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### Wasted Water: The Problems and Promise of Improving Efficiency Under Western Water Law

Steven J. Shupe

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WASTED WATER: THE PROBLEMS AND PROMISE  
OF IMPROVING EFFICIENCY UNDER WESTERN WATER LAW

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COLORADO WATER ISSUES AND OPTIONS:  
THE 90'S AND BEYOND  
Toward Maximum Beneficial Use  
of Colorado's Water Resources

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## I. INTRODUCTION

For over a century, western states have worked to effectively administer their limited water resources. During most of this period, administration has been mainly a reactive process, one in which state officials and courts developed water allocation mechanisms that simply reflected the customs and uses that grew in the early West. State judges embodied the local customs of thirsty miners and farmers in the Prior Appropriation Doctrine, with state administrators then enforcing historic priorities established under this doctrine of "first in time, first in right."<sup>1</sup> Such a system of law and administration was designed for, and succeeded in, protecting water use practices that developed over the decades.

In recent years, this limited concept of water administration has been rejected. Water officials have been moving away from merely allocating water in response to old priorities and have instead been looking at ways of managing water to achieve maximum use of limited supplies. State administrative programs have expanded from strictly enforcement to include assessing means for developing, controlling, and conserving the water resources of the state.

Several motivating forces lie behind this shifting of the states' role from water allocator to water

manager. First, the days of massive federal planning and funding of water projects appear to have come to an end. As a consequence, states are becoming more directly involved in looking at, and potentially sponsoring, water development activities. Second, the growing conflicts created by ground water use and its impact on senior surface rights have required states to look at innovative means for managing the resource. Also, a recent appreciation for the values of free-flowing waters has caused many states to take affirmative steps in water planning and policy (i.e. implementing instream flow programs). Water quality concerns have likewise influenced current attitudes and actions towards precious water resources. Finally, and perhaps most importantly, there is a growing realization that without improved management, we have gotten to a point in many western areas where there is simply not enough water to support a growing populace.

Management of water by states has therefore become a critical issue of the 1980's. Moreover, comprehensive discussions of water management invariably turn to the topic of inefficient water practices that have persisted into modern times. In these days of severe financial and physical limitations upon new sources of developed water (i.e. through additional reservoir projects), many believe that improved efficiency and

conservation of our existing supplies will prove to be the main component in fulfilling future demands.

This Article assesses such a conclusion, looking at both the benefits and limits of improving efficiency of water use. In particular, the barriers to efficiency imposed by the Prior Appropriation Doctrine are discussed, with a blueprint presented for overcoming these restrictions. The Article then focuses on the efficient management of water within the state of Colorado. The state's historic perspective on wasted water is reviewed, which leads to a discussion of the current framework that promotes and, in some ways, discourages efficient use. The paper then concludes with a look at ways of achieving the concept of maximum utilization that has been increasingly espoused by Colorado's legislature and courts.

## II. BENEFITS OF IMPROVING EFFICIENCY

Whenever western state officials, attorneys, and commentators preach about the problem of wasted water, a finger usually is pointed at agriculture. Crop irrigation accounts for roughly 90% of all water diversions that are consumed in the West,<sup>2</sup> and many of the operations are notoriously inefficient. On the average, nearly one-fourth of the diversions are lost in leaky conveyance ditches, while crops utilize only 53% of the remainder that reaches the field.<sup>3</sup>

Fingers that point to improved irrigation efficiency as the panacea for water shortages, however, risk getting caught in the pincers of economic and hydrologic realities. The amount of water that constitutes "waste" in irrigation is difficult to quantify--and it is subject to varying interpretations. For instance, a vast majority of the excess diversions eventually return to the stream or ground water where they can be reused by other irrigators. In fact, in some areas, these return flows from ditch seepage and overapplications during the spring and early summer enhance a region's capacity to support irrigation in the drier late-summer season. Downstream irrigators who rely upon these late return flows would hardly consider that the upstream practices result in waste. Also, throughout the West, water applied in excess of the crops' consumptive demands cannot be deemed wasteful where such overapplication is necessary in order to prevent salt from building up in the soil. Even that amount of water which is evaporatively lost during the irrigation process may not be completely wasted; studies show that such losses can result in cooler temperatures and higher humidity near the field surface which in turn reduce the consumptive water requirements of the crop.<sup>4</sup>

The lessons gleaned from the preceding paragraph indicate that one must tread very carefully when



advocating for improved water use efficiency. They do not, however, negate the need for reducing unnecessarily large applications of irrigation water in areas throughout the West. Even in regions where improved efficiency will not result in making more water available for alternative uses (i.e. where return flows are already being fully utilized and irretrievable waste is negligible), the benefits of reducing irrigation diversions can be varied and significant.

#### A. Protecting Instream Flows

The many benefits of free-flowing water have come to be recognized and appreciated in recent years.<sup>5</sup> Not only do natural streams harbor aesthetic and other intangible values, but they are economically important as well. When excessive diversions deplete a stream, the repercussion can be felt in many ways. First, the stream's capacity to support fish can be diminished, thereby hurting important recreational opportunities. Recreation can be impeded as well when rafters and boaters are no longer able to take advantage of the free-flowing conditions.

Instream flow also plays an important role in diluting pollutants. Diminished streamflow can result in high concentrations of contaminants, thereby making the water unsuitable for downstream use.<sup>6</sup> Also, there is increasing recognition of the important role that

minimum flows play in maintaining viable stream channels and in protecting the riparian habitat for birds and animals.<sup>7</sup> Finally, hydroelectric production is adversely impacted in some areas of the West by excessive surface diversions.

Improved irrigation conveyance and application systems can reduce diversions and thereby promote the many values of instream flows. Such benefits would occur even in areas where the overapplied irrigation waters historically returned to the stream system. Rather than spending time percolating underground through the basin or running down surface channels before reemerging in the stream, the flow would remain in the intervening natural bed. Such a result not only protects instream flow levels but, as explained below, can also help to reduce salt and erosion problems associated with excessive return flows.

#### B. Salinity Amelioration

If too little water is applied to crops, salt can build up in the soil and destroy its capacity to support crops. Salinity problems, however, can arise due to over-application of irrigation water as well. Excessive irrigation diversions create salt damage to both water and land in several ways.

First, excessive applications teamed with poor drainage cause water to evaporate from the field,

thereby leaving salt accumulations in the soil. Also, the return flows may pond in low areas or raise the ground water table to the extent that evaporation occurs and creates a saline soil condition.

Salinity problems can also arise in the waters that receive irrigation return flows. Seepage from ditches and percolation from the field in many areas of the West leach natural salt from geologic strata and carry it to the ground water supply. Often, this ground water reemerges as surface flow, thereby creating saline stream conditions.

The Colorado River basin is an area where salt contamination of ground and surface supplies is an acute problem. In areas of the upper basin, each acre-foot of return flow carries up to 8.5 tons of salt back to the Colorado River.<sup>8</sup> If no ameliorative measures are taken, it is estimated that additional basin development will cause the salt content of the lower river to increase by one-third.<sup>9</sup> This increase in salinity would in turn make the water less suitable for downstream irrigation and result in more than \$100 million of damage to agriculture annually.<sup>10</sup>

Improving conveyance and on-farm efficiency have proven useful means of controlling this salinity problem. For example, the lining of ditches in the Grand Valley of western Colorado decreased annual

seepage by 930 acre feet which in turn reduced salt contributions to the Colorado River system by 4,700 tons per year.<sup>11</sup> Furthermore, the economic benefits accruing to downstream irrigators from this reduction of salinity in their water supply exceeded the total cost of lining the canals and ditches.<sup>12</sup> Not all water conservation programs will have such dramatic impacts on salinity amelioration, but such efforts will prove quite valuable in many areas of the West.

### C. Erosion Control

Reducing irrigation return flows can also be a significant factor in controlling erosion. As was recently stated by soil experts:

Erosion is threatening the continued productivity of more than half of all the irrigated land in the West. Part of this is caused by the attempt to grow crops on land not suited to crops.... But most of this damage results from misuse of irrigation water.<sup>13</sup>

One study in southern Idaho showed that 6,000 pounds of topsoil were carried away with each acre foot of surface runoff during the irrigation season.<sup>14</sup> Not only is this erosion destructive to the field upon which the water is applied, but the resulting degradation can make the receiving waters unsuitable for downstream irrigation. For example, in Washington's Yakima Valley, return flows carried so much silt that down-channel irrigators experienced plugging of

sprinkler heads, pipe abrasion, and wear on pumps.<sup>15</sup> In addition, the state's water quality standard for turbidity was violated when these return flows hit the stream.<sup>16</sup> Overapplication of irrigation water also creates water quality problems associated with fertilizers and pesticides carried away by return flows.

D. Reduced Operating Costs

The leaching of costly fertilizer and pesticides by excessive irrigation not only creates water quality problems, but it also results in increased cost to the farmer. Yet this is only one way in which inefficient techniques can increase on-farm production costs. In many areas, pumping of the irrigation supply constitutes a major portion of operating expenses. The ability to reduce electricity bills by implementing modern irrigation practices is widespread. In the Great Plains area alone, it has been estimated that conservation measures could reduce irrigation pumping costs by \$50 million annually.<sup>17</sup> Likewise, labor expenses can decrease dramatically when modern scheduling, automation, and application techniques have been implemented.

This is not to say that reductions in operating expenses will always justify the capital costs of improving on-farm efficiency. In fact, such capital costs will often be prohibitive to farms that are

already operating on the margin of economic return. But in many instances, capital investments are not needed to promote conservation. Reductions in irrigation applications can be made with no loss of crop on numerous farms which have historically applied more water than necessary. In such situations, water savings (along with reduced operating expenses) can be experienced simply through education and proper scheduling of irrigation applications.<sup>18</sup>

#### E. Increasing the Available Water Supply

As stated in the above introduction, it is difficult to quantify just how much irrigation water can be salvaged and used for other purposes. Most conservation measures would simply reduce return flows upon which other users rely and, therefore, not salvage "wasted" water for additional uses. Nonetheless, some conveyance and on-farm losses are irretrievable and could be salvaged for other uses if modern irrigation techniques were employed. These losses include water consumed by phreatophytes, evaporation from surface soil and ponded areas, and deep percolation into aquifers that are not readily accessible.

One federal study estimated that these irretrievable irrigation losses amount to 24 million acre feet annually (compared to 79 maf consumed by crops and 92 maf of return flows).<sup>19</sup> This consumptive waste totals

more than the combined average annual flow of the Colorado and Rio Grande rivers; it also exceeds the total amount of water consumed by all municipalities and industries in the United States. Another study indicated that \$5 billion investment in conservation techniques would annually salvage from 2 to 5 million acre feet of water irretrievably lost through inefficient irrigation.<sup>20</sup>

Projecting numbers such as those in the preceding paragraph is difficult and it is risky to base policy decisions on generalities regarding water waste and salvage. Despite the difficulties in quantifying overall waste, however, it is clear that in certain areas of the West, irrigation losses can be salvaged in order to provide more water for additional uses. Over \$60 million is currently being spent in the upper Rio Grande region to salvage irrigation return flows that were being lost to non-beneficial evapotranspiration.<sup>21</sup> In California, the State Water Resources Control Board recently ordered the Imperial Irrigation District to improve its practices in order to reduce up to 1 million acre-feet of annual waste.<sup>22</sup> In both of these regions, as well as in many other western areas, improvements in irrigation techniques could make more water available for beneficial uses. Perhaps the total amount salvagable will never come close to 24

maf. But in some arid regions of the West, improvements in efficiency that salvage even one acre foot annually can translate into thousands of dollars of value.<sup>23</sup>

#### F. Control of Interstate Waters

A final benefit from water conservation accrues to states in the context of interstate conflicts. Although many existing compacts allocate interstate rivers, states continue to find themselves in battles over who controls limited water resources in the West. Not only are surface waters often the subject of interstate conflict, but states are increasingly wrestling for control over finite ground water supplies. Officials are fully cognizant of the economic importance of obtaining the right to use interstate waters, thus states have invested millions of dollars to litigate these conflicts.

Recent Supreme Court decisions have established that a particular state's control over interstate waters is a direct function of that state's commitment to water conservation and efficiency. The Court will more readily defer to a state's management and use of disputed waters if such management and use reflect conservation goals. This lesson has been demonstrated in the context of both surface and ground water disputes.



In Sporhase v. Nebraska,<sup>24</sup> the state sought to enjoin Sporhase's use of Nebraska ground water on acreage across the border in Colorado. Nebraska based its case on its anti-export statute which severely limited the out-of-state use of ground water. Sporhase argued that this statute interfered with interstate commerce, and therefore was unconstitutional under the Commerce Clause.

Nebraska asserted that the purpose of its anti-export statute was solely "to conserve and preserve diminishing sources of ground water."<sup>25</sup> After reviewing the state's water management program, the U.S. Supreme Court found that this "purpose is unquestionably legitimate and highly important, and the other aspects of Nebraska's ground water regulations demonstrate that it is genuine."<sup>26</sup> The Court further concluded that western states' interests and competence in conserving and preserving scarce water resources are relevant in the Commerce Clause analysis and that limitations on ground water exports are lawful in the context of promoting conservation.<sup>27</sup>

Nebraska's statute was ultimately found unconstitutional, however, because it contained a reciprocity provision allowing export only to those states that permitted the import of ground water into Nebraska. The Court could find "no evidence that this restriction

is narrowly tailored to the conservation and preservation rationale,"<sup>28</sup> nor was it persuaded that the reciprocity provision "significantly advances the State's legitimate conservation and preservation interest; it surely is not narrowly tailored to serve that purpose."<sup>29</sup>

A state's level of commitment to conservation and efficiency was likewise found relevant in determining the extent to which it could control and use its interstate surface waters. Colorado v. New Mexico<sup>30</sup> involved a dispute over how much of the Vermejo River, if any, Colorado users were allowed to divert. Although New Mexico users had historically diverted the entire flow, Colorado asserted under the doctrine of equitable apportionment<sup>31</sup> that it should be entitled to some of the river as well. It based its claim on a number of points, including the assertion that if New Mexico upgraded its irrigation techniques, enough supply would be available for all demands. In remanding the case for further findings of fact, the U.S. Supreme Court stated:

Our prior cases clearly establish that equitable apportionment will protect only those rights to water that are "reasonably acquired and applied." Especially in those Western states where water is scarce, "[t]here must be no waste...of the 'treasure' of a river.... Only diligence and good faith will keep the privilege

alive." Thus, wasteful or inefficient uses will not be protected.<sup>32</sup>

The Court later emphasized not only that New Mexico's apportionment should be limited to non-wasteful practices, but that the magnitude of Colorado's share would likewise reflect its commitment to efficiency:

We conclude that it is entirely appropriate to consider the extent to which reasonable conservation measures by New Mexico might offset the proposed Colorado diversion and thereby minimize any injury to New Mexico users. Similarly, it is appropriate to consider whether Colorado has undertaken reasonable steps to minimize the amount of diversion that will be required.<sup>33</sup>

Upon remand, the Special Master allocated 4,000 acre feet per year to Colorado users. The Supreme Court in its 1984 decision, however, refused to recognize this allocation and gave the entire Vermejo to New Mexico.<sup>34</sup> Colorado failed to meet its burden of proof in a number of areas, including the fact that

there is no evidence in the record that "Colorado has undertaken reasonable steps to minimize the amount of the diversion that will be required." [quoting its 1982 opinion]... Financially and physically feasible conservation efforts include careful study of future, as well as prudent implementation of current, water uses. Colorado has been unwilling to take any concrete steps in this direction.<sup>35</sup>

### III. IMPEDIMENTS TO IMPROVING WATER USE EFFICIENCY

In reviewing the many benefits of water conservation, state officials may be tempted to require immediate improvements in irrigation efficiency. Salinity and erosion control, instream flow protection, and salvaged water add up to a compelling case for modernization in many areas of the arid West. Programs for improving irrigation techniques, however, whether initiated by state or private entities, will face significant roadblocks under current economic conditions and legal structures.

#### A. Financial Constraints to System Modernization

Any state official contemplating mandatory moves toward irrigation efficiency must squarely consider the economic realities currently facing the agriculture industry. Lining ditches, upgrading application methods, implementing automation, and leveling fields all require money. Although some methods for improving efficiency can be quite cheap, even an incremental burden on today's farmers may accelerate the sorry number of foreclosures sprouting across the western landscape.

As water becomes more valuable, however, the opportunity arises for the conservation methods to pay for themselves. In other words, farmers may find it lucrative to voluntarily improve their irrigation

systems in order to market the salvaged water or to apply it to additional lands. Also, buyers may be willing to finance the modernization in return for the right to use the salvaged water. Such scenarios, however, depend upon the free marketing and transfer of water which in many instances is constrained under state law.

B. Restraints Upon Transfers and Expanded Use

A case coming out of the water-short state of Arizona aptly demonstrates the type of legal complications facing those who wish to improve their efficiency and market or use the salvaged water. In Salt River Valley Users' Association v. Kovacovich,<sup>36</sup> irrigators lined their ditches with concrete which, due to decreased seepage, enabled them to irrigate more acreage. Junior users objected to this expansion of use, claiming that they were entitled to the saved water. The court agreed with the juniors' assertion, holding that state law

precludes the application of waters gained by water conservation practices to lands other than those to which the water was originally appurtenant.... Any practice, whether through water-saving procedures or otherwise, whereby appellees may in fact reduce the quantity of water actually taken inures to the benefit of other users and neither creates a right to use the waters saved as a marketable commodity nor the right to apply same to adjacent property

having no appurtenant water rights.<sup>37</sup>

This concept of appurtenancy has restricted water transfers in other jurisdictions as well. For instance, the Oklahoma legislature has flatly stated that "[a]ll waters used in this state for irrigation purposes shall remain appurtenant to the land upon which it is used."<sup>38</sup> Only if it somehow becomes impractical to irrigate the original acreage may a water rights holder transfer use to other land. Similar statutes exist in South Dakota and Nevada as well, although each has different exceptions and restrictions to the basic appurtenancy requirement.<sup>39</sup>

Most other western states are less restrictive regarding changes in the use of a water right, yet the procedures and limitations can be quite complex. In fact, it is currently difficult to set forth any general rule regarding the law of transfer and expanded use resulting from conservation. Commentators of several years ago were confronted with a simpler situation and were able to state with some certainty that "[t]he prevailing rule is that the person who installs water saving devices is allowed to take the water thus saved."<sup>40</sup> Such a statement was generally made after citing several old cases in which persons who installed pipes and lined ditch were given the right to utilize the former seepage losses.

But such a conclusion is not so simple under current standards, practices, and understandings. With ground water now being heavily utilized throughout the West and with our increased awareness that seepage and percolation often return to the stream system, rarely can ditch seepage and other return flows be salvaged without adversely impacting other water users. Moreover, most jurisdictions prohibit a situation where a senior user changes the water right in a way that injures junior users in the basin.<sup>41</sup> This tenet arises from the policy that junior appropriators who invest in diversion works should have the assurance that the stream conditions will not change to their detriment over time. As a consequence, improvements in irrigation efficiency that simply reduce return flows will usually not enable the investor to capture the salvaged water if those return flows had been historically used by others.

Some states further inhibit salvage by allowing a transfer of irrigation rights only to the extent of historic crop consumption.<sup>42</sup> Consequently, if there had been other irretrievable losses (i.e. evaporation, phreatophyte transpiration, or irretrievable percolation), the farmer would not be entitled to salvage and market this portion of the water right. Under such

restrictions, there is little, if any, incentive for implementing efficient irrigation practices.

Idaho, on the other hand, takes a very liberal approach to allowing irrigators to benefit from their salvage efforts. As was recently stated by its supreme court:

it has long been settled law in Idaho that a senior appropriator of water retains his right to surface waste and seepage water, and may reclaim it, even though such water has been used by a junior appropriator, even for as long as forty years.... The senior appropriator retains his right to all the water, including that which is lost through reasonable seepage, and thus may reclaim it, for instance, by improving his transmission system.<sup>43</sup>

This liberal tenet grew from the concept recognized in some western states that farmers have the right to reuse the excess tailwater from the irrigation of their lands.<sup>44</sup> Recent cases in most jurisdictions, however, have significantly restricted this right to such capture and reuse, including the restriction that reapplication of the tailwater is limited to the acreage originally irrigated.<sup>45</sup>

The sum of the above analysis leads to the conclusion that there is no easy answer under western water law regarding the extent to which conservation efforts will result in benefits to the one undertaking the improvements. Future court battles and legislative



actions will undoubtedly refine the law in the various states as the demand for water and its transfer becomes more intense. In the meantime, impediments to selling or using salvaged water will remain in most jurisdictions.

C. Barriers of the Prior Appropriation Doctrine to State Water Management

States may find it advantageous to consider legislation designed to facilitate the marketing of salvaged water in order to promote efficiency. The market system alone, however, is inadequate for effectively managing the waters of a state. Management of this precious public resource involves decisions and actions that go beyond concerns of the market. For example, the free transfer of salvaged water to other uses is limited in its ability to promote instream flow values. Also, it is difficult for market forces to incorporate all factors when the benefits of waste reduction incrementally accrue to numerous unrelated downstream users who suffer from the effects of salinity and other water quality problems associated with over-irrigation. As a consequence, state consideration is being given to ways of compelling efficient use as part of a comprehensive water management policy.

Any state program of mandatory improvements in irrigation efficiency will meet head-on with the Prior Appropriation Doctrine. This fact was demonstrated by

the case of Enterprise Irrigation District v. Willis.<sup>46</sup> Enterprise objected to a threatened closure of its headgates by Nebraska officials, arguing that its 1889 right to 3.5 acre-feet of water per acre of irrigated land (af/acre) was not subject to a 1911 statute limiting use to 3.0 af/acre. The court held that retroactive application of the statute exceeded the state's regulatory authority and constituted a deprivation of property without due process of law.<sup>47</sup> Enterprise was allowed to continue diverting its original right of 3.5 af/acre.

The Prior Appropriation Doctrine indeed establishes a strong property interest in water users. Vested water rights historically could not be diminished by the state so long as the right was being put to beneficial use. If, however, waters were being applied in a non-beneficial manner, this constituted waste and subjected the holder to potential loss of the right.

Rarely has this policy against waste been used to divest water rights holders of their appropriations. Courts have been reluctant to deem inefficient irrigation systems "wasteful" so long as they were of the type customarily used in the area and were operated properly. As a consequence, century-old irrigation practices abound throughout the West, resulting in the

many contemporary problems associated with excessive diversions and return flows.

It is time for a change.

#### IV. A BLUEPRINT FOR CHANGE

In 1982, a blueprint for change was published describing a means for removing the legal protections traditionally afforded excessive senior water rights.<sup>48</sup> The blueprint explained "how the common law concept of waste and existing forfeiture statutes can be invoked to hurdle the constitutional taking barrier that currently inhibits the adjustment of established water rights."<sup>49</sup> The approach was based on recognizing the following sequence of tenets:

- 1) Early irrigator's inviolate property interest was their right to accrue benefits from watering their crops. The quantity required to derive such benefit constituted the protectable water right.

- 2) After technologies developed that allowed for more efficient conveyance and application of irrigation water, the old, water-intensive practices became a mere privilege rather than a part of the irrigators' vested right.

- 3) With the full appropriation of local water supplies by later development, the privilege afforded the inefficient system was lost and any further use of the excess water by that system would constitute waste.

- 4) Following passage of a forfeiture statute and the running of the requisite period, the wasteful amount was no longer part of the water right and legally reverted to the control of the state appropriation system.

5) As part of a comprehensive water management and conservation program, state officials must now determine how much of prior water rights was forfeited as waste, taking into account sociological impacts and economic realities.

These five steps chart a course that enables states to begin implementing a commitment to water conservation. The legal basis of each step is summarized below.

A. Step 1--Defining the Nature of a Water Right

This first step in the blueprint counters the common misconception that a vested water right provides its holder with an ownership interest in a specified quantity of flow. Such a notion is incorrect from two standpoints.

First, under the Prior Appropriation Doctrine no right can be established to water per se. Rather, an appropriator gains an interest only in the use of water for some beneficial purpose, not in the flow itself. Moreover, the appropriator's protectable interest is not measured by the quantity of the flow, but in the benefits reaped by the user from the using flow. As has been repeatedly stated in the West, "beneficial use shall be the basis, the measure, and the limit of all rights to the use of water,"<sup>50</sup> regardless of how much has been appropriated.

In short, an established water right ensures that its holder may accrue the benefits derivable from using

the water, without interference by junior appropriators or the government. The quantity of flow needed to achieve such benefits becomes the associated water right. The rights holder does not own the water, but merely has the continuing right to use it so long as it is applied without waste.

B. Step 2--Recognizing the Privilege Concept

The wasteful methods so common with early settlers can, under the light most favorable to their system of use, be deemed only a privilege permitted merely because it could be exercised without substantial injury to any one; and no right to such method of use was acquired thereby.<sup>51</sup>

This holding of the Oregon supreme court reflects the fact that, while irrigators have a vested right to beneficially water their crops, the volume of water associated with that right may change as technology develops. When more efficient conveyance and application techniques become available, the excessive water requirements of the old systems are "declared to be wasteful and have been only a privilege and not a right...."<sup>52</sup>

This privilege concept recognizes that modern courts are not bound by century-old interpretations of beneficial use and of what constitutes waste of precious water resources. Courts and administrative officials must, however, respect senior irrigators' inviolate right to reap the benefits of applying water

to their crops. Only the use of excessive water in an outmoded irrigation system is considered a privilege.

C. Step 3--Termination of the Privilege

In times of plentiful water, the privilege to use excessive amounts of flow can be exercised without shortchanging junior diverters. Courts in the western states, however, have recognized the need to extinguish this privilege when limited water supplies become fully appropriated.<sup>53</sup> Under such conditions, senior diverters are entitled only to the amount reasonably needed, and the "excess over the amount for proper irrigation...should be allowed to be used by someone else."<sup>54</sup> As summarized by the Utah supreme court:

In this arid country it becomes increasingly necessary, as the demand for water use increases, to pay careful attention to the manner of use so as to insure the greatest [benefit] possible for the quantity of water available. Wasteful methods must be discontinued. The duty to accomplish this desired ends falls upon all users regardless of the priority of appropriation.<sup>55</sup>

The privilege of utilizing antiquated irrigation techniques has been terminated in cases from several states. In Nevada, a senior appropriator was enjoined from using a porous natural creek bed for conveyance after another farmer wanted to share in the area's limited water supply.<sup>56</sup> In an Oregon case, the court held that, after a region's waters became fully

appropriated, the custom of using sloughs and depressions for water conveyance "should be sanctioned only until a fair opportunity is had to construct ditches or canals and pipe lines, or other artificial works, where necessary, to conserve the water and minimize the waste."<sup>57</sup> The California court likewise concluded that no privilege to wasteful practices exists when another appropriator is "willing to invest in a more efficient conveyance system in order to capture and use the water."<sup>58</sup>

D. Step 4--Forfeiture of the Waste

The preceding examples, in which courts terminated the privilege of using inefficient techniques, occurred as a result of private disputes between competing water users. State officials, however, do not have to wait for the initiation of private actions in order to act against excessive senior decrees. With the advent of forfeiture statutes in most western states, officials are now able to take affirmative steps to terminate the privilege of using excessive amounts of water in outmoded irrigation systems.

A typical forfeiture statute reads as follows:

Any appropriation of water must be for a beneficial use, and when the appropriator fails to apply it to the beneficial use...for three successive years...the state engineer may declare such water permit or right forfeited.<sup>59</sup>

Forfeiture statutes are typically invoked under circumstances in which water under a vested right was not diverted for the requisite period for forfeiture (usually 3 to 5 years).<sup>60</sup> They have, however, also been applied in situations of misuse--that is, where the water was diverted but not applied beneficially. This first occurred in New Mexico in 1957 where use of an uncapped artesian well for pasture irrigation was found to be wasteful, and the associated water right forfeited to the extent of nonbeneficial use.<sup>61</sup> More recently, the Oregon supreme court affirmed an administrative order forfeiting a portion of a decreed, senior water right on the basis that new technology enabled the historic beneficial use (i.e. power production) to be achieved with a lesser diversion of water.<sup>62</sup>

E. Step 5--Implementing a Commitment to Conservation

Forfeiture statutes provide states with a powerful tool with which to pursue water use efficiency. It would be a travesty, however, for any western state to immediately deem as forfeited all water rights in excess of that amount needed in modern irrigation systems. Individual farmers would suffer great hardship, regional economies would be severely dislocated, and the very existence of an important sector of western life would be threatened. Leaky conveyance



networks and inefficient applications systems persist throughout the West, and it will take a longterm and carefully considered program to realistically promote conservation. Nonetheless, such a commitment must be initiated if the quality of life in the West is to be maintained.

California has recently taken an important step towards this commitment to conservation. In 1984, the State Water Resources Control Board found that the practices of the Imperial Irrigation District constituted a misuse of water and ordered the District to initiate extensive conservation measures.<sup>63</sup> Such measures included ways to control excessive tailwater, curtail canal spills, reduce canal seepage, and minimize leachwater requirements. The Board determined that approximately 1 million acre feet of precious water was irretrievably lost each year through these wasteful practices--water that Southern California could not afford to waste from its limited Colorado River allocation.

In arriving at its determination, the Board looked to the state constitution, water code, and case law. It initially concluded that "regulation to prevent waste and unreasonable use of water is a clearly established element of California water law."<sup>64</sup> It also determined that although the state's water code

confirms the traditional view that local custom should be considered in evaluating reasonableness of water use, it clarifies that conformity with local custom alone does not foreclose a finding of waste and unreasonable use in appropriate circumstances.<sup>65</sup>

The Board, in its decision, also reiterated that "[w]hat is a beneficial use at one time may, because of changed conditions become a waste of water at a later time."<sup>66</sup> Finally, the Board recognized the need for timely action when it comes to implementing a commitment to conservation. Even though

there currently is no dispute between competing water right holders...there are impending shortages of water which are reasonably certain to exist within the period in which a physical solution to avoid shortages could be implemented. Therefore, it is proper to initiate steps immediately which will assist in alleviating shortage.<sup>67</sup>

It is not only in California that steps need to be quickly taken in order to ameliorate the problems caused by excessive water diversions. A commitment to conservation is important to all regions of the arid West--including the State of Colorado.

#### V. WATER USE EFFICIENCY UNDER THE COLORADO SYSTEM

In many areas of western water law, Colorado cases are cited as the leading decisions in the field. The Colorado courts historically have been forced to deal with many difficult conflicts due to competing water

needs in the states's complex hydrologic setting. One category, however, in which Colorado decisions are sorely lacking is in the area of reducing wasted water.

A. Constraints to State Regulation

Although much rhetoric has been spoken regarding the need to conserve water, neither the Colorado supreme court, nor administrative officials, nor the legislature has implemented strict measures to promote efficient use of this precious resource. As a consequence, in many basins of the state, irrigation water evaporates uselessly from saturated fields; tons of Colorado topsoil are eroded by excess return flows and are carried out of state; aquifers are needlessly depleted; and salinity problems are aggravated by the continued use of antiquated conveyance and application systems.

Although economic constraints in some instances inhibit improved efficiency, many wasteful applications of senior irrigation rights can be cheaply reduced without impacting yield. Modern knowledge regarding actual crop water demands and proper scheduling can now substitute for the margin of error (i.e. excessive diversions) that many 19th century irrigators incorporated when they created their water rights. Also, as was previously mentioned, even where capital is needed

to reduce water waste, the benefits of such measures often outweigh their costs.

The question remains, then, as to why Colorado officials have not taken action to prohibit blatant waste in those instances where excessive senior rights can be reduced with little, if any, adverse impact on the water rights holder. One aspect of the answer to this question is political. Powerful agricultural and other water interests are understandably skeptical of legislative proposals to change the status quo. Likewise, in such a political climate, the State Engineer would find it difficult to begin administering senior water rights in a manner to reduce historic waste. The courts, too, are limited by the traditional view of the protections afforded senior rights under the Colorado Doctrine of prior appropriation. Finally, efforts in Colorado to terminate wasteful water rights are inhibited by the psychology of being an upstream state.

It is no coincidence that the only two states not to have forfeiture statutes (Colorado and Montana) are upstream states--that is, states containing the headwaters of major drainages which flow out of the states' boundaries. In such a situation, early state officials were reluctant to mandate loss of a senior water appropriation for fear of losing the right to its

use to a downstream state. Although interstate compacts have somewhat allayed this concern in recent times, Colorado remains without a forfeiture statute. This, in turn, inhibits the implementation of the above-mentioned blueprint for change for reducing waste.

Some may argue that a forfeiture statute is not needed in Colorado due to the procedures currently being enforced under the state's abandonment statute.<sup>68</sup> This statute provides that abandonment lists be compiled every ten years, listing each water right that the Division Engineers have "determined to have been abandoned in whole or in part...."<sup>69</sup> Inclusion on this list constitutes a rebuttable presumption that the water right has been abandoned. If rights holders protest their inclusion on the list, the appropriate water court reviews the situation in order to determine whether the elements of abandonment had arisen (i.e. nonuse teamed with an intent to abandon).

Although such a procedure is effective in identifying abandoned water rights, it does nothing to promote efficient use. As a practical matter, the Division Engineers compile the abandonment lists by looking to diversion records to uncover those rights that had not been taken from the stream and applied

to the field for ten years. The analysis goes no further regarding whether that amount of water is actually needed for beneficial use on the field. It is only nonuse--not wasteful use--that is identified under the abandonment list to reduce obsolete senior water rights.

B. Existing Framework for Waste Reduction

The fact that Colorado has historically done little to affirmatively promote efficiency does not mean that the state's courts and legislature have been unconcerned about wasted water. As Colorado's streams and rivers became overappropriated in the late 1800's, the supreme court began emphasizing that appropriators of water "could not waste it, nor divert more than their necessities required."<sup>70</sup> This theme was reiterated on numerous occasions over the decades:

[N]o matter how early a person's priority of appropriation may be, he is not entitled to receive more water than is necessary for his actual use. An excessive diversion of water cannot be regarded as a diversion to beneficial use within the meaning of the constitution. Water in this country is too scarce and consequently too precious to admit of waste. [1892]<sup>71</sup>

We thoroughly agree with counsel that no waste of water from natural streams should be countenanced by the courts, and that their decrees for its use should be withheld in the absence of evidence showing, inter alia, with reasonable certainty, the quantity

continuously applied to some beneficial use. [1898]<sup>72</sup>

The law contemplates an economical use of water. It will not countenance the diversion of a volume from a stream which, by reason of loss resulting from the appliances used to convey it, is many times that which is actually consumed at the point where it is utilized. Water is too valuable to be wasted, either through an extravagant application for the purpose appropriated, or by waste resulting from the means employed to carry it to the place of use....[1908]<sup>73</sup>

This language prohibiting waste reflects tenets of the Prior Appropriation Doctrine, as embodied in the Colorado constitution. "The constitution provides that the water of natural streams may be diverted to beneficial use; but the privilege of diversion is granted only for uses truly beneficial...."<sup>74</sup>

The court increasingly recognized the need to prohibit all but beneficial uses as additional water users moved into the state. Junior users, and the economic growth that they represented, were inhibited by excessive diversions by seniors. Consequently, the Colorado supreme court stated that the "owner of a priority for irrigation has no right, as against a junior appropriator, to waste it."<sup>75</sup> Further, the court recognized that many early decrees had been excessive in quantity relative to the amount of water needed for irrigation under contemporaneous practices:

It is well known that since the entry of the early decrees in this state, the old irrigated lands require less water, and improvements in the construction of ditches, and more scientific methods of irrigation, have made possible a greater saving of water....<sup>76</sup>

It thus became the "unquestioned law of this state" that a senior appropriator

may use the quantity awarded only when good irrigation usage justifies it, and when the needs of the land are satisfied, the water must no longer be used by him, but must be permitted to flow uninterruptedly in the natural channel of the stream.<sup>77</sup>

The court also made clear that the time of usage, not just the quantity, of the lawful diversion was also "measured by the reasonable needs of the land."<sup>78</sup> When the water is not "so needed, it may no longer rightfully be diverted from the stream, but must be left therein for use of subsequent appropriators."<sup>79</sup> In short, "[r]egardless of the quantity specified in a decree, the amount of water actually applied to beneficial use defines the full extent of the water right."<sup>80</sup>

This concept was also reflected in the court's statement that "into every decree must be read a provision that only so much water is to be used as is necessary; that a decree for an excessive amount does not authorize waste or excessive use."<sup>81</sup> Finally, as



in other western states, a decree for a water right in Colorado does not provide the holder with an ownership interest in an absolute quantity of flow:

It is elementary that the waters of the public streams of this state belong to the people, and that appropriators acquire only a right of use. It is also settled law that an appropriator is limited in his use of water to his actual needs. He must not waste it....<sup>82</sup>

With Colorado cases filled with strong words (though little action) regarding waste of water, the blueprint for change is clearly in place in the state. The preceding court decisions establish that the Prior Appropriation Doctrine will not prevent reductions of excessive water rights when such reductions are reasonably undertaken by state officials in light of current needs and practices. Although officials cannot deem the wasted diversions as being forfeited (since no such forfeiture statute exists in Colorado), the blueprint for promoting efficiency is nonetheless available under the laws of the state. Section 37-92-502(2) of the Colorado Revised Statutes provides a powerful tool with which to eliminate wasteful practices:

Each division engineer shall order the total or partial discontinuance of any diversion in his division to the extent the water being diverted is not necessary for application to a beneficial use....

This statute provides the state not only with the power to prohibit waste, but with the affirmative duty to ensure that water is being properly utilized. Nevertheless, the Division Engineers have not enforced this provision to reduce the amount of excess water being diverted under outdated decrees. As they well know, such a move would meet with firm resistance from irrigators, with the battle soon spilling into the courtrooms.

In light of the historic view of the Colorado supreme court regarding waste of water, the state would likely prevail if it began administering water in a manner that reduced unnecessary waste. This conclusion is further bolstered by an additional tool recently made available to the state in its effort to effectively manage Colorado's waters--the Doctrine of Maximum Utilization.

C. The Doctrine of Maximum Utilization

As administration of water approaches its second century the curtain is opening upon the new drama of maximum utilization and how constitutionally that doctrine can be integrated into the law of vested rights. We have known for a long time that the doctrine was lurking in the backstage shadows as a result of the accepted, though oft violated, principle that the right to water does not give the right to waste it.<sup>83</sup>

This statement, made by the Colorado supreme court in the 1968 Fellhauer case, coined the term "maximum utilization" as being an integral component of water policy in the state. The passage has been quoted on several subsequent occasions, reflecting the fact that "it is implicit in our Constitution that there be maximum utilization of our state's scarce water resources."<sup>84</sup> The Colorado legislature likewise picked up on this theme and in the Water Right Determination and Administration Act of 1969, mandated that surface and ground waters be administered "in such a way as to maximize the beneficial use of all of the waters of this state."<sup>85</sup> This need was further codified in Section 37-92-501.5 in 1977:

[T]he state engineer and division engineers shall exercise the broadest latitude possible in the administration of waters...to allow continuance of existing uses and to assure maximum beneficial utilization of the waters of this state.<sup>86</sup>

In discussing the doctrine of maximum utilization, the Colorado supreme court has recognized that such a concept is flexible, and evolves along with advances in conservation methods and other technological developments. As scientific understanding progresses, so too does the potential expand for managing the state's waters in accordance with the policy of maximum utilization:

In Fellhauer, we attempted to sound the note of a new era in the utilization and optimal use of water. It appears to us that the General Assembly reacted favorably to that attempt and in turn sought to promote in detail the general thought of Fellhauer.... By the same token, further research and testing will not only result in correction of past mistakes, but also will lead us closer to the goal of minimal waste of water.<sup>87</sup>

The court has also made reference to its "dreams and hopes that future technology would provide new methods under the doctrine of maximum utilization."<sup>88</sup> Further, strict adherence to traditional views of the prior appropriation system has been recognized as running counter to the need to accommodate improvements utilizing limited waters. In 1979, the court found that a common protection afforded prior appropriations (the right to have senior water available in both the necessary quantity and condition) was contrary, in this particular case, to the need for maximum utilization of limited water resources.<sup>89</sup> Maintenance of the historic condition of a senior water right was made subordinate to a junior user's storage reservoir based on

the policy of this state that there should be maximum utilization of water and that the maximum utilization doctrine be integrated into the law of vested rights. Without the storage of water, the use thereof cannot be maximized.<sup>90</sup>

The court has also recognized that strict adherence to prior appropriation in allocating water between private users frequently runs counter to wise management--and that accommodations must be made in the system to enable users to optimize their use of limited supplies:

Informal exchanges and mutual accommodations by owners of water rights occur frequently in response to changes in water levels, weather patterns and crop needs to permit maximum utilization of this critical resource. In view of these necessary practices, the adoption of mutually agreeable rotation systems by the owners of water rights cannot be deemed conclusive proof of either the creation or the abandonment of particular ownership rights. Any such legal presumption would discourage that spirit of cooperation and mutual concern which is essential to the maximum beneficial use of available water.<sup>91</sup>

In 1983, these ideas grew to full form in the landmark decision of Alamosa - La Jara Water Users Protection Association v. Gould.<sup>92</sup> In this case, the Colorado supreme court reviewed the rules promulgated by the State Engineer to administer junior wells in the Rio Grande basin. These wells pumped ground water that was tributary to overappropriated rivers and streams, thereby resulting in injury to senior surface rights. In drafting the rules, the state engineer had concluded that "the priority system governs water

allocation and that junior water rights from whatever source are not entitled to divert water that otherwise would be available for use by senior water rights."<sup>93</sup> Consequently, the rules mandated the curtailment of junior well pumping to the extent that it impacted senior surface rights.

The supreme court disagreed with the State Engineer's conclusions, and refused to affirm the proposed rules. The court recognized that in the Rio Grande basin, protection of surface water rights from the impact of junior well pumping could result in an inability to tap vast underground sources of precious water. Such a result, caused by a traditional interpretation of prior appropriation, was found to run contrary to the idea of utilizing the state's water resources to their fullest extent. After discussing the importance of maximum utilization, the court stated:

The prior appropriation doctrine is not a legal barrier to the concurrent consideration of the state engineer of the various methods of implementing the state policy of maximum utilization....<sup>94</sup>

The court went on to state that historic surface diversions from rivers may now be unreasonable if their perpetuation prohibits others from tapping into a vast underground supply. Under such circumstances, "surface stream appropriators may be required to withdraw

underground water tributary to the stream in order to satisfy their surface appropriations."<sup>95</sup> In this way, the basin's surface and ground water resources could be fully tapped, thereby promoting the policy of maximum utilization.

This notion that senior surface diverters may be compelled to drill wells in order to obtain their water right diverges significantly from traditional concepts of prior appropriation. The court, however, did not dictate this specific scenario. Rather, it remanded the rules to the State Engineer with instructions to consider this and other alternatives for achieving maximum utilization of the basin's water resources.<sup>96</sup>

D. Maximizing Future Water Utilization in Colorado

It is clear that Colorado is at a crossroads in its management and use of limited water resources. It is not so certain, however, how the move to maximum utilization will be implemented. Legislators, judges, conservancy districts, the State Engineer, and individual water users each hold the potential to promote conservation and efficiency. Who will take action, and when, remains to be seen.

One option is for the Division Engineers, on their own initiative or upon the direction of the State Engineer, to begin enforcing Section 37-92-502(2) of the Colorado Revised Statutes. This would involve

identifying blatantly wasteful users and regulating their headgates to eliminate diversions "to the extent the water being diverted is not necessary for application to a beneficial use."<sup>97</sup>

Such a mechanism for promoting conservation, however, is fraught with practical problems. Irrigators would no doubt react vociferously if suddenly the local Water Commissioner began regulating their headgates in a manner that prevented them from getting their decreed, though wasteful, water rights. Such a move would only exacerbate the difficulties already facing Water Commissioners in the field--difficulties highlighted by the fact that the State Engineer recently requested an opinion from the Attorney General regarding whether Commissioners could carry guns while on duty.<sup>98</sup>

Another option is for a junior water user to initiate the process to promote efficient use. Such a user, who is traditionally shut off during shortfalls and who believes that a wasteful senior right is diverting more water than is beneficially used, could file a mandamus-type action to require the Division Engineer to curtail the wasteful diversion under Section 37-92-502(2).

Colorado water judges are also in a position to promote efficiency. In decreeing new appropriations,



they can ensure that the quantity and method of use is consistent with the concept of maximum utilization, not merely reflecting customary practices of the past century. The potential for water judges to promote efficiency in Colorado is somewhat limited, however, due to the fact that very little water is available for new appropriations, and that senior rights do not automatically come before the court for periodic review.

Board members of water conservancy districts and other water allocation entities can also choose to promote efficiency among their users. Although reallocating water to reflect waste savings and efficiency would be controversial, a Board might determine that it is best for the District to undertake some form of mandatory or voluntary conservation program.

Even though various boards, individuals, and officials can play important roles in the process, it is ultimately in the legislative arena where a comprehensive program for water conservation must be formulated. Piecemeal litigation and administrative enforcement lead to unfair burdens on a few individuals and do not fully address the statewide problems associated with excessive water diversions. Legislation is needed in order to encourage the marketing and

transfer of salvaged water, to ease the economic burden on irrigators of system modernization, to eliminate practices suited only to a 19th Century era of exploitation, and to generally raise Colorado water law and use into the modern scheme of wise resource management.

Conservation legislation can take many forms ranging from systems of reward to imposition of penalties. Also, new measures can be designed to encourage conservation both through the workings of the free market system as well as through regulation.

Whatever the path taken, decisionmakers will encounter many difficult judgments and tradeoffs. Should a forfeiture statute be enacted to allow the water courts to reduce the level of decreed senior rights that are using their diversions wastefully? Should a user fee be charged for each acre foot of diversion in order to fund water programs and to encourage efficient use of water? Should the watering of blue grass on private lawns be deemed a nonbeneficial use of precious water in this arid state? And how can an equitable process be designed to allow senior water users to benefit from their conservation and salvage efforts?<sup>99</sup>

These and other questions will face legislators as they ponder the need for comprehensive water management. Furthermore, such questions must not be viewed simply in a vacuum of maximizing utilization of water. The Colorado supreme court has recognized that the "policy of maximizing beneficial and integrated use of surface and subsurface water must be implemented with a sensitivity to the effect on other resources."<sup>100</sup>

[E]fficacious use does not mean uplifting one natural resource to the detriment of another. The waters of Colorado belong to the people, but so does the land. There must be a balancing effect, and the elements of water and land must be used in harmony to the maximum feasible use of both.<sup>101</sup>

Finally, this necessary balancing "can only be achieved with proper regard for all significant factors, including environmental and economic concerns."<sup>102</sup>

The task ahead is indeed difficult. Legislation for promoting water conservation will require innovative ideas, extensive dialogue, and cooperation between competing interest groups. It will demand that antiquated notions about water be set aside in order to allow management of this precious resource in accordance with modern needs. Coloradans have begun making this shift in the field of energy conservation. Likewise, our habits are adapting to the need for

recycling important metals. And in the high country, antiquated timber practices have given way to harvesting and replanting techniques consistent with wise resource management. The time has arrived where water must also take its rightful place in a comprehensive framework of resource management and conservation.

## FOOTNOTES

1. Irwin v. Phillips, 5 Cal. 140 (1855); Coffin v. Left Hand Ditch Co., 6 Colo. 443 (1882).

2. U.S. Geological Survey Circular 1001, Estimated Use of Water in the United States in 1980 (Alexandria, Virginia: U.S. Geological Survey, 1983).

3. Interagency Task Force, U.S. Dep't of the Interior, U.S. Dep't of Agriculture & U.S. Env'tl. Protection Agency, Irrigation Water Use and Management 22 (1979).

4. Kruse & Heermann, "Implications of Irrigation System Efficiencies," 32 J. Soil & Water Conservation 265, 268 (1977).

5. Colo. Rev. Stat. §37-92-102(3) (Cum. Supp. 1984); Colo. Rev. Stat. §37-92-103(4) (1973); Or. Rev. Stat. §536.325 (1983); Wash. Rev. Code Ann. §90.22.010 (Cum. Supp. 1985).

6. This can also create higher treatment costs for municipal and industrial dischargers. Whereas secondary treatment of sewage may be adequate to prevent high contaminant levels in the receiving waters under regular flow conditions, tertiary treatment may be required if the flows are diminished by upstream diversions.

7. The Forest Service has recently claimed reserved rights to instream flows in a quantity sufficient to transport sediment downstream and thereby maintain the natural stream channel. (See Shupe, "Reserved Instream Flow Rights in the National Forests--Round 2," WNRL Digest, Commentary--Spring 1985.) The need for instream flows to protect stream channels has also resulted in a court ruling upholding the denial of a permit for a reservoir that would deplete flow in the South Platte River, which in turn might allow vegetation to encroach upon the natural stream channel. Such encroachment was found to potentially threaten the whooping crane, in contravention of the Endangered Species Act. Riverside Irrigation District v. Andrews, 758 F.2d 508 (10th Cir. 1985).

8. Holburt, "Salinity Control Needs in the Colorado River Basin," Proceedings of the National Conference on Managing Irrigated Agriculture to Improve Water Quality 21 (May 16-18, 1972).

9. Office of Research and Development, U.S. Env't'l Protection Agency, *Minimizing Salt in Return Flow Through Irrigation Management 1* (1977).

10. Holburt, supra note 8, at 22.

11. Skogerboe & Walker, "Salinity Control Measures in the Grand Valley," *Proceedings of the National Conference on Managing Irrigated Agriculture to Improve Water Quality* 134-135 (May 16-18, 1972).

12. Id.

13. D. Bosworth & A. Foster, *Approved Practices in Soil Conservation* 379-80 (1982).

14. Carter, "Irrigation Return Flows in Southern Idaho," *Proceedings of the National Conference on Managing Irrigated Agriculture to Improve Water Quality* 53 (May 16-18, 1972).

15. Carlile, "Sediment Control in Yakima Valley," *Proceedings of the National Conference on Managing Irrigated Agriculture to Improve Water Quality* 81 (May 16-18, 1972).

16. Id. at 77.

17. Interagency Task Force, supra note 3, at 101-102.

18. "Many studies have shown that in most irrigated areas the amount of water applied and the timing of this water application are quite random. For example, oftentimes when the farmer finds that his field is dry, he will irrigate, but the irrigation application may be more than is really needed by the crop. Thus two-fold problem occurs where the plant has already been stressed because of the field being too dry, which means that the yield has already been reduced. The second problem is due to more water being applied than was really necessary. In extreme cases, this might even lead to a problem of reduced aeration in the soil." Bennet and Taylor, "Irrigation Scheduling Studies for Water Quality Improvement," *Proceedings of the National Conference on Managing Irrigated Agriculture to Improve Water Quality* 195 (May 16-18, 1972). See also Heerman, "Irrigation Scheduling," *Operations Research in Agriculture and Water Resources*, North-Publishing Co. (1980); Richardson, "Saving Water from the Ground Up--A Pilot Study of Irrigation Scheduling on Four California Fields," *INFORM*, Inc. (1985).

19. U.S. Technical Work Group for the Interagency Task Force on Irrigation Efficiencies, Irrigation Water Use and Management at glossary 1-5 (June 1978 review draft), cited in Pring & Tomb, "License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West," 25 Rocky Mtn. Min. L. Inst. art. 25, at 4 (1979).

20. Interagency Task Force, supra note 3, at ix.

21. This is a federally funded program, called the Closed Basin Project, consisting of a series of wells and channels that convey ground water from the Closed Basin back to the Rio Grande.

22. Elmore v. Imperial Irrigation Dist., 159 Cal. App. 3d 185, 205 Cal. Rptr. 433 (1984); In re Alleged Waste and Unreasonable Use of Water by Imperial Irrigation Dist., California State Water Resources Control Board, Decision 1600 (June 1984). See also notes 63-67 and accompanying text infra.

23. Although markets for water vary in different regions and from year to year, in some water short areas a reliable acre-foot of annual consumptive supply generally sells for several thousands of dollars (e.g. transmountain water from the Colorado River transported to the Arkansas basin via the Fryingpan-Arkansas project).

24. 458 U.S. 941 (1982).

25. Id. at 954.

26. Id. at 954-955.

27. Id. at 953-57.

28. Id. at 957-58.

29. Id. at 958.

30. 459 U.S. 176 (1982).

31. Equitable Apportionment is the doctrine created by the Supreme Court to guide its decisions regarding interstate allocation of limited waters. It is based on no specific precepts other than fairness, and adapts to the particular facts of the case. It calls for "the exercise of an informed judgment on a consideration of many factors to secure a 'just and equitable' allocation" of water between the competing states. Id. at 183.

32. Id. at 184.
33. Id. at 186.
34. Colorado v. New Mexico II, 104 S. Ct. 2433 (1984).
35. Id. at 2440.
36. 3 Ariz. App. 28, 411 P.2d 201 (1966).
37. Id. at 30-31, 411 P.2d at 203-204.
38. Okla. Stat. Ann. tit. 82, §105.22 (West Supp. 1984-85).
39. Nev. Rev. Stat. §533.040 (1983); S.D. Codified Laws Ann. §§46-5-33 to -35 (1983).
40. Dickenson, "Installation of Water Saving Devices as a Means of Enlarging an Appropriative Right to Use of Water," 2 Nat. Resources Law. 272, 285 (1969).
41. See, e.g., Farmers Highline Canal & Reservoir Co. v. City of Golden, 129 Colo. 575, 272 P.2d 629 (1954); Jones v. Warm Springs Irrigation Dist., 162 Or. 186, 91 P.2d 542 (1939); Crafts v. Hansen, 667 P.2d 1068 (Utah 1983); Thayer v. City of Rawlins, 594 P.2d 951 (Wyo. 1979).
42. See Basin Elec. Power Coop. v. State Bd. of Control, 578 P.2d 557 (Wyo. 1978).
43. Hidden Springs Trout Ranch, Inc. v. Hagerman Water Users, Inc., 101 Idaho 677, 680-681, 619 P.2d 1130, 1133-1134 (1980).
44. See Tongue Creek Orchard Co. v. Town of Orchard City, 131 Colo. 177, 280 P.2d 426 (1955); Binning v. Miller, 55 Wyo. 451 102 P.2d 54 (1940).
45. See Benson v. Burgess, 192 Colo. 556, 561 P.2d 11 (1977); Fuss v. Franks, 610 P.2d 17 (Wyo. 1980).
46. 135 Neb. 827, 284 N.W. 326 (1939).
47. Id. at 836, 284 N.W. at 331.
48. Shupe, "Waste in Western Water Law: A Blueprint for Change," 61 Or. L. Rev. 483, 492-501 (1982).



49. Id. at 484.

50. Or. Rev. Stat. §540.610 (1983). See also Kaiser Steel Corp. v. W.S. Ranch Co., 81 N.M. 414, 417, 467 P.2d 986, 989 (1970); Gossner v. Utah Power and Light, 612 P.2d 337, 341 (Utah 1980); Ariz. Rev. Stat Ann. §45-131 (B) (Cum. Supp. 1984-1985); Nev. Rev. Stat. §533.035 (1983); N.D. Cent. Code §61-04-01.2 (Supp. 1983); S.D. Codified Laws Ann. §46-1-8 (1983); Wyo. Stat. §41-3-101 (1977).

51. Hough v. Porter, 51 Or. 318, 95 P. 732, modified, 51 Or. 318, 420, 98 P. 1083, 1102 (1908), aff'd on rehearing, 51 Or. 318, 102 P. 728 (1909).

52. Warner Valley Stock Co. v. Lynch, 215 Or. 523, 536, 336 P.2d 884, 890 (1959).

53. See, e.g., Tudor v. Jaca, 178 Or. 126, 164 P.2d 680 (1945); Broughton v. Stricklin, 146 Or. 259, 28 P.2d 219 (1933).

54. In re Willow Creek, 74 Or. 592, 647, 144 P. 505, 523 (1914), modified, 74 Or. 592, 146 P. 475 (1915). See also Enlarged Southside Irrigation Ditch Co. v. John's Flood Ditch Co., 120 Colo. 423, 210 P.2d 982 (1949); Baker v. City of Pueblo, 87 Colo. 489, 289 P. 603 (1930).

55. In re Water Rights of Escalante Valley Drainage Area, 10 Utah 2d 77, 81, 348 P.2d 679, 682 (1960).

56. Doherty v. Pratt, 34 Nev. 343, 124 P. 574 (1912).

57. In re Water Rights in Silvies River, 115 Or. 27, 44, 237 P. 322, 328 (1925), modified, 122 Or. 47, 257 P. 693 (1927).

58. Erickson v. Queen Valley Ranch Co., 22 Cal. App. 3d 578, 585, 99 Cal. Rptr. 446, 450 (1971).

59. N.D. Cent. Code §61-04-23 (Supp. 1983).

60. Alaska Stat. §46.15.140(b) (1982); Ariz. Rev. Stat. Ann. §45-131(B)-(C) (Cum. Supp. 1984-1985); Cal. Water Code §1241 (Cum. Supp. 1985); Idaho Code §42-222(2) (Cum. Supp. 1985); Kan. Stat. Ann. §82a-718 (1984); Neb. Rev. Stat. §46-229 (1984); Nev. Rev. Stat. §533.060(1)-(2) (1983); N.M. Stat Ann. §72-5-28 and §72-12-8 (Cum. Supp. 1984); Okla. Stat. Ann. tit. 82 §105.17 (West Cum. Supp. 1984-1985); Or. Rev. Stat. §540.610 (1983); S.D. Codified

Laws Ann. §46-5-37 (1983); Tex. Water Code Ann. §11.030 (Cum. Supp. 1985); Utah Code Ann. §73-1-4 (1980); Wash. Rev. Code Ann. §90.14.160 (Cum. Supp. 1985); Wyo. Stat. §41-3-401 (1977).

61. State v. McLean, 62 N.M. 264, 308 P.2d 983 (1957).

62. Crandall v. Water Resources Dep't, 290 Or. 771, 626 P.2d 877 (1981).

63. In re Alleged Waste and Unreasonable Use of Water by Imperial Irrigation Dist., California State Water Resources Control Board, Decision 1600 (June 1984).

64. Id. at 15-16.

65. Id. at 28.

66. Id. at 23 (quoting Tulare Irrigation Dist. v. Lindsay-Strathmore Irrigation Dist., 3 Cal. 2d 489, 567, 45 P.2d 972, 1007 (1935)).

67. Id. at 29.

68. Colo. Rev. Stat. §37-92-401 et seq. (1973 & Cum. Supp. 1984).

69. Colo. Rev. Stat. §37-92-401(1)(a) (Cum. Supp. 1984).

70. Cache La Poudre Irrigating Co. v. Larimer & Weld Reservoir Co., 25 Colo. 144, 150, 53 P. 318, 320 (1898).

71. Combs v. Agricultural Ditch Co., 17 Colo. 146, 153-154, 28 P. 966, 968 (1892).

72. XY Irrigating Ditch Co. v. Buffalo Creek Irrigating Co., 25 Colo. 529, 530-31, 55 P. 720, 721 (1898).

73. Town of Sterling v. Pawnee Ditch Extension Co., 42 Colo. 421, 430, 94 P. 339, 341 (1908).

74. Combs, 17 Colo. at 152, 28 P. at 968.

75. Enlarged Southside Irrigation Ditch Co. v. John's Flood Ditch Co., 116 Colo. 580, 586, 183 P.2d 552, 554 (1947).

76. New-Brantner Extension Ditch Co. v. Kramer, 66 Colo. 429, 436, 182 P. 17, 20 (1919).

77. Baker v. City of Pueblo, 87 Colo. 489, 494, 289 P. 603, 605 (1930).

78. Enlarged Southside Irrigation Ditch Co. v. John's Flood Ditch Co., 120 Colo. 423, 428, 210 P.2d 982, 985 (1949).

79. Id. at 428-429, 210 P.2d at 985.

80. Thompson v. Colorado Ground Water Comm'n, 194 Colo. 489, 497, 575 P.2d 372, 378 (1978).

81. Hoehne Ditch Co. v. Martinez, 71 Colo. 428, 430, 207 P. 859, 860 (1922).

82. Pulaski Irrigating Ditch Co. v. City of Trinidad, 70 Colo. 565, 568, 203 P. 681, 682 (1922).

83. Fellhauer v. People, 167 Colo. 320, 336, 447 P.2d 986, 994 (1969).

84. City of Thornton v. Farmers Reservoir and Irrigation Co., 194 Colo. 526, 542, 575 P.2d 382, 394 (1978) (Erickson, J., dissenting).

85. Colo. Rev. Stat. §37-92-102(1)(a) (Cum. Supp. 1984).

86. Colo. Rev. Stat. §37-92-501.5 (Cum. Supp. 1984).

87. Kuiper v. Well Owners Conservation Ass'n, 176 Colo. 119, 149-150, 490 P.2d 268, 283 (1971).

88. Kelly Ranch v. Southeastern Colorado Water Conservancy Dist., 191 Colo. 65, 74, 550 P.2d 297, 304 (1976).

89. See A-B Cattle Co. v. United States, 196 Colo. 539, 589 P.2d 57 (1979).

90. Id. at 545, 589 P.2d at 61.

91. Bagwell v. V-Heart Ranch, Inc., 690 P.2d 1271, 1275 (Colo. 1984).

92. 674 P.2d 914 (Colo. 1984).

93. Id. at 932.

94. Id. at 934.

95. Id. at 935.

96. The State Engineer has not yet proposed new rules. Rather, he has initiated a process whereby the area's water users meet to assist him in discussing options for regulating surface and ground water in a manner to maximize utilization.

97. Colo. Rev. Stat. §37-92-502(2) (Cum. Supp. 1984).

98. The response was made in an informal memo to the State Engineer in 1985, and was not published as an Attorney General's Opinion.

99. The Colorado Legislature has twice addressed means for allowing water salvagers to benefit from their efforts, but has failed to act in favor of the proposed legislation. See Senate Bill 95, 55th General Assembly, 1st Session (1985); Senate Bill 161, 54th General Assembly, 2nd Session (1984).

100. R.J.A., Inc. v. Water Users Ass'n of Dist. No. 6, 690 P.2d 823, 828 (1984).

101. Southeastern Colorado Water Conservancy Dist. v. Shelton Farms, Inc., 187 Colo. 181, 191, 529 P.2d 1321, 1327 (1975). A recently introduced legislative proposal was designed to promote this balancing between water and land resources. House Bill 1266, introduced in 1985, proposed that when water is transferred away from an irrigation right, "the landowner shall take steps during the year preceding the loss of the water to establish a permanent vegetative cover or to establish a dryland crop cover appropriate to the area." The bill passed the House but did not get out of committee in the Senate.

102. Alamosa-La Jara Water Users Protection Ass'n, 674 P.2d at 935.

## APPENDIX

A SCENARIO FOR DISCUSSION: A Legislative Package for Promoting  
Water Use Efficiency in Colorado

I. ESTABLISH OFFICE OF WATER CONSERVATION

Composition: 3-person Board; Director and small staff in  
Denver; Local Conservation Engineer in each  
of the seven water divisions.

Functions:

- Sponsor research and educational activities on water conservation
- Local Conservation Engineers provide technical assistance for improving irrigation efficiency
- Determine salvage credits (see II below)
- Implement procedures for waste forfeiture (see III below)
- Administer grants and subsidies for upgrading inefficient water use systems (see IV below)

II. ALLOW FOR MARKETING OF SALVAGED WATER

Purpose: To allow irrigators to market or use salvaged water that was formerly consumptively wasted in their operation.

Procedure:

- Application to Local Conservation Engineer for salvage credit; burden of proof on applicant.
- Publication in monthly resume and opportunity for objectors to submit written opinions and data.
- Office of Water Conservation (OWC) makes finding as to amount of salvage credit and submits to Water Court.
- Water Court decrees salvage credit after period for protest. If protested, the OWC finding carries an administrative presumption of validity.

### III. CREATE PROCEDURE FOR FORFEITING WASTED WATER

Purpose: To phase out the wasting of water where technically and economically feasible.

Elements of the Forfeiture Procedure:

- 3 years of "non-beneficial use"; followed by
- Notice from the Local Water Engineer of the amount of the water right that is considered as being non-beneficially used and subject to forfeiture; followed by
- A two-year waiting period in which the water rights holder can market the consumptive portion of the wasted water (pursuant to II above); followed by
- Water Court proceedings to determine the amount forfeited under the "non-beneficial use" standard (burden of persuasion on the OWC).
- "Non-beneficial use" is tied to the ability of the irrigator to afford improved efficiency (i.e. water rights holders cannot be compelled to improve their systems beyond their economic reach).

### IV. CREATE BOTH POSITIVE AND NEGATIVE ECONOMIC INCENTIVES

- Increase irrigators' "economic reach" by providing for subsidies and tax breaks associated with system modernization.
- Raise funds and encourage conservation through:
  - a) a users charge for each acre-foot of water diverted for municipal and industrial purposes.
  - b) a fee on each acre-foot of irrigation water applied in excess of 4 af/acre.