the-field activities described by Michael, Pugsley and Oliver during their depositions, however, indicated little knowledge of the written criteria developed by Wyoming's legal representatives and given to the Special Master. Not only did they not follow the written guidelines, but through the depositions of these Wyoming employee witnesses and others, Nebraska officials ultimately concluded Wyoming's enforcement activities were haphazard, lax or more often, nonexistent.

Updated – 7/3/02

CONJUNCTIVE USE AND MANAGEMENT OF SURFACE AND GROUNDWATER IN THE STATE OF NEBRASKA

This purpose of this paper is to provide background information on laws relevant to conjunctive use of surface and groundwater in Nebraska. Included are sections on historical background, Nebraska Water Law, Nebraska Water Law relevant to surface water – groundwater relationships, state water planning and management and potential conjunctive use issues.

I. Historical Background

Irrigation in Nebraska began in the late 1850's, and by 1890 there were about 12,000 acres irrigated in the state. Early irrigation relied primarily on the riparian rights system derived from the common law of England. Legislative bills in 1877 and 1889 included some limited irrigation provisions. However, it was the drought years of 1889-1895 that helped provide the political momentum that ultimately resulted in the legislature's passage of an 1895 act adopting the appropriation system. The 1895 law and resultant *"first in time, first in right"* priority system remain the basis for surface water rights administration in the state.

Surface water use expanded considerably in the ensuing decades with Bureau of Reclamation projects on the North Platte (early 1900's), the Tri-County Project (1941), and projects on the Republican (1949-1962) among the projects that assisted that expansion. Surface water irrigated acreage approached current levels by the mid to late 1960's.

In the 1940's groundwater irrigation in Nebraska began to expand at a rapid rate. Groundwater irrigated acreage was probably less that a tenth of surface water irrigated acreage in 1940 and yet surpassed it by sometime in the early 1950's. Installation of groundwater wells peaked in the mid 1970's and groundwater irrigated acreage has expanded more slowly since that time. Today surface water irrigated acreage accounts for only about 1 million of Nebraska's 7.5 to 8.15 million irrigated acres. Nebraska currently ranks second in the nation in total irrigated acreage and first in the nation in acreage irrigated from wells. Groundwater wells also supply about 81% of the state's public water supply customers and virtually all of the rural domestic supply.

The rapid expansion of groundwater has helped lead to a number of significant changes in the way the state administers water resources and other natural resources. In 1957 bills passed requiring registration of irrigation wells and a 600 foot minimum spacing between irrigation wells. Then in 1969 the Nebraska Unicameral passed a bill consolidating and expanding the duties of Soil and Water Conservation Districts and a variety of other special purpose districts into 24 (now 23) local natural resources districts (NRDs). The responsibilities and authorities of the NRDs have expanded considerably since that time. One of those expansions was passage of groundwater control area legislation in 1975. That legislation has evolved into today's Groundwater Management and Protection Act which serves as the basis for Nebraska's local control approach to groundwater management. One of the major expansions of that act occurred in 1996 when passage of LB 108 provided the NRDs with responsibilities and authorities relating to management of hydrologically connected surface water and groundwater.

Surface water and groundwater relationships are particularly important to Nebraskans in two major instances. Half of the public water supply for the Omaha Metropolitan Area and all of

the public water supply for Lincoln, Nebraska's two largest cities, comes from wellfields inducing recharge from the Platte River. In 1993 the Unicameral passed legislation allowing cities to obtain water rights to the flows needed for induced recharge. Integrated use of surface and groundwater is also a special consideration in portions of the Central Platte region, especially the area of the Tri-County project. Surface water use in the project region has helped lead to build-up of a groundwater mound that can serve as the basis for groundwater irrigation and help sustain flow by seepage in periods of off-peak flow. In addition to these two instances, surface water – groundwater relationships are significant factors on several major interstate lawsuits or agreements – the Platte River Cooperative Agreement and the Kansas-Nebraska lawsuit on the Republican River compact and the Nebraska - Wyoming settlement related to the North Platte Decree.

The groundwater level rises in the Tri-county region are in contrast to groundwater level drops from predevelopment in several areas of the state. Portions of the Upper Republican, Box Butte County, the Blue Basins and some other smaller areas have experienced significant groundwater declines since predevelopment. However, overall Nebraska's generous groundwater supplies are in contrast to many of its neighbors in the High Plains Region and the groundwater level declines experienced in parts of those states. Nebraska has about 38 ½ % of the total area of the high plains aquifer system and about 65 ½% of the drainable water in storage. Ironically, the area of most abundant groundwater supply (up to 1200 feet of saturated thickness) lies under the central portion of the Sandhills, an area generally not suitable for irrigation. Also, well over half of the state's population lives in the eastern 16% of the state not served by the High Plains aquifer system.

II. General Summary of Nebraska Water Law

Surface Water

The foundation for Nebraska's surface water rights system is found in Article XV, Sections 4 through 7 of the Nebraska Constitution, especially Sections 5 and 6 which provide:

> *"Sec. 5. Use of water dedicated to the people. The use of the water of every natural stream within the State of Nebraska is hereby dedicated to the people of the state for beneficial purposes, subject to the provisions of the following section.*
>
> *Sec. 6. Right to divert unappropriated waters. The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied except when such denial is demanded by the public interest. Priority of appropriation shall give the better right as between those using the water for the same purpose, but when the waters of any natural stream are not sufficient for the use of all those desiring to use the same, those using the water for domestic purposes shall have preference over those claiming it for any other purpose, and those using the water for agricultural purposes shall have the preference over those using the same for manufacturing purposes. Provided, no inferior right to use the waters of this state shall be acquired by a superior right without just compensation therefor to the inferior user."*

In general, rights to use surface water are obtained by acquiring a state permit. The permit can be denied if there is insufficient water or if it is not in the public interest. Administration of the water right in times of shortage is based upon the *"first in time, first in right"* principle, with senior rights receiving priority. In practice, the preferences listed above in Article XV Section 6 have limited value. Three different major types of appropriative rights are issued – natural flow, storage, and storage use. Permits are also issued for wells for irrigation that are located within 50 feet of a stream (such wells are considered to be surface water uses) and for pumping from a natural lake.

Rights are lost by non-use, but specified excuses for non-use are allowed. For natural flow rights quantities allowed for irrigation are limited to 1 cubic foot per second per 70 acres irrigated and 3 acre feet per year. Instream appropriations may be obtained for recreation, fish and wildlife purposes. Only natural resources districts or the Nebraska Game and Parks Commission may file for streamflow rights and such rights do require that the Director of Natural Resources make additional findings beyond those associated with most other types of water rights.

Surface water right transfers are allowed, subject to a variety of public interest and other requirements. Included is a prohibition against transfers that would change the type of use, i.e. agricultural rights can be transferred to another agricultural user, but not to a domestic or industrial use. Although interbasin transfers are allowed, they must be treated the same as other appropriation requests, plus the benefits to the state from the transbasin diversion must be equal to or greater than those from denying it. Nebraska surface water management is also subject to the provisions of the U.S. Supreme Court Decree on the North Platte River and Congressionally approved compacts governing interstate use of the South Platte, Republican, Upper Niobrara and Blue Rivers. Surface water quality is regulated through the Nebraska Department of Environmental Quality through a variety of regulations.

Groundwater

Groundwater in Nebraska belongs to the public, but landowners have the right to make reasonable and beneficial use on overlying lands. That right is subject to the correlative rights of others and public management policies. Preferences somewhat similar to those for surface water apply, but have been little used thus far. In 1957 the Unicameral passed legislation requiring the registration of all irrigation wells. Registration of all water wells drilled since September 9, 1993, including domestic wells is now required. Six hundred foot spacing is required between irrigation wells of different owners. One thousand foot spacing is required between industrial water wells, public supply wells and irrigation wells. Runoff of irrigation water from groundwater sources is regulated by natural resources districts. Transfers of groundwater off the overlying land are allowed for geothermal, large scale industrial, public water supply, and agricultural purposes. Transfers across state lines are also allowed if a variety of specified conditions are met.

Nebraska's 23 natural resources districts play a major role in groundwater quantity and quality management, primarily through the Groundwater Management and Protection Act. That act also has provisions related to the integrated management of hydrologically connected groundwater and surface water. All districts are required to have groundwater management plans that contain information about supply and groundwater quantity or quality problems as well as management objectives, a proposed reservoir life goal, groundwater quality goals and solutions, and proposed controls. Groundwater management areas can be formed to address problems

relating to quantity, quality, or integrated management of surface water and groundwater. Natural resources districts have a variety of potential controls for management areas, including:

Allocations of Withdrawals
Rotation
Reduction of Irrigated Acres
Limit or Prevent the Expansion of Irrigated Acres
Well Spacing
Metering/Monitoring
Use of Best Management Practices
Chemical / Fertilizer Analysis of Water or Deep Soil
Mandatory Education
Moratorium on New Wells
Other Reasonable Rules and Regulations

With a few exceptions, new wells pumping greater than 50 gallons per minute in ground water management areas must have a permit from the natural resources district before drilling. Nebraska currently has 23 natural resources districts, of which 17 have district-wide ground water management areas. Two additional districts have a portion of their district within a management area. All of the management areas are focused on water quality with 7 of the areas also addressing water quantity. There are two management areas which encompass integrated management, one is a district-wide area and one is a subarea of a district-wide management area. Natural resources districts also conduct a variety of education programs, have programs for groundwater level measurement and groundwater quality monitoring, are responsible for chemigation inspections, and can fund studies. The NRDs also administer soil and water conservation incentive monies and have project construction authorities. Their local property tax base and available federal and state funding sources have helped contribute to supplemental water project construction in the state.

The Nebraska Department of Environmental Quality maintains a wide variety of water quality powers. These include regulation of point sources of pollution, source water protection, and coordination of state wellhead protection efforts. State pesticide management efforts are coordinated through the Nebraska Department of Agriculture.

III. Nebraska Water Law Relevant to Surface Water – Groundwater Relationships

In 1997 passage of LB 108 expanded the Ground Water Management and Protection Act to include authorities related to integrated management of hydrologically connected groundwater and surface water. The language of the act indicated that *"Hydrologically connected ground water and surface water may need to be managed differently from unconnected ground water and surface water in order to permit equity among water users and to optimize the beneficial use of interrelated ground water and surface water supplies"*.

The act identifies natural resources districts as the *"preferred entities"* to regulate groundwater related activities that could contribute to conflicts between ground and surface water users. That preference also extends to groundwater management activities that may be necessary for resolving interstate compact or decree disputes or for carrying out state compacts or agreements. The Nebraska Department of Natural Resources is identified as the entity which

should be responsible for surface water activities contributing to such conflicts or providing opportunities for such dispute resolution.

Additional language states:

> *"46-656.06 Conflicts between ground and surface water use: legislative intent. The Legislature recognizes that ground water use or surface water use in one natural resources district may have adverse effects on water supplies in another district or in an adjoining state. The Legislature intends and expects that each natural resources district within which water use is causing external impacts will accept responsibility for ground water management in accordance with the Nebraska Ground Water Management and Protection Act in the same manner and to the same extent as if the conflicts between ground water use and surface water use were contained within the district."*

LB 108 provided three new reasons for establishment of a groundwater management area: 1) prevent, eliminate, or reduce in-state conflicts between ground water users and surface water appropriators, 2) resolve disputes over interstate compacts or decrees, or 3) carry out the provisions of other formal state contracts or agreements. These management areas can be established by any one of three procedures. First, an NRD can create a management area for integrated management of hydrologically connected supplies primarily on its own, in the same manner as it would for other purposes. While this method is the easiest to use, it allows the NRD only to manage groundwater that interferes with surface water use; it does not provide for any comparable surface water management that might help reduce or eliminate the conflict.

For purposes of integrated management only, a management area also can be designated in accordance with either of two independent procedures in the bill. The first can be initiated only by a natural resources district but, once initiated, will involve a partnership effort among the NRDs, the Department of Natural Resources, and surface water users. (Section 46-658.28) Joint action plans can be developed by those parties working together to address the surface water and ground water conflicts. The second independent procedure allows the Department of Natural Resources to initiate designation of a management area on its own. (Sections 46-656.49 to 46-656.60) It can also be used by DNR to require preparation of an action plan for integrated management in an already existing management area. Use of that process is limited to situations where there are disputes over interstate compacts or decrees or *"other formal state contracts or agreements"*.

Even if DNR initiates and establishes a management area under this procedure, DNR is not authorized to implement controls on ground water users unless the applicable NRD(s) refuse to develop an action plan for the management area or if an NRD-developed plan is not approved by DNR. (Section 46-656.60) In the event that DWR would propose to take over actual groundwater management responsibilities, an Interrelated Water Review Committee consisting of the Governor and two members of the Natural Resources Commission selected by the Commission would serve as a buffer between DNR and the NRD(s). DNR could assume jurisdiction and adopt ground water regulations only if the Interrelated Water Review Committee agreed. (Sections 46-656.60 – and 46-656.61)

The statutes also encourage ground water and surface water users to work together to resolve existing or potential conflicts between them. The burden for avoiding or mitigating conflicts does not rest just on the shoulders of the ground water users. If management areas are

designated using either of the two independent procedures, two-part action plans are anticipated. The first part is what the natural resources districts will do to manage groundwater. Those controls were previously mentioned. The second part relates to surface water and how it will be managed differently. (Sections 46-656.28 and 46-656.54) That part of the action plan can include the following surface water related controls:

- increased monitoring and enforcement of surface water diversions
- a moratorium on additional appropriations
- requirements for surface water appropriators to apply or utilize reasonable conservation measures
- other reasonable restrictions on surface water use

The surface water part of the action plan is to be developed by DNR with the assistance of the affected surface water users, including the surface water project sponsors.

Nebraska law also makes provision for the recognition of **incidental and intentional underground storage** of water. The law allows parties to file for new water rights for surface water projects that will result in intentional underground water storage. Those with approved but unperfected rights for use of surface water may also file for a modification of their water right to include intentional underground storage associated with the appropriation. Fees may be assessed on non-domestic wells pumping over 100 gallons per minute for use of **intentional** underground storage water associated with projects not existing before August 26, 1983. Those who have perfected appropriations may file for recognition of the **incidental** underground storage associated with such appropriations, but no fees can be assessed on the users or other beneficiaries of such **incidental** storage. The law includes language noting:

> *"The Legislature finds that uses of water for incidental and intentional underground water storage are beneficial uses of water which contribute to the recharge of Nebraska's aquifers and that comprehensive, conjunctive management of surface water and intentional or incidental underground water storage is essential for the continued economic prosperity and well-being of the state, serves the public interest by providing an element of certainty essential for investment in water resources development, and will improve Nebraska's standing in the event of interstate dispute".*

Public water suppliers may obtain an appropriation for induced groundwater recharge of wells completed prior to September 9, 1993 provided the Director of Natural Resources finds the appropriation is necessary to maintain the well for the uses requested, the rate and timing of flow requested is reasonable for those uses, and the application is in the public interest. For wells drilled after September 9, 1993 additional requirements must be met.

Other important provisions of Nebraska's groundwater law include:

1. An NRD may treat groundwater users differently on the basis of date of drilling, but there are two limitations on that authority. (Section 46-656.25) First, that can be done only for purposes of integrated management and secondly, the date used for such differential treatment can be no earlier that the date of designation of the management area for integrated management purposes.

2. An NRD may treat groundwater users differently on the basis of different hydrologic relationships between groundwater and surface water. (Section 46-656.25) For example, wells in alluvial aquifers could be treated differently from "upland" wells

even if they are also hydrologically connected to surface water supplies, but would affect surface water supplies in a different way.

3. Replacement wells have to be treated the same as the wells they replace. (Section 46-656.25) However, the district does have some authority to define what constitutes a replacement well.

4. For purposes of determining whether conflicts exist between groundwater users and surface water appropriators, surface water appropriators do not include holders of instream flow appropriations. (Section 46-656.25)

IV. State Water Planning and Management

Nebraska's water planning and management take place on several different levels. Each natural resources district has a master plan, a long range implementation plan, and a groundwater management plan. These provide the local direction for water and other natural resource related activities.

The Department of Natural Resources is responsible for directing a state water planning and review process and provides assistance to the NRDs in selected planning and modeling/data manipulation activities. The DNR is also responsible for water rights administration, well registrations, floodplain regulation, dam safety, stream and canal gaging, NRD groundwater management plan approval, maintenance of a natural resources data bank, and representing the state in water compact and decree administration. The DNR also administers a variety of water resources related funds, including a Resources Development Fund for a variety of water related projects, a Soil and Water Conservation Fund, and a Small Watersheds Flood Control Fund.

The Nebraska Department of Environmental Quality is responsible for a variety of water quality regulatory programs and selected water quality planning efforts. The Nebraska Department of Agriculture is responsible for the state pesticide management strategy, and the Nebraska Department of Health and Human Services administers the Safe Drinking Water Act statutes / public water supplies. Other water related agencies include the University of Nebraska Conservation and Survey Division, the UNL Water Center, the Nebraska Game and Parks Commission, and irrigation and reclamation districts.

Overall, regulatory action related to the interrelationship of surface water and groundwater in Nebraska generally falls to either the local natural resources district or the DNR. However, a wide range of state, local and federal agencies can assist in studies or research related to the topic.

V. Potential Issues Related to Surface Water - Groundwater Relationships

Nebraska has a number of tangible existing issues or administrative efforts in which surface water – groundwater relationships are a significant factor. These include the Kansas versus Nebraska lawsuit relating to the Republican River Compact, the Platte River Cooperative Agreement, the Nebraska - Wyoming settlement relating to the North Platte Decree, and potentially threatened and endangered species requirements on the Lower Platte River.

There are a number of general physical situations that current or perhaps future laws may be used to address. These include:

1. Addressing the impacts of groundwater pumping on surface water users, especially prior surface water users
2. The potential use of groundwater to supplement streamflow
3. The impact of streamflow on groundwater recharge
4. Management of water levels in areas subject to higher groundwater tables due to surface water projects
5. Integration of surface water and groundwater use in an optimum manner to increase the effectively usable water supply.

A variety of current research efforts seem likely to add to the physical knowledge of surface water – groundwater relationships in the state. However, the degree to which surface water – groundwater relationship questions are addressed under current law is likely to depend upon the interest level of local NRDs or the degree to which interstate factors or state agreements result in state involvement.