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# WATER PROBLEMS AND PROPERTY RIGHTS— AN ECONOMIC PERSPECTIVE

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## INTRODUCTION

The purpose of this paper is to raise significant property rights questions with respect to water that bear on solutions to water resource problems. In order to raise these questions, water resource problems must first be identified. Problems, as well as their solutions, are largely subjective. Perception of problem areas determines which property rights questions are relevant as well as which solution among the possible alternative solutions is appropriate. There are few objectively right or wrong property right laws.

Water resource problems may generally be placed into two major classes—policy issues and technical program details. Economics can provide some useful insights for certain policy issues but generates no clear-cut answers. For example, economics can provide information with respect to the benefits and costs associated with the inclusion or exclusion of certain subgoals and can speak directly to some goal dimensions that fall within the economic sphere. Once policy issues are decided, economics can make a more direct contribution to the solution of water problems. If it is concluded that efficiency of use is a subgoal, then economics can state what conditions must hold in order to achieve that efficiency and something about the cost of achieving it.

This paper will set forth an economic perspective of principal water problems along with a discussion of property right questions that are relevant for the defined problems. This will be followed by a summary of current property rights arrangements for water. Finally, alternative approaches to the solution of the problems will be discussed along with some elements of the costs of achieving the solutions.

## DEFINITION OF WATER PROBLEMS

There is no one set of “relevant” water problems. For purposes of this paper, the scope of problems will be limited to those that fall within the purview of economics. A basic concern is one of economic

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efficiency in the development and use of the water resource. If efficiency is achieved, a maximum social value of goods and services will flow from a given quantity of water or the cost of achieving a given mix of goods and services will be minimized. A related problem concerns the impact of the allocation of water on the distribution of wealth and income. The efficiency and distribution problems can be viewed and discussed in terms of supply and demand for water.

The basic economic problem is one of scarcity, when the demand for water is high relative to its supply. When supply and demand are not balanced, the problem can be attacked from either the supply or the demand side. Supply can be increased to meet demand, or demand can be constrained so that it is limited to the available supply. An engineering solution, i.e., build whatever structures are necessary to meet water needs, has traditionally been viewed as *the* solution. This approach presumably stems from the observations that there are large quantities of undeveloped water and that technology for impounding and transporting large quantities of water exists and from the view that since many classes of water use stem from a natural "need" rather than economic demand, they should be met almost regardless of cost. When new supplies are developed, the costs are often widely dispersed and not obvious. Further, it is usually recognized that if new water is developed, there is no need to face the hard problem of allocating the scarce supply among competing users. When the supply is not adequate to meet all needs the costs are direct and obvious.

Over time, the cost of developing new sources of supply increased substantially as relatively cheap sources were tapped. This eventually led to a concern for efficiency in the design of water resource systems, the economics of project evaluation, and efficiency in government organization for water development. Now, as the cost of developing new supplies to meet all expressed needs continues to increase, more attention is given to attacking the problem from the demand side. The problem becomes one of reallocating the developed supplies of water from low value uses to high value uses. For example, if the value of a unit of water in use *A* is \$5, and the cost of developing a unit of new supply to nearby use *B* is \$10, then from an efficiency perspective, society is unnecessarily committing \$5 to water development. It would be more efficient to transfer the unit of water from use *A* to use *B*.

The allocation problem would be solved automatically if water were bought and sold within a market structure (if certain conditions held). The resulting allocation would generate a maximum social value of water. Many past economic studies of water resource prob-

lems contrasted the theoretically necessary conditions for optimum allocation with elements in the existing water industry and concluded that there was a need to develop a market for water similar to the market for other inputs and products. These economic prescriptions have had little impact. A principal reason is that these studies usually assumed that the overriding factor in water policy is economic efficiency. In addition, they often neglected problems created by the existence of external effects, nonmarket values, collective goods and common property. These factors are assumed away in the traditional economic model. Finally, those who draw up a plan for change often give little attention to the magnitude and incidence of the economic and noneconomic costs associated with implementing change. The focus is on a desired end, and the means used to get there are ignored.

In summary, from an economic point of view, efficient use is a major contemporary water problem. Efficient use of water depends on a mechanism for allocation or transfer. This mechanism should allocate water resources between alternative users and over time in such a way that an equal value from the marginal units of all uses is obtained. The way water is allocated affects the quantity and mix of goods and services produced by a society and the distribution of wealth among members of society. Thus, determination of the "best" water property rights system depends on the relative desirability of the distributional impacts of other native property rights systems.

### PROPERTY RIGHT ISSUES

Before specific property right questions are raised, it will be instructive to look briefly at the general nature of the institution of property as it relates to economics.

#### *Property Rights in Economics*

Although economics has traditionally abstracted from the complexity of property rights, such rights constitute a fundamental underpinning of economic activity. Property rights confer a capacity to participate in economic decisionmaking and activity. This capacity is defined in terms of relative rights over inputs and outputs as well as coercive power over others to reap benefits and impose the burden of costs. The person-resource dimension of property rights is a common but less useful notion than the person-person relationship. The latter focuses on the relative position of one right holder vis-a-vis others in a system of interrelationships. It is a system of reciprocal

capacities of interacting individuals. There is a systematic, but by no means uniform or static, relationship between the capacity conferred by property rights and economic decisions. This systematic interaction provides a basis for a market. Thus market activities evolve from and function within the institution of property rights. In turn, property rights directly affect economic outcome, *i.e.*, the pattern of resource use, the quantity and mix of goods and services produced, and the associated distribution of income and wealth. However, it should not be concluded that property rights *determine* economic outcome because the latter can influence the configuration of property rights. Property rights are not an immutable given (even though in the case of water the structure of property rights has not changed significantly over a considerable period of time). The institution of property is an instrument of man designed to facilitate the accomplishment of certain ends. Thus, property rights are subject to change by man. Government is the machinery through which change is achieved. Any question of a change, creation or abolition of a property right must therefore include people, their motivation for change, the government entity with jurisdiction, and the people's ability to exert pressure on that entity.

A system of property rights for water is really an intelligence system. Property rights confer upon individuals duties to and rights over resources and other individuals. Property rights convey rights to capture the benefits associated with resource use or disposition and the duty to bear the burden of certain obligations and costs.

Many contemporary water problems can be linked to the fact that the existing system of property rights in water does not include the right to appropriate the benefits a right holder may provide to others, defined as external benefits, or the duty to bear the burden of the costs a water user may impose on others, defined as external costs. The solution to these problems is impeded by the high cost of identifying, quantifying, and developing a mechanism for assigning the liability for external costs and providing for the appropriation of external benefits.

A system of property rights in water may contain many problems of external effects because of water's physical characteristics. Because water flows through space, use at one point may affect uses at other points. Because water molecules commingle, use at a given point may affect other uses at the same point, and because water is a universal carrier, there may be synergetic effects. There is also a general mobility of the goods and services produced from water as well as mobility of the people that consume them. These physical

and economic interactions make problem solutions extremely difficult.

### CURRENT PROPERTY RIGHT ARRANGEMENTS FOR WATER

This section will briefly summarize principle water rights doctrines, the general nature of property rights in water, and certain property right dimensions that are directly relevant to water allocation and use.

In the given space it is not possible to develop even a summary picture of existing property rights in water. The subject is very complex, and although underlying themes exist, there is considerable variation in those themes between jurisdictions. Only a bare-boned skeleton will be presented. This paper will merely introduce the subject of property rights in water. The water code, administrative rules and regulations, and court decisions for a particular jurisdiction will give specifics.

#### *Principal Property Right Doctrines*

Two major surface water rights systems are recognized in the United States—riparian and appropriative. The former is generally found in the Eastern states and the latter (or a combination of the two) in the Western states. As settlement moved westward, the Western states first adopted the riparian system, which was in existence in the more humid East. Over time, it became apparent that the riparian system was not particularly suited for arid conditions, and it was either replaced by the appropriative system, or the two were combined.

A riparian right exists by virtue of ownership of land bordering a natural stream or lake. The owner of such land is entitled to take water from that source for use upon that land. The riparian owners of land have a co-equal right in the water in the stream or lake. In contrast, an appropriative right is acquired by performing certain acts required by law. These acts may include filing an application to divert water with an appropriate state agency and actually taking water from the source and applying it to a beneficial use. The land to which the water is appropriated may be either adjacent to a source or located some distance from it. The appropriative right gives a specific quantity of water for a specific period of time for a specific use and place of use. The relative priority among holders of appropriative rights is usually determined by the date of application to appropriate the water.

In addition to riparian and appropriative rights to water, there are

in some jurisdictions two other classes of water rights. One is the correlative right, which relates to ground water. An individual who owns land over a body of percolating ground water, i.e., ground water moving slowly through the soil and not part of a definite underground stream, is entitled to withdraw the water for use upon his overlying land. The other right is the pueblo right. A city that is a successor to a Spanish or Mexican pueblo has the right to use a stream that flowed through the old pueblo.

### *Nature of Property Rights in Water*

A fundamental principle of the law of water courses is that the corpus of water in a natural water course is the property of no one. This absence of private ownership is variously expressed as one of "the negative community," "common," "public," or "the property of the state in trust for the people." The doctrine of public ownership of available water supply has been declared in many states and lays the foundation for state control over the management and use of water.

While water flowing in its natural channel is the property of the public, upon severance from the stream flow it generally becomes private property. That is, water lawfully diverted from its natural course and reduced to possession by means of artificial devices and put to a beneficial use on or in connection with land becomes the property of the appropriator or the riparian land owner. This right granted under the law is called a usufructuary right. The courts have held that this principle applies to both appropriators and riparians. The right of capture and use are "water rights." This usufructuary right is regarded and protected as property.

The ownership of the water which the diverter acquires is not unqualified; it may be subject to a condition of reasonable beneficial use. Thus, water use must be both beneficial in itself and reasonable in relation to other rights that attach to the same supply. Beneficial use is the basis, measure and the limit of the right to the use of water.

The right which an appropriator gains is a private property right subject to ownership and disposition like other kinds of private property. The right usually becomes appurtenant to the land upon which the water is used. An appropriative right is an interest in real property and it may be mortgaged as other realty. Similarly, the riparian right is a right of private property which is vested in the owner of riparian land. The right is a part of the realty. A water right may be protected by court proceedings against unlawful acts that infringe

upon it. This property right, like any other part of the realty, is subject to taking for public use under the power of eminent domain. (See Appendix)

#### PROPERTY RIGHT ISSUES IN WATER PROBLEMS

As stated above, a principle water problem from an economic perspective is one of efficiency in use. The fundamental issue in this problem is developing water allocation criteria and mechanisms for the initial acquisition of rights and their later transfer. Solutions to this water allocation issue are largely the result of an interaction of old water property right institutions and contemporary conditions.

The existing property right arrangements for water grew out of past needs. The rights and duties conveyed by property rights evolved during a period of abundant water. Formal rules arose in large part from a desire to create legal security for ongoing uses. Increased security presumably results in an increased incentive for development. Simple allocation and priority rules developed which were dominated by equity considerations, viz., co-equal rights for riparian land owners along a water course and temporal priority for rights acquired by appropriation. Allocative efficiency was often not a concern, since water was not a scarce resource.

The initial distribution of water became inefficient over time, since new uses were introduced and demand changed for the set of goods produced with the initial allocation. As demand for water increased the incentive to transfer water rights increased. The existing property right structure provides for a limited transfer of rights, but few transfers have occurred within the system. There are several possible explanations. The interrelatedness of water use makes it difficult to show that a transfer will not cause injury to others, a requirement under the appropriation doctrine. In addition, the status of the transferred as well as the initial right is usually uncertain. These and other factors create an incentive to acquire a new right via supply development rather than acquiring an old right.

The rationalization of the initial granting of rights and subsequent transfer of rights can lead to an increase in efficiency. This can be done by either increasing the effectiveness of the administrative allocation/transfer scheme or decreasing the cost of market-type transactions. The initial granting of rights is the first place to attack the problem. Even where water is relatively scarce, states generally continue to grant water rights to anyone who satisfies the administrative procedures. Since any appropriation is subject to all prior rights, this merely places the determination of how water will in fact be



allocated with the courts. Few economic criteria enter directly into this process. The issue of reallocation presents a more difficult problem. The physical interrelatedness of water means that the transfer of a water right from user *A* to *B* will generally affect many other users in addition to *A* and *B*. Thus a simple market structure whereby the buyer and seller can bargain and negotiate directly is not sufficient. It is necessary to determine who will be affected by the transfer, and the nature and the impact of the effect.

The following discussion briefly covers the principle allocation/transfer criteria found in existing water law. These include explicit and implicit criteria as they relate to the initial allocation of water and subsequent transfers.

*Beneficial Use:* An almost universal general declaration is that the application of water must be to a "beneficial" use. If the use ceases to be beneficial, the right ceases. This criterion permits the state to prevent waste and some particularly low value uses, such as eradicating pests. It may be considered a low order aggregate efficiency criterion.

*Use Preference:* In some states some classes of use have statutory preference over others. For the most part, preference is afforded those uses that meet the biological needs of man, livestock and crops. After this class of use, the preference base appears arbitrary. The desire to establish preference in water use is understandable, but it is impossible to develop a preference order that is rational in all situations, in all places, at all times. Thus, there are definite costs as well as benefits associated with the statutory preference scheme. The general co-equal right doctrine of riparian law serves to maximize a limited concept of equity at the expense of efficiency.

*Temporal Priority:* Under appropriation law, priority of use is established by date of application. Legal security is achieved at the expense of efficiency.

*Non-regulated Uses Over Regulated Uses:* In those jurisdictions with a permit system it is usual that certain domestic and livestock uses are exempted from complying with the statutory procedure. Since these classes of uses are not regulated, they have a priority over all other uses.

*Pre-permit Uses Over Permit Uses:* When a permit system is instituted, some jurisdictions exempt all or some portion of existing beneficial use from the new procedure. Others merely give riparian owners priority to perfect their rights. In both cases the established uses acquire priority over new uses.

*Priority With Respect to Source of Water:* This priority often stems from the failure fully to recognize the physical interdepen-

dence of water. For example, at a time of low flow a user who withdraws water from a well which is fed by a stream may enjoy a priority over a user who diverts water directly from the stream.

*Priority of Minimum or Base Flows Over Permit Uses:* Some jurisdictions permit the establishment of minimum flows for fish or wildlife, recreation or aesthetic purposes, or to maintain the ecological integrity of a stream. In times of scarcity these uses obviously have a priority over permit uses, since consumptive use must be terminated when the flow reaches the statutory minimum. The impact of minimum flow laws is dependent upon the criteria used to establish them. Without flexibility they impute an infinite value in times of water scarcity to the uses served by the minimum flow.

*Economic Consumptive Use Over Physical Consumptive Use:* Most jurisdictions use a physical concept of consumptive use. A consumptive use is defined as a use that reduces the physical quantity of water. Thus, consumptive uses are often more restricted than nonconsumptive uses. However, an economic concept of consumptive use is also relevant; a particular use may "use up" a certain characteristic of water, e.g., its ability to absorb heat or assimilate waste, without reducing the physical quantity of water. Under certain conditions, these dimensions of the resource may be as important as the quantity dimension. Failure to recognize this gives an implicit priority to economic consumptive uses over the physical consumptive uses.

*No Injury Proviso:* This lies at the heart of the interrelationship problem. Statutes generally provide that the user can change most dimensions of use (including sale or lease of the right to others) *if* the proposed change imposes no injury on others. Strictly construed, the no injury rule places an implicit infinite value on the rights of other users. This value has at least two dimensions—the value of water in productive use and the value of security of the right. Absolute protection of these values may well work to the economic detriment of right holders as well as the general public. The burden of reaching an optimum arrangement is placed on the new user; he must show no injury, a difficult and costly requirement, or he must forego the contemplated use. The reciprocal nature of property rights is clear here, for in a real sense the initial holders of rights are permitted to injure newcomers.

#### ALTERNATIVE APPROACHES TO THE SOLUTION OF PROBLEMS

There may be disagreement regarding the appropriate approach to the solution of a problem even though there is agreement with re-

spect to what constitutes the problem. Although the focus of this symposium is on property rights, it should not be assumed that the only or best way to solve a problem is through substantive change in property rights. Do problems arise from the legal specification of property rights or from the administration of the water resource within the legal structure? Undoubtedly, there are elements of both in most problems. Elements of administrative and structural change viewed from the perspective of both planned and unplanned change will now be discussed.

### PLANNED CHANGE

#### *Change in the Management of the Structure*

The direct administration of water has increased significantly. Perhaps the best evidence is the movement away from the riparian to the appropriation doctrine, in which property rights in water are more specific and subject to decisions. The nature of this water administration, however, is largely one of record keeping. Appropriators are usually granted rights if they comply with the statutory formalities. The water right granting agency is typically given discretionary authority over the granting of rights which is seldom used. For example, many water codes contain an overriding criterion for the administration of water rights—that of public interest or public welfare. This criterion is usually empty because of lack of operational definition. Without specificity it provides no guidance to water administrators. The automatic granting of rights coupled with the absence of operational criteria for water management means that hard allocation decisions are left to the courts.

The need to change from water supply management to water resources management has long been advocated. The latter includes all phases of pre- and post-use water management and recognizes the interrelationships between sources of water. This need is not questioned though evidence suggests that a definition and articulation of goals, objectives and policy is needed to provide direction to management. While there exists considerable flexibility within existing property rights arrangements, the absence of direction often results in inaction and reliance on the status quo. By default, state, regional and local water policy has generally been and remains dominated by an ad hoc water facilities development policy. Specific policy should comprise a collection of basic norms from which all priorities for development, allocation and administrative programs could be derived.

The opportunity for positive water management lies at two inter-

related levels—the granting of new rights and the management of existing rights. Permits could be denied in the public interest, operationally defined, or rights could be granted only if the dimension of use were altered to be consistent with the public interest. Rational management of existing rights is more difficult, especially when the granting of initial rights is without direction. The problem is to develop a workable mechanism within which the water policy may be carried out. Elements of this will be discussed below.

### *Piecemeal Change Within The Structure*

This class of change is planned change only in a limited sense. Change in the property rights structure occurs as a reaction to pressures exerted by water users attempting to solve a felt problem. This is the process of change relied upon in the past. It assumes that water problems are nothing more than the aggregate of individual problems which can be solved individually in a remedial fashion. It fails to recognize relevant interrelationships; the solution of problem *A* may generate problems *B* and *C*; however, these problems won't be considered until pressure for their solution develops.

### *Change in the Property Right Structure Itself*

An appeal for a comprehensive approach is often the result of a negative reaction to the piecemeal approach. The underlying assumption is that the failure to achieve solutions to problems results from a piecemeal approach: all that is required is to integrate all problem elements into a grand overall design. The economic proposal for the instant development of a market structure within which water property rights could be exchanged frictionlessly is an example. Schemes for comprehensive change generally originate outside the existing property structure and have not been accepted. On one hand, rejection can be linked to the absence of comprehensiveness, *e.g.*, economic schemes often fail to recognize goals other than efficiency and costs other than economic. On the other hand, rejection can be linked to the fact that truly comprehensive planning is an impossibility. We do not yet have the capacity to consider and comprehend all the interaction linkages in a large system.

*The Traditional Approach:* Proposals for change are usually based on the recognition that many problems arise from the set of interrelationships that exist among water users. The reaction to this recognition is almost always in terms of the necessity and desirability to change the formal rules of interaction, *i.e.*, property rights. A redefinition of property rights in light of the defined problems pre-

sumably will change resulting interaction systems in a desired way. The solution, however, tends to be slow, difficult to achieve and short-run in nature because of changing relationships. Piecemeal proposals focus on symptoms; that is, they react to an endless flow of interaction conflicts. Comprehensive proposals presumably focus on causes, but they are rarely implemented.

*An Alternative Approach:* An alternative approach would also emphasize the relationships in the interaction system but would focus on the dynamic elements of interaction rather than on the formal rules of interaction. The property rights that convey rights and duties in the use of water must be general because they must be applied to a varied set of circumstances. However, this tends to impute a static and homogeneous aspect, since it abstracts from the user and the use to which the resource will be put. A dynamic aspect emerges when an individual puts the rights and duties into effect. The set of rights and duties and their exercise are inextricable in reality. Nevertheless, it is useful to separate them conceptually, since it shows that two different users acting within the same set of formal rules generate different interrelationship patterns. In the administration of water, managers can profitably move out of the static generalities of law into dynamic specificity of water use.

The exercise of rights and duties, rather than the rights and duties themselves, generates the pattern of reciprocal behavior between water users. This dynamic dimension leads to mutual adaptation or to conflict. The appropriation doctrine, for example, emphasizes the vertical status of the relationship between water users. The horizontal dimension is recognized only to define the vertical hierarchy of relative rights. In water management it would be useful to look at the horizontal arrangement of uses which generate the patterns of reciprocal behavior. Rights could be granted on a particular stream so that use interrelationships would be complimentary or neutral, for example, in terms of place or time of use rather than competitive. The grouping of water users in terms of complimentary relationships is reflected in the economic concept of "separate facilities." It serves to eliminate or reduce the cause of adverse interactions. The "no adverse effect" proviso of current water law is designed to eliminate interrelationship conflicts but only at the cost of low productivity of water. Emphasis would be on the use structure, as well as on the relative rights structure. For a given water course users would, in effect, be allocated to a particular set of use interrelationships. The scarcity of the latter would be as relevant as scarcity of water itself.

This approach implies the need to combine water resources planning with land use planning, since one resource is used in conjunction

with the other. Each use interaction system interrelates with the other. Broader jurisdiction over these systems would permit use groupings as refined as desired to reflect trade-offs between efficiency, equity, security and other values. The nature of refinement in these subsystems would likely vary over time and space.

With respect to implementation, there is a distinct advantage in the piecemeal symptomatic tinkering with formal rules of interaction. Change efforts are restricted to those persons who are directly affected by the problem. The objective of any change is to reach a solution for parties to the conflict. This often involves a specific "we" and an undefined or an unrepresented "them." An approach that focuses on the dynamic elements of the structure affects more people because it deals with larger interaction systems. As a result, it will likely generate more resistance. On the other hand, it has the potential to benefit more people over the long run, since it in effect serves to convert a zero sum game (if *A* wins, *B* must lose) to a positive sum game (if *A* wins, *B* may also win or may be no worse off).

#### UNPLANNED CHANGE

In addition to planned change, change often emerges from the workings of a system. An example of this is the piecemeal change that results from court decisions. Such change may be real in a structural sense or only apparent if change derives from a changed interpretation within a given structure. Judges are forced to make hard decisions to resolve conflict. However, it is difficult to piece these decisions together to form a rational water policy; the court system is not designed for that.

Unplanned change has also occurred from within the water economy itself. These changes have important implications for solution of water problems and for selection of appropriate intervention strategies. Over time there has been a significant decrease in the number of situations in which an individual water user taps a source of supply directly. More and more, a supplier is placed between the source of supply and the ultimate user. This pattern is more prevalent in the arid West, where large water works are required, but it is also occurring in the East in areas where water is becoming relatively scarce. It is a direct result of the engineering solution to excess demand problems. Large entities are required because of large capital requirements and the desire to capture economies of scale. These organizations are usually government entities or government-regulated private entities. The existence of these entities opens the

door for a different form of control over the development, distribution and use of water.

In this situation the user is not a producer or a holder of a water right, but a consumer with a claim on a supplier to deliver water or water-related goods. However, whether all supplies have a public service responsibility can be questioned. Even in the case of domestic water suppliers, it can be argued that such responsibility should apply only to a minimum specified amount of water required for basic domestic needs. A policy of providing a large amount of low cost water on a presumed basis of "need" rather than economic demand is very costly in terms of the value of foregone uses of water.

Water administrators should take advantage of this change in the structure of the water economy. A changed structure means that different intervention strategies can be applied. The reduction of water producers means that water administrators will have to deal with a smaller number of entities. Existing governmental jurisdiction over water suppliers provides a foot in the door for implementing desired consumer-supplier relationships as well as supplier-supplier relationships. The organizational structure of the separate or integrated suppliers can be used to help rationalize the allocation of water. The potential to internalize external effects is much greater with large suppliers than with small producers. For example, states could impose certain requirements on suppliers as a condition of the continued existence of their rights. Water allocation could be significantly improved in terms of economic efficiency if suppliers were required to use future opportunity costs rather than historical average costs as the basis for their charges and if they were required to charge a price for water per se which would reflect its scarcity value in addition to the charge for capture and distribution. Efficiency would also be increased if charges varied over time and space to reflect marginal costs of supply. The existence of large water entities also provides a basis for supplier cooperation and integration for mutual benefit as already exists among power suppliers.

### THE COSTS AND BENEFITS OF CHANGE

Implementation of proposed change requires consideration of the magnitude and incidence of benefits and costs of achieving the change. It is not sufficient to observe, for example, that the present property right system leads to inefficiencies in the use of water and conclude that a market oriented scheme should be developed. As mentioned, the physical interrelatedness of use results in external effects and thus high transfer costs. The cost of implementing a

flexible transfer scheme may exceed the benefits of increased efficiency. If a market in water rights were established, the price of water would have to include this cost of transfer. This increased price might be greater than the value of water to the user. Some suggest that the transfer cost should be borne by the general public rather than by the user. The relevant question remains one of whether the cost would be greater than the social value of the efficiency gain. More information on the nature and magnitude of these costs is needed.

The nature and level of transfer costs associated with the existing "no injury" proviso may be changed as is often done when rights are initially granted. Issuing rights on streams where the quantity of recorded rights exceeds the physical supply implies that states are unwilling to bear the cost of inaction associated with incomplete supply-demand information. The complementary spatial and temporal aspects of water use often transform a stream that is over-appropriated on paper to an under-appropriated stream in reality. The cost of complete information is exchanged for cost of uncertainty to the new appropriator since his right is subject to all prior rights. In a similar way, the cost of no transfer associated with meeting the requirements of the no injury rule could be exchanged for an uncertainty cost borne by the person desiring the transfer. The action could be authorized subject to a later finding of injury. This would constitute an incomplete solution to the problem but would provide for trade-offs between security and efficiency benefits.

Other cost elements associated with changes also need to be considered. For example, if property rights are viewed more as ends than as means, a proposed change is likely to generate high intangible costs in terms of a threat to deeply held values regarding private property. Another important cost element is the cost associated with a disruption of the existing distribution of wealth. A change in property rights will result in a change in control over the use of water and the wealth that flows from that control.

Increased flexibility should increase the potential for transfer between individual water users and between individuals and the state. Voluntary transfer between individuals occurs only when both parties stand to gain. A state's policy to grant no-cost rights to a scarce resource increases the relative cost of private transfers. If a right is obtained from an existing right holder, it presumably will command a positive price; if the right is obtained from the state the cost will be nil. The rationality of a continuing give-away program for water can be questioned on many grounds. In the past, the social welfare that was associated with economic activity stemming from



the application of water to a private beneficial use justified granting free water rights. Cost of this policy is high in terms of foregone public use of water for such things as recreation. If a state charged for a water right or imposed a tax on the value of the right, it could build up a fund from which it could draw to purchase previously granted individual rights when the value of public use exceeds the value in private use.

Constitutional questions regarding the power of eminent domain and payment of compensation for private property for a public purpose are outside the scope of this paper. However, the control and wealth impacts of this means of transfer are relevant. There is an efficiency as well as an equity rationale for compensation. Without compensation, there is no objective measure to assure that the value in public use exceeds that in private use. Even when taking is accompanied by full compensation which theoretically substitutes present wealth for the value of future control, there is a public policy argument against the exercise of the power of eminent domain. The transfer of property outside the market involves an intangible cost associated with the absence of a "willing seller." The "haves" resist becoming "have nots" even if the taking is proclaimed to be in the public interest. The cost to the individual is concentrated and direct; the benefits to the public are generally diffuse. This differential wealth impact often greatly increases the political cost of action.

## APPENDIX

### SUMMARY OF PRINCIPAL PROPERTY RIGHT DIMENSIONS.

#### Acquisition

*Riparian:* Acquired by obtaining title to riparian land, *i.e.*, land that borders a natural stream, lake or pond.

*Appropriative:* Acquired by compliance with statutory procedures, *i.e.*, file application for permit to make appropriation, publish public notice of same, state approves application, user reports completion of project and application of water to use, if conditions of permit are met, water right issued.

#### Quantity Dimensions of Right

*Riparian:* Right attaches to an uncertain quantity of water since riparians are entitled to a co-equal share of the water in a water course. Rights may be exercised at any time.

*Appropriative:* Right is specifically defined in terms of quantity, purpose of use, place of use, time of use.

#### Conditions of Use

##### Purpose of Use

*Riparian:* Water may be put to any beneficial use on riparian land. Beneficial use includes natural uses (those necessary to maintain the lives of owners of riparian land) and artificial uses (including irrigation, manufacturing, power and recreation).

*Appropriative:* Water may be appropriated for any beneficial use. Beneficial use includes domestic, municipal, power, industrial, mining, irrigation and recreation. Original appropriation is for a specific use; purpose of use may not be changed without permission of state water agency.

#### Point of Diversion and Place of Use

*Riparian:* Owner may divert water at any point on his riparian land for use anywhere on the riparian land.

*Appropriative:* Water must be taken from a water course at a specified point for application to a specific parcel of land. Neither point of diversion nor place of use can be changed without permission of state water agency.

#### Priority of Rights

##### General

*Riparian:* Rights are relative rather than absolute; riparians are entitled to a co-equal share of water in the water course.

*Appropriative:* Temporal priority is the rule; priority relates back to date of filing application to appropriate water. Senior appropriator is entitled to the water defined by his right in preference to any use by any junior appropriator.

##### Priority in Terms of Short Supply

*Riparian:* In periods of short supply, natural uses have priority over artificial uses. Any remaining water is pro-rated among the riparians for partial satisfaction of their artificial uses.

*Appropriative:* If the flow of water is inadequate to meet all rights, the earliest priorities are entitled to the entire flow and the later ones must do without any water at all.

### Means of Transfer or Loss of Rights

**Riparian:** The water right is considered part and parcel of the riparian land. When the land is sold the right passes with the land unless specifically reserved. Once rights are severed from the land, they can never be regained. A right holder has complete freedom to change purpose, place (within the boundaries of the riparian land) and time of use. A right may be lost if the stream channel changes its location. A right may also be lost by prescription (adverse use by an upstream user for a specified period of time) and condemnation. The right is not lost by nonuse.

**Appropriative:** The water right is considered appurtenant to the land on which the water is used; when the land is sold, the right is included in the sale unless specifically reserved. A right holder may change the purpose, place and time and use *if* the change does not impose an injury on other appropriators. The right may be lost by a) nonuse for a specified period, b) abandonment, c) prescription and d) condemnation.

### BIBLIOGRAPHY

1. W. Hutchins, I and II Water Rights Laws in the Nineteen Western States, Natural Resource Economics Division, Economic Research Service, U.S. Dep't. of Agriculture, Misc. Pub. No. 1206 (1970, 1974). (The first two of three volumes which bring together the prolific writings of Mr. Hutchins on water law.)
2. W. Hutchins, *Background and Modern Developments in Water Law in the United States*, 2 Nat. Res. J. (1962).
3. H. Thomas, Water Laws and Concepts, U.S. Geological Survey, U.S. Dep't. of the Interior, Geological Survey Circular 629 (1970).
4. F. Trelease, Cases and Materials on Water Law (1967).
5. Farm Economics Division, Economic Research Service, U.S. Dep't of Agriculture, Misc. Pub. No. 921, State Water-Rights Laws and Related Subjects: A Bibliography (1962).
6. Farm Economics Division, Economic Research Service, U.S. Dep't. of Agriculture, Misc. Pub. No. 1249, State Water-Rights Laws and Related Subjects: A Supplemental Bibliography, 1959 to mid-1967 (1972).