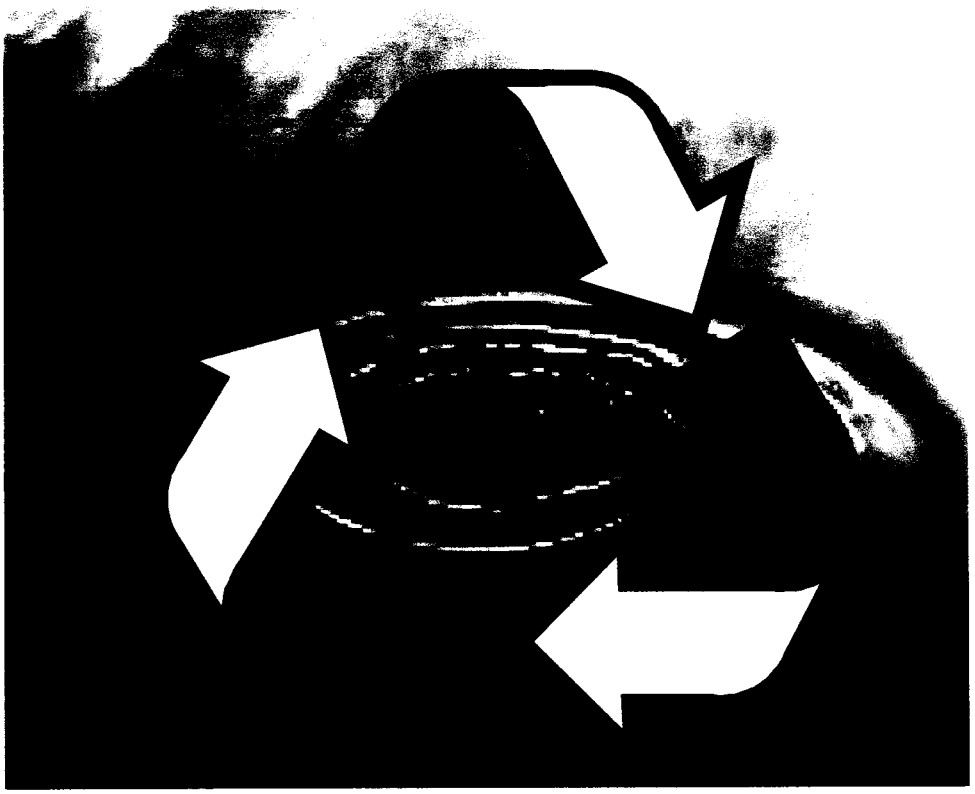
2002

WATER REUSE and ARTIFICIAL GROUNDWATER RECHARGE in the WESTERN UNITED STATES



A Report Compiled by the
Western States Water Council
Chad Shattuck, Legal Counsel

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AND

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INTRODUCTION

As western water resources face increasing and varied demands and the value of water rises, so does the viability of different water supply and reuse opportunities. As part of its 2001 and 2002 work plans, the Council determined to compile a report on western state water laws as they relate to the regulation of water reuse and artificial groundwater recharge activities. This report is intended to identify potential areas in which western states can improve the management of their water resources, primarily illustrating how different states handle similar water law issues.

This report consists of two parts: Part one of this report deals with water reuse. This section analyzes the extent of water reuse in western states, as well as the regulation of such activities. It contains a review of state programs and local projects, as well as an analysis of funding for reuse/recycling projects, project regulation and monitoring, and future water reuse concerns in the West.

Part two deals specifically with artificial groundwater recharge. Artificial recharge is generally carried out by utilizing one of two methods: the use of recharge ponds, and water injection projects. Part two analyzes both methods of recharge on a state-by-state basis. Due to water scarcity west of the 100th meridian, and the lowering of water table levels in many areas, artificial groundwater recharge has increased significantly in recent years. Part two is intended to give a brief overview of what western states are doing to recharge groundwater, describing state rules and regulations, examples of successful projects, and incentives which have helped different states promote successful recharge operations.

Due to the interrelationship between reuse and recharge, many water reuse projects will involve artificial groundwater recharge, and many artificial groundwater recharge projects are intended as a means of water recycling. This is most evident in the summary of operations at California's Water Factory 21 which is a water recycling project which also has a major role in Orange County's ground water management.

Examples of water reuse and artificial groundwater recharge are found in many states throughout the West. In several instances, techniques, rules, or concepts are reviewed with specific reference to an individual state as a means of illustration rather than excluding other states that may also have similar programs. This report does not contain a full explanation of the legal framework of each state's water reuse and artificial groundwater recharge laws, but it does contain summary information for the benefit of Council members.

EXECUTIVE SUMMARY

WATER REUSE IN THE WEST

All states have some sort of water reuse or recycling activity, but the extent to which reuse is promoted varies widely from state to state. Western states do not share a universal definition of water reuse. In fact, many do not even refer to the word reuse. For example, California does not refer to water reuse, but rather water recycling, and Washington uses the term "reclaimed" to mean reused. Some states refer to water reuse as the use of treated sewage effluent, but reusing treated wastewater is just one example of many methods of water reuse. For purposes of this report, water reuse is the secondary and post-secondary use of captured surface water before it returns to a natural hydrologic system. Wastewater, which is treated by a sewage treatment process, reenters the hydrologic system at one point or another. In every state in the West, treated sewage is reintroduced into waterways. The uses of treated wastewater are many. Reuse is most common in crop, stock water, and landscape irrigation. In many instances, reused water is used in secondary systems in lieu of potable supplies, preserving culinary water for domestic and recreational uses. However, water reuse by way of irrigation, cooling, or other means varies greatly. It is also used for power plant cooling, as well as artificial groundwater recharge.

This report gives examples of how states approach water reuse in the West. This comparative approach allows states to observe the approach taken by neighboring states, in solving common reuse challenges. Some states allow the forces of the private market to further promote water reuse, while other states set specific goals for the amount of water the state will reuse in years to come. There are many places where water reuse is practically non-existent, but there are others that reuse water extensively. Yelm, Washington, currently reuses all of its treated wastewater.

The greatest driving forces for water reuse are population growth, water scarcity, and a lack of new readily available water supplies. Due to the harsh climate in the Southwest, coupled with the great population influx in recent years, this area has been forced to find reuse opportunities. Most surface water in this region comes from the Colorado River and its tributaries, which carry little water, when compared to the nation's other major waterways. Consequently, Arizona, California, and Nevada reuse a greater percentage of their water than other western states. Oregon and Washington have developed water reuse laws and policies due to their region's conservation ethic, as well as needs imposed by a constantly growing population. Other western states generally find themselves responding to the demands of nature and population in varying levels, but most are turning to greater reuse as populations grow. As population increases, reuse becomes more of a necessity due to greater amounts of wastewater, higher demand for culinary sources, and infrastructure demands. When comparing similarities in state water supply, one can simply group states by geographic similarities, but the amount of water reused in each western state is dependent on individual state policy coupled with the state's demand for reuse.

Despite receiving more precipitation than other western states, Oregon and Washington have enacted comprehensive water reuse legislation, which provides numerous opportunities and incentives for water reuse. In Arizona, California, Idaho, Kansas, Montana, New Mexico, Oklahoma, Texas, Utah, and Wyoming, water reuse is most commonly used for crop irrigation, golf courses, creating wildlife habitat, and various municipal purposes. Water reuse is still in its infancy in Nebraska, North Dakota, and South Dakota, where water is occasionally reused for irrigation. Due

to a smaller population coupled with high precipitation levels, Alaska does not legally recognize any water reuse.

Though reuse is becoming more prevalent, there are no state-run reuse projects in the West. Projects are run at the local level since local governments, cities, and irrigation districts are primarily responsible for their own water supply. Though local officials are better able to regulate the quality of water that is being put to a second use, state Health Departments regulate and monitor, and in some instances, prohibit certain reuse.

Perhaps the best-known water recycling project is Water Factory 21 in Orange County California. The Orange County Water District operates a hydraulic barrier system to prevent further intrusion of seawater, and to provide basin management flexibility by replenishing the county's aquifers. Water Factory 21 reclaims approximately 15 million gallons per day (MGD), which, when blended with deep well water, produces 22.6 MGD that is injected into the Santa Ana alluvial fan in the Talbert Gap, forming a hydraulic barrier to seawater intrusion. The injection water meets all California drinking water standards and is virtually drought proof since it utilizes reclaimed effluent in its operations.

Just as they govern the initial use of water, most states in the West govern water reuse under the prior appropriation doctrine, using the principles of beneficial use and "first in time, first in right," to govern reuse. Under the doctrine of prior appropriation, water right holders may reuse water while it is in their control, with certain limitations. Water must be used for the same purpose, and at the same location for which the water right permit was granted. This allows a user the ability to capture water and reuse it again on the same land and for the same purpose, so long as doing so does not have an adverse effect on other water right holders. Such on-site reuse in appropriation doctrine states usually does not require an additional permit or special reporting. The greatest difficulty is calculating whether or not this reuse is the cause of an injury to another water user; this is especially difficult in dry years. Where a reuse would adversely affect another water right holder, such a use is generally not permissible under the prior appropriation doctrine. Issues related to return flows continue to evolve, with the initial water user generally entitled to reuse water under his control and not released back into the hydrologic system.

Those states having comprehensive reuse laws nevertheless define and regulate reused waters differently. Arizona defines effluent as separate and distinct from surface or groundwater. The state groundwater storage program utilizes effluent in groundwater recharge, but the program deals principally with groundwater storage of fresh and otherwise reused water. Artificial groundwater recharge legislation springing forth throughout the West is treated separately from reuse legislation due to the differing focus, but they often accomplish the same thing, namely reusing water.

A lack of funding is the greatest hindrance to more extensive water reuse. While no western state builds and operates water reuse projects, almost all states in the West have loan or grant programs that help private entities afford the cost of reuse. Water reuse projects are financed at the local level, sometimes assisted through federal and state loans or grants.

It would be impracticable to monitor all water reuse since single water users may use water several times before it escapes the property. All states regulate the treatment of sewage. However, only some states mandate a reporting of all water that is reused. Most water monitoring is incidental

to compliance with federal environmental laws such as the Clean Water Act and the Safe Drinking Water Act. In fact, most states monitor reuse just to comply with federal standards. States with comprehensive reuse legislation usually have a more intricate monitoring system.

In all western states, any entity wishing to implement a reuse project is faced with the burden of proving its viability and safety. Typifying the burden placed on project proponents, California's requirements for granting permission for a recycling project include: demonstration of adequate treatment of the wastewater; identifying how the water would be used (including addressing variable production rates or storage needs if demands are seasonal); and satisfying Department of Health Services requirements that there be no adverse impacts to public health.

States prohibit certain types of water reuse. For example, using water for a second time to the detriment of a junior right holder is generally not allowed under a prior appropriation system. In considering reuse, some states treat a water right based on diversion differently under the law than a water right based on consumption. In general, this distinction deals with reusing return flows from irrigated agriculture; this report does not address this issue.

Other prohibited uses include irrigating, cooling or evaporating with untreated sewage; unpermitted discharge of wastewater; the direct use of reclaimed water for human consumption; and using untreated water for recreation or other body contact activities. Reuse could also be restricted in the case of discharging reused water into a stream without meeting water quality standards.

California has passed laws stating that using potable water would be illegal for some uses where treated water (including needed infrastructure) is available for a secondary use. In fact, California had set a state-wide goal to recycle one million acre-feet (MAF) of water per year by 2010. In addition, a new task force was created in 2002 to work towards this and other recycling goals.

The future of water reuse is certain; more reuse is imperative as water becomes a scarcer commodity in the West. Typically, the greatest incentives are financial. With growing populations in the West, coupled with recurring periods of drought, the dollar value of usable water continues to climb, but state subsidies are still necessary in many instances to make reuse economically viable. Thus, many states offer low interest loans to those developing water reuse projects. In order to promote water reuse, Oregon and Washington both allow the reuse of municipal effluent without a new water right permit. Washington even grants a tax deduction for some types of water reuse.

An additional hurdle for water reuse is public acceptance. Millions of Americans are not convinced that there is a need to reuse water. The general public rarely considers that the water they drink and wash with has been previously used by someone higher up in the same river basin, or by someone above the same aquifer. Nevertheless, as the benefits of water reuse exceed the costs, more water supply entities will implement water recycling.

ARTIFICAL GROUNDWATER RECHARGE IN THE WEST

Rights to use groundwater are created under four basic legal doctrines or theories: the doctrine of absolute ownership; the reasonable use doctrine; the correlative rights doctrine; and the doctrine of prior appropriation. The doctrine of absolute ownership provides that groundwater is

appurtenant to land and owned as an incident of land ownership. The reasonable use rule provides that while a landowner controls water under his land as an incident of land ownership, he may only use the amount of water that can be reasonably applied to benefit the land from which the water is taken. The correlative rights doctrine, another modification of absolute ownership, extends the reasonable use rule to require the equitable sharing of groundwater among overlying landowners. The doctrine of prior appropriation, used in most western states to allocate groundwater rights, is unlike the other legal theories. It is not founded upon a proprietary interest in overlying land, but is based upon beneficial use of water. Under the appropriation doctrine, the first user to put water to a beneficial use is protected in that use and a chronological hierarchy among appropriators is established whereby initial users receive priority rights over subsequent users. The limit of the right is legislatively defined as a beneficial use, which may occur on or off overlying land.

Demand for more efficient use of scarce water resources is the driving force behind artificial groundwater recharge. Many streams West-wide have been fully appropriated, and groundwater has been pumped from many aquifers at rates that exceed the natural recharge rate. This disparity between water table drawdown and natural recharge pushed Arizona to enact its Underground Water Storage Savings and Replenishment Act in 1994 to promote and regulate the recharge of groundwater supplies. The idea of water banking has become popular in the arid regions of the West, with California, Idaho, Nevada, and New Mexico enacting comprehensive artificial groundwater recharge legislation to provide for growing needs. A few other states have incorporated an artificial groundwater recharge section into existing laws, and others are in the process of creating comprehensive legislation.

Artificial groundwater recharge opportunities vary according to climate and water demands. Arizona and California lead the West in artificial groundwater recharge, while in Montana, artificial groundwater recharge is almost non-existent. There is no artificial groundwater recharge in Alaska.

Similarities in artificial groundwater recharge exist amongst western states. Most western states are arid, and depend greatly on the groundwater supply. Though groundwater levels in some areas have been dropping for decades, only recently have states begun expanding the use of recharge projects to replenish the diminishing supply. Western states recognize that groundwater and surface water are often interrelated hydrologically, though some states' laws continue to treat them separately.

Using excessive amounts of groundwater may lower surface stream flows, and likewise, using more of the surface flow, without artificially recharging the underlying aquifer, may deplete groundwater supplies. Groundwater mining is the removal of groundwater at a faster rate than it is replenished by either natural or man-made processes. While some states have formally declared a policy against groundwater mining, few have groundwater mining statutes.

Most western states do not statutorily define artificial groundwater recharge as a beneficial use of surface water, but in practice, most consider it as such, or recognize the beneficial uses to which the water is ultimately put. Some do not see a need to recognize artificial groundwater recharge as a beneficial use by way of legislation, but rather consider recharge as one of the uses to which surface water may be put. Most states allow artificial recharge to be the description of a beneficial use when applying for a permit. This indicates that in practice artificial groundwater recharge is commonly accepted as a beneficial use, whether or not it is statutorily recognized as such.

In general, states that follow the appropriation doctrine for surface waters also use the same doctrine to govern groundwater activity. Under the appropriation doctrine, Idaho includes recharged waters as part of one's appropriation. Colorado does not. Some states, such as Arizona, California, Colorado, Nevada, New Mexico, Oregon, Utah, and Washington allow a groundwater recharger to claim the water that he has recharged. Oregon requires a secondary groundwater permit for those wishing to recover recharged water. Kansas and Oklahoma do not afford groundwater rechargers any legal claim on recharged water. Texas is unlike other western states in that it follows the doctrine of absolute ownership. Thus, if water is recharged, whoever owns the land above that groundwater has the legal right to the water beneath the land.

State engineers, as well as health departments, and natural resources personnel throughout the West have the responsibility to monitor artificial groundwater recharge projects, whether they be accomplished by direct injection, or using settling ponds. Typically, the water quantity and quality are measured. Water quantity is regulated in order to prevent groundwater mining, as well as to comply with interstate compacts that deal with groundwater. Water quality is regulated in order to preserve groundwater as a source of culinary water. Both the quality of the injected or recharged water, as well as the quality of the receiving water, are measured. In general, water of lower quality cannot be recharged into cleaner groundwater. Again, states vary in their approaches. For example, Arizona and California promote the recharge of treated effluent, while Washington prohibits its recharge. In all western states, the Department of Health will not allow even treated effluent to be recharged if it will degrade groundwater quality. Federal legislation such as the Underground Injection Control Program under the Safe Drinking Water Act, outlines water quality criteria that must be observed in recharge activity. Much of the regulation is done for the purpose of complying with these federal laws.

Though the states vary greatly in the manner by which they regulate artificial groundwater recharge activities, states are slowly moving towards greater conjunctive use of water. The greatest difficulty is finding surface waters available for recharge. Further, those who might likely benefit the most from conjunctive use, often may not own both groundwater as well as the surface rights that could be used conjunctively. This and other problems are being resolved as states make the transition towards what is likely to become a West-wide practice. As the demand for water increases, many options presently prohibited by high costs will become affordable in order to preserve groundwater supplies.

PART I: WATER REUSE IN THE WEST

Water reuse, in the broadest sense, includes all uses of water following its original use; reuse infers using something again. This would include all waters known to man. For purposes of this report, water reuse is the secondary and post-secondary use of captured surface water before it returns to a natural hydrologic system. This does not include any water that is taken directly out of a natural hydrologic system for direct or indirect primary use. This report also does not deal with the reuse of return flows from irrigated agriculture.

To provide the water reuse analysis below, the Western States Water Council staff circulated the "State Water Reuse Questionnaire" to 18 western states. Responses from each state comprise the majority of the following information on reuse. Each response was written by the state agency with primary responsibility over water reuse, with input from other state agencies as appropriate.[1] Where necessary, additional information was provided by WSWC staff.[2]

Water reuse and recycling are often used synonymously. Here the word reuse is preferred since recycling connotes some sort of additional water treatment prior to its reuse. Since reuse includes both recycled and non-recycled waters, this report covers both using the same term.[3]

Some states provide information on artificial groundwater recharge or injection as a type of water reuse. Indeed injecting water back into the underground reserves is a type of reuse, but it will be dealt with in part two: the artificial groundwater recharge section of this report.

ADMINISTRATION

Water reuse activities are handled by various agencies throughout the western states. Virtually every western state has a department of water resources, water quality department, or state engineers office that handles water resource issues in conjunction with state health departments. While most states handle water reuse issues in administrative proceedings, Colorado[4] utilizes water courts for the resolution of its water issues. This has been a boon to Colorado since it has forced the federal government to pay for adjudicating its water rights, while other states currently struggle to cover the costs of federal claims. Many states, such as Kansas,[5] Utah, and Wyoming, administer the water quantity and water quality issues by utilizing separate entities. For purposes of this report,

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[1] As an appendix to the report, these responses are available at the WSWC office.

[2]While information provided by states in response to the questionnaire comprises most of part 1, sources of additional information, which may or may not be a part of the state responses, have been cited in the footnotes where appropriate.

[3]Note that there is an attempt to give deference to the word "recycled" rather than reuse where the state normally uses it in the place of reuse.

[4]COLO. REV. STAT. § 37-92-201 (2001).

[5]Kansas response to general question 1, WSWC State Water Reuse Questionnaire, September 2001.

distinguishing which governmental organization oversees water reuse regulation in each state is not as important as the role of water reuse in the several states of the West.

STATE REUSE PROJECTS

Though California has a state goal for water reuse, no western state has a state water reuse project. Among the states in the West, many of which are relatively arid, only Arizona has a state-sponsored water project that has a significant reuse effect.[6] It is noteworthy that other states have groundwater storage acts, but as explained below, the regulation and effects are not as far reaching as the Arizona project. Other states indicated in their response to the questionnaire that the state had fiscal or other incentives which encouraged water reuse within the state, but currently had no state-run, or state sponsored project.

In 1994, the Arizona legislature adopted the Underground Water Storage Savings and Replenishment ("UWS") Act, which recodified and integrated existing recharge projects into a single, comprehensive project.[7] This state program covers both water reuse, and artificial groundwater recharge, or banking. Local agencies and private parties have used the UWS to implement various water reuse projects throughout the state. Though significant quantities of effluent are stored underground and later recovered for reuse, there are no state projects involving the direct reuse or recycling of water.

Though Arizona is the only state that currently has a state project facilitating reuse via effluent storage, New Mexico has similar legislation regarding groundwater storage and recovery which is seen as a method of water reuse.[8] The biggest difference is the greater extent to which Arizona's project is utilized for water reuse. As outlined below, rather than utilizing a state project, several states throughout the West encourage water reuse, and have smaller, locally-run projects currently in operation.

LEGAL FRAMEWORK AND CURRENT EXTENT OF LOCAL REUSE PROJECTS

Alaska

Due to the abundant supply of water, Alaska has no permits issued for water reuse. No water reuse projects exist in the state. State officials do not anticipate dealing with reuse in the near future.

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[6]ARIZ. REV. STAT. §§ 45-801.01 *et seq.*; see also state responses to general question 2, WSWC State Water Reuse Questionnaire.

[7]Id.

[8]N.M. STAT ANN. §§ 72-5A-1 *et seq.*

Arizona

In Arizona, the beneficial reuse of reclaimed water is regulated by the Arizona Department of Environmental Quality (ADEQ). ADEQ rules prescribe reclaimed water quality standards and a permit system for persons beneficially reusing reclaimed water. Regulation of water rights, water supply, and water conservation is by the Arizona Department of Water Resources (ADWR). Under ADWR's jurisdiction, different laws govern three categories of water: groundwater; surface water; and effluent. "Effluent" is defined in statute as water that is gathered in a sanitary sewer for subsequent treatment in a wastewater treatment facility.[9] "Reclaimed water" under the jurisdiction of ADEQ is defined in statute as water that has been treated or processed by a wastewater treatment plant or an on-site wastewater treatment facility.[10] This statute also defines "direct reuse" as the beneficial reuse of reclaimed water.[11]

Facilities designed to recharge water are regulated under a permit program by ADWR. If the water intended for recharge is effluent (reclaimed water in ADEQ terminology) both ADWR and ADEQ issue permits. The ADWR permit primarily focuses on recharge locations, amounts, and impacts due to the volume and hydraulics of the recharged water. ADWR tracks each storer's credits and issues permits for recovery wells. The ADEQ permit primarily focuses on the water quality impacts and ensuring that Aquifer Water Quality Standards are maintained at appropriate downstream points in the aquifer. ADWR and ADEQ coordinate closely in their permitting activities to avoid gaps and prevent inconsistencies.

There is extensive reuse of reclaimed water in Arizona. ADEQ rules allow reclaimed water to be used for a variety of uses depending on reclaimed water quality.[12] Reclaimed water is used in significant amounts for agricultural, turf, and landscape irrigation, with large amounts going to irrigation of golf courses. Approximately 150,000 acre-feet (af) of reclaimed water was reused in the Phoenix area in 1998, and approximately 100,000 af was reused in the Tucson area. In addition, under ADWR jurisdiction, more than 120,000 af has been recharged in Arizona through 1999 for future use. Of that amount, more than 34,000 af has already been recovered and reused. ADWR and ADEQ foresee no decline in permitting activities for recharge of reclaimed water.

California

Statutes dealing with water reuse and recycling are scattered throughout several codes – the California Water Code, Health & Safety Code, Public Resources Code, Government Code, etc. Since California enacted an initial "Water Recycling Law"[13] in 1969, those code sections have been substantially amended. There are also extensive regulations governing the reuse of water. Title 22

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[9]ARIZ. REV. STAT. § 45-101 (2002).

[10]ARIZ. REV. STAT. § 49- 201 (31) (2002).

[11]ARIZ. REV. STAT. § 49-201(10) (2002).

[12]ARIZ. ADMIN. CODE, Title 18, Chapter 11, Article 3, Appendix A.

[13]CAL. WATER CODE §§ 13500 *et seq.*

of the California Code of Regulations, for example, includes Department of Health Services requirements for permitting recycling projects.

Rather than define water recycling or reuse as a beneficial use, the California Water Code explicitly finds that the use of potable domestic water for numerous specified non-potable uses, such as irrigating golf courses, crops, parks, industrial uses, toilet flushing in non-residential buildings, etc., is a waste or unreasonable use of water if recycled water is available under specified circumstances.[14] In California, "recycled water" means water which, as a result of treatment, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource.[15]

California has both loan and grant programs to aid local entities in water reuse activities. Literally hundreds of smaller, locally-operated water recycling projects have been implemented in the state. A 1995 survey funded by the California Department of Water Resources estimated that there was about 500,000 acre-feet of recycled water production in California at the time. The state's Water Resources Conservation Board maintains a database of recycling projects, but the information in the database is insufficient to accurately quantify actual recycled water production and use. Comparing the 1995 survey to numbers for the year 2000, recycled water was used for the following purposes, in the following percentages:

agricultural irrigation	32% in 1995, 48% in 2000
groundwater recharge	27% in 1995, 12% in 2000
landscape irrigation	17% in 1995, 20% in 2000
industrial	7% in 1995, 5% in 2000
environmental	3% in 1995, 6.4% in 2000
seawater intrusion barrier	1% in 1995, 2.5% in 2000
other	13% in 1995, 6.1% in 2000[16]

State policy emphasizes maximizing the development of recycled water in coastal urban areas, where wastewater would otherwise be lost to ocean discharge. However, many of the state's largest regional recycling projects in the San Francisco Bay Area and Southern California have been driven by increasingly more stringent state & federal wastewater discharge requirements (federal Clean Water Act & state Porter-Cologne Act), more than by water supply considerations. For example, the San Jose area regional recycling project is driven by the need to reduce the discharge of "fresh" water to the estuary, because the estuary supports ESA-listed flora & fauna that rely on a saline environment.[17]

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[14]CAL. WATER CODE §§ 13550 - 13554 (2002).

[15]ID. § 13050; Legislation in the early 1990s amended all of the California codes to replace terms such as "water reclamation", "reclaimed water", etc with water recycling, recycled water, etc.

[16]See California response to questionnaire, as compared to California State Water Resources Control Board, Office of Water Recycling, table for May 2000.

[17]Id.

Examples of water recycling in California include the following operations: the San Jose Water Creek Reclamation Plant which can recycle 100 MGD; the Donald C. Tillman Reclamation Plant in Los Angeles, with a capacity of 80 MGD; the Fresno-Clovis Metropolitan Area Regional Wastewater Facilities with a 60 MGD capacity; and the Los Coyotes Water Reclamation Plant of the Los Angeles County Sanitation District which can recycle up to 37 MGD. These are some of the larger operations within the state, recycling by a number of different processes. One of the newest is in Orange County, where the county is building a $600 million system that should turn sewage into clean water for 600,000 residents expected to relocate there within the next 20 years.[18]

Perhaps the best-known water reuse project in California is Water Factory 21 in Orange County. The county relies largely on its groundwater resources, as the Santa Ana River is an ephemeral stream. Groundwater levels have declined as the water has been used for irrigation, municipal purposes, and industrial activities for decades. By 1956, the groundwater level had dropped low enough for water from the Pacific Ocean to infiltrate the porous soils of the buried Santa Ana Alluvial fan, causing a saltwater intrusion into the aquifer. The alluvial fan, known as the Talbert Gap, stretches between the cities of Newport Beach and Huntington Beach. The Orange County Water District operates a hydraulic groundwater injection barrier system to prevent further intrusion of seawater, and to provide basin management flexibility.[19]

Water Factory 21 has produced the reclaimed water used to prevent seawater intrusion for years. Currently, Water Factory 21 utilizes 23 multi-point injection wells, located about 4 miles inland, to create a barrier between the encroaching seawater and the deeper freshwater aquifer. The project not only creates a seawater intrusion barrier, but it replenishes the groundwater that supplies 50% of the county's demand. The project reclaims approximately 15 MGD, which, when blended with deep well water to meet water quality standards, produces 22.6 MGD which is pumped back into the underlying aquifers.[20]

"Water Factory 21 product water is a blend of five [MGD] reverse osmosis treated water, nine MGD carbon absorption-treated water, and 8.6 MGD deep well water." The blend has a total dissolved solids content of 500 milligrams per liter or lower, meeting all California drinking water standards for primary and secondary water.[21]

The first reclaimed water was injected in October 1976. Several water sources were considered for creating a barrier before Water Factory 21 was built and began recycling secondary effluent provided by the Orange County Sanitation District. The recycled water meets California drinking water standards, costs less than culinary water, and has a number of environmental advantages. Recycling has reduced 15,000 acre-feet of wastewater discharged into the ocean annually; reduced dependence on Colorado River water and the State Water Project; and provided a dependable supply of reclaimed water. As seawater intrusion barriers are a low priority for

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[18]The *Wall Street Journal*, August 15, 2002.

[19]Summary information about Water Factory 21 taken from Orange County Water District's web site. Go to *http://www.ocwd.com/_html/wf21.htm.*

[20]Id.

[21]Id.

imported surface supplies, particularly in times of shortage, utilizing reclaimed water protects Orange County's ground water supply.[22]

Implementing recycling and conservation projects in coastal Southern California is one tool California is using to reduce its dependence on Colorado River water, helping the state comply with its 4.4 MAF basic annual apportionment of river water. To better enable the state to meet this obligation, Governor Gray Davis created the Recycled Water Task Force in April 2002.[23] The general intent of the Task Force is to advise the Department of Water Resources on opportunities for and constraints to increasing the use of recycled water. Membership on the Task Force includes State and local entities with water and wastewater responsibilities and interest groups. It is expected that the Task Force will identify actions that can help increase the use of recycled water in California.[24]

Colorado

Under Colorado statutes, water users have the "right to the reuse of imported water," where such was imported from another river system.[25] Water reuse has been recognized in the state as a beneficial use of water.[26] As is the case with many states in the West, Colorado recognizes several methods to reuse foreign or imported water. These include direct reuse of treated wastewater and effluent, and reuse by exchange, where water is used, then recaptured for re-introduction into a stream for subsequent use. In Colorado, "reuse" is water being used a second time for the same purpose, while "successive use" is using water a second time for a different purpose. Both are permitted under Colorado law.

Colorado reports eleven locally operated reuse projects in the state, as well as 80 other projects that implement reuse by exchange. It is estimated that about 90% of the water reuse projects in the state are located within the South Platte River and Arkansas River basins.

Idaho

Though the state has no definition of water reuse, and it does not officially recognize reuse as a beneficial use of water, Idaho allows water to be reused, or reapplied to a beneficial use that is recognized as such. Idaho has no water recycling or reuse statute, but current Idaho law permits recapturing water before it escapes the property for the purpose of reuse.[27] Reuse is permitted for

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[22]Id.

[23]See Assembly Bill 331, Task force created on April 3, 2002 as a part of the California Department of Water Resources.

[24]See *wwwdwr.ca.gov* - 2002 news archive - meeting announcement.

[25]COLO. REV. STAT. § 37-82-106 (2001).

[26]Id; see also *City and County of Denver v. Fulton Irrigation Ditch Co.*, 179 Colo. 47, 506 P.2d 144 (1972).

[27]IDAHO CODE §42-228 (2001).

the same use for which the water right was originally granted, but any new or expanded use must be supported by a new appropriation.

Numerous reuse projects by irrigation districts and canal companies are in operation. Among other purposes, these projects use the water for crop irrigation and the creation of wetlands and wildlife habitat and for water quality improvement.

Kansas

Several Kansas cities have developed water reuse in conjunction with local wastewater treatment projects. While the reuse of graywater (which is the water that comes from domestic uses such as showering, laundry, and sink water), is limited in Kansas, it is becoming more common. Notable examples are golf courses in Wichita and several small communities, which use graywater obtained from city treatment systems for irrigation. The use of livestock lagoon effluent or wastewater, normally supplemented by fresh water for irrigation at cattle feedlots, dairies and hog farms, is common at most large concentrated animal feeding operations (CAFOs). Approximately 100 Kansas CAFOs reuse effluent.

Montana

Montana has no statute dealing specifically with water reuse, but any water that is to be put to a beneficial use must be covered by a use permit issued by the Montana Department of Natural Resources and Conservation. The state does not define water reuse, nor does it recognize such as a beneficial use per se. Whether or not a certain use of water is a "beneficial use" is determined by the actual use rather than the source from which the water comes.

The state has a water salvage statute that enables a water right holder to retain the "salvaged" portion of the water right that is accomplished through water saving methods or increased efficiency. If approved by the state, the water can then be sold or used for some other purpose.[28] Excess water is dealt with in the same manner as stream flow; once it has left the control of an appropriator, it is again subject to appropriative uses.

A few use change applications have been approved for salvaged water to be used in irrigation as well as instream flows. Montana reports the reuse of municipal sewage effluent for land application in cities such as Deer Lodge and Anaconda.

Nebraska

The state of Nebraska does not have a water reuse or recycling statute, and there is no state recognition of reuse as a "beneficial use." In fact, the state does not even define "water reuse" by statute or case law. Although there are no formal projects operated by state or local agencies, landowners in Nebraska are entitled to reuse irrigation and runoff water by collecting the water in "reuse pits." Otherwise, there has been little effort to develop reuse operations in the state.

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[28]MONT. CODE ANN. §§ 85-2-102(16), 85-2-419 (2001).

Nevada

Nevada does not have a specific statute for water reuse, but the state does legislatively promote the reuse of effluent.[29] Though no statute defines it as such, water reuse is seen as a beneficial use of water in Nevada. Many local agencies have appropriated effluent for golf course and crop irrigation. Several Nevada cities have appropriated sewage effluent for irrigation and cooling purposes. Additionally, private entities reuse water discharged from mining operations for various uses, including the irrigation of more than 10,000 acres of farm land.

A Nevada statute[30] allows for effluent to be considered water that can be obtained for a beneficial use under a secondary permit. The application is first filed as a primary source of water showing the wastewater treatment plant as the point of diversion, but it differs in that no place for the use, or proof of beneficial use is needed initially for the permit. This primary application is then subject to public comment, and if granted, then the applicant would file a second application specifying the place of use and beneficial use. If the applicant applying for the secondary permit is not the same party that is releasing the effluent, an agreement for the delivery of the effluent must be made and filed with the state engineer before the secondary permit can be granted.

New Mexico

New Mexico statutes do not define "reused" water; rather the state refers to "artificial waters," as those generated from seepage and other by-products of beneficial use. This definition is broad enough to cover discharges from sewage treatment plants. In the case of *Reynolds v. City of Roswell*,[31] the New Mexico Supreme Court held that unless a permit from the state engineer specifies otherwise, until it leaves the city's control, wastewater belongs to the municipality that created it.

There is no New Mexico case law that refers to "reuse" of water as a beneficial use of water; however, if water is reused in any productive way, it would be considered a beneficial use.

The Ground Water Storage and Recovery Act is the only New Mexico law that raises the subject, and it is it not designed specifically to utilize "reused" water. Rather, it contemplates imported water such as that from the San Juan/Chama Project, a project that imports water from the Colorado into the Rio Grande river system. The Act provides a mechanism for injection and withdrawal of waters, but is specific in that its focus is on storage and not on reuse of treated water.

Likewise, the City of Rio Rancho, New Mexico, is evaluating the feasibility of reusing effluent as a counter to the potential cost of elevating levels of treatment before water is placed back into the Rio Grande. However, this is not technically a reuse project, and there is no specific statute governing this process.

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[29]NEV. REV. STAT. §§ 533.024, 533.440 (2001).

[30]See NEV. REV. STAT §533.440(3), (2002).

[31]*Reynolds v. City of Roswell*, 654 P.2d 537 (N.M. 1982).

The Ground Water Storage and Recovery Act, authorizes political subdivisions to store water and recover it from the aquifer. Also, conjunctive use, reuse and recharge converge in some instances. The state engineer decisions authorizing return flow credits for discharge water returned to streams entitle entities to pump more ground water, which in effect trades return flows to the stream for increased ground water pumping.

There have been limited water reuse projects in New Mexico. Those that have been implemented have been very small in scale. Secondarily treated sewage is used mostly on golf courses and medians. There are no current projects whereby wastewater has been treated to potable standards. And, the New Mexico Environment Department has not adopted standards for such actions.

North Dakota

North Dakota has not officially defined "water reuse," and it does not recognize such as a beneficial use per se. Beneficial use is determined by the use of such water. Though there are no water reuse projects that have been undertaken by any local agencies, there is limited use of municipal and industrial wastewater for irrigation by private entities in the state.

Oklahoma

Oklahoma does not have a water reuse statute. However, the state utilizes operational requirements for wastewater plants to ensure the safety of water that is eventually reused. The state does not officially define water reuse or recycling. Consequently such uses are not deemed as beneficial uses of water.

Effluent that is treated in municipal wastewater treatment plants is used to irrigate cropland and golf courses, as well as for industrial cooling. Reuse is not extensive in Oklahoma.

Oregon

"Reclaimed water" is defined in Oregon as water that has been used for municipal purposes, and after such use, has been treated in a treatment works, which, as a result of treatment is suitable for a direct beneficial purpose or a controlled use that could not otherwise occur.[32] Permits for reusing treated municipal water on Oregon land dates back to the early 1960s. In recent years, increased water pollution concerns have led to further land application of treated water, rather than direct discharge into waterways. In 1991 Oregon passed a bill that allows, under certain conditions, treated municipal effluent to be put to other beneficial uses without acquiring a new water right.[33] A registration with the Water Resources Department is required. In certain instances, downstream users may assert a preference to the use of reclaimed water. If, however, the water escapes the control of the municipality, any subsequent user would have to obtain a permit under the regular basin program for surface water application.

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[32]OR. REV. STAT. § 454.010 (1991).

[33]OR. REV. STAT.§§ 537.131, 537.132, 540.610(h) (1991).

There are currently 22 municipal registrations of reuse in Oregon. Though the state does not fund any particular project completely, it provides fiscal and technical support as incentives for local reuse. Oregon reports a wide variety of projects sponsored by several different local partners. An example of one such project is "Oregon Gardens," where the City of Silverton and the Oregon Association of Nurserymen have partnered to create a display of a garden and artificial wetlands treatment. Other examples include the use of effluent to irrigate a golf course in the City of Prineville, where water from potato processors is reused for irrigation. The City of Woodburn reuses water to grow a poplar tree plantation.

South Dakota

South Dakota does not define water reuse, but reuse for irrigation is common. Though the state has no reuse statute, a water right holder may reuse water under that right until the water escapes the right holder's control, and re-enters a waterway. Most reuse in the state is done by private parties rather than state or local governments.[34]

Texas

For reuse of surface water, Texas draws a distinction between direct reuse projects and indirect reuse projects. Direct reuse projects are so called "flange-to-flange" projects where, after diversion from the water course, the water right holder, or its customer, has control over the water through its water works prior to discharge into a watercourse. Indirect reuse projects involve the discharge of appropriated water right back into a water course for subsequent re-diversion by the same water user at a point downstream.

Direct reuse projects are regulated in two ways. First, the diversion and use of the water is regulated by the Texas Commission on Environmental Quality (TCEQ) under its administration of water rights.[35] Generally speaking, most water right permits in Texas have been issued with a fixed annual diversion amount, a type of use, and a place of use limitation. Therefore, most Texas water right holders are entitled to use and reuse the surface water they divert for their authorized use at the authorized location up to full consumption. The direct recycling or reuse of wastewater for health and safety is regulated by the TCEQ under its authority to regulate water quality.[36]

Indirect reuse projects, involving the return of the appropriated water to a watercourse and subsequent diversion by the same user for further use, are regulated.[37] Indirect projects require a special "bed and banks" permit from the TCEQ. In general, such permits are allowed if they will

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[34]South Dakota did not respond to the WSWC State Water Reuse Questionnaire, but the above information comes from S.D. CODIFIED LAWS Chapters 46 & 46A.

[35]See Texas Water Code ch. 11.

[36]See Texas Water Code ch. 26.

[37]Texas Water Code §11.042 (2001).

not harm existing water right holders or the environment.[38] Any water discharged into the watercourse is subject to permitting and regulation by the TCEQ for water quality.[39]

Subject only to local groundwater conservation district controls, a landowner may pump and use, and recycle or reuse all the water that they can physically pump from their land, with certain very limited exceptions. However, if a watercourse is used to transport such groundwater, TCEQ authorization must be obtained. TCEQ considers carriage loss and imposes any special conditions necessary to protect existing rights granted based on the availability of such flows, or as are necessary to protect instream flows, bays, and estuaries.[40]

Any recycling or reuse of water for public drinking water must meet federal Safe Drinking Water Act standards and the regulation of the TCEQ.[41]

State statutes do not define water reuse as a beneficial use of water. However, TCEQ regulations do. Direct reuse is the authorized use "of water that remains unconsumed after the water is used for the original purpose and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake or other body of state-owned water."[42]

Texas provides funding assistance for local reuse project operations through the Texas Water Development Board (TWDB). This includes a project with the City of Harlingen to treat wastewater for reuse as industrial process water and return it to the wastewater treatment plant. The City of El Paso has a project to inject treated wastewater into an aquifer to enhance recharge to the aquifer. Numerous other cities have used partially treated wastewater for golf course irrigation, or for aesthetic uses in public facilities. Numerous cities are presently seeking "bed and banks" permits for discharge and subsequent re-diversion and reuse of wastewater. The Bureau of Reclamation is currently working with the City of El Paso to treat and reuse water for landscape irrigation purposes. Before the project was created, wastewater was discharged into the Rio Grande, contributing to the problem of dissolved solids in the waterway, now the treated sewage effluent is used outside the river corridor. It is estimated that the project will provide 11,000 acre-feet by 2005, enough to free up enough potable water for an additional 20,000 homes. San Antonio has also expanded its water reuse program, providing treated effluent for landscape, irrigation, and other uses.[43] As part of its annual water use survey, the TWDB requests information from water suppliers regarding water reuse, quantity and application. The survey data is available to the public.

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[38]Id.

[39]See Texas Water Code ch 26.

[40]Texas Water Code § 11.042 (2001).

[41]TEX. HEALTH & SAFETY CODE §341.031 et. seq.

[42]30 TEX. ADMIN. CODE §297.1(41), (2001).

[43]Resource Stewardship Report, 2000, U.S. Department of Interior, Bureau of Reclamation.

Utah

Though Utah does not have a water reuse statute per se, the governing water law outlines the legal framework necessary for the reuse of effluent. Generally, reusing water requires a new appropriation permit, but under some circumstances water may be reused even without a new appropriation.[44] Rather than defining "water reuse," Utah laws simply refer to the source of the water as domestic wastewater effluent. Utah does not identify reuse as a beneficial use of water in statute, but based on the policy of reusing water for public purposes, reuse is a beneficial use. In Utah, public use is a type of "beneficial use." Since existing reuse projects are used for the public purpose of irrigation, such projects are considered to be beneficial uses.

Utah reports three main types of water reuse. First is the use of effluent to irrigate crops. Second, municipalities and private parties are reusing water for golf courses, athletic fields, public parks, etc. Lastly, the Utah Department of Transportation is reusing water for highway construction and beautification. The state reports a total of seven currently running reuse projects, with others being developed.

One of the projects being developed is the Tooele Wastewater Treatment and Reuse Project. The Bureau of Reclamation and the City of Tooele are currently constructing a project that will gather, convey, and treat wastewater. Wastewater will undergo primary, secondary, and advanced treatment, enabling full reuse of effluent. Providing up to 2.25 million gallons of reclaimed water per day, the water will be used to irrigate a golf course and residential landscaping.[45]

Washington

Washington statutes govern both the use of municipal reclaimed water and graywater.[46] "Reclaimed water" in Washington is effluent derived in any part from sewage from a wastewater treatment system that has seen adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater.[47]

The state has sponsored and partially funded four full-scale municipal reclaimed water demonstration projects totaling about $10 million. There are 11 other projects that have been implemented by local governments, with 15 others in the planning phase. The four demonstration

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[44]UTAH ADMIN. CODE § 317-1-4 (2001); UTAH CODE ANN. § 73-3c (2001).

[45]Resource Stewardship Report, 2000, U.S. Department of Interior, Bureau of Reclamation.

[46]WASH. REV. CODE ANN. §§ 90.46.005 *et seq.* (2001).

[47]WASH. REV. CODE ANN. § 90.46.010 (2001); see also Washington response to legal questions 3 and 4, WSWC State Water Reuse Questionnaire, January 8, 2002.

plants have a combined capacity of three MGD, while the eleven others in the state have a total capacity of 18 MGD.[48]

As an example of efficient water reuse, the city of Yelm recently received an award for successfully reusing 100% of its treated wastewater, currently about 200,000 gallons daily, to irrigate landscaping within the city.[49] The city uses the water for recharge and to irrigate a football field, church landscaping, and the property of one residence.[50]

Wyoming

Wyoming does not have a water reuse or recycling statute, but it does allow reuse by appropriators until the water escapes the permitted point of use, where it becomes subject to further appropriation. Under Wyoming law, reuse is not recognized as a beneficial use of water, but in practice it is recognized as such. Apparently reusing water in Wyoming is commonly accepted as a beneficial use although it still has not been dealt with by the legislature.

There are only a limited number of permitted facilities that involve reuse of treated municipal wastewater in Wyoming. The primary one is the City of Rock Springs, which provides tertiary treatment of a portion of the discharge from the wastewater treatment plant prior to using it to irrigate parks and the cemetery. The City of Casper is considering using treated wastewater to irrigate soccer fields. These projects are based upon "substitution" of treated wastewater for a potable water supply source. The Wyodak power plant near Gillette makes use of water from the city's wastewater treatment plant for cooling purposes. In addition, the state engineer's Office has also issued permits for draining and reusing water that has been recaptured on private property.

FINANCING REUSE PROJECTS

Funding for projects throughout the western states is usually provided by local governments and businesses rather than by the state. However, local sponsors can get some state help where state water development programs exist. The grant and loan programs offered are usually not specifically for the purpose of promoting water reuse, but rather they may be used for reuse projects, among other purposes. As reported by member states, California, Idaho, New Mexico, Oklahoma, Oregon[51] and Wyoming have programs that may be used to obtain grants or loans to fund reuse projects. Arizona and Nebraska have grant programs, while Utah, Texas, and Washington have loan programs. Idaho utilizes its Water Resources Board loan and grant programs to assist reuse, as well

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[48]Id. For further detail on capacity of Washington's reuse projects, go to: *http://www.ecy.wa.gov/biblio/0010062.html.*

[49]*http://www.ecy.wa.gov/news/2002news/2002-012.html.*

[50]Id.

[51]Currently there are no specific programs for funding reuse projects. However, efficient water use is a consideration in grant application reviews and prioritization of loan programs. The Oregon Economic and Community Development Department has a variety of programs to assist these types of projects. *http://www.econ.state.or.us/finance.htm.*

as funding for various projects by the Soil Conservation Commission of the Idaho Department Agriculture. Washington provides some state assistance to reuse projects. California specifically lists the creation of infrastructure for water reuse as an eligible project purpose under its Water Conservation Feasibility Study Grants program, part of Proposition 13, adopted in 1978.[52] Large water recycling projects in California are funded by local, state and federal efforts combined.

The U.S. Bureau of Reclamation provides financial help under the Reclamation Wastewater and Groundwater Study and Facilities Act of 1992 (the Title XVI Program).[53] The program helps many western cities and towns make the most of their water resources by reusing treated wastewater. Reclamation has the authority to conduct appraisal and feasibility studies on water reclamation and reuse projects. The Act further gives authority for demonstration programs to test water reuse technologies. Funding for projects under this act are restricted to 17 western states, and are usually operated on a cost-share basis between the Bureau of Reclamation and the recipient.[54]

Projects and studies authorized under Title XVI include: a study on the feasibility of a comprehensive water reclamation and reuse system for southern California; water reclamation and reuse facilities for the San Jose metropolitan area; wastewater facilities and a wastewater treatment plant in Phoenix, Arizona; a study on reclaiming the waters of Lake Cheraw, Colorado; a reclamation project in San Francisco; a reclamation and reuse project in the San Diego metropolitan area; an effluent treatment project for the city of Los Angeles; a conjunctive use facility to improve water quality in the San Gabriel groundwater basin; and lastly, it authorizes a study of all existing Bureau projects on the quality and quantity of groundwater.[55]

Local governments receiving help from Reclamation under the Title XVI program pay at least 50% of the costs of the feasibility study, as well as 75% of the construction costs. Reclamation emphasizes that eligible projects must be economically justified, environmentally acceptable, and ineligible for funding under another federal program.[56] These projects may begin construction with federal funds as soon as repayment contracts are signed by local governments.[57] This enables local governments to finish projects much faster than they would be able to if they had to come up with their portion of construction costs up front.

The Congress extended the Bureau's authority by way of the federal Reclamation Recycling and Water Conservation Act of 1996, giving Reclamation the authority "to investigate and identify opportunities for reclamation and reuse of municipal, industrial, domestic, agricultural wastewater, and naturally impaired ground and surface waters, for the design and construction of demonstration

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[52]See *http://wwwdpla.water.ca.gov/grants-loans/G1.html.*

[53]Authorized by 43 U.S.C. § 390h et seq. 16 U.S.C. §§ 590y - 590z-11 (2002).

[54]See *http://www.cfda.gov/public/viewprog.asp?progid=442.*

[55]Resource Stewardship Report, 2000, U.S. Department of Interior, Bureau of Reclamation.

[56]Id.

[57]16 U.S.C. § 590y (2002).

and permanent facilities to reclaim and reuse wastewater, and to conduct research, including desalting, for the reclamation of wastewater and naturally impaired ground and surface waters."[58]

Other federal government programs may be used to assist local entities in reuse efforts. The Bureau's Water Conservation Field Services Program/Efficiency Incentives Program may award grants to local agencies to reuse or recycle agricultural wastewater, so long as the agency has a contract for water delivery through Reclamation. The Department of Agriculture's Natural Resources Conservation Service offers aid through its Resource and Conservation Development Program for resource conservation projects, including reuse projects, run by state or local governments and nonprofit organizations. The limitation on this program is that the beneficiaries of the project must be located within the designated resource and conservation development area defined by the department.

The Environmental Protection Agency (EPA) offers the Clean Water State Revolving Fund Program, which deals primarily in loans to finance local wastewater treatment, but can also be used for water reuse, and graywater recycling, among other projects. EPA also has the Safe Drinking Water State Revolving Fund Program, which provides low-interest loans to drinking water systems for projects that will ensure safe and affordable drinking water. Though reuse was not the intended use of these funds, States may use these funds for wellhead and source water protection projects, or various water reuse projects. The States administer these funds and make the loans.

Federal funding may also be obtained through the Department of Commerce's Economic Development Administration's Public Works and Development Facilities Grants Program. Under this grant program, wastewater reuse activities in economically distressed areas (calculated by comparing incomes and unemployment to national averages) are eligible for fiscal assistance to cover infrastructure costs.

Lastly, there are two programs offered by the U.S. Department of Housing and Urban Development, one aimed at helping moderate-income communities, and another for urban areas. The first, the Community Development Block Grants Program, usually provides loans, and occasionally grants to assist in community economic development projects, including projects to reuse wastewater. Second, the Empowerment Zones Program, is available for urban revitalization planning, which may include water reuse or recycling projects, as well as funding for similar activities in a rural setting (30,000 persons or less).[59] As with many federal programs, the purpose of these two programs was not pointed at wastewater reuse, but it is one accepted activity under the programs.

REGULATING REUSE PROJECTS

Most states in the West do not have specific reporting requirements for water reuse. With few exceptions, measuring and reporting of the quality and quantity of reused water is only incidental to reporting of waters used pursuant to a permit issued by the state.

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[58]43 U.S.C. § 390h.

[59]See *http://www.epa.gov/owm/wave0319/append_e.htm.*

Water Quantity

Most western states rely on the doctrine of prior appropriation when dealing quantitatively with water reuse. The appropriation doctrine was not created with any consideration of reuse, but the doctrine does permit some reuse of wastewater on the same land to which the water is appropriated. In most prior appropriation states, a water right holder is allowed to reuse wastewater before it escapes the permit holder's property, as long as doing so does not adversely affect other water rights. It is noteworthy that in a 1989 Arizona Supreme Court decision, the court held that downstream irrigators could not force a city to continue to discharge its effluent into the Salt River when the city decided to pipe it to a nearby power plant for cooling purposes instead.[60] "If the senior appropriator, through scientific and technical advances, can utilize his water so that none is wasted, no other appropriator can complain," the court concluded.[61] This approach is contrary to that taken by most states following the appropriation doctrine, which removes an appropriator's right to water as soon as it again becomes tributary to the stream. A Wyoming case drew the line at whether or not the sewage water is delivered in pipes for reuse, or returned to the stream. The court stated, "...all the authorities agree that when the appropriated waters have been used to the full extent intended by the appropriation, the quantity unconsumed and returned to the stream is then a part of the waters of the state.[62] A Utah Supreme Court ruling recognized that "If such...[wastewater] has reentered a portion of the stream system from which it was originally appropriated, it becomes a part of that watercourse in legal contemplation as well as physically, and from the standpoint of rights of use, it is just as much a part of the flow as is the water with which it is mingled."[63] The difference between the Arizona case and generally prevailing law on the issue may lie in the trend towards greater liberality by courts concerning reuse of effluent by municipalities.[64]

In order to protect water right holders, water diversions are closely monitored relative to appropriations as well as return flows. However, there is considerable difficulty in proving that another water user's reuse is adversely affecting a subsequent user. That is the exact task state engineers across the West face. Quite often, small-scale reuse for irrigation or washing in a farm

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[60]Arizona Public Service Co. v. Long, 733 P.2d. 988, (Ariz. 1989).

[61]Id. at 438-439.

[62]Wyoming Hereford Ranch v. Hammond Packing Co., 236 P. 764, 773 (1925 Wyo.).

[63]Estate of Steed v. New Escalante Irrigation Co., 846 P.d. 1223, 1226 (Utah 1992). However, the court held that, where there was no connection between the wash, where the plaintiff appropriator acquired his water and the natural stream, the plaintiff could not compel the defendant to allow the water to continue to flow off his land to the wash. The use of such escaped percolation is subject to the original water right holder's continued water loss.

[64]In Arizona *Supra*, the court reasoned, "It is well known that the disposition of sewage is one of the important problems that embarrass municipalities.... The city should not be hampered by a rule that would always require the sewage to be treated as waste or surplus waters. Sewage is something which the city has on its hands, and which must be disposed of in such a way that will not cause damage to others. It would often be considered the height of efficiency if it could be disposed of in some other manner than by discharging it into a stream." Arizona Public Service Co. v. Long, 733 P.2d. 988, 993-994 (Ariz. 1989).

setting is of no real concern since the water would return to the river in any event. The problem lies where the return flow from an appropriation diminishes so that subsequent appropriators are harmed.

States with comprehensive water reuse legislation have statutes specifically tailored to govern water reuse. States without such legislation apply the same regulations to all water use, regardless of whether it is the initial use of water, or a reuse of water. Among western states, only California, Oregon, and Washington have comprehensive water reuse legislation in place. Arizona could be added to this short list if comprehensive artificial groundwater recharge legislation is considered a form of reuse legislation as explained below. States with comprehensive legislation have the legal framework for more extensive water reuse monitoring than do other states whose laws do not deal directly with reuse.

Oregon's 1991 law allows treated municipal effluent to be put to other beneficial uses without acquiring a new water right.[65] If, however, the water escapes the control of the municipality, any subsequent user would have to obtain a permit under the regular basin program for surface water application. In Washington, a reclaimed water permit is issued to the wastewater utility that "generates" water. Such water is exempt from the water rights permitting requirements. Utah reports that there are statutory provisions for monitoring reuse projects within the state. However, at this time there is not an active program to oversee their implementation. In Arizona, there are no specific reporting or monitoring requirements for water "reuse." Likewise, New Mexico has no formal permitting process for water reuse.

Water Quality

To the extent that water is reused after being treated in a sewage treatment facility, all states monitor and regulate such treatment activity.[66] Most water quality monitoring is in place due to federal regulations under the Safe Drinking Water Act,[67] the Clean Water Act,[68] or other preemptive federal statutes that mandate certain standards of clean water.

As a condition to receiving a permit to discharge wastewater, California requires that periodic reports be made to Regional Water Quality Conservancy Boards. Under certain circumstances, such as authorization under the National Pollution Discharge Elimination System, reclaimed water is exempt from the permitting process in Oregon.[69]

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[65]OR. REV. STAT. §§ 537.131, 537.132, 540.610(h) (1999).

[66]For example: Alaska, AK Stat § 46.03.020 (2001); Colorado, COLO. REV. STAT. § 25-10-106 *et seq.*(2001); Idaho, Idaho Code § 39-3637 (2001); Kansas, KAN. STAT. ANN. § 24-408a (2000): Montana, MONT. CODE ANN. § 75-10-203 (2001); Texas, 2001 Texas ALS § 376 (2001). See also state responses to general question 5 and legal questions 5-10 WSWC State Water Reuse Questionnaire.

[67]42 U.S.C.A. §§ 300f-300j-26.

[68]33 U.S.C.A. §§ 1251-1387.

[69]OR. REV. STAT.§537.132 (1999).

Typifying the burden placed on project proponents, California's requirements for granting permission for a recycling project include: demonstration of adequate treatment of the wastewater; identifying how the water would be used (including addressing variable production rates or storage needs if demands are seasonal); and satisfying Department of Health Services requirements that there are no adverse impacts to public health.

All western states identify some types of water reuse that are prohibited due to quality degradation. Some of the prohibited uses of reused water are: irrigating, cooling or evaporating with untreated sewage; unpermitted discharge of wastewater; the direct use of reclaimed water for human consumption; and using untreated water for activities such as swimming and other activities where there is direct body contact with the water.[70] Reuse is restricted in the case of discharging water into a stream without meeting water quality standards.[71]

THE FUTURE OF REUSE PROJECTS

Most states in the West encourage water reuse to some extent. A few also incorporate incentives into state programs and laws. Washington, for example, specifically exempts the reuse of water from the state's application permitting process, so long as such reuse does not interfere with downstream water rights. In addition, new legislation in Washington provides a tax deduction for the sale of reclaimed water for commercial and industrial uses. Washington also requires the consideration of opportunities for using reclaimed water in sewage planning.[72] As part of the Water Recycling Act of 1991, California set a statewide goal to recycle one million acre-feet annually by 2010.[73] California currently recycles about 500,000 acre-feet of water per year.[74] Idaho is one western state that permits effluent trading as an incentive to reuse water.

When asked to list potential incentives to promote reuse in the West, a majority of states replied that funding would be the biggest factor. Member states suggested more technical research on reuse of effluent, researching new water reuse methods, and most importantly leaving control with the states.

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[70]See ARIZ. ADMIN. CODE § R18-9-704 (2001).

[71]See Colorado response to legal question 10, WSWC State Water Reuse Questionnaire, September 18, 2001; UTAH CODE ANN. § 317-1-4 (2001); Kansas response to legal question 10, WSWC State Water Reuse Questionnaire, September 2001; WYO. STAT. ANN. § 35-11-301; Washington response to legal question 10, WSWC State Water Reuse Questionnaire, January 8, 2002.

[72]WASH. ADMIN. CODE § 90.48.112.

[73]CAL. WATER CODE §§ 13575 *et seq.*

[74]According to a May 2000 report by the California State Water Resources Board, the state was then recycling 401,900 acre-feet annually. In a phone conversation with Fawzi Karajeh of the Office of Water Use Efficiency, California is likely recycling over 500,000 acre-feet per year.

Perhaps the biggest hurdle for water reuse is public acceptance. Water is not yet scarce enough to convince millions of Americans that there is a need to reuse water. It is much easier for people to use water from a waterway which had initially been used far upstream than it is to reuse water that they themselves have already used once. The general public rarely considers that the water they drink and wash with has been used by someone higher up on the same river system, or by someone above the same aquifer.

Notwithstanding the concern about public acceptance, water reuse and recycling will happen when the project costs are less than or equal to the costs for alternative sources of water. As an example of this principle, Texas currently recycles a considerable amount of water, driven by market forces and the lack of other sources of water.

Among the states without comprehensive reuse legislation, when asked if such legislation should be created, all responded similarly that none was needed. Many also felt that such legislation had little chance of passing in their state. Obviously the demand to reuse water has not reached a point at which it would be necessary to create new laws dealing with reuse in many western states.

CONCLUSIONS

All states have some sort of water reuse or recycling, but the extent to which reuse is purposeful varies widely from state to state. Western states do not share a universal definition of water reuse. In fact, many do not even refer to the word reuse. Regardless of the linguistic disparity, water reuse is on the rise in the West.

The two greatest driving forces for water reuse are population and precipitation. Consequently, Arizona, California, and Nevada reuse a greater percentage of their water than other western states due in part to the harsh climate, and in part to the population boom that these western states have seen in recent years. While the Southwest has its greatest pressure created by water scarcity, the northwestern states of Oregon and Washington have developed water reuse laws and policy due to the region's trend towards conservation, as well as needs imposed by a constantly growing population and the desire to protect anadromous fish. Other western states generally find themselves responding to the demands of nature and population in varying levels, but all are turning to greater reuse as populations grow.

The amount of water reused in each western state is dependent on individual state policy coupled with the state's need for reuse. In California, Idaho, Kansas, Montana, New Mexico, Oklahoma, Texas, Utah, and Wyoming, water is most commonly reused for crop irrigation, golf courses, creating wildlife habitat, and various municipal purposes. Water reuse is still in its infancy in Nebraska, North Dakota, and South Dakota, where water is occasionally reused for irrigation. Due to a smaller population coupled with high precipitation levels, Alaska does not recognize any water reuse.

Though only a few states have enacted comprehensive water reuse legislation, as the demand for water increases, more states will likely find that such legislation is needed. Water quality as well as water right issues grow more and more complex with the increase in reuse. The problems are further complicated by the lack of legislation to deal with these new issues. But with comprehensive reuse legislation, many states may be more able to gain control over the complexities of reuse.

Regardless of who takes the initiative to develop water reuse, funding is the greatest hindrance to the further development of reuse. No western state directly funds water reuse projects. However, almost all states in the West have loan or grant programs that help private entities afford the cost of reuse. Generally, water reuse is funded at the local level, with federal assistance. As the value of water increases, more state legislatures are likely to provide greater fiscal incentives for water reuse.

State-driven monitoring of reuse is usually to protect vested water rights, whereas federally-driven monitoring focuses on water quality. Most water monitoring is incidental to compliance with federal environmental laws such as the Clean Water Act, the Safe Drinking Water Act. In fact, some states monitor reuse just to comply with federal standards. States with comprehensive reuse legislation tend to have a more intricate monitoring system than do states without reuse legislation.

The uses of wastewater are many. Reuse is most widely used for crop, animal, and landscape irrigation. It is also used for power plant cooling, as well as artificial groundwater recharge. In many instances reused water is used in lieu of potable supplies, preserving culinary water for domestic and recreational uses. All states prohibit certain types of water reuse. In general the prohibited uses would adversely affect public health, or private rights.

The future of water reuse is certain; more water reuse will occur as greater conservation becomes a must for the West's growing population and changing societal values. Greater water reuse in the West is an essential part of the well-being of western society.

PART II: ARTIFICIAL GROUNDWATER RECHARGE IN THE WEST

Before proceeding to a state-by-state analysis of laws relating to artificial groundwater recharge, a synopsis of certain aspects of groundwater law is appropriate. Groundwater, in the broadest sense, includes all subsurface water as distinct from surface water. As the term is more commonly used, it refers to that portion of subsurface water located in the saturated zone of the earth. Another definition might be water located underground that is available for extraction and beneficial use under state water law.

The importance of groundwater in the West is illustrated by a few observations. On average, citizens in western states depend on groundwater for some 50% or more of their municipal water needs. In some states, the figure is as high as 90%.[75] Municipal treatment costs for groundwater are relatively low because groundwater quality is generally high. Second, groundwater is essential to irrigated agriculture in the West. It is a principal source of supply in many important agricultural areas. Third, groundwater is an important source of industrial process and cooling water.

Population and development trends in the West indicate dependence on groundwater will likely increase in the future. While demands are generally expanding, however, supplies are generally replenished slowly. This creates an important responsibility to carefully manage groundwater resources. In some instances, artificial groundwater recharge projects may play an important role in "stretching" the use of available groundwater concurrently and conjunctively with similar efforts to "stretch" the use of surface water. At the same time, protection must be given to the constitutionally protected private property rights to use ground and surface water that are ubiquitous in the West. Rights to use groundwater are created under four basic legal doctrines or theories.

The doctrine of absolute ownership provides that groundwater is appurtenant to land and owned as an incident of land ownership. As such, a landowner can, essentially, withdraw and use as much water as he can extract, without regard to the effect of the withdrawal on others. The second legal doctrine is related to the absolute ownership doctrine. It is known as the reasonable use rule. It provides that while a landowner controls water under his land as an incident of land ownership, he may only use the amount of water that can be reasonably applied to benefit the land from which the water is taken. Another spin-off from the absolute ownership doctrine is known as the correlative rights doctrine, which is similar to the reasonable use doctrine. Under the correlative rights doctrine, the reasonable use rule is extended to require the equitable sharing of groundwater among overlying landowners. When a landowner has correlative groundwater rights he may withdraw a "fair and just portion" of groundwater from a common pool. The overlying owners have no right to a specified pump lift level, and there is no priority among right holders.

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[75]See "Groundwater Recharge Projects in the Western United States" by the U.S. Department of Interior, U.S. Bureau of Reclamation, and Western States Water Council, October 1990.

The doctrine of prior appropriation, used by most western states to allocate groundwater rights, is unlike the other legal theories.[76] Unlike absolute ownership, which is founded upon a proprietary interest in overlying land, the prior appropriation doctrine is based upon beneficial use of water. Under the appropriation doctrine, the first user to put water to a beneficial use is protected in that use, according to priority among appropriators, over subsequent users. The limit of the right is legislatively defined beneficial use, which may occur on or off overlying land.

Under the appropriation doctrine, a permit to use groundwater should not issue if it will interfere with prior existing ground or surface water rights. It is much more difficult, however, for a senior groundwater right holder to ensure the continued enjoyment of his right than for a senior surface water right holder to do the same. Every user of water from an aquifer contributes to the draw down of the aquifer and, thus, affects the rights of other users. But, for a number of technical reasons, it is difficult to determine the precise effect of one use upon another's rights. This difficulty complicates groundwater management generally, and artificial groundwater recharge project management in particular.

Consider the hypothetical situation where a farmer in Idaho's Magic Valley has an appropriative right to use 1500 acre-feet (af) of water from the Snake River in a given year. That right has an attached priority date that the farmer could use to force upstream junior water right holders to abstain from using their full portion of water if he was not getting his full entitlement. The junior water right holders would be bound by state law to reduce their diversion to the amount that would restore the farmer. There is no issue of proof involved. The reduction in use must come from upstream. The water shortage could be from diversion, drought, or both. Under the appropriative system, it makes no difference. The doctrine protects water users by appropriation date regardless of the cause of water reduction. Now if the same farmer was using groundwater, it would prove more difficult to guarantee that a senior groundwater right holder would get his entitlement since the source of the groundwater draw down could be caused by drought conditions, surface water users, or others consuming the same groundwater. It is very hard to prove which one is at fault. Who should be forced to reduce consumption in order for the farmer to get his groundwater? The question is not easily answered since both the surface water users, as well as the other groundwater pumpers will claim that the other is causing the draw down.

A different problem is that groundwater aquifers seldom "run dry." Water is usually available at some depth. Thus, a central issue is who should pay the cost of pumping water from a well deeper than the well originally drilled by an early appropriator. In this regard, aquifer depletion is a question not only of the amount of groundwater use and natural replenishment, but also the type of use, well spacing, geo-hydrology, transmisivity, and aquifer size, shape, and storage capacity. Officials in states where the appropriation doctrine governs groundwater use take these and other factors into account, determine whether to manage an aquifer as a renewable or non-renewable water source, and then take administrative, judicial, or regulatory action to regulate use. The states have taken different approaches to determine what use should be allowed.

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[76]In the state-by-state legal summaries contained later in this section of the report, where a state's groundwater law is based on a legal theory other than the appropriation doctrine, that fact is explained.

Early appropriators in a groundwater basin may have enjoyed artesian pressure, or some other beneficial hydrologic condition, that allowed them to extract groundwater with minimal expense for well drilling and energy to pump water. Since any additional use reduces the amount of water in an aquifer, and thus increases the difficulty in extracting groundwater, they may have argued that additional use should not be allowed, or that subsequent users should have to compensate initial appropriators for increased pump lift costs. A few early court decisions went along with some of these arguments.[77] Critics countered that requiring such compensation impeded efficient groundwater use.[78] They pointed out that a surface water right holder may "call" his appropriated water right, but that he may not demand the stream flow at a rate that provides the least costly method of diverting that right. Courts began to require a "reasonable" rather than a "convenient" pump lift.[79]

Some states address the issue of a pump lift through administrative regulation. For example, a section of the Idaho Water Code says that "early appropriators of under groundwater should be protected in the maintenance of reasonable groundwater pumping levels as may be established by the Director of the Department of Water Resources" to assure optimum economic use of the state's groundwater.[80] Other states have addressed the issue through well spacing regulations.[81] Still others create groundwater use control areas where groundwater use is strictly regulated or precluded under certain conditions.[82] North Dakota does not allow senior groundwater appropriators to prevent changes in the water table, artesian pressure, or surface water level, by later appropriators, so long as the senior right holder can still reasonably acquire water under the changed conditions.[83]

The critical issue with respect to pump lift is protecting the rights of the third parties. Under the appropriation doctrine these rights receive general protection. The methods of protection vary from state to state. Artificial groundwater recharge projects may afford an appropriate means to

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[77]See, e.g., *Noh v. Stoner*, 53 Idaho 651, 26 P. 2d 12 (1993); *Volkmann v. City of Crosby*, 120 N.W.2d 18 (N.D. 1963).

[78]See, e.g., Bagley, Water Rights Law and Public Policies Relating to Ground Water "Mining" in the Southwestern States, 4 J.L. ECON. 144 (1961).

[79]See City of Colorado Spring v. Bender, 148 Colo. 458, 363 P.2d 552 (1961); Wayman v. Murray City Corp., 23 Utah 2d 97, 458 P.2d 861 (1969), Baker v. Ore-Ida Food Inc. 95 Idaho 575, 513 P.2d 627 (1973), Mathers v. Texaco Inc. 77 N.M. 239, 421 P.2d 771 (1966).

[80]IDAHO CODE § 42-226.

[81]See Aiken and Suppalla, Ground Water Mining and Western Water Rights; the Nebraska Experience, 24 S. DAKOTA L. REV. 607, 628-45 (1979).

[82]See, e.g., KAN. STAT. ANN. §§ 82a-1020-1035; MONT. CODE ANN. § 85-2-506; NEV. REV. STATE. §§ 534. 0-187; N.M. STAT. ANN. § 72-12-20; and ORE. REV. STAT. 537.730. See also TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 6.04 (1988); WESTERN STATES WATER COUNCIL, WESTERN STATES GROUNDWATER MANAGEMENT 10-79 (1986).

[83]N.D. CENT. CODE § 61-04-06.3 (2002).

allow continued pumping of a heavily used aquifer without detrimental impacts to establish groundwater rights. The effect of such projects on third party surface water rights, however, must also be considered and mitigated. Again, the methods of protecting these third party rights vary.

STATE-BY-STATE ANALYSIS

To provide the state-by-state analysis below, the Western States Water Council staff drew upon an earlier summary contained in the 1990 report entitled "Groundwater Recharge Projects in the Western United States." This summary was distributed to WSWC member states in order to update the information which was compiled from the responses to the previously circulated "State Groundwater Recharge Questionnaire." Several states have updated this previous information where needed, and the updates are incorporated into the following summaries in an attempt to keep current on the status of artificial groundwater recharge laws throughout the West. Each response updating the summary was written by the state agency with primary responsibility to regulate artificial groundwater recharge projects, with input from other state agencies as appropriate.[84] Where necessary, additional information was provided by WSWC staff to help update the summaries.[85]

Some states have substantial practical, legal, and institutional experience related to artificial groundwater recharge. Others do not. Often, responses to the Council's questionnaire reflected the experience of the responding state. Council staff attempted to supplement state responses where appropriate and feasible. The state-by-state information that follows, however, is based primarily on survey responses from 1990, as updated in 2001/2002.

The law of artificial groundwater recharge varies significantly from one western state to another. What some states describe as issues or solutions to problems, however, may be applicable in other states as well. Generally, the more use of groundwater in a state, the greater the body of recharge law that has developed.

A few states have enacted artificial groundwater recharge statutes. Others have a portion of their groundwater law devoted to artificial groundwater recharge. In some states, the law relating specifically to artificial groundwater recharge is meager, or non-existent. Most states, however, have legal mechanisms to govern groundwater use. Thus, in some instances, state artificial groundwater recharge laws are specific, comprehensive, and detailed. In other instances, general principles of state groundwater law are applied to a recharge situation, with its resulting questions and ambiguities. Where appropriate, the summaries below contain WSWC Staff comments on the scope of a state's artificial groundwater recharge law.

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[84] As an appendix to the report, these responses are available at the WSWC office.

[85] While information provided by states in response to the questionnaire comprises most of part 2, sources of additional information, which may or may not be a part of the state responses, have been cited in the footnotes where appropriate.

Alaska

Alaska has no artificial groundwater recharge projects, and no permits for such projects have been sought. Likewise, the state has no artificial groundwater recharge statutes. The issue of whether artificial groundwater recharge qualifies as a beneficial use of water in Alaska has not been raised. Currently, there are no permits issued for an artificial groundwater recharge project but state officials believe that if such a permit request were made, artificial groundwater recharge would be deemed as a beneficial use allowable under a state water use permit. It is also unclear how state groundwater quality laws would apply to a recharge project. State officials do not anticipate dealing with this issue in the near future.

Arizona

Arizona encourages "...the use of renewable water supplies, particularly [the] state's entitlement to Colorado River water, instead of groundwater, through a flexible and effective regulatory program for the underground storage, savings and replenishment of water."[86] In 1994, the Arizona legislature adopted the Underground Water Storage, Savings and Replenishment ("UWS") Act, which recodified and integrated previously adopted recharge projects into a single, comprehensive project.[87] The UWS Project is administered by the Arizona Department of Water Resources ("ADWR"). The regulatory program applies throughout the state, and any Underground Water storage projects must be permitted by ADWR.

Under the UWS, there are three basic types of permits. Storage facility permits allow operation of a storage facility. In order to obtain a storage facility, the applicant must show the Director of ADWR that: (1) the applicant has the technical and financial capability to construct and operate the project; (2) the facility is hydrologically feasible; (3) storage at the facility will not cause unreasonable harm to surrounding land and water users; (4) any necessary flood plain use permit has been obtained; and (5) the Director of the Department of Environmental Quality has found that the facility will not cause a pollutant to be leached into the aquifer and will not cause pollutants or poor quality groundwater to migrate so as to cause unreasonable harm to surrounding land and water users.[88] In addition, if the storage facility will store effluent, the storer must obtain an aquifer protection permit from the Department of Environmental Quality before it may begin recharge operations under its storage facility and water storage permits.[89]

Water storage permits allow the storage of water at a storage facility and the accrual of recovery rights to that water. Prior to a water storage permit being issued, the applicant must establish that it has the legal right to store the water at issue and that the storage will occur at a permitted storage facility.[90]

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[86]ARIZ. REV. STAT. § 45-801.01 (2001).

[87]ARIZ. REV. STAT. §§ 45-801.01 et seq (2001).

[88]ARIZ. REV. STAT. § 45-811.01 © (2001).

[89]ARIZ. REV. STAT. § 45-831.01; ARIZ. REV. STAT. § 49-241 (2001).

[90]ARIZ. REV. STAT. § 45-831.01 (2001).

Recovery well permits allow the holder the right to recover previously stored water. In general, a recovery well permit is not issued if it would result in unreasonable damage to surrounding land or water users from concentration of wells.[91]

The UWS program is very flexible, and it can be used to accomplish a number of objectives. A water storage permit can be designated as storing non-recoverable water if the storer seeks to restore the aquifer, rather than obtaining recovery rights.[92] Non-recoverable water storage, for restoring the aquifer, and thus avoiding subsidence, and reducing pump lift, is recognized as a beneficial use of water.[93]

The UWS program can also be used for either short-term or long-term water storage.[94] Long-term storage accounts of stored water are maintained by ADWR.[95] Annual reports of all storage and recovery activities are required of all permit holders. The reports allow ADWR to maintain up-to-date storage accounts.

The UWS program includes a program to use public funds to finance the construction of some underground storage facilities. A real property tax assessed for several years in the Phoenix and Tucson metropolitan areas provided funding for state demonstration storage facilities to be constructed in those areas.[96] The task of constructing and operating the state demonstration storage facilities was assigned to the Central Arizona Water Conservation District (CAWCD), a multi-county water district, which operates the Central Arizona Project.

The UWS program also functions as the tool used to replenish groundwater used by new subdivisions in excess of amounts allowed by state-prescribed water management goals.[97] Replenishment is also the responsibility of the CAWCD, which undertakes replenishment for those cities, towns, private water companies, and individual subdivisions that have chosen to meet the water management goals through replenishment. CAWCD distributes the cost of replenishment annually on those entities based on a per-acre-foot-cost basis.

Storage facilities are not limited to state demonstration projects operated by CAWCD. Numerous cities and private water companies have also been permitted to operate storage facilities, and a limited number of storage facility permits have been issued to private corporations that are not utility companies. The costs of the facilities and water storage are born by the participants in the individual projects.

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[91]ARIZ. REV. STAT. § 45-834.01 (2001).

[92]ARIZ. REV. STAT. § 45-833.01 (2001).

[93]ARIZ. REV. STAT. § 45-151 (B) (2001).

[94]ARIZ. REV. STAT. §§ 45-851.01; 45-852.01 (2001).

[95]Id.

[96]ARIZ. REV. STAT. § 45-891.01 et seq (2001).

[97]ARIZ. REV. STAT. §§ 45-859.01, 45-576; 45-576.01 (2001).

In 1994, the Arizona Water Banking Authority (AWBA) was created to allow the interstate use of the UWS program.[98] The principle purpose of the AWBA is to import Colorado River water that is currently unused in Arizona, and store it underground for future use. The AWBA does not operate storage facilities but affiliates its water storage permits with existing storage facilities to store water. AWBA funding comes from groundwater withdrawal fees, a tax on real property in central Arizona, and from annual general fund appropriations from the legislature.[99]

Stored AWBA water will be used to offset future water shortages in Arizona, to meet the water management objectives of the state, and to facilitate settlement of Indian water rights.[100] The AWBA is also authorized to enter into interstate agreements with the other Lower Division States of the Colorado River to store water on behalf of California and Nevada, allowing them to take more water in times of need.[101] Through the year 1999, the AWBA had stored over 730,000 acre-feet of water in central Arizona.

California

Groundwater in California is managed at the local rather than the state government level. State policy encourages local agencies to employ artificial groundwater recharge and conjunctive use programs to make efficient use of their water supplies, and both statutory and financial support is provided to local agencies for managing their groundwater resources. The California Water Code establishes a procedure and provides the authority that any local water agency, or group of local water agencies, may use to manage groundwater.[102] Additionally, there are at least 23 types of California special districts having generic statutory authority for groundwater management activities; many special districts have specific management authorities in their individual enabling legislation. Groundwater may also be managed at the county level by county ordinances, or by basin-specific court adjudications. Currently, more than 160 local agencies have prepared management plans pursuant to the Water Code, 18 counties have adopted groundwater management ordinances under their general police powers, and 18 groundwater basins have gone through court adjudications (17 in State Superior Court and 1 in federal District Court).

The majority of the law supporting California groundwater use, recharge, and storage is case law, rather than statute only. Issuance of state administrative permits is limited to recharge projects that entail recharge with recycled water, where permits from Department of Health Services and the Regional Water Quality Control Board are required. DHS or the RWQCB can prohibit recycled water recharge if such recharge is considered a threat to public health. In addition, the Regional Water Quality Control Boards can prohibit recharge with any surface water that the Board considers will degrade the state's waters.

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[98]ARIZ. REV. STAT. § 45-2401 (2001).

[99]ARIZ. REV. STAT. § 45-2425 (2001).

[100]ARIZ. REV. STAT. § 45-2457 (2001).

[101]ARIZ. REV. STAT. § 45-2471 (2001).

[102]CAL. WATER CODE §§ 10750 *et seq.*

The California Environmental Quality Act[103] requires all state and local agencies that carry out or approve a project that may have a significant effect on the environment, including surface water or groundwater resources, to prepare and certify an environmental impact report. Impacts are required to be mitigated – and a monitoring plan implemented for the mitigation – unless the project sponsor is able to support a finding of overriding significance.

Groundwater storage projects are not a new concept in California. Los Angeles County began operation of a groundwater spreading basin in 1917. Today the County Department of Public Works (LADPW) operates 28 spreading basins covering more than 2,400 acres, and three seawater intrusion barriers – well fields where fresh water is injected to create a hydraulic barrier to landward migration of saline water. LADPW and its neighbor to the south, Orange County Water District, each typically recharge at least 300 thousand acre-feet (TAF) annually.

Large-scale groundwater storage projects are increasingly being implemented in California. The majority of them are located in the southern San Joaquin Valley and in Southern California, although even in the San Francisco Bay Area (where geologic conditions severely constrain the ability to implement storage projects) local agencies are recharging more than 125 TAF annually. Some of the large-scale projects are being operated as banks, where storage capacity is rented to other agencies; others were developed only for the use of the owning agency. Two of the San Joaquin Valley banking projects have developed storage capacities in excess of 1 MAF each.

The California Legislature authorized more than $500 million in state financial assistance for local agency groundwater projects between 1996 and 2000, the majority of it in the form of bond-funded grants for project feasibility studies and construction administered by the California Department of Water Resources (CDWR). Prior to the availability of bond-funded grants, CDWR made $74 million in bond-funded low-interest loans to local agencies between 1986 and 2000 for groundwater projects. Providing funding to local agencies for the development of local groundwater storage projects is one component of California's joint state-federal CALFED Bay-Delta program. Several legislative proposals placed a $2 billion water bond measure supporting CALFED and other programs on California's November 2002 ballot. Additional state funding for local groundwater projects is contained in these legislative proposals.

With respect to groundwater rights, California Law does not follow the appropriation doctrine. Rather, the state follows the overlying rights or correlative rights doctrine.[104] The California Supreme Court, however, in *Los Angeles v. San Fernando*, concluded that the first right to water in a groundwater basin belongs to the party that has imported and recharged the water for storage in the basin, as long as there is room for the storage of imported water.[105] In contrast, groundwater that is recharged as the result of the natural storm event is water available to an overlying landowner as a part of his correlative right to extract the groundwater or, in an adjudicated groundwater basin, his adjudicated right. The same decision also affirmed an entity's right to

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[103]CAL. CODE REG. §§ 15000 *et seq.*

[104]Katz v. Waklinshaw, 141 Cal. 116, 74 P. 766 (1903)

[105]14 Cal. 3d 199 (1975); 537 P.2d 1250 (1975)

recapture recharged groundwater under certain conditions.[106] Generally, there must be space in an aquifer and the sponsoring entity must be able to demonstrate that its recharge activities have increased the level of water in the aquifer. Also, the quality of the aquifer must not be degraded. Thus, case law provides protection for the sponsor or sponsors of an artificial groundwater recharge project to recover recharged water.[107]

Colorado

The Colorado Division of Water Resources has jurisdiction over water quantity aspects of artificial groundwater recharge in the state. The Department of Health has jurisdiction over water quality issues. Recharge projects were first undertaken in the early 1960s. There are over 210 existing, active artificial recharge facilities in Colorado operated by municipalities, ditch companies, water supply districts, and other public agencies. This number appears to be increasing.

Some recharge facilities are elaborate. For example, Willows Water District recharges the Arapaho Bedrock aquifer through a 1500-foot well. South Adams County Water and Sanitation District recharges through a specially constructed pit using water that has been changed from its previous irrigation use. The Central Colorado Conservancy District recharges through spreading ponds and basins to augment the many irrigation wells covered by their plan. Several cities are using artificial recharge pits or land application plots to recharge their sewage effluents to the underlying alluvial aquifers from which they pump a like amount of water from alluvial wells. There are many sites where local farmers or ditch companies will spread excess surface water so as to artificially recharge the underlying alluvium. This directly benefits their pumping of alluvial groundwater through one or more of their wells. The amount of water artificially recharged each year is a function of water availability.

Accurate records of the quantities artificially recharged do not exist, but the amount is estimated to average over 110,000 acre-feet per year and could exceed 160,000 acre-feet in a wet year. The state engineer's Office strongly encourages artificial recharge to maximize the use of the state's water resources, including underground storage.

Conjunctive use is recognized by statute in Colorado.[108] The statute requires the state and the Division of Water Engineers to maximize the beneficial use of the state's water resources. State officials believe the existing and future artificial recharge projects are consistent with maximizing beneficial use.

Colorado recognizes artificial groundwater recharge as a beneficial water use and such a use of surface water for recharge purposes must be carried out under a valid water right. [109] The state issues no recharge permits, but issues well permits for withdrawal of recharged water, and in this way can protect a recharge project sponsor's right to withdraw recharged water. Before a well

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[106]Id.

[107]Id.

[108]COLO. REV. STAT. §§ 37-92-102 (1) and (2).

[109]COLO. REV. STAT. § 37-92-103 (10.5).

permit may be issued, the operator must demonstrate that he has retained dominion and control over the recharged water and that withdrawal will not injure any other well or water right.

In addition to the administrative protection of the right to withdraw recharged water, the Colorado water courts have decreed underground storage rights. Many of the decrees contain specific limitations and retain jurisdiction to prevent injury to other water rights and to allow revision or modification of the terms and conditions. In this way, a proponent of artificial groundwater recharge is protected in the exclusive use of the recharged water. The volume of recharged water is measured by various devices depending on the type of recharge. Sometimes, depending on the type of recharge project, evaporation losses must be assessed and subtracted from the amount of water being recharged. Recovery of recharged water is also measured. Information on recharge projects generally must be developed and maintained by a project operator. He carries a burden to prove that: (1) water has been recharged; (2) he has maintained dominion and control over the water; and (3) that the operating terms and conditions will not cause injury to other vested water rights. Colorado, then, regulates: (1) diversion of water for artificial recharge, according to decreed priorities; (2) the entry of storage decrees; (3) the calculation of timing, location, and amount of return flow credits; and (4) based on appropriate data, limits the amount of recharged water that can be recovered.

Colorado allows groundwater mining in some aquifers. A statutory 100-year minimum aquifer life is used for administration of some aquifers, while a 40% depletion in 25 years is allowed in others. Both of these mining provisions, however, exclude artificially recharged groundwater, and an over-appropriated groundwater system will usually have declining groundwater levels on a frequent or continuous basis. Colorado's groundwater permit statutes allow new permits to be issued if there is unappropriated water available and if issuance of such permits and the associated use of water would not injure other vested water rights.

Colorado officials are concerned that the quality of recharged water must not contaminate a receiving aquifer. The specific provisions to accomplish this goal, however, are not defined by statute and now rest with the individual or entity carrying out the recharge. Any recharge accomplished by injection well must be accompanied by a permit from the U.S. Environmental Protection Agency. It is not yet clear in Colorado whether either the Health Department or the state engineer have the power to override an EPA permit decision. The State Department of Health has control over entities that discharge water to both the surface streams and groundwater. Colorado is also concerned about whether permits should be required for all recharged activities, including those accomplished by other than injection wells, and which state or local agency should be responsible for issuing such permits. State officials also believe, however, that any permitting regulations that are developed should not be so restrictive as to prevent artificial recharge as a viable water management tool. Overly restrictive controls or costs for groundwater quality monitoring, and data collection could preclude many artificial recharge projects.

Colorado officials do not believe the state needs comprehensive artificial groundwater recharge legislation. Because of the success that has been enjoyed by many groundwater recharge projects, state officials believe that any new legislation would be helpful only if it is "reasonable, based upon factual concerns, and addresses those topics where new statutes would benefit state water interests. There is great concern that improper legislation could seriously prevent the use of artificial recharge."

Idaho

Idaho has an artificial groundwater recharge law that authorizes the organization of aquifer recharge districts and provides that use of water for recharge purposes is a beneficial use for which the Idaho Department of Water Resources may grant an appropriative water right.[110] In a statement of policy, the law says:

In view of public betterment to be achieved by the completion of aquifer recharge projects, the legislature hereby declares that the appropriation and underground storage of water by any person, aquifer recharge district, irrigation district, canal company or water district for purposes of groundwater recharge shall constitute a beneficial use and hereby authorizes the Department of Water Resources to issue a permit pursuant to section 42-203 [42-203A], Idaho Code for the appropriation and underground storage of the unappropriated waters of the state.[111]

Thus artificial groundwater recharge is recognized as a beneficial use for which any person or entity can receive a permit in accordance with law.[112] Incidental recharge resulting from some other water use, such as irrigation, is not recognized as a beneficial use for which a water right can be established or claimed, but is recognized to be in the public interest and must be considered in water management.[113] A recharge permit must be issued for all recharge projects. Where an injection well greater than 18 feet deep is used, an injection well permit is also needed.[114] The Idaho Department of Environmental Quality must approve all artificial groundwater recharge projects not using injection wells.

In general, Idaho encourages conjunctive use of ground and surface water supplies. The state water plan says:

> It is the policy of Idaho that, where evidence of hydrologic connection exists between ground and surface waters, they are managed conjunctively in recognition of the interconnection.[115]

The Idaho Department of Water Resources encourages conjunctive use, including artificial groundwater recharge activities, where the department considers a project to be beneficial under the criteria of the state water plan. Similarly, such projects would be discouraged if considered non-beneficial.

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[110]IDAHO CODE §§ 42-201 TO 42-231.

[111]Id. § 42-4201A (a) (2) (1994).

[112]Id.

[113]IDAHO CODE §42-234 (2001).

[114]IDAHO CODE § 42-3909.

[115]Idaho State Water Plan, Policy 1F (1997).

The major use of artificial groundwater recharge in Idaho is to enhance water supply in areas where all existing water right holders benefit from the recharge project. Often such benefit is in the form of assuring a continued flow from hydrologically connected surface water sources (e.g. springs emerging from an aquifer). The Idaho Department of Water Resources treats recharged water resulting from state-sponsored recharge programs as part of the overall supply in an aquifer. In this sense it is allocated between existing groundwater and surface water right holders by priority of right. Recharge from projects specifically approved to mitigate the effects of pumping by junior priority groundwater rights on senior priority surface and ground water rights can be recognized as a basis for allowing out-of-priority diversion by the junior right holder.[116]

An applicant seeking to appropriate water for the recharge has the burden of proof to show that: (1) the proposed use will not reduce the quantity of water under existing water rights; (2) the water supply is sufficient for the purpose for which it is sought; (3) the application is made in good faith, and not for speculative purposes; (4) the applicant has sufficient financial resources to complete work involved; (5) the proposed use will not conflict with the local public interest, which is broadly defined under state law; and (6) the proposed use will conserve water for use in Idaho.[117] The quality of the recharged water and the effect of the recharge on aquifer quality are critical issues in these determinations.

Idaho provides that groundwater may not be available to fill a right if withdrawal would "result in drawing the groundwater supply at a rate beyond the reasonably anticipated average rate of future natural recharge."[118] The law allows diversions beyond the rate of natural recharge if the Department of Water Resources determines that such diversions are in the public interest and: (1) a program exists or is proposed to bring withdrawals into balance with recharge; and (2) holders of prior rights will not be required to pump from below the established reasonable pumping level.[119] By rule, the "reasonably anticipated average rate of future natural recharge is defined as:

> The estimated average annual volume of water recharged to an area having a common groundwater supply from precipitation, underflow from tributary sources, and stream losses and also water incidentally recharged to an area having a common groundwater supply as a result of the diversion and use of water for irrigation and other purposes. The estimate will be based on available data regarding conditions of the diversion and use of water existing at the time the estimate is made and may vary as these conditions and available information change.[120]

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[116]Rule 42.02 "Rules for Conjunctive Management of Surface and Groundwater Resources" Idaho Administrative Procedures Act §37.03.11.

[117]Id. § 42-203A.

[118]IDAHO CODE ANN. § 42-237a (g).

[119]Id.

[120]Rule 10.19, Conjunctive Management Rules.

No artificial groundwater recharge may occur in Idaho unless all applicable water quality standards are met, including those established under Idaho's groundwater protection law generally, [121] and those created under the Idaho Underground Injection Control Program,[122] which regulates injection of any fluids by injection wells, including artificial groundwater recharge wells.

Changes in irrigation practices from gravity to sprinkler diversions are reducing the recharge to the Snake Plain Aquifer and other aquifers in Idaho. Managed recharge is viewed as important to maintaining and developing water use in Idaho.[123]

Kansas

Kansas does not have a specific artificial groundwater recharge statute. Artificial groundwater recharge, however, is identified as a beneficial use of water in both the State Division of Water Resources' administrative regulations,[124] and the Kansas Water Appropriation Act. [125] Further, the State Water Resources Planning Act[126] contains several sections that are written broadly enough to apply to artificial groundwater recharge.[127] Kansas' Groundwater Management District Act also contains sections that infer that artificial groundwater recharge is a beneficial use of water under Kansas law.[128]

The Division of Water Resources issues artificial groundwater recharge permits for structures and diversions. A permit is required to divert the natural flow of a stream in any quantity for the purpose of recharging an aquifer, and such recharge qualifies as a beneficial use under Kansas law. But where runoff water is trapped and recharged via level terraces, or in ponds, no permit is required.

Recharged groundwater was indirectly measured in early work with recharge research in Kansas. The amount of recharge was quantified specifically for short periods of time. With recharge dams, the measurement of recharge was quantified by identifiable changes in the water table. For terraces, moisture enhancement was measured and some quantification was made, based upon certain assumptions.

While recharged groundwater can be measured in Kansas, the individual or entity responsible for the recharge is not currently provided legal protection to recover the recharged groundwater.

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[121]IDAHO CODE § 39-3601.

[122]Id. §§ A2-3901 to 3919.

[123]Idaho State Water Plan, Policy 1J (1997).

[124]Kansas Division of Water Resources' Administrative Regulation 5-1-1 (F).

[125]KAN. STAT. §§ 82a-701 *et. seq.*

[126]Id. §§ 82a-901 *et. seq.*

[127]See, e.g., id. §§ 82a-907 (g), 82a-927 (d), and 82a-928 (k) (e).

[128]Id. §§ 82 (a) -1020 *et. seq.*

Once recharged to the aquifer, the water is available for appropriation through normal procedures. Indeed, once the water is in the aquifer, there is no differentiation under Kansas law between water that is artificially or naturally recharged. However, where water is collected in a pond for artificial groundwater recharge and an individual pays for the structure, the Division of Water Resources can give consideration for additional quantity on his water rights.

Kansas has compiled substantial information concerning groundwater resources, especially those available at shallow depths. The state is currently updating and collecting more information on the Dakota and Roubidoux aquifers, particularly related to protection of aquifers from pollution. A recharge project in Kansas would most likely be located in the Ogallala aquifer or some alluvial material of younger age in the western one-third of the state where the rate of recharge is less than the rate of withdrawal, and where water from other sources is not economically available. Some areas in central Kansas, however, where use is very heavy, may also consider recharge alternatives. For water to be used as a source for recharge, an individual or entity would have to prove the availability of water and demonstrate the benefits to be derived from the recharge activity.

The opportunities related to conjunctive use by a recharge project in Kansas would be to enhance the quantity of water available for uses such as domestic, municipal, and irrigation by way of the recharge projects. Problems associated with recharge could relate to groundwater quality deterioration of the aquifer associated with the recharge of poor quality water. The Kansas Department of Health and Environment, however, does not allow quality of groundwater aquifers to be degraded. In areas of extremely good quality groundwater, such as the Ogallala formations, the Equus Beds, part of the Great Bend Prairie, and some other alluvial material, even good quality recharge water may deteriorate the quality of an aquifer. The Department of Health and Environment's policy essentially eliminates use of sewage effluent for recharge, even when the effluent has been treated and restored to a potable condition.

Kansas has four surface water interstate compacts covering the Arkansas River with the states of Colorado and Oklahoma and the Republican and Little and Big Blue Rivers with the state of Nebraska. The surface water base flow associated with groundwater flow is affected by groundwater withdrawal, especially close to the river. Artificial groundwater recharge could help replenish surface water stream flow. Unless such recharge amount were very substantial, however, the increase in flow most likely could not be recognized. Conversely, diversions to recharge groundwater cannot reduce compliance with the flow delivery requirements of the compacts. Currently, effects of any recharge activity on compact requirements must be addressed on a case-by-case basis.

Kansas, through its groundwater management districts, has initiated protection of artificial groundwater recharge areas for some wells on a pilot-program basis. The city of Oakley in western Kansas was the first such wellhead protection study. Wichita has a pilot artificial groundwater recharge project that has been in place since 1995. The Equus Beds Groundwater Management District No. 2 has combined with the city in an effort to store, or "bank" water in aquifers for later municipal use. The Aquifer Storage Recovery ("ASR") project is planned to recharge of roughly 20,000 feet annually after transition into more intensive capability.

Quality of injection water and degradation of an aquifer by sediment, chemicals, and bacteria has always been an issue in Kansas, and thus the state has not encouraged injection as a method of recharge. With respect to water quality issues related to artificial groundwater recharge, concerns

have been expressed about fertilizers, herbicides, and bacteria in agricultural runoff recharging some underlying aquifers.

The primary state water quality regulations that affect artificial groundwater recharge projects in Kansas require that water may not be recharged if it will degrade the ambient quality of an aquifer.[129] These state regulations comply with the federal Clean Water Act and the Safe Drinking Water Act.[130] If the quality of recharge water is not equal to or better than the quality of water in an aquifer, regardless of how pristine that water may be, the project may not proceed.

In the late 1970s, funds were appropriated by the Kansas legislature for artificial groundwater recharge pilot projects. Up to $1 million could have been spent. The funding, however, ceased after $400,000 was appropriated. The cessation of funding by the legislature indicated a lack of total support for recharge projects. In general, Kansas officials believe that the state has sufficient groundwater management legislation in place, but more funding may be necessary if projects with local support are to be constructed.

Montana

State officials in Montana have yet to see any significant interest in artificial groundwater recharge. State administrators believe the spectrum of consumptive users (public, private domestic, irrigation) and, conceivably, those interested in preservation of instream flows (in cases where groundwater storage might provide an economical option for seasonable augmentation of stream flows) would be the most likely sponsors of future artificial groundwater recharge projects.

Montana has one small "controlled groundwater area" where recharge augmentation is a requirement of an applicant seeking to obtain or expand a groundwater right. In this sense, the state has, in a limited fashion, recognized recharge augmentation as a valid approach to increasing groundwater availability. Such augmentation, however, has been investigated at only a few Montana sites. However, the concept of such augmentation is "worth considering in certain Montana settings," according to state officials.

Montana has no specific artificial groundwater recharge statute. State officials believe that legal action with respect to artificial groundwater recharge would be most directly related to the issuance of a right to divert water intended for recharge and subsequent withdrawal for beneficial use. Further, the state could offer no legal protection to the sponsor of a potential recharge project if it extended under the property of other potential well developers. The state has made no effort to differentiate between naturally and artificially or intentionally recharged water. Montana recognizes any type of water storage as a beneficial use.

The Montana Water Quality Bureau of the Department of Health and Environmental Sciences regulates underground injection wells under the state's underground injection control program. Recharge activities by injection well would have to be carried out in conformity with this

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[129]Kansas Department of Health and Environment Administrative Regulation §§ 28-16-57 and 28-16-28e.

[130]33 U.S.C. §§ 1251-1376.

program and in harmony with Montana general groundwater quality laws and programs.[131] Currently, there are no problems in the state related to groundwater quality and artificial groundwater recharge.

Montana, at the present time, is trying to establish policies to promote conjunctive use of ground and surface water, and thereby enhance the state's ability to manage its water resources. Montana officials view artificial groundwater recharge as a further step in promoting water use efficiency in the future. Thus, at some future time, artificial groundwater recharge legislation may be an appropriate consideration.

Nebraska

Nebraska's general groundwater law is based on a combination of the reasonable use and correlative rights doctrines. Originating in case law and now codified in statute, it allows that: "Every landowner shall be entitled to a reasonable and beneficial use of the groundwater underlying his or her land subject to (statutory requirements)... and the correlative rights of other landowners when the groundwater supply is insufficient for all users."[132] The statutes require state registration of all wells except domestic wells drilled prior to September 9, 1993, including well-spacing restrictions. With some conditions, they allow for transportation of groundwater off the overlying land for municipal, rural domestic, industrial, and out-of-state uses.

The statutes also authorize management areas where use restrictions may be imposed. Restrictions can be imposed for both water quality and water quantity reasons. The state is divided into twenty-three Natural Resources Districts, which have the primary responsibility for management of groundwater resources.

Natural resources districts are authorized to create groundwater management areas. State approval is not required, but the districts must first prepare a groundwater management plan that is reviewed by the state.[133]

If a management area is formed for water quantity purposes, the natural resources district board can adopt rules to allocate water, require measuring devices, require stricter spacing of wells, adopt a system of rotation of use, and if necessary set up a temporary moratorium on the drilling of new wells.

Management areas may also be formed for water quality reasons, especially if water quality problems are created by non-point contaminant sources. In such event, landowners, both rural and

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[131]MONT. REV. CODES ANN. §§ 75-5-101 to 1122.

[132]NEB. REV. STAT. § 46-656.02 (2001).

[133]Id. § 46-656.12.

urban, can be required to use best management practices in applying chemicals.[134] Water use can also be restricted if the district concludes that leaching could be thus reduced.[135]

Currently there are two management areas for water quantity only, sixteen for water quality only, and five for both water quality and quantity.

In the event that natural resource districts fail to act when serious problems arise, the Department of Natural Resources or the Department of Environmental Quality can establish management areas and implement controls.

Concerning recharge specifically, Nebraska law recognizes that:

> As a result of water project operations, surface water in some areas of the state has been, is, and will be in the future intentionally and incidentally stored in and withdrawn from underground strata. The legislature acknowledges that rights to water intentionally or unintentionally stored underground and rights to withdrawal of such water should be formally recognized and quantified and recognizes the propriety of all beneficiaries proportionately sharing, to the extent of potential benefit from intentional Underground Water storage, in the financial obligations necessary for construction, operation, and maintenance of water projects which cause intentional Underground Water storage.[136]

The legislature has declared that uses of water for incidental and intentional underground water storage are beneficial uses of water that contribute to the recharge of Nebraska's aquifers.[137] Further, the legislature has declared 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.
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> To facilitate optimum beneficial use of water by the people of Nebraska, the legislature recognizes the need for authorizing the recognition of the incidental Underground Water storage, for authorizing intentional Underground Water storage, and for authorizing the levying

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[134]Id. § 46-673.09.

[135]Id.

[136]NEB. REV. STAT.§ 46-295.

[137]Id.

> and collection of fees and assessments on persons who withdraw or otherwise use or benefit from intentional Underground Water storage....[138]

Nebraska law defines intentional groundwater storage to mean "Underground Water storage which is an intended purpose or result of a water project or use."[139] Such storage may be accomplished "by any lawful means such as injection wells, infiltration basins, canals, reservoirs, and other reasonable methods..."[140] The source of a permit for intentional Underground Water storage must be surface water. Incidental Underground Water storage is defined as "Underground Water storage which occurs as an indirect result, rather than an intended or planned purpose, of a water project or use and shall include, but shall not be limited to, seepage from reservoirs, canals, and laterals, and deep percolation from irrigated lands."[141] Nebraska law allows an individual who holds an approved, unperfected appropriation to apply for a modification of the permit to include intentional Underground Water storage associated with the appropriation.[142]

Concerning rights to the water after it has been stored, Nebraska law provides that:

> Any person who has obtained a permit for intentional Underground Water storage associated with a project not existing on August 26, 1983... may...levy a fee or assessment against any person for the right or probable right to withdraw or otherwise use such stored water.[143]

Wells with a capacity of less than 100 gallons per minute used solely for domestic purposes are exempt from any fee or assessment.[144] Before a person or an entity can levy fees or assessments, it must receive approval from the Nebraska Department of Natural Resources. Requirements for approval are specified by statute.[145] An individual who obtains approval for fees or assessments may commence an action to enjoin a person from withdrawing or otherwise using stored water if the person has not entered into an agreement to pay or has not paid applicable fees and assessments.[146] However, this appears to be the only basis upon which use of intentionally recharged groundwater can be prevented if the use is consistent with other groundwater laws and regulations.

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[138]Id.

[139]Id. § 46-296.

[140]Id.

[141]NEB. REV. STAT. § 46-296.

[142]Id. § 46-297.

[143]Id. § 46-299.

[144]Id. § 46-2, 100.

[145]See id. § 46-2, 101.

[146]Id.§ 46-2, 103

Nebraska law also still allows water users with perfected water rights to receive approval for Incidental Underground Water storage associated with some kinds of water use.[147] The Director of the Department of Natural Resources may approve an application subject to the following conditions: (1) the use of surface waters will not be increased from that proved in the original right; (2) if the water to be stored underground from incidental recharge is to be used on lands different from lands included under the original appropriation, the Director must determine that the change is in the public interest; (3) the appropriation date shall remain the same as that of the original appropriation; and (4) the incidentally recharged water must be used for beneficial purposes.[148] The burden of proof with respect to incidental recharge is on the applicant for a permit. The Director may grant an application in a modified or reduced form.[149]

A provision in the original law passed in 1983 allowed the holder of a water right for incidental recharge to collect up to fifty cents per acre per year from groundwater irrigators benefitting from that recharge. However, as a result of landowner opposition that authority was repealed in 1989. As explained in more detail later, the most likely motivation for now obtaining a water right for incidental recharge is to protect the surface water diversion upon which that recharge depends.

With respect to intentionally recharged Underground Water storage, a permit may be obtained from the Department of Natural Resources to appropriate public waters for intentional storage and recovery of such water. Further, an unapproved application pending on August 26, 1983, may be amended to include an appropriation for intentional Underground Water storage and recovery.[150] In many respects, applications to withdraw intentionally recharged water are treated the same as applications to appropriate water from a lake or a reservoir.[151] An application for storage and recovery of water intentionally stored underground may be made only by an appropriator of record who shows, by documentary evidence, sufficient interest in the Underground Water storage facility to entitle him to the water requested.[152]

As alluded to earlier, the Incidental Underground Water storage permit allows existing projects to "firm-up" their rights to divert water at historic diversion rates. State statutes set a maximum diversion rate for irrigation at 1 cubic foot per second for every 70 acres.[153] Over the last 15 years the Department of Natural Resources has had an aggressive adjudication program. Several districts have filed applications for recognition of Incidental Underground Water storage prior to or simultaneously with the adjudication of their water rights. By so doing, and providing incidental

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[147]Id. § 46-226. 01.

[148]Id. § 46-225.02.

[149]Id.

[150]Id. § 46-233.

[151]See id. § 46-242.

[152]Id. § 46-241 (3).

[153]NEB. REV. STAT. § 46-231.

recharge from operation of projects, the districts were able to retain a diversion rate and priority date on the basis of recharge for a portion of the water historically diverted, but otherwise unused.

The following simplified hypothetical situation helps explain. District X has an 1898 priority date water right to divert 300 cubic feet per second for irrigation of 21,000 acres of land. Since the right was granted, neighboring towns have grown, wells have been drilled, farming practices have changed, and the District now only provides direct service to 14,000 acres of land. Historically, the district has diverted approximately 250 cubic feel per second, and the groundwater table under the project has risen. Following a hearing and adjudication, the district could be recognized as having the right to divert 200 cfs to irrigate 14,000 acres and 50 cfs for Incidental Underground Water storage.

The water quality effects of artificial groundwater recharge in Nebraska are regulated by various laws. Most activities designed to recharge groundwater directly would require a permit from both the Department of Natural Resources and the Department of Environmental Quality. Intentional groundwater recharge using injections wells is regulated under the Nebraska Environmental Protection Act[154] and by Nebraska rules and regulations for underground injection and mineral production.[155] The limits on contaminant levels and injectate are based on the Nebraska groundwater quality standards and use classifications.[156] These controls, in turn, are based in part on the federal Safe Drinking Water Act.[157] Further, Nebraska is developing a wellhead protection program that will be used to allow public water suppliers to protect recharge areas of a public supply well.

Nebraska is concerned that some groundwater resources could be degraded through artificial groundwater recharge projects. Where the source water contains nitrates, pesticides, or other substances that could cause contamination, some groundwater resources may be in jeopardy. However, the state has little control over a recharge project based on water quality concerns unless injection wells are used. Two programs described earlier could be used to protect artificial groundwater recharge from non-point source contamination. As noted, the natural resource districts in the state may designate groundwater quality management areas, where the districts can require best management practices with respect to certain agricultural practices to limit non-point source contamination. Further, the Department of Environmental Quality may create management areas designed to achieve the same goal.

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[154]NEB. REV. STAT. §§ 81-1501 to 1533.

[155]Nebraska Department of Environmental Control, Title 122 - Rules and Regulations for Underground Injection and Mineral Production Wells, January 2, 1989.

[156]Nebraska Department of Environmental Control, Title 118 Groundwater Quality Standards and Use Classification, May 29, 1988.

[157]42 U.S.C. §§ 300f - j (11).

Nevada

In 1987, Nevada enacted an artificial groundwater recharge statute and gave the state engineer specific authority over recharge and recovery projects.[158] The Nevada Division of Environmental Protection has authority over the quality of recharged water under Nevada statutes[159] and administrative regulations.[160] The Nevada Department of Conservation and Natural Resources actively supported the passage of the Nevada recharge law and has encouraged water purveyors and users to explore artificial groundwater recharge as an option to enhance the state's ability to manage water resources. Department officials feel that artificial groundwater recharge projects are viable water management tools, and the Division of Water Planning has identified artificial groundwater recharge as an important water management option to explore in future studies. The state seeks to provide an incentive for use of artificial groundwater recharge by recognizing the increase in efficiency of water management generally when artificial groundwater recharge plays a significant role. This could allow future reliance on recharge to support additional growth in the state. Although only preliminary analysis has been done, the Department believes artificial groundwater recharge is cost effective.

Nevada's recharge legislation established procedures and requirements to develop and operate a project both to store and recover water for beneficial use. The source of recharged groundwater must be water held under existing water rights and the amount of water that may be recovered cannot exceed the recharged amount. The applicant is required to demonstrate the amount of recoverable water that remains in a recharge area. Significant penalties may be imposed by the state engineer for mismanagement of a recharge project.[161]

Recharge of water is not specifically defined as a beneficial use under Nevada law. The uses that will be made of the recharged water when it is recovered, however, may be considered beneficial use under Nevada's recharge legislation, and may serve as a legal basis for the recharge project. To date, recharge applicants have all intended to use groundwater basins as storage facilities for future use of water for a defined beneficial use. There are, however, projects being considered by local entities where the recharge water would relieve over drafting of a groundwater basin, leaving the water, rather than pumping the water back out. In these instances, the beneficial use would likely be deemed an adequate water supply for domestic use, which is considered a beneficial use under Nevada Law.

Operation of all artificial groundwater recharge projects in Nevada requires a permit from the Department of Conservation and Natural Resources. Recharged water must be monitored by the permittee and an annual report must be filed with the , including information of the quantity and quality of recharged water. Nevada differentiates between artificially and naturally recharged groundwater. With respect to artificially, or intentionally stored water, an applicant must have a valid right to use water from the proposed source. Where the source of recharge is derived from a

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[158]NEV. REV. STAT. §§ 534-.250 to .340.

[159]Id. § 445.

[160]NEV. ADMIN. CODE §§ 45.422 to .4278.

[161]See Nev. REV. STAT. §§ 534.250 to .340.

storm event, an applicant would have to first obtain from the a permit to appropriate the storm water. In making a determination of whether to issue such a permit, the would have to consider whether or not the storm water was part of the perennial yield of the groundwater basin, or part of the surface water system already appropriated, and then determine whether a permit could issue. Nevada finds that sufficient information is available in most instances to determine the amount of water recoverable from a recharge project. A project sponsor is required to perform hydrologic studies in sufficient detail to determine if the project is hydrologically feasible, and then is being operated in a hydrologically sound manner, to assure the amount of recoverable water.

The must set up a storage account for each project. The amount of water that may be recovered from the storage account is the portion of the recharged water defined as "recoverable." The permittee is required to submit to the a detailed analysis of the recoverability of recharged water. The utilizes the information in the analysis, along with any additional information available to him, to determine the amount of water the permittee may recover. In no instance would the permittee be allowed to recover an amount exceeding the amount recharged. Domestic wells are exempt from the appropriation process, and the recharge/recovery process. The permittee has the right to operate a recharge project, and no entity or individual may recover recharged water unless designated by the permittee and approved by the .

No recharge project may be permitted in Nevada if it adversely affects existing water rights. If, after a permit has been issued for a recharge project, the state engineer determines that the project is adversely affecting existing rights, the state engineer can modify the conditions of the recharge project permit. Any recharge activity not permitted is considered a violation of Nevada water law. Further, no recharge projects are allowed to adversely affect interstate water compacts or allocations, or Indian reserved water rights. To date, the Nevada Division of Water Resources has received 16 applications for artificial groundwater recharge projects, and two permits have been granted, both to the Las Vegas Valley Water District, the City of North Las Vegas, Washoe County, Carson City and the Truckee Meadows Water Authority (formerly Sierra Pacific Power Company).

Nevada law does not allow groundwater mining.[162] State policy defines available groundwater as the perennial yield of the groundwater basin. There is little direct relationship under the law between groundwater mining and recharge projects, because recharge projects are only allowed if the source of water to be recharged has already been appropriated by the applicant and the water is from a different source than the aquifer being recharged. As mentioned previously, recovery of recharged water from a recharge project is limited to the demonstrated amount of recharged water that is recoverable.

The Nevada Division of Environmental Protection may regulate artificial groundwater recharge injection wells under the state Underground Injection Control Program to assure that the quality of recharged water meets applicable standards.[163] State water pollution control laws, which also regulate contamination of groundwater, provide the state with adequate tools to protect groundwater quality that might be affected by recharge projects.[164] This includes the authority to

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[162]NEV. REV. STAT. § 533.370 (3).

[163]See NEV. REV. STAT. §§ 445.221 to .241.

[164]See generally id. §§ 445.015 to .399.

regulate rapid infiltration basins and other means of artificial groundwater recharge and require such projects to comply with all applicable state water quality laws.

New Mexico

Artificial groundwater recharge is a useful method of water conservation in New Mexico, and the state has a general interest in any artificial groundwater recharge activity. The state's specific interests include preventing contamination of aquifers, assuring the chemical compatibility of the recharged water with that of the aquifer, protecting existing water rights from impairment, and insuring that recharge is not contrary to the conservation of water in the state or detrimental to the state's public welfare.

In New Mexico, water in underground streams, channels, reservoirs, or lakes is public water subject to appropriation for beneficial use. In *State Ex Rel. Reynolds v. King*,[165] the New Mexico Supreme Court faced a situation where a landowner claimed the right to use water recharged into an underground basin below a private lake located on his land. The waters flowed intermittently into the lake with the permission of the landowner. A portion of the water percolated downward and contributed to the quantity of water in the aquifer below the lake. When the landowner claimed the right to use this recharged water without applying for a permit from the state engineer, he was enjoined for failure to make an application to appropriate the public waters from an underground source. In upholding the injunction, the New Mexico Supreme Court found no law "permitting the storing of private waters in established Underground Water basins."[166] The court said, "When waters, either artificial surface waters or natural surface waters, reach an established Underground Water basin by percolation, seepage or otherwise, they become public waters...."[167] The court held that the water in question was public water, subject to appropriation under New Mexico law. Thus, the court refused to recognize the right of a landowner to "recharged" groundwater and found the landowner was properly required to obtain an appropriative permit, subject to the priorities of other existing water rights, to use the water to irrigate his land.[168]

In *Kelley v. Carlsbad Irrigation District*,[169] the same court faced a situation where an appropriator attempted to change his point of diversion from an intermittent stream to a downstream, fully-appropriated aquifer. The court upheld the state engineer's refusal to make the transfer. Although the case was not really an artificial groundwater recharge case, the court made the following statements that are applicable to artificial groundwater recharge under New Mexico law. The court said:

> When an artificial or natural flow of surface water, through percolation, seepage or otherwise, reaches an underground reservoir and thereby loses

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[165]63 N.M. 425, 321 P. 2d 200 (1958).

[166]Id. 63 N.M. at 428.

[167]Id.

[168]Id.

[169]76 N.M. 466, 415 P. 2d 983 (1966)

> its identity as surface water, such waters become public... and are subject to appropriation in accordance with applicable statutes...
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> * * *
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> The transfer of a surface right to water, which has lost its identity as surface water because it has reached an underground reservoir...would constitute a new appropriation in the underground reservoir.
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> * * *
>
> It is clear from the evidence the appellee's surface water, through percolation, reached the underground basin. Upon this occurring, it immediately lost its identity as appellee's water and became public water, subject to appropriation.[170]

New Mexico recognizes artificial groundwater recharge as a beneficial use of water.[171] In fact, in 1999, the state passed the Groundwater Storage and Recovery Act.[172] The Act outlines the policy behind artificial groundwater recharge in New Mexico, as well as the procedures for obtaining a permit to operate a recharge project. The Act creates accounts by which users can utilize underground water storage as a type of water banking similar to the UWS system established in Arizona.[173]

The state engineer issues permits for artificial groundwater recharge projects. The state engineer will grant a permit upon finding that: (1) there is water available for the recharge project; (2) the project would not impair or be detrimental to existing private or state rights; (3) the proponent demonstrates that the project is not contrary to water conservation within the state; and (4) the use would not be detrimental to the public welfare or contrary to conversation of water in the state.[174] An individual promoting artificial groundwater recharge, however, would be given no deference in the permitting process, but could be granted the right to recover the recharged groundwater under the current accounting system.[175] There is no differentiation under New Mexico law between groundwater artificially recharged by diverting water from another source for injection and groundwater naturally recharged.

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[170]Id. 76 N.M. at 472-3.

[171]N.M. STAT ANN. § 72-5A-3 (2001).

[172]N.M. STAT ANN. §§ 72-5A-1 to 72-5A-17 (2001).

[173]Id.

[174]N.M. STAT ANN. § 72-5A-4 (2001).

[175]N.M. STAT ANN. § 72-5A-9 (2001).

Artificial groundwater recharge projects authorized under the Groundwater Storage and Recovery Act are monitored by the state engineer.[176] Permit holders are to make an annual report to the state engineer which is to include: a measurement of the water table; the amount of water stored; the amount of water recovered on the account; the quality of the stored as well as the receiving water; and a sworn affidavit attesting to the truthfulness of the report.[177]

In New Mexico there is a very limited amount of excess surface water, most of which is held under contract by municipalities for future municipal and industrial use. Thus, in the view of state officials, there is very little water available that might be used for artificial groundwater recharge. There is "essentially no unappropriated surface water in the state."

New Mexico allows some "groundwater mining," not as defined by statute, but as defined by case law.[178] But according to state officials, New Mexico statutes fail to identify a relationship between groundwater mining and artificial groundwater recharge. Officials are uncertain as to what effect artificial groundwater recharge might have on reserved water rights for federal or Indian lands or on interstate compacts. The state has opined that if artificial groundwater recharge did occur it would "have to be carefully scrutinized to determine its effect on water apportioned by the compacts and decrees or on delivery obligations. The other states affected might not be willing to agree to theoretical determinations of returns to the stream from artificial groundwater recharge and "the problems raised would likely outweigh the opportunities."

The New Mexico Water Quality Control Commission, with the Environmental Improvement Division as the enforcement agency, regulates the disposal of water onto or below the surface of the ground in New Mexico. Where recharge would affect the quality of the water in aquifers, it would have to be regulated by the State Water Quality Control Commission. Numerous problems could be created by recharge, including plugging of a recharge well by chemical, biological, or physical factors, the potential chemical incompatibility of injected water with that of the natural groundwater, and possible contamination of the aquifer injected and adjacent aquifers, especially those from which potable waters are drawn.

On a related note, currently officials from Santa Fe County are exploring the idea of using injection wells to offset the draw-down of the area's water table. Arizona experts on groundwater injection have briefed the Santa Fe County commissioners, and many are hopeful to use injection wells to help meet climbing demands in the area.[179]

New Mexico has primary enforcement authority for administration of the federal underground injection control program.[180] Enforcement or protection is also carried out under the

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[176]N.M. STAT ANN. § 72-5A-6 (2001).

[177]N.M. STAT ANN. § 72-5A-10 (2001).

[178]Mathers v. Texaco, Inc., 77 N.M. 239, 421 P. 2d 771 (1966)

[179]"Water search turns to Arizona," S anta Fe New Mexican, July 9, 2002.

[180]Water Quality and Water Pollution Control in New Mexico, 1988; New Mexico Water Quality Control Commission Clean Water Act § 305(b) report.

authority of the New Mexico Oil and Gas Act[181] and partly under the authority of the New Mexico Water Quality Act.[182] If artificial groundwater recharge were accomplished by injection wells, the requirement of these acts would have to be met.

North Dakota

Approximately two-thirds of North Dakota is glaciated. Much of the state's population resides in small, rural towns and villages. Many of these obtain their water supply from aquifers of glacial origin. Although glacial aquifers are relatively limited in areal extent, they provide dependable municipal water supplies for most rural communities in some areas of the state.

North Dakota advocates and promotes innovative water development and management, which includes artificial groundwater recharge. Such recharge is viewed as a viable alternative for groundwater supply enhancement, depending on the type of use, demand, technical and economic feasibility, and political acceptability. The North Dakota state engineer is required to regulate the development of artificial recharge under general water appropriation statutes. The state has no artificial groundwater recharge statute. The state encourages artificial groundwater recharge to enhance the availability of water for beneficial use.[183]

Artificial groundwater recharge is not specifically recognized as a beneficial use in North Dakota. The ultimate use of recharged water, however, may be a beneficial use that would allow surface water to be used for a recharge project. In North Dakota the term "beneficial use" is broadly construed as any purpose consistent with the best interests of the people of the state.[184]

North Dakota does not issue artificial groundwater recharge permits, per se. The diversion of surface water for artificial recharge would require a water permit from the state engineer. The permit would define quantity, point of diversion, and source and type of use of water.[185] The porous underground media (the aquifer) would be viewed as a storage reservoir under North Dakota law and legal issues related to the project would be handled in much the same way as if the aquifer were a surface water storage reservoir. This seems to be a pattern taken by states that follow the appropriation doctrine. The quantity of water diverted for recharge would be measured by a metering device. The amount of water recoverable by the project sponsor would depend upon the hydraulic characteristics of the aquifer. In settings where the quantity of water diverted for artificial recharge cannot be accurately measured, the water "credits" subject to recovery could be based upon monitoring the water level in the receiving aquifer and allocating benefits accordingly.

North Dakota does not differentiate between groundwater that is artificially recharged by diverting water from a surface water source, versus naturally recharged groundwater. Further,

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[181]N.M. STAT. ANN. §§ 70-2-1 to 38 (1978).

[182]Id. §§ 74-6-1 to 13.

[183]N.D. CENT. CODE §§ 61-04-01 to 31.

[184]See N.D. CENT. CODE § 61-04-04.1.

[185]Id. § 61-04-02.

apparently North Dakota statutes do not provide specific protection for the sponsors of a recharge project to recover intentionally recharged groundwater. The North Dakota state engineer believes that the general body of water law in the state as it is currently administered, however, could provide necessary protection to a recharge project sponsor. The state would be required to issue a water permit for the diversion of water for intentional recharge of an aquifer based upon the beneficial use to which the water would eventually be put. Generally, a water permit is required prior to construction of facilities for diversion of water. In the case of a recharge project, the same would hold true. The demonstration of beneficial use would be required for issuance of a permit for diversion. Such a permit is required prior to the construction of facilities for the diversion of water. Thus, the water would be allocated. The state believes it is unlikely that after such a permit was issued, and facilities to utilize it constructed, that the state would subsequently permit intentionally recharged water to a different beneficial user.

Historically, activities in North Dakota have, in some instances, resulted in some mining of a select few groundwater sources. While there is no definition in North Dakota statutes for groundwater mining, contemporary groundwater management policy avoids sustained mining of an aquifer. Though such definitely exists, the state has not defined any relationship between groundwater mining and artificial groundwater recharge. With respect to conjunctive use of surface and groundwater generally, as noted previously, the use of surface water for artificial recharge can be permitted under existing statutes. This could result in some competitive problems between surface and groundwater users, but would be dealt with under existing statutes, based upon the prior appropriation doctrine.

North Dakota officials believe there is sufficient information concerning the geology and general hydraulic characteristics of the state's aquifers to support administrative decisions concerning recharge projects. Because a water permit is required for a recharge project, the project sponsor must provide to the state engineer the data necessary to determine water availability, beneficial use, water quality effects, and the safety of the project works. Sufficient information in each of the categories would be required for a project sponsor to carry his burden of proof regarding withdrawal of recharged water.

An artificial groundwater recharge project in North Dakota would be required to meet all applicable state and federal water quality laws, and the state could prohibit a project on the basis of harm to other water rights or degradation of water quality. North Dakota regulates all injection wells under a state Underground Injection Control Program. While the state has a program for such regulation, injection wells are defined by federal law. Artificial groundwater recharge by injection well would have to comply with all state and federal regulations. No critical aquifer protection areas or sole source aquifers have been designated in North Dakota. There is, however, a wellhead protection program being implemented to protect water supplies and any artificial groundwater recharge project would have to conform with requirements of this program.

The North Dakota State Water Commission considers artificial groundwater recharge a viable water management practice. Widespread application of artificial recharge, however, does not seem likely in the near future. Prerequisites for artificial recharge include community growth and development resulting in sustained groundwater mining and a dependable high quality water source, generally surface water, close to the groundwater reservoir. Many rural communities in North Dakota are experiencing a net population decline. Thus, sustained groundwater mining is not a significant water management problem. In addition, many rural communities are not in close

proximity to a dependable surface water source for artificial recharge. Moreover, the population of these communities generally is too small to absorb the cost of a lengthy conveyance system. Finally, some rural communities may receive Missouri River Water for their municipal water supplies as is stipulated under the Garrison Diversion Unit Reformulation Act of 1986[186] and the Dakota Water Resources Act of 2000.[187]

North Dakota officials believe the state probably does not need comprehensive artificial groundwater recharge legislation. However, some enhancement or strengthening of present statutes relative to artificial groundwater recharge would be desirable. State officials believe such legislation would have a reasonably good chance of enactment.[188]

Oklahoma

Legally, in Oklahoma ground and stream waters are separate types of water with respect to appropriation and management. Stream water is public water and groundwater belongs to the landowner. Oklahoma officials recognize artificial recharge as a beneficial use of surface water, and the Board may issue permits to use surface water for artificial recharge underground. At least one surface water appropriation permit for recharge has been issued in Oklahoma. The requirements to obtain a stream water use permit were followed.[189] The only protection for the recovery of recharged groundwater is by the normal permitting process under state law.

The Oklahoma Water Resources Board has statutory authority over appropriation of surface and groundwater, as well authority to set the surface and groundwater quality standards. While Oklahoma has no specific artificial groundwater recharge statute, it is considered a beneficial use under Oklahoma groundwater law and applicants must comply with the basic system of water rights administration.[190]

The basis for the groundwater law and the system of water rights administration and regulation in Oklahoma originates in a statute that reads in part:

> The owner of the land owns water standing thereon, or flowing over or under its surface but not forming a definite stream. The use of groundwater shall be governed by the Oklahoma Groundwater Law....[191]

It is apparent that the entire system of groundwater law administration and regulation is based upon the premise that the owner of the land owns the water thereunder. However, further reading

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[186]Pub. L. 99-294, § 5, 100 Stat. 418 (1986).

[187]Pub. L. 106-554 (2000).

[188]Pub. L. 99-294, § 5, 100 Stat. 418 (1986).

[189]Id.

[190]OKLA. STAT. tit. 82, §§ 1020.1-1020.22.

[191]OKLA. STAT. tit. 60, § 60.

of this section indicates that this "ownership" is not an unqualified right, because the "use of groundwater is to be controlled, governed and managed according to the provisions of the Oklahoma Groundwater Law."[192]

Oklahoma groundwater law may be considered somewhere between a correlative rights doctrine and an absolute ownership doctrine. The policy declarations of the Oklahoma legislature make it clear that the groundwater resources of the state are to be put to beneficial use including but not limited to agriculture, domestic, municipal and industrial use. The policy also states that reasonable regulations restricting production are in the interest of the general economy and health and welfare of the state and its citizens. The legislature encouraged use of groundwater resources in the state, yet realized that some restriction of production was necessary, and provided mechanisms to set restrictions on the use of the groundwater.[193]

In order to place groundwater to beneficial use, the applicant must make an application for use permit to the Oklahoma Water Resources Board. The application must meet general permitting requirements[194] and conditions[195] for the Board to grant a groundwater permit. Paraphrased, these statutory conditions are: (1) that the lands dedicated to the application are owned or leased by the applicant; (2) the lands dedicated overlie the fresh groundwater basin or sub-basin; (3) the applicant's intended use is a "beneficial use;" and (4) "... that waste will not occur..." by virtue of the intended use.[196]

The allocation system of Oklahoma Groundwater Law and the amount of groundwater that can be withdrawn from a groundwater basin by permit depends on the number of acres of land the applicant owns or leases overlying the basin. Once a hydrologic survey is completed for a basin, a "maximum annual yield" of the basin is determined. The landowner may take his equal, proportionate part of the yield of the basin depending on the number of acres he owns or leases overlying the basin. Until such a survey is completed, a legislative allocation of two acre-feet per surface acre owned or leased is the amount authorized by a "temporary" permit.

The process by which hydrologic surveys and investigations are made and conducted and the maximum annual yield determined is quite complex and involves considerable time and expense. The determination of maximum annual yield of fresh water to be produced from a groundwater basin must be based upon the following: (1) the total land area overlaying the basin or sub-basin; (2) the amount of water in storage in the basin or sub-basin; (3) the rate of natural recharge to the basin or

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[192]Id.

[193]See generally the Sections of id., tit. 82 discussed in the immediately following paragraphs.

[194]Id. tit. 82, §§ 1020.7-1020.11.

[195]Id. § 1020.9

[196]Id.

sub-basin and total discharge from the basin or sub-basin; (4) transmissibility of the basin or sub-basin; and (5) the possibility of pollution of the basin or sub-basin from natural sources.[197]

The maximum annual yield of fresh groundwater to be allocated to each acre of land overlying the basin is then determined and is based on a minimum basin life of 20 years. This means that at the end of twenty years, groundwater wells on fifty percent of the land overlying the basin would not be able to pump their equal proportionate share.

As can be seen, the rate of recharge is a factor in setting the maximum annual yield of a groundwater basin. This rate includes both natural and artificial recharge. Oklahoma law does not distinguish between natural and artificially recharged groundwater. If groundwater is to be withdrawn for any use, with the exception of domestic use, a permit must be obtained in accordance with the statutory requirements.

In making an application to appropriate recharged groundwater, the individual or entity that has initiated the recharge may request a permit to withdraw an amount of groundwater that is based on the amount of land owned or leased by the applicant which overlies the basin. The amount actually placed to beneficial use is reported annually to the Water Resources Board by the permit holder. The Board believes that generally there is adequate information regarding groundwater resources in Oklahoma for the state to rule on applications to withdraw recharged water. The permit applicant must show the same statutory elements any user of water would have to show in order to obtain a permit. The difference for an applicant who would like to withdraw recharged water is that both a stream water and a groundwater permit would need to be obtained, one to recharge the basin with stream water and one to use the groundwater. Upon an adequate showing, the Board could grant the landowner, or one who has permission from the landowner, a permit to withdraw the recharged groundwater.

The Water Resources Board's interest in protecting the quality of the groundwater in the state is accomplished through Oklahoma's Water Quality Standards. Any recharge project in Oklahoma would have to meet the established standards set for the basin. In addition, such projects would have to meet the Department of Environmental Quality's requirements for Class V injection wells under the state underground injection control program. Artificial groundwater recharge wells are classified as Class V injection wells and must meet all applicable regulatory requirements.

Oklahoma state officials do not believe the federal critical aquifer protection area program provides any significant added protection to artificial groundwater recharge areas. Also, water quality monitoring of recharged wells is generally not required. In some instances a minimal amount of monitoring is mandated by state statutes and regulations. There is no evidence of the need for any additional monitoring.

Oklahoma officials view their authority under existing statutes and regulations as sufficient to deal effectively with issues related to artificial groundwater recharge. Comprehensive artificial groundwater recharge legislation, they believe, is probably not needed at the present, and there would probably be little chance of enacting such legislation.

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[197]OKLA. STAT. tit. 82, § 1020.5.

Oregon

A section of Oregon water law pertains specifically to artificial groundwater recharge.[198] The law requires a permit to appropriate water for the purpose of artificial recharge. Such recharge is considered a beneficial use of water.[199] The law also requires the proponent of a recharge project to obtain a "secondary permit" to withdraw the artificially recharged water. Some measure of protection is afforded the recharger in that no one may make appropriation of artificially recharged water without first getting the recharger's written approval. According to state officials, Oregon's ability to protect the recharged water, however, is not foolproof.

There is no requirement that artificial recharge be conducted only in areas closed to new development of naturally occurring groundwater. Where there is naturally available groundwater in an artificially recharged aquifer, the state continues to issue rights to the naturally available water. In the view of state officials, it may be difficult to determine exactly when that supply is fully appropriated, with the result that the permitting process may proceed and permits may be issued that result in inadvertent consumption of artificially recharged water. Of course, in areas where further development of naturally occurring groundwater has been prohibited, the problem would not exist.[200]

Before the recharge permit may be issued, the Oregon Water Resources Commission must determine whether the project would prejudicially affect the public interest in the state. Further, the Commission may not issue a recharge permit unless the surface water source has an instream flow established for the protection of aquatic and fish life. The State Department of Fish and Wildlife may waive this requirement if it decides that the instream flow to protect aquatic and fish life is not needed in the supplying stream.[201]

Oregon law directs the Water Resources Commission to develop standards that an applicant must meet before the Commission may approve an artificial groundwater recharge permit.[202] The Water Resources Department has issued accompanying administrative rules. These rules require an applicant to submit information to assist the commission in making public interest determinations concerning a proposed project. Also, certain attachments must accompany a permit application. They include: (1) proof that the supplying stream continues to have an instream flow; (2) a copy of necessary water quality permits; (3) a description of the ultimate use or value of the artificial groundwater recharge; (4) a description of the volume of water expected to be stored; (5) if the recharged diversion is for 5 cfs or more, proof of financial capability to construct and operate the project; (6) proof that the proposed recharge project is hydrologically feasible; (7) a copy of plans for recharge project construction, operation, and costs; and (8) any additional information that would assist the Commission in making its public interest determination regarding the project.

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[198]OR. REV. STAT. § 537.135.

[199]Technically, such recharge is considered an appropriation for a beneficial purpose, which some state officials would argue is synonymous with "appropriation for beneficial use."

[200]OR. REV. STAT. § 537-135.

[201]Id.

[202]Id.

Any permit that is issued must address the following: (1) the maximum diversion rate and annual maximum diversion volume; (2) metering of recharged water from the diversion source and at the place of recharge; (3) requirement of accurate and current records of metered values, water levels, and other pertinent information; and (4) the response of water levels in wells. The administrative rules also require a permit to specify the formula to be used to determine the availability of artificially recharged groundwater for appropriation based upon negotiations between the applicant and the department, or upon a definitive groundwater investigation. The department must record its final determinations on stored recharged water in a storage account ledger. The permittee must submit an annual report to both the department and any secondary permittee. If, under the actual operating conditions of a recharge project, the director notifies the permittee that the director has reason to believe there are adverse groundwater quantity or quality effects of a project, the permittee is required to cease recharge activities and make no further diversions until measures to prevent, correct, or monitor the adverse effects have been agreed to and implemented.

With respect to "secondary groundwater permits," which are needed for the use of artificially recharged water, the following must be provided: (1) identification of an artificially recharged groundwater reservoir as a source of supply; (2) written consent of the holder of the recharge permit or certificate; (3) proof that the proposed use will actually be from the recharged reservoir; and (4) a copy of the valid recharge certificate or permit. The rules require limitations on secondary groundwater permit approval as follows. During the first five years of recharge, cumulative secondary permits to no more than 85% of a project's permitted annual recharge volume may be issued. Subsequently permits may exceed 85% in some instances. A secondary groundwater permit must address the following: (1) maximum diversion rate; (2) metered withdrawal; (3) measured water levels; (4) current and accurate records of withdrawals and water levels; (5) an annual report noting withdrawals, dated water levels, and other data pertinent to the storage account; and (6) any other conditions specified by the director.

In Oregon, artificial recharge can be used to store water in times of "surplus" for later use. This form of conjunctive use, according to state officials, increases the total quantity of water available for beneficial use. However, it may do so at the expense of surface flows when direct use of those flows may be more efficient. Permit conditioning may mitigate this concern. Artificial recharge using winter "surplus" water may result in the delayed and slow movement of runoff out of a drainage basin. This, in turn, may result in stream flows later in the year that are somewhat enhanced over what would otherwise be present as some of the artificial recharge discharges to surface waters. This aspect of conjunctive water management is attractive and beneficial, at least with respect to the surface waters, as long as the recharge project is in operation. However, if the project ceases for any reason, the parties and interests that have become accustomed to or dependant upon the resultant enhanced surface flows will be adversely impacted. In Oregon, there is no legal means to require continued project operation on behalf of those who have so benefited. Similarly, some artificial recharge occurs incidentally by way of leaky canals and distribution systems. Those who have become the beneficiaries of that recharge are also without recourse, when the leakage is reduced or eliminated.

The potential exists in Oregon, according to state administrators, for using artificial recharge to improve the supplies of water available for beneficial use. Storing surface water for later use under a secondary groundwater right (water right with the source being artificially recharged groundwater) could improve the lot of several surface and groundwater appropriators in at least one region of the state. Unresolved impediments to recharge include funding, public perceptions about

the ultimate fate of recharged water, and the relative merits of artificial groundwater recharge versus instream values. Also, in Oregon there is a need to better educate the public concerning groundwater. According to state administrators, much of the public still views groundwater as something mysterious, or otherwise, unknowable. This breeds distrust of artificial groundwater recharge and accusations of waste whenever recharge is mentioned as a water supply alternative.

Oregon law does not define "groundwater mining." The state's groundwater management philosophy as expressed and implied in statute, however, is contrary to the concept of mining groundwater. Statutory policy states that groundwater should be "...beneficial[ly] use[d] without waste, within the capacity of available sources..."[203] Additionally, Oregon statutes clearly authorize, or require, corrective action when overdraft of groundwater is eminent, or when it occurs. Overdraft has been defined in administrative rule as production of water at a rate faster than recharge occurs, or at rates that reduce surface water availability to the detriment of surface rights or instream values. Under certain circumstances, artificial groundwater recharge offers an opportunity to avoid groundwater mining, while at the same time pursuing optimum groundwater use.

Artificial groundwater recharge has not affected interstate agreements in Oregon, nor is it likely to be a factor with respect to those agreements in the future. Some issues have arisen concerning federal reserved rights for Indian reservations. State officials report that the Confederated Tribes of the Umatilla Indian Reservation have expressed concern over the two current recharge projects in Oregon. They are also concerned with the recently modified Umatilla Basin Plan, which classifies much of the Basin's water available for, among other things, artificial groundwater recharge.

The Oregon Department of Environmental Quality administers the underground injection control program in the state. By memorandum of understanding with the Department of Water Resources, the Department of Environmental Quality controls recharge in accordance with the Underground Injection Control Program. This is done through permit conditions developed by the Department of Environmental Quality for inclusion in water rights and/or permits necessary for a recharge project. This arrangement results in the issuance of permits with conditions agreeable to both departments. The Department of Water Resources then regulates the project to assure compliance with Department of Environmental Quality's water quality conditions.

In 1989 the Oregon Department of Environmental Quality adopted a groundwater protection policy.[204] That policy declares the need to protect groundwater from degradation, although the policy is not based strictly upon non-degradation. The policy requires use of best practicable technology and best management practices wherever groundwater quality is at risk. It guides the department's decisions, practices, and permit related to any activities affecting air, land, or water quality, that in turn impact groundwater quality.

Also, Oregon's land use goals target groundwater protection. They require land use planning at the local (county) level to inventory and protect groundwater.[205] Oregon officials expect that

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[203]OR. REV. STAT. § 537-525 (3),

[204]Oregon Administrative Rules 340.40

[205]OR. REV. STAT. §§ 197.225 et seq.; Oregon Administrative Rules 660.

improvement in its interagency coordination may provide a vehicle for generating artificial groundwater recharge protection by way of land use plans or zoning. Further, some forest plans currently under review in Oregon take into account artificial groundwater recharge[206] generally. They provide some protection in terms of restrictions on land use and forest management activities.

In Oregon, the quality of the water used to recharge an aquifer must not degrade ambient groundwater quality. In most cases, natural groundwater quality is superior to surface water quality. Recharge permits may contain a permit condition requiring the treatment of surface water to bring it to ambient groundwater quality. This could create a burden on recharge permittees such as to effectively prevent artificial recharge. State officials believe that potential, future advances in technology may allow large volumes of water to be treated at a cost low enough that recharge permittees can still afford to operate recharge projects.

Oregon state administrators do not believe that a comprehensive artificial groundwater recharge statute is necessary. Current statutes allow artificial recharge and protect use of recharged water through the existing water rights system established primarily for surface water.

South Dakota

South Dakota is in its infancy in using artificial means of recharge to augment groundwater resources. The Department of Environment and Natural Resources has jurisdiction over the few artificial groundwater recharge activities that have occurred. The state has no specific artificial groundwater recharge statute. However, beneficial use of water is broadly defined in South Dakota.[207] Providing that the recharge activity does not degrade existing groundwater quality, officials say there is reason to believe it would be considered a beneficial use.[208] Generally, state appropriation and water quality laws are applied by the State Water Management Board to regulate any artificial groundwater recharge project in the state.[209] The state, however, does not issue artificial groundwater recharge permits. Rather, a permit to use surface water for recharge is issued under the general appropriation statutes.[210] While South Dakota does not have any specific measuring or reporting statutes for recharged waters, the Water Board could condition water permits to require measuring and reporting. The state can offer protection to a recharge project sponsor to

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[206]This is accomplished under authority of Oregon Governor's Executive Order EO-87-09 and OR. REV. STAT. §§ 536.450 and .460.

[207]S.D. COMPILED LAWS ANN. § 46-1-6 (6), see also South Dakota response to WSWC State Groundwater Recharge Summary Update, April 12, 2002.

[208]Administrative Rules of South Dakota (hereafter referred to as ARSD) Chapter 74:03:15, Groundwater Quality Standards adopted pursuant to S.D. COMPILED LAWS ANN. §§ 34A-2-93, 34A-2-10 and 34A-2-11. See also South Dakota response to WSWC State Groundwater Recharge Summary Update, April 12, 2002.

[209]S.D. COMPILED LAW ANN. § 34A-2, Water Pollution Control; § 34A-3A, Safe Drinking Water; and §§ 46-1, 46-2A and 46-5, Water Rights Law.

[210]Id. §§ 46-1-15, 46-2-9, 46-5-9, and 46-5-10.

retain an exclusive right to withdraw recharged groundwater as part of the approval and qualification of a permit to appropriate surface water for the recharge project.[211]

South Dakota law addresses groundwater "mining" in the following manner:

> No application to appropriate groundwater may be approved if according to the best information reasonable available, it is probable that the quantity of water withdrawn annually from the groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source...[212]

Although South Dakota Law prohibits "mining" there is no legal or hydrological reason that a quantity of water equal to the amount artificially recharged could not be withdrawn from an aquifer that the Board determines is being "mined." However, any recharge project would probably be conducted in an aquifer that was not being "mined," but rather when lower water levels resulted from pumping and lack of normal recharge. For example, one city in South Dakota has been issued a permit to pump surface water into an old by-pass channel to recharge a shallow sand and gravel aquifer that has low water levels due to drought condition pumping. Normally, the aquifer receives recharge each spring from flood flows.

There is no differentiation under South Dakota law between groundwater artificially recharged and groundwater recharged from a natural storm event. There is no case law on artificially recharged or "developed water." Notwithstanding this paucity of law, there appears to be sufficient information to make administrative decisions with respect to aquifer recharge projects in South Dakota.

The South Dakota Water Rights program within the Department of Environment and Natural Resources does not expect that interstate water compacts or allocations nor federal reserved rights would affect or be affected by artificial groundwater recharge activities.

There may be some problems of water availability and water quality relating to conjunctive use of recharged water in South Dakota. The state could prohibit any artificial groundwater recharge activity that includes the injection of waste or degrades the existing water quality.[213]

South Dakota has underground injection control regulations, but does not have delegation of the federal underground injection control program.[214] Any injection of recharged groundwater made in violation of state regulations would be prohibited by the state. The state has wellhead

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[211]Id. § 46-1-14. see also South Dakota response to WSWC State Groundwater Recharge Summary Update, April 12, 2002.

[212]Id. § 46-6-3.1.

[213]ARSD Chapters 74:03:15 and 74:03:16, adopted pursuant to S.D. COMPILED LAWS ANN. § 34A-2.

[214]ARSD Chapter 74:03:12, adopted pursuant to S.D. COMPILED LAWS ANN. § 34A-3A.

protection legislation that allows local units of government to develop wellhead protection areas.[215] The state has prioritized those areas for its regulatory efforts. The department must develop procedures to safeguard public health and welfare and prevent pollution of public water supply systems and must develop a voluntary wellhead protection program specifying the guidelines for the general program, the duties of the department and local governments, the method for determining the extent of wellhead protection areas, and all potential and actual pollution sources to those areas. It must take into consideration potential sources of pollution when siting new wells and develop contingency plans for pollution release containment and cleanup. Any artificial groundwater recharge activity would be required to comply with these rules, protect the beneficial use of existing water, and the appropriation permit would have to assure that recharge activities are in the public interest.[216]

Except for the example cited, South Dakota state officials believe artificial groundwater recharge efforts may not be understood by many residents and may be viewed as a potential source of contamination. Because of this, other water supply management alternatives are seen as more favorable. Artificial groundwater recharge, however, may be necessary in the future as groundwater resources become fully appropriated. For this reason South Dakota officials believe research is necessary to closely monitor the effects of artificial recharge. This could lead to an education process that will likely make recharge more acceptable in certain situations, when accompanied by close monitoring.

Currently, South Dakota officials do not see the need for comprehensive artificial groundwater recharge legislation. They believe the present groundwater protection laws provide the state regulatory authority to prohibit activities that constitute a menace to public health, welfare, or the environment. State officials believe it is premature to speculate on the chance of enactment of comprehensive legislation.

Texas

The law governing groundwater resources in Texas is different from most other western states. Texas basically follows a common law groundwater doctrine known as the absolute ownership rule. This doctrine provides that ownership of groundwater is incident to ownership of overlying land. Thus, groundwater is considered a privately owned resource, subject to disposition at the unfettered will of the owner. However, there are some exceptions to the absolute ownership rule.

Under the authority of the 1917 Conservation Amendment,[217] the Texas Legislature enacted Chapters 35 and 36 of the Texas Water Code.[218] The code authorizes and establishes the procedures for the creation of groundwater conservation districts. It also sets forth the various powers of a district to regulate, conserve, or manage the groundwater supply, which includes the power to

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[215]S.D. COMPILED LAWS ANN. § 34A-3A-17.

[216]ARSD 74:03:15 and 74:08:16; and S.D. COMPILED LAWS ANN. § 46-2A-9.

[217]See TEX. CONST. art. XVI, § 59.

[218]See TEX. WATER CODE ANN. ch. 35 & 36 (Vernon Supp. 2002).

regulate withdrawals. In addition to the creation of districts under Chapters 35 and 36, for the management of groundwater, districts may be created by special acts of the Texas Legislature for groundwater management. The powers of such districts are specified in the legislation. Texas encourages the formation of groundwater conservation districts to protect and conserve groundwater. Currently there are 88 groundwater conservation districts in Texas, including some that are still subject to confirmation elections.

Texas has no specific statute regulating the recharge of water that originated as groundwater. Texas believes that any artificial groundwater recharge that might occur within the state would be by sediment beds, in-channel impoundment (in place or subsequent release) or underground injection. Special regulations would apply to any recharge activity in the Edwards Underground Aquifer.[219] Like other states, Texas views artificial groundwater recharge wells as Class V injection wells and regulates the wells accordingly. Where artificial groundwater recharge would degrade groundwater quality, the state could refuse to issue an injection permit or approval. There are currently no controls related specifically to artificial groundwater recharge other than the UIC regulations. Since groundwater is privately owned, there would be no limit on the amount an individual could withdraw, as long as the water pumped was not wasted and the pumpage caused no water quality deterioration. Texas does not require a permit to appropriate artificially stored groundwater and, as noted, would provide no legal protection to a project sponsor to recover recharged groundwater that migrated off their land. Since groundwater is privately owned in Texas, a recharge project sponsor must obtain ownership of overlying land or contractually obtain water rights from the owner of the land in order to recover recharged groundwater.

Texas has statutes to regulate the storage and subsequent retrieval of surface water.[220] Under these statutes, the state recognizes that artificial groundwater recharge of water that originated as surface water can be a beneficial use of that surface water. In order to obtain a permit to store surface water in an aquifer, an applicant to the Texas Natural Resource Commission must demonstrate that the groundwater produced from the project will not be harmful or detrimental to people, animals, vegetation, or property, and that the water stored in the aquifer can be successfully harvested for beneficial use. Surface water aquifer storage and retrieval projects are also regulated by the state's underground injection control program that requires the state to govern the underground injection of all types of fluid.[221] Any artificial groundwater recharge project involving injection wells would have to conform to this statute.

Texas officials do not believe that comprehensive artificial groundwater recharge legislation is necessary at the present time. It is the state's policy that the best way to protect and regulate groundwater is at the local level through groundwater conservation districts. Use of surface water

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[219]See TEX. WATER CODE ANN §27.051(h).

[220]TEX. WATER CODE ANN. §11.153 and §11.154

[221]TEX. WATER CODE ANN. §27.011

for aquifer storage and retrieval is adequately addressed under existing legislation. The public's health and safety are protected through the underground injection control statute.

Utah

Artificial groundwater recharge in Utah is uncommon mostly because of economic factors. As water supply projects become more expensive to construct, and larger withdrawals are made from subsurface supplies, artificial groundwater recharge will become more viable. Presently, it appears that individual water suppliers need more financial incentive to further develop artificial groundwater recharge projects. Due to the complex nature of hydrologic systems, technical assistance is also needed to deal with the water quality and water rights issues that play a major role in the disposition of water within the state.

Utah enacted the Groundwater Recharge and Recovery Act of 1991, which outlines the procedures that must be followed in making an application to artificially recharge groundwater, or to recover recharged water.[222]

Utah officials believe extensive implementation of conjunctive use, including artificial groundwater recharge, would have positive benefits. It would extend, in may instances, the water supply by allowing an entity to use surface water during high water years to recharge groundwater so that the recharged water could be used in times of drought. There could be some localized negative effects related to excessive drawdowns during drought periods and perhaps some mitigation would have to be provided in those instances. Utah has an interest in regulating and promoting artificial groundwater recharge to ensure such activities are conducted according to state law and do not adversely impact other rights, with regard to either quantity or quality. Also, the state wants to encourage and promote projects that can have a positive impact on the future availability and management of water supplies in the state.

State funding for artificial groundwater recharge could possibly come from the water development funding program, but no funding exists specifically for artificial groundwater recharge. Though not directly sponsored by the state, Utah encourages recharge projects and conjunctive use of surface and groundwater. Water officials in Utah have promoted artificial groundwater recharge as part of conjunctive use, but set withdrawal limits within a 5 to 10 year period. The biggest hindrance to conjunctive use is that oft times the very entities that would benefit the most from such use do not own sufficient amounts of both surface water rights and groundwater rights to be able to make it work. However, officials are hopeful that such a water use scheme will work its way into the existing system.

Utah law does not specifically recognize artificial groundwater recharge as a beneficial use of water. State officials, however, believe that it could likely be included by implication within the statute that defines beneficial water use as any public use.[223] Further, state officials believe that water that is recharged is likely to be put to some beneficial use that would be recognized under Utah law.

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[222]UTAH CODE ANN. §§ 73-3b-101 *et seq.* (2001).

[223]UTAH CODE ANN. § 73-1-5 (2001).

Pursuant to the Groundwater Recharge Recovery Act, a permit is required for any artificial groundwater recharge or recovery.[224] To date, only two applications for an artificial groundwater recharge permit have been filed and approved, and a third is under consideration. In all three instances, the entity which owned the water right is the same one who claimed the water upon recovery. The Act provides for a storage account created for each recharge project, or recovery permit issued.[225] The holder of the account is to make regular reports to the state engineer, in which a reporting of water quantity and quality are made for recharge water, receiving water, and recovered water.[226]

For the majority of groundwater basins in Utah, there is sufficient information available to make sound decisions concerning the administration of artificial groundwater recharge activities. The Division of Water Rights has been active with USGS in a cooperative study of water resources in the state. Almost all groundwater-flow systems in the state have at least some reconnaissance level report prepared. The state has computer models for most of the major groundwater basins. In addition, there is an ongoing groundwater monitoring program in place to collect water level, pumpage, and water quality data on an annual basis.

There is no law in Utah defining or prohibiting groundwater mining. In 1984, Utah Governor Scott Matheson issued an Executive Order indicating that groundwater mining could be allowed in certain instances when it is determined to be in the best interest of the state.[227] As a general rule, however, Utah does not encourage or allow groundwater mining. The state attempts to maintain a safe yield level of groundwater extraction. Though Utah has several groundwater sources that cross state boundaries, there are no compacts or agreements with Indian tribes, or other states that address the groundwater issue.

The state engineer is to issue a permit for artificial groundwater recharge or recovery only if the applicant meets six requirements: (1) the applicant has the technical capability[228] to run such an operation; (2) the applicant has a valid water right; (3) the project is hydrologically feasible; (4) the project will not unreasonably harm land; (5) the project will not impair existing water rights; (6) and lastly, it will not adversely affect water quality.[229]

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[224]UTAH CODE ANN. § 73-3b-103; §§ 73-3b-201 *et seq.* (2001).

[225]UTAH CODE ANN. § 73-3b-301 (2001).

[226]Id.

[227]Executive Order on Utah Ground-Water Policy, October 4, 1984.

[228]This includes the necessary equipment to monitor the surrounding ground-water flow system of which the recharge/recovery project is a part.

[229]UTAH CODE ANN. § 73-3b-202 (2001).

Utah regulates all artificial groundwater recharge projects to ensure compliance with applicable water quality standards.[230] Injection wells as a type of artificial groundwater recharge are regulated by the Division of Water Quality. For noncompliance, the Division of Water Quality may revoke or suspend the permit, and may levy a fine of up to $10,000 per day for violations.[231] Also, other groundwater quality statutes and regulations could apply to an artificial groundwater recharge project. Utah could prohibit a recharge project, through state groundwater or UIC regulations, if the project had the potential to cause water quality problems.[232]

Utah actively participated in the High-Plains States Groundwater Recharge Demonstration Program because it believed that the program was an opportunity to develop the necessary experience, background, and institutional structure to address artificial groundwater recharge.[233] Under the program, the Jordan Valley Water Conservancy District, previously known as the Salt Lake County Water Conservancy District, was selected as a location for an artificial groundwater recharge operation. The project utilized injection wells to recharge groundwater in the southeast portion of the Salt Lake Valley. The project, funded by both the federal government and the water district, made use of high spring and winter water levels to inject water to be withdrawn during the summer peak demand period.

Utah water officials feel that the Groundwater Recharge Recovery Act of 1991 is sufficient for Utah's present needs for artificial groundwater recharge law.

Washington

The "Underground Artificial Storage and Recovery Project" covers any project in which it is intended to artificially store water in the ground through injection, surface spreading and infiltration, or other department-approved method, and to make subsequent use of the stored water. However, this does not apply to irrigation return flow, or to operational and seepage losses that occur during the irrigation of land, or to water that is artificially stored due to the construction, operation, or maintenance of an irrigation district project.[234] The law makes a clear distinction between naturally occurring groundwater and artificially stored groundwater. The latter is defined as "water that is made available in underground storage artificially, either intentionally, or incidentally to irrigation and that otherwise would have been dissipated by natural processes."[235]

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[230]UTAH CODE ANN. § 73-3b-301 (2001).

[231]UTAH CODE ANN. §§ 73-3b-401 and 402 (2001).

[232]UTAH CODE ANN. §73-3b-201 (2001).

[233]Id.

[234]WASH. REV. CODE § 90.44.035(6), (2001).

[235]Id. § 90.44.035 (5).

This definition specifically refers to water occurring "incidental to irrigation." It is not clear how the law should be interpreted to address waters artificially stored, but incidental to non-agricultural activities. This could pose future problems for existing municipal recharge projects and may require statutory changes.

Washington law allows for conjunctive use of surface and groundwater. Although there is no specific statutory reference to conjunctive use, the groundwater code clearly allows for use of waters that are artificially stored in aquifers and declares that all such waters that have been abandoned or forfeited are public groundwater and are subject to appropriation for beneficial use.[236]

In order to administer the waters of a given area, the state, through the Department of Ecology (Ecology), may designate groundwater areas or subareas. The establishment of such areas provides administrative control over groundwater withdrawals for the purpose of controlling overdraft. Ecology may establish depth zones to control a single and distinct body of public groundwater.[237]

The creation of a groundwater area or subarea may be proposed by Ecology or by one-fourth of the water users in the proposed area, whichever is less and is accomplished through a process including public notice and culminating with a written order by Ecology establishing the area or subarea.

Once established, priorities of rights are established separately for each area. Within 90-days of designation, any claims for ownership of artificially stored water, then stored, must be submitted to Ecology. Thereafter, claims of waters being stored must be made within 3 years of the earliest artificial storage. These claims must include information about the water use, including evidence of storage due to action by the claimant. Ecology must then either accept or reject the declaration. Acceptance does not convey any right to the claimant to withdraw public groundwater, nor to impair any existing rights to such public waters.[238] Any subsequent withdrawals must have a declaration of ownership for the waters to be withdrawn.[239]

Ecology may convene a public hearing (or may be petitioned to do so) to determine whether the water supply in the area is adequate for the current needs of all such holders. If the department finds supplies are not adequate, it shall order the aggregate withdrawal decreased so it does not exceed the available supply. This decrease shall conform to the priority of rights established within the area (i.e. first in time, first in right) except that, by mutual consent of the water users and the

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[236]Id. § 90.44.040.

[237]Id. § 90-44-130.

[238]"Public Groundwater" are defined, generally, as all natural groundwater and all artificial groundwater that has been abandoned or forfeited. Id. § 90-44.040.

[239]Id. § 90.44.130.

Department, the reduction in aggregate water use may be accomplished by the waiving of all or some specified part of a senior right in favor of a junior right. However, when such agreements are reached, the relative priorities of such rights are unchanged.[240]

In order to properly manage the groundwater in a designated area, the department may appoint groundwater area supervisors to supervise the withdrawal of groundwater within that area.[241]

The state requires a water right for all surface water diversions and for the storage of water in reservoirs.[242] With the exception for small quantities (i.e.: domestic use), the state requires a water right permit for all withdrawals of groundwater.[243] Washington allows the recharge of groundwater for subsequent withdrawal for beneficial uses.[244] For an artificial groundwater recharge project involving the diversion of surface water to be stored in an aquifer, the following water right permits would be required: (1) a permit for the diversion of the surface waters, or a reservoir permit;[245] and (2) a secondary permit for the subsequent withdrawal and beneficial use of the stored groundwater.[246]

A recharge project sponsor is expected to demonstrate: (1) recharge effects on basin hydrology; (2) availability of water for recharge; and (3) impacts, or lack of impacts, on other beneficial uses and water quality.[247]

Any permit issued for a recharge project would contain provisions to provide for measuring and reporting artificially recharged waters. This would be accomplished under existing groundwater

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[240]Id. § 90.44.180.

[241]Id.

[242]Id. § 90.03.370(2)(a), (2001).

[243]Id. § 90.44.050.

[244]Id.§ 90.03.370(2)(a), (2001).

[245]See Id. §§ 90.44.250 - 90.03.320 (2001).

[246]See Id. REV. CODE WASH §90.03.370.

[247]WASH. ADMIN. CODE Ch. 173-216.

law.[248] Additionally, authority is contained in a separate regulation adopted by Ecology,[249] which establishes a permit system for the withdrawal and use of groundwater consisting of commingled artificially stored groundwater and public waters located in established groundwater areas or subareas.

There are a number of water quality concerns associated with artificial groundwater recharge projects. Under the state Water Pollution Control Act,[250] it is unlawful to pollute waters of the state, which includes groundwater. Pollution or contamination means the physical or chemical alteration of the receiving water that results in impingement of the beneficial uses of the waters.[251] Any party recharging groundwater must notify Ecology.[252]

Injection of any waste fluids into groundwater which would impair water quality is prohibited.[253] Injection of treated wastewater is allowed only where water quality standards are met.[254] Injection of uncontaminated storm water is allowed.[255] Injection well owners are required to notify Ecology.[256] Physical or chemical changes to the groundwater quality will be measured against Washington's groundwater quality standards.[257] The standards will be used to determine compliance with water pollution control laws. Such an assessment would also be used to determine whether storm waters are considered to be contaminated.

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[248]Id. § 90.44.050.

[249]WASH ADMIN. CODE Chs. 173-136.

[250]WASH. REV. CODE § 90.48.080.

[251]Id. § 90.48.020.

[252]WASH. ADMIN. CODE Ch. 173-218-090 (3).

[253]Id. Chs. 173-218-050 (1) and 173-218-090 (1).

[254]Id.

[255]Id. Ch. 173-218-030 (17) (b).

[256]Id. Ch. 173-218-090 (3).

[257]Id. Ch. 173-200.

If the injectate (fluid) does not change the water quality and does not violate the groundwater quality standards, Ecology may issue the discharger a state waste discharged permit.[258]

Washington officials believe that sufficient information is generally available to support administrative actions relating to artificial groundwater recharge projects although conditions vary on a case-by-case basis. Washington could prohibit such projects if they adversely affect: (1) existing water rights; (2) instream flows; (3) quality of the receiving waters; (4) in situations where water withdrawals exceed permitted recharge volume; or (5) if, for any reason, a water right permit is denied.

Wyoming

Development of artificial groundwater recharge is still in its infancy in Wyoming, but the state is nevertheless interested in artificial groundwater recharge as a potential alternative to traditional water development projects.

The state has sponsored three large artificial groundwater recharge studies in Wyoming. These studies involve the Green River, Crow Creek, and the City of Cheyenne.[259] The state has also become involved in the Lodge Pole Creek Aquifer Storage and Retrieval Feasibility Study Project. This project was funded by the Wyoming Water Development Commission. Locally funded recharge projects are also in place in Gillette, and utilized to re-inject water that has been extracted in the process of mining coalbed methane in Northeastern Wyoming.

The above recharge projects are designed principally for the purpose of replenishing groundwater, not necessarily for storage and retrieval purposes. Entities that recharge groundwater are entitled to withdraw that same amount of water pursuant to the recharger's appropriative right. Wyoming has not reached the point of issuing credit for recharged waters. According to the state engineer's office, there are no formal credit-based recharge projects underway.

Despite the lack of a credit-appropriation system for recovering recharged groundwater, a permit is still necessary for such projects. Both the state engineer's Office and the Wyoming Department of Environmental Quality (DEQ) issue permits. The state engineer may deny a permit for artificial groundwater recharge if the project is not deemed to be in the best interest of the public. The DEQ may also deny a permit on the grounds of water quality degradation.

Artificial groundwater recharge is considered a beneficial use of water, though it is not specifically set forth as such under statute. The state does not officially promote or discourage artificial groundwater recharge and other water conservation measures. In areas of Wyoming where large quantities of groundwater are used for irrigation, adequate information on groundwater systems support administrative decisions regarding artificial groundwater recharge projects.

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[258]Id. Ch. 173-216.

[259]WYO. STAT. ANN. § 41-2-119 (2001).

Wyoming water law does not specifically prohibit mining of groundwater. There is no statutory definition of groundwater mining. According to state officials, however, such a prohibition may be inferred from a statutory prohibition on unreasonable interference with adequately developed stock and domestic wells and by practicing a safe yield concept for groundwater withdrawal. With respect to conjunctive use, Wyoming law dictates that priority of appropriation is the measure by which water is apportioned in areas where "underground waters and the waters of surface streams are so interconnected as to constitute in fact one source of supply."[260]

In most areas in Wyoming where large-scale groundwater pumping occurs, there is little surface water available. Thus, conjunctive use considerations offer few opportunities for success with respect to artificial groundwater recharge. Artificial groundwater recharge might be available, in some instances, to help alleviate problems with groundwater mining.

Water quality parameters under Wyoming water pollution control statutes[261] could preclude the use of poor quality groundwater for recharge activities. The Water Quality Division of the DEQ makes such determinations. Further, where artificial groundwater recharge is accomplished by injection wells, the Water Quality Division has to issue an underground injection control program permit. The DEQ has an ongoing aquifer protection program to ensure water quality, as well as compliance with the Safe Drinking Water Act, and other federal water quality legislation.

Wyoming state officials believe the state does not need comprehensive artificial groundwater recharge legislation at this time. Current Wyoming statutes handle what little recharge activity takes place in the state. Due to the further exploration and extraction of coalbed methane in the state, water officials believe that such is a potential source of usable water.

CONCLUSIONS

Demand for scarce water is the driving force for artificial groundwater recharge. Streams West-wide have been fully appropriated. All the while, groundwater has been pumped from aquifers at rates that exceed the natural recharge rate. The idea of water banking has become popular in the arid regions of the West, with Arizona, California, Idaho, Nevada, and New Mexico enacting comprehensive artificial groundwater recharge legislation to provide for growing needs. A few other states have incorporated an artificial groundwater recharge section into existing laws, and others are in the process of creating comprehensive legislation.

Water is recharged at varying levels throughout the West. Artificial groundwater recharge in states varies according to climate and development. Arizona leads the West in artificial groundwater recharge, while in Montana, artificial groundwater recharge is almost non-existent.

Many similarities in artificial groundwater recharge exist amongst western states. Most western states are arid, and depend greatly on the groundwater supply. Groundwater levels have been dropping for decades, and recently states have begun recharge projects to replenish this diminishing resource. Western states recognize that groundwater and surface water are often interrelated, but some states' laws do not reflect this relationship.

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[260]WYO. STAT. ANN. § 41-3-916.

[261]See WYO. STAT. §§ 35-11-301 to 304.

Groundwater mining, removing groundwater at a faster rate than it is replenished by either natural or man-made processes, is formally addressed by some states in their respective water laws, while in others it is not. But almost all states in the West have a policy against mining groundwater.

Most western states do not statutorily recognize artificial groundwater recharge as a beneficial use of water. But in practice, artificial groundwater recharge is deemed to be a beneficial use throughout the West, whether or not it is statutorily recognized as such.

In general, states that follow the appropriation doctrine for surface waters also use the same doctrine to govern groundwater activity. Under the appropriation doctrine, Idaho includes recharged waters as part of one's appropriation, while Colorado does not. Some states, such as Arizona, California, Colorado, Nevada, New Mexico, Utah, and Washington allow a groundwater recharger to have claim on water that he has recharged. States like Kansas and Oklahoma do not afford groundwater rechargers any claim on recharged water. Oregon requires a secondary groundwater permit for those wishing to recover recharged water. Texas is unlike other western states in that it follows the doctrine of absolute ownership. Thus if water is recharged, whoever owns the land above that groundwater, has the legal right to the water. However, when issuing a permit to recharge an aquifer with surface water, consideration is given to the ability of the permittee itself to retrieve the water for beneficial use and to protect the waters from unauthorized use.

Typically the water quantity and quality associated with recharge projects are measured. Water quantity is regulated closely in order to prevent groundwater mining, as well as to comply with interstate compacts that deal with aquifers. Water quality is regulated in order to preserve groundwater as a source of culinary water. Both the quality of the injected or recharged water as well as the quality of the receiving water are continually measured. In general, water of lower quality cannot be recharged into cleaner groundwater. Again, states vary in their approaches. In western states, generally the Department of Health restricts the use of treated effluent in recharge projects if its injection will degrade groundwater quality. Most water quality regulation is done for the purpose of complying with federal standards.

Though the states vary greatly in the manner by which they regulate artificial groundwater recharge activities, states are increasingly moving towards greater conjunctive use of water. The greatest difficulty is that those who would likely benefit the most from conjunctive use, often do not own both groundwater and surface rights which could be used conjunctively. This and other problems are being resolved as states make the transition. As the demand for water rises, many options presently prohibited by high costs will become affordable to preserve and enhance groundwater supply.

APPENDICES

Appendix one is a copy of the original survey on water reuse which was originally circulated in September 2001. Appendix two contains copies of the actual state responses to the survey, coupled with updated information provided by the states for the artificial groundwater recharge portion of this report. Due to the length of the appendices, they are available at the Western States Water Council office, or upon request at (801) 561-5300.

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