Water Rights Transfers: A Legal, Economic, and Informational Analysis of Water in Oregon

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ABSTRACT

In the last 20 years, a considerable volume of literature has emerged with respect to the efficacy of the market place in the allocation of water resources. Economists have been very willing to apply their tools of optimization in a comparative statics framework to indicate that any resource can be allocated in an efficient manner once the nature of the efficiency criteria had been decided. That the legal system for allocating the resource was found to be limiting became almost axiomatic for economic studies of water rights. This study has sought to examine the water (re)allocation issue vis a vis the performance of the legal water rights transfer mechanisms that exist under the prior appropriation doctrine of water law. As such the study is in part a positivistic analysis of the way water is allocated. To set the stage for this kind of investigation, Part 1 serves as an introduction to water rights transfers and the way that this issue is related to other problem areas in water resources such as upstream storage and minimum instream flow standards. Part 2 is devoted to a review of statutory, case law, and administrative law on the subject of water rights transfers. Part 2 also reports the results of a survey on the characteristics of legal water rights in Oregon from 1970 to 1980. The principal finding of the survey was that there were very few transfers of water taking place between two individuals along a single watercourse. Part 3 focuses on the measurement process in assessing the economically efficient use of water. A significant contribution of this study is the exploration of a means of estimating regional (i.e. any aggregation of single farm units) water use in irrigated agriculture while minimizing error due to the aggregation process. In Part 4, an examination of the way in which the legal system uses economic criteria to allocate water is undertaken. It is concluded that the appropriation doctrine statutes do constitute a workable reallocative system, provided that would-be transferrors of water rights gain more knowledge about the process of establishing claims in the legal system. Part 5 provides insights into the lack of initiation of transfers from an information theoretic point of view. The results of a survey of water users in eastern Oregon are presented showing that informal sharing arrangements exist, but that land transactions were preferable to severing water from irrigated land. Valuations of water in the area surveyed are reasonable approximations of the value of average contribution of water to the value of total production. In this area futute shortages of water were thought to be amenable to being solved by implementing upstream storage.

FOREWORD

The Water Resources Research Institute, located on the Oregon State University Campus, serves the state of Oregon. The Institute fosters, encourages and facilitates water research and education involving all aspects of the quality and quantity of water available for beneficial use. The Institute administers and coordinates statewide and regional programs of multidisciplinary research in water and related land resources. The Institute provides a necessary communications and coordination between the agencies of local, state, and federal government, as well as the private sector, and the broad research community at universities in the state on matters of water-related research. The Institute also coordinates the inter-disciplinary program of graduate education in water resources at Oregon State University.

It is Institute policy to make available the results of significant water-related research conducted in Oregon's universities and colleges. The Institute neither endorses or rejects the findings of the authors of such research. It does recommend careful consideration of the accumulated facts by those concerned with the solution of water-related problems.

PREFACE

Interdisciplinary research projects often combine the efforts of pure disciplinarians to derive an integration of thought. In this project, a closer integration was achieved due to the backgrounds of the personnel involved. Two of the authors at Oregon State University (Kraynick and Bhadra) have backgrounds in engineering and project development as well as economics. The third OSU author, Whittaker, had been awarded a J.D. in Law prior to his work on this project. Professor Huffman at Lewis and Clark Law School possesses an advanced degree in economics. The authors were also fortunate in having considerable research experience concerning water resource issues.

In the course of the project, some inevitable changes in the affiliations of the authors occured. Herbert H. Stoevener is currently Professor and Head, Department of Agricultural Economics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia. Binayak P. Bhadra is affiliated with Institute of Economic Development, Triohuwan University, Kathmandu, Nepal; Gerald W. Whittaker is a Graduate Research Assistant at Department of Agricultural and Applied Economics, University of Minnesota.

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I. INTRODUCTION

As concerns over water scarcity in the West have continued to mount and as public policy decision-making prerogatives seem to be shifted more to state and local levels, some attention has been focused on the growing importance of state-level water rights and related issues (including land use regulation). A sizable research literature (legal and otherwise) has emerged over the years including well known treatises on water law[1], articles in legal journals[2], economic assessments[3], special reports[4], and commentaries in the transactions of professional societies[5]. Statutes[6], administrative rules[7], judicial material[8] as well as all other findings and records pertaining to surface (and ground-) water allocation in each state constitute a voluminous body of data for this research. (Scarcely anybody, however, claims that the abundance of this "data" has easily facilitated research discovery).

Methodological Considerations

In this study we call strong attention to the methodological issues underlying the research objective, the manner in which the research is carried out, as well as the derivation of results. First, it may be useful to suggest that research on water rights varies considerably -- from that which is in the domain of pure legal research (at one extreme) and that which tends toward pure interest group politics (at the other). It could be argued that in either case, however that the law (or modification thereof) is the foremost objective. Occupying some middle ground along this spectrum, we believe, is research on water rights jointly involving different disciplines. This interdisciplinary approach may attempt to

integrate, for example

- o legal theory
- o economic theory
- o hydrology & engineering
- o public policy administration

What methodological guidelines should govern such research? It is difficult for those researchers in non-physical and non-biological disciplines to undertake research without some problem statement. Declaration of problem statements may reveal as much about the normative value judgements governing a discipline as they do about the "problem" at hand.

As an example, consider findings on the question of whether or not the prior appropriation system of water law results in "serious" misallocations of water among competing uses -- one that might appear to be unjust in an intuitive sense. Interdisciplinarians are often at odds on this matter. Conclusions generally depend on which of the established norms (from each of the disciplines) weigh most heavily in their analysis. The norms provided by economic theory (generally efficiency -- the attainment of maximum net social welfare) lead in one direction. Norms in some theories of legal rule-making (e.g., a realist view) lead in another direction. And who will state (to state engineers/water resource department administrators) that norms in engineering and public policy administration are not relevant?

It is little wonder that one encounters a great deal of circularity in the matter of constructive policy research on water rights. Over time a few more economic and engineering "facts" will be discovered and legal decisions on allocation will have been made. However, it will be difficult to discern whether the prior appropriation system is being made better or worse in terms of "serious" misallocations.

This assessment comments primarily on the degree to which integrated research on water rights has been conducted. It suggests that there is considerable scope for in-depth interdisciplinary focus on specific issues relevant to water rights where

1. normative assumptions in the relevant disciplines can be identified
2. the variations in the state statutes can be focused to a manageable number
3. generalizable results may be derived preferably from analysis of empirically testable hypotheses
4. extension of policy implications is a desirable end result.

Water Rights Transfers

Water rights transfers, in particular, are often advanced as an effective decentralized means of allocating water resources among competing uses. Indications are, however, that individuals (specifically unorganized rights-holders along a single watercourse) are imperfectly employing this solution to water scarcity problems. Many policy analysts have, therefore, openly suggested that the only solution lies in more centralized administrations with enhanced allocative powers. Investigations into the workings of the decentralized exchange processes inherent in water rights transfers and the institutional environments in which transfers take place may thus be very important.

Previous research on these topics has been undertaken in several western states. Significant economic research on water rights transfers was accomplished by Hartman and Seastone in the 1960's.[9] There were several other economists and agricultural economists pursuing this line of research, much of it reported initially at meetings of the (now

discontinued) Western Agricultural Economics Research Council's Committee on the Economics of Water Resource Development.[10] Among lawyers, Trelease has published most extensively on the legal (and economic) aspects of water rights transfers[11]. Other legal scholars have contributed findings on individual-to-individual transfers, some of it truly interdisciplinary and some more focused on the law.[12]

Both lawyers and economists have addressed "change of use" transfers. Such changes (agriculture to municipal, agriculture to energy, etc.) usually involve comparisons of value in use, but also particular problems such as the assembly of individual rights (via the market or possibly by condemnation.[13]

Recently, attempts have been made to examine water rights transfer issues in more critical fashion. Articles by Burness and Quirk[14] and Johnson, Gisser, and Werner[15] have sought to perfect the criteria for transfers along a single water course suggested by Hartman and Seastone. Water resource engineers have sought to develop systems analysis approaches for studying the effects of transfers.[16]

Research on the issue of water rights transfers, then, seems to have reached a stage where lawyers, economists, engineers, and professionals in water administration have become knowledgeable about the interdisciplinary nature of water rights. Most important, however, is that some integrations of traditional disciplinary approaches to the problem have been attained. In regard to water rights transfers, perhaps more can be accomplished.

Exchanges of Water Allocations Within Organized Water Districts

In contrast to the decentralized transfers of water rights along single watercourses, there is the related issue of exchanges of water allocations within organized water districts. In the eleven western-most

states there are probably well over a thousand districts whose roles in facilitating water exchanges vary considerably.[17]

Research in this area has been largely economic and descriptive in nature, exemplified by Anderson's studies of water districts in Colorado.[18] Other recent research has focused on the viability of state-administered water banks.[19] Legal research has focused on certain provisions in Federal Reclamation Law which can preclude reclamation districts from facilitating intra-district exchanges.[20]

Interdisciplinary research opportunities hinge on further definition and analysis of the ways that statutes affect the ability of districts to act as facilitators of water exchanges. For instance, in some western states, water right certificates are not extended to individual members of water districts. Instead, blanket rights are held by the districts. Many districts, moreover, are still gradually having their initial permits submitted for inspection and approval as certificate (perfected) rights.[21] In the course of this process, allocations (in terms of appurtenant lands) can change, although there are limits to how much change can take place. The majority of organized water districts, however, are in situations which permit exchanges of water allocations among district members to be more easily accomplished. Such exchanges can be permanent transfers, temporary sales (or rentals), or swapping arrangements. In all of the above situations, the presence of the district contributes significantly to the reduction of transactions costs which would otherwise have to be borne by the parties making the exchanges. The question of how districts function to achieve these allocation functions has been addressed in several recent studies.[22] Little effort has been devoted to ascertaining the value of the coordination functions provided by districts and the costs of encouraging

districts to employ those functions.

Establishment of Minimum Instream Flow Levels

One of the more intriguing topics in research on water rights involves minimum instream flow levels. The states employing the appropriative system of water rights have acknowledged the allocation of water to various uses (and the distribution of benefits resulting from these uses) on the basis of the existence of water-related transactions in some relevant marketplace. In effect, the states have precluded some uses because marketplaces pertinent to the water resources being considered are not functioning or are unlikely to exist even in a conceptual form. At first sight, minimum instream flow issues may tend to involve more overt political pressure not directly associated with the economic welfare of well-identified interest groups.[23] The recent study by Huffman[24] indicates that individual states will elect to follow different institutional approaches in responding to pressure for implementation of instream flow protection. In spite of the obstacles presented by a myriad of emerging statutory/administrative procedures for implementing minimum instream flow levels, it may be worthwhile focusing on the importance of technical (and economic) information needed in using these rules (as well as in analyzing the circumstances which led to their development). Analyses of the worth of water resource information in the context of legal and institutional decision-making have seldom been undertaken.[25] In addition, credible findings on some values attributable to minimum instream flow levels are just beginning to emerge.[26]

Organization of the Report

The remainder of this report is organized to lay out the principal

findings of the principal investigators. The citations listed above indicate what we believe to be a necessary background for dealing with this topic. The core elements of the findings are two theses (one for the M.S. degree and one for the Ph.D. degree) completed at Oregon State University in Department of Agricultural and Resource Economics. The theses are incuded as appendixes, although certain of their finding are summarized below. As associated findings, we include three other elements relevant to the issues of water rights transfers in Oregon (and generally to the issue of water allocation). These are (1) a review of the important provisions of Oregon's statutory law, administrative law, and judicial rule-making on water rights transfers and related matters; (2) a report on the number legal water rights transfers which have occured in Oregon in a recent ten-year period; and (3) a report on a in-depth study of farmers and ranchers in an eastern Oregon watershed, some of whom belong to a water district, some about to form a district, and some who are and will likely remain individual appropriators along a single watercourse.

These findings are organized and integrated into a format which discusses legal research first, economic theory second, joint legal and economic ideas third, and informational issues fourth. A concluding section discusses the relevance of our findings to the general body of research on water rights issues.

NOTES

(1) See F. Trelease, Water Law (2nd ed. 1979); J. Sax, Water Law, Planning & Policy (1968); R. Clark, ed., 5 Waters and Water Rights (1972); W. Hutchins, 1 Water Rights Laws in the Nineteen Western States (1971). There are also treatments of water rights in the two legal encyclopedias: 93 C.J.S. Water; also Water and Water Rights in Am. Jur.

(2) E.g., see F. Trelease, The Concept of Beneficial Use in the Law of Surface Streams, 12 Wyo. L.J. 1 (1957); F. Trelease, The Model Water Code, the Wise Administration, and the Goddam Bureaucrat, 14 Nat. Resources J. 1 (1974).

(3) E.g., see A. Kneese, Economic and Related problems in Contemporary Water Resources Management, 5 Nat. Resources J. 236 (1965); F. Trelease, Policies for Water Law: Property Rights, Economic Forces, and Public Regulation, 5 Nat. Resources J. (1965); S. Ciriacy-Wantrup, Concepts Used as Economic Criteria For a System of Water Rights, 32 Land Econ. 295 (1956); J. Milliman, Water Law and Private Decision-Making, 2 J. Law & Econ. 41 (1959).

(4) E.g., see C. Phelps, Efficient Water Use in California (November, 1978) (Rand Corporation Report R-2385-CSA/RF); G. Weatherford, et al, Western Water Institutions in a Changing Environment (December, 1980) (Project completion report prepared at John Muir Institute for Environmental Studies, Inc., Napa, California); G. Gould, State Water Law in the West: Implications for Energy Development (January, 1979) (Los Alamos Scientific Laboratory Informal Report LA-7588-MS); G. Radosevich, Western Water Laws and Irrigation Return Flow (August, 1978) (USEPA Report EPA-600/2-78-180).

(5) E.g., see R. Dewsnup, Problems Under State Water Laws: Initiation of New Rights, 8 Natural Resources Lawyer 347 (1975); W. Walker, State Water Rights, 99 J. Irr. & Drainage Div. - Am. Soc. Civil Eng. 499 (1973).

(6) In addition to Hutchins, supra. note 1, see R. Dewsnup and D. Jensen, ed., A Summary-Digest of State Water Laws (1973) (National Water Commission Background Study) and Radosevich, supra. note 4 at 95-256.

(7) Administrative rules consist basically of state water resource agency (and/or policy commission) directives, regulations, or rulings concerning water rights. Also relevant in many states are (a) federal regulations and rulings pertinent to states which may be found in the Code of Federal Regulations and the Federal Register, and (b) provisions in interstate water compacts.

(8) Judicial material includes principally state supreme court and appellate court decisions interpreting water the state water law and

resolving disputes in the allocation, distribution, and utilization of the state's water resources. Volumes of cases involving water resources have been decided during the past 100 years. Decisions can be referenced by means of the state reporter in each state or by means of the National Reporter System prepared by West Publishing Company.

(9) L. Hartman and D. Seastone, Water Transfers: Economic Efficiency and Alternative Institutions (1970).

(10) See S. Ciriacy-Wantrup, Water Economics: Relations to Law and Policy in I Waters and Water Rights 397 (1967); M. Gaffney, Diseconomies Inherent in Western Water Laws: A California Case Study, in Proceedings, Western Agricultural Economics Research Council 61 (1961).

(11) See F. Trelease, Charges and Transfers of Water Rights, 13 Rocky Mt. Min. L. Inst. 507 (1967); F. Trelease, Water Law and Economic Transfers of Water, 43 J. Farm Econ. 1147 (1961); F. Trelease and D. Lee, Priority and Progress - Case Studies in Transfer of Water Rights, 1 Land and Water L. Rev. 1 (1966).

(12) E.g., see C. Meyers and R. Posner, Market Transfers of Water Rights: Toward an Improved Market in Water Resources (National Water Commission, Legal Study No. 4, 1971); W. Ellis, Water Transfer Problems: Law in Water Research 33, (1966); D. Riggs, Changing Manner and Place of Use of Water Rights in Wyoming, 10 Land and Water L. Rev. 450 (1975); C. Lee, The Transfer of Water Rights in California: Background and Issues (December, 1977) (Governor's Commission to Review California Water Rights Law Staff Paper No. 5); W. Parr, Water Law: Legal Impediments to Transfers of Water Rights, 7 Nat. Resources J. 433 (1967).

(13) M. Kelso and J. Jacobs, Economic Analysis of Transfer of Water From Irrigation to Municipal Use: A Case Study of Tucson, in Proceedings, Western Agricultural Economics Research Council 57 (1967); R. Dewsnup, Assembing Water Rights for a New Use, 17 Rocky Mt. Min. L. Inst. 613 (1972); J. Ross, Valuation of Water Rights for Acquisition, Condemnation and Taxation Purposes, 17 Rocky Mt. Min. L. Inst. 563 (1972); R. Anderson, N. Wengert, and R. Heil, Physical and Economic Effects on the Local Agricultural Economy of Water Transfer to Cities (1976) (Colorado State University Environmental Resources Center Report No. 75); M. Gisser, et al, Water Tradeoff Between Electric Energy and Agriculture in the Four Corners Area, 16 Water Resources Research 529 (1979).

(14) See H. Burness and J. Quirk, Appropriative Water Rights and the Efficient Allocation of Resources, 69 Am. Econ. Rev. 25 (1979); H. Burness and J. Quirk, Water Laws, Water Transfers, and Economic Efficiency: The Colorado River, 23 J. Law & Econ. 111 (1980).

(15) R. Johnson, M. Gisser, and M. Werner, The Definition of A Surface Right and Transferability, 24 J. Law & Econ. 273 (1981).

(16) C. Scherer, Water Allocation and Pricing for Control of Irrigation-Related Salinity in a River Basin, 13 Water Resources Research 225 (1977).

(17) K. Frederick and J. Hansen, Water for Western Agriculture, Washington, D.C., Resources for the Future, Inc. (1982).

(18) See R. Anderson, The Effects of Streamflow Variation on Production and Income of Irrigated Farms Operating Under the Doctrine of Prior Appropriation, 11 Water Resources Research 15 (1975); R. Anderson, Windfall Gains from Transfer of Water Allotments Within the Colorado - Big Thompson Project, 40 Land Econ. 265 (1967).

(19) E.g., see S. Kennedy and J. Wrigley, An Economic Water Market As An Alternative to Reduce Return Flow From Irrigation (February, 1979) (Idaho Department of Water Resources Report); J. Angelides and E. Bardach, Water Banking: How to Stop Wasting Agricultural Water(1978)

(20) See J. Sax, Selling Reclamation Water Rights: A Case Study in Federal Subsidy Policy, 64 Michigan L. Rev. 1 (1965).

(21) W. Hallmark, Oregon's Water Management Districts 47 Oreg. L. Rev. 16, (1967).

(22) See R. Kraynick and H. Stoevener, An Economic Study of Three Small Watershed Projects in Midlife: Performance Evaluation (1981) (Completion Report Prepared at Oregon State Univ. Dept. of Agric. & Resource Econ.).

(23) R. Anderson, Conflict Between Establishment of Instream Flows and Other Water Uses on Western Streams, 18 Water Resources Bull. 61 (1982).

(24) J. Huffman, The Allocation of Water to Instream Flows: A Comparative Study of Policy Making and Technical Information in the States of Colorado, Idaho, Montana, and Washington (1980) (Completion Report Prepared at Lewis & Clark College Natural Resources Law Institute).

(25) E.g., see D. Davis, L. Duckstein, R. Kryzstofowicz, The Worth of Hydrologic Data for Nonoptimal Decision-Making, 15 Water Resources Research 1733 (1979).

(26) J. Daubert and R. Young, Recreational Demands for Maintaining Instream Flows: A Contingent Valuation Approach, 63 Am. J. Agric. Econ. 666 (1981).

II. LEGAL ISSUES IN ACCOMPLISHING WATER RIGHTS TRANSFERS IN OREGON

The intent of this section is to briefly lay out the relevant statutary law, administrative law, and important judicial decisions which have guided the accomplishment of water rights transfers in Oregon. We hereafter refer to these transfers as "legal" transfers, as opposed to less formal "sharing", "renting", or "temporary transfers" which are known to exist in the state in spite their having no sanction under the statutes. We also call attention to the comprehensiveness implied in the term "legal transfer", meant to signify changes in points of diversion as well as the place of use/nature of use transfer which has heretofore been deemed more interesting from an allocation point of view.

The Basic Statutory Provision

The Oregon statutes provide that the owner of a perfected water right (technically a water right "certificate-holder") may change his point of diversion, place of use, or purpose of use without loss of priority, as long as there is no injury to other water rights and the permission to change one of these definitional elements of the right is obtained from the Director, Water Resources Department.[1] While these provisions apply to groundwater as well as surface water, we concern ourselves only with the surface water aspects.

The transfer provision originates in very early case law in which it was held that appropriators could sell water to other individuals for an entirely separate use as long as there were no injurious effects on others. In 1909 as part of trend to institute administrative control over water rights in the West, Oregon enacted a new water code. It like many others of this era contained a section encompassing the prevailing case law which

held that water used in agriculture be appurtenant to the land irrigated,

> ...provided, that if for any reason it should at any time become impracticable to beneficially or economically use water for the irrigation of any land to which the water is appurtenant, said right may be severed from said land, and is simultaneously transferred, and becomes appurtenant to other land, without losing priority of right theretofore established, if such change can be made without detriment to existing rights, on approval of an application of the owners to the Board of Control...[2]

Some commentators have remarked critically on the implementation of state level water code in the period 1890 to 1910, particularly the shifting of attention from the relatively simple matter of "prioritization" (under judicial regulation) to the more complex issue of ensuring "nonimpairment" among users (under administrative regulation). [3] Appropriators were protected from those who had no legal right to take water, leading to a state of strict administrative control over water supplies. This control extended to universal non-impairment in the case where any rights-holder, even the most junior appropriator, was protected against the possible injurious effects of transfers involving potentially the most senior rights-holders. The selection of the strict nonimpairment rule begs for sophistication in measurement capability which did not exist at the time. It has been suggested that active and open markets in water rights were from that point on impeded by the statutory mandate.[4] While "transfer" and "appurtenancy" have remained linked as provided for in the 1909 code, changes in 1927 code provided for the transfer of water rights in all other uses where appurtenancy was not an element of the right.[5] Since that time the statutes pertaining to transfers have modified only to provide guidance on the administration of transfer applications and hearings.

Basic Provisions in the Statutes

Right to Make Changes: The statutory provisions governing change in use are ORS §540.510 to ORS §540.550. ORS §540.510 states that an owner of any water right, may, upon compliance with ORS §540.520 and ORS §540.530, change the use, place of use, and point of diversion without losing priority. The statute is emphatic, however, that no change for any purpose may be made without compliance with ORS §540.520 and ORS §540.530, which outline the procedure for obtaining permission from the Water Resource Director for a change.

Some Aspects of the Change of Place of Use: As examined in the section "Transfer of Water Rights", when water rights are conveyed separately from land, a change in the place of use takes place and so the procedures outlined in ORS §540.510 must be followed. A similar situation occurs when water appurtenant to one tract is used on a detached tract even though the tracts are owned by the same person. This is a change in the place of use and the above provisions must be complied with. Another restriction on changes in the place of use is that there must be no time lag in the intent to continue the existing appropriation. "If the intention to irrigate Whiteacre is abandoned before the intention to irrigate Blackacre becomes fixed, the water right is lost." If such a lapse in intent occurs, the formation of a new intention to irrigate other lands marks the beginning of a new appropriation.

Administrative Procedure: As stated earlier, the statutory requirements that the user obtain permission from the Water Resource Director before implementing the change in use, to insure protection of

other users, are outlined in ORS §540.520 and ORS §540.530. The scheme first requires any owner desiring to change the use, or point of diversion, to file an application for change with the Water Resource Director. The Director then gives notice by publication of time and place for a hearing upon the application, so that objections may be filed.[6] If no objections are filed, the Director may approve the change without a hearing. If objections are filed, a hearing is held and testimony taken. If the Director finds that the change will not injure existing rights, he shall approve the change, cancel the old certificate and issue a new certificate, preserving the priority.[7]

Pre-1909 Vested Rights: Changes in the place of use of pre-1909 vested rights present a problem under ORS §540.510.[8] The Water Resources Department presently does not officially sanction, pursuant to ORS §540.510, changes in the place of use of pre-1909 vested rights. The reasoning for not doing so stems from the fact that since these rights are conditional upon final proof in an adjudication, by affirming a change, the Department would give complete validity to that which may not exist. In addition, ORS §540.510 declares that the owner of any "water right" may change the place of use. Although a pre-1909 vested rights is obviously a right to water, the term "water right" throughout the code seems to refer to rights evidenced by a certificate.[9] The Department does recognize, however, the common law regarding changes in place of use for pre-1909 rights and allows such changes, foregoing the statutory requirements. Thus, other users are not offered the safeguards of ORS §540.510 et al. but can only protect their rights from infringement by a change by a court or action for an injunction.

Basic Provisions Left Unaddressed by the Oregon Statutes

Since several commentators have surveyed the transfer law of all nineteen western states, it is apparent that some states have added provisions which further specify the nature of legal transfers.

Temporary Transfers: There is no doubt that all states permitting transfers of water make them subject to the nonimpairment requirement. Some states, particularly Washington, New Mexico, and Colorado have allowed that transfers may be of an expressly temporary type.[10] Within organized water districts, temporary transfers seem to be a logical function of district management -- sometimes unavoidable in the short run. Transfers which are ostensibly temporary (but sustained over a few season) and entail a major change in water delivery from one district member to another may need special attention in the Oregon statutes.

Proscription of Valuation in Transfers: ORS §537.280 states that "... in any proceeding for the acquisition of rights to the use of water...under the laws of Oregon, no value shall be recognized or allowed for such rights in excess of the actual cost to the owner of perfecting them..." The statute was probably intended to discourage speculation in water rights, but on the other hand it weighs against providing incentives for individuals to explore possibilities for water rights transfers.

Statutes Which Are Complimentary to Water Rights Transfers

Abandoment and Forfeiture: The Oregon statutory provisions regarding abandoment/forfeiture are ORS §540.610 to ORS §540.650. There is also some authority that water rights may be lost by adverse use and estoppel. The

difference between abandonment and forfeiture is often confused. Abandonment requires an intent of the owner to permanently relinquish a water right in addition to a concurrent act of relinquishment. Forfeiture is the loss of right because of a failure to comply with statutory requirements of water usage such as beneficial use. Adverse use, adverse possession, and precsription all refer to the case where a second person openly and notoriously uses the water right of a first person and the latter does nothing about it. If this continues for a specific period, the former can claim the right as his own. The practice is not looked upon with great favor in the courts, however. ORS §12.050 provides for adverse possession of property in Oregon after a ten-year period of open, notorious, etc. use. But it has been noted that ORS §537.120 provides that a five year period of nonuse shall cause the right to revert to the public and the water is only appropriable under the permit system as provided for by law.[11]

Condemnation: Condemnation occurs when a preferred user or public entity exercise the right of eminent domain. Normally the only real issue is the amount of compensation. Unlike Colorado, for example, Oregon has not passed legislation requiring municipalities condemning agricultural water rights to shoe the necessity for taking such action. In Oregon, water rights can be condemned by water control districts, water conservation districts, domestic supply corporations, etc.[12] Oregon's basic preference statute (ORS §540.140) grants preference in times of scarcity to domestic, agricultural, and manufacturing uses in that order, but the statutory scheme does not spell out the relationship between the preference statute and the power of eminent domain.

Due Diligence or Reasonable Diligence?: The Oregon statutes provide water districts an implicit advantage over individuals in effectuating transfers (in reality "adjustments in use of water by members"). The basic issue has to do with the amount of time that permit holders have to perfect their appropriations and be eligible to receive certificates. ORS §537.230(1) provides that actual construction work will begin one year from the date of approval of the permit application. Municipal corporations (all water districts are municipal corporations) are exempted from this requirement. After commencing construction the work must be "prosecuted with reasonable diligence" and completed within a reasonable time, not to exceed five years. ORS §537.230(2) allows the Director, Oregon Department of Water Resources to grant extensions beyond the five year limit "...for good cause shown..." ORS §537.410(1) provides that a water right permit be cancelled if the owner has not commenced construction, not shown reasonable diligence, not completed construction or made a beneficial application of water within the time fixed in the permit or extension given by the Water Resources Department. ORS §537.410(2) provides that permits issued to irrigation districts (for reclamation purposes) and to municipal corporations are not subject to cancellation. As a result of these exemptions, a water district having secured a permit may elect to perfect it over an unlimited time period. It is interesting to note that districts formed before February 24, 1909 and thereby subject to the pre-1909 law can be treated more restrictively.

Waste Water: The topic of waste water is mentioned no fewer than eight different times in the Oregon statutes. The duty to not waste water is a corollory to beneficial use requirement -- most strongly worded in ORS

§540.720 (No person shall...wilfully waste water...). A penalty is implied in ORS §540.990(1). Watermasters are empowered to prevent waste in ORS §540.040(5) etc. The most interesting reference to waste water in the statutes, however, comes at ORS §537.800, which provides that waste water may be appropriated under the same laws relating to running streams. Just as it is difficult to define what constitutes beneficial use, it is equally difficult to define what constitutes waste except on a case by case basis.

> What may be beneficial use where water is present in excess of all needs would not be a reasonable beneficial in an area of great scarcity and need, and that what is a beneficial use at one time may, because of changed conditions become a waste of water at a later time.[13]

Transfer of Conserved Surplus and Transfers of "Partial" Water Right: Like most western states, Oregon has not addressed these troublesome issues in its water code. The closest one gets to this is the waste water statute described above. This is also discussed more fully in a recent note.[14]

Court Decisions Relevant to Water Rights Transfers

Most of the detailed discussions of the case law on water rights transfers are contained in Appendix B. We present brief discussions on three of the most important issues.

Water Rights Transfers: The Oregon Supreme Court has been emphatic that no changes in the place of use or character of the water use can be made without strict compliance with the statutory procedure pertaining to impairment.[15] The Oregon Supreme Court has often held that an appropriator has the right to make changes in the exercise of water rights

including character or purpose of use, place of use and point of diversion, when they can be made without prejudice to rights of others.[16] As to the preservation of priority when making a change in the exercise of the right, the Supreme Court has approved the principle in ORS §540.510 that changes in the exercise of a right do not waive any priority as long as the change is made without injury to others or intent to abandon.[17]

Appurtenance As It Affects Transfers of Conserved Water: Allowable changes in the exercise of a water right according to one holding do not include any increase in the quantity of water. An enlargement in the quantity can only be made by acquiring a new appropriative right, separate from the earlier priority and junior to all rights acquired between the original appropriation and the additional one.[18] The issue of transfer of conserved water must, however, include a thorough airing of the landmark decision in Salt River Valley Water Users Association v. Kovacovich According to one description, defendants Kovacovich and Ward engaged in water saving practices (improving and lining ditches)which enabled them to enlarge the area under irrigation by thirty-five and fifty acres respectively. Each defendant held a valid water right, and the two parcels were irrigated with water which had formerly been applied to lands to which the water rights were appurtenant. In fact, the proposed management practice was to allow the original land to lay fallow while irrigating the "extended" parcels. Because of this the annual consumptive use may indeed have been reduced. Other appropriators filed suit, however, requesting Kovacovich and Ward be enjoined from diverting the quantity of water saved onto the newly irrigated lands. The Arizona Supreme Court in reversing a lower court held with the plantiffs. The matter was disposed of through application of the appurtenancy statutes.

> Any practice, whether through water saving procedures or otherwise, whereby appellees (water users) may in fact reduce the quantity of water actually taken inures to the benefit of other water users and neither creates a right to use the waters saved as a marketed commodity nor the right to apply same to adjacent property having no appurtenant water rights. It is believed that any other decision would result in commencement of return to the very area of confusion and chaos!which gave use to the development of the concept of beneficial use. (Ibid. 411 P.2d at 206) [20]

Oregon does not have a case like Kovacovich, but case law pertaining to appurtenancy seem every bit as emphatic on the importance of appurtenancy as exemplified in Broughton v. Strickland.[21] This is also one of the implication of the holding in Williams v. Altnow.[22] Furthermore, in Tudor v. Jaca, the court ruled on the disposition of water granted under a decree -- a rancher was allowed to "use 100 inches of water as he saw fit on any of his lands". The Oregon Supreme Court interpreted this language as making 100 miners inches appurtenant to certain lands, but allowing a change in place of use.[22] Originally the water right was appurtenant to 119.9 acres. The court refused to allow the appropriator to apply that 100 inches of water to 300 acres under the same right. Using the criterion of beneficial use, the court held that only the water which was applied to the original 119.9 acres was included in the appropriation. The portion of the 100 inches applied to the remaining acres was a new appropriation. "If ... 100 miners inches is a sufficient quantity of water to irrigate 300 acres of land, then the surplus over the amount reasonably necessary to irrigate the land for which it was originally appropriated was not in the original application."

Reliance on Return Flow As It Affects Tranfers: The right to return

flow is in essence a statement by the courts that one's position and priority on a stream creates a legally protected economic interest in a level of flow and not simply (and more narrowly) the right to consume a specified quantity of water. Waters which return to a stream after use by an upstream (say senior) appropriator may become subject to vested rights of downstream users. If it were only the consumptive right that was protected, problems created by transfers on stream would vanish.[23] The courts have held that it is the right to withdraw water at a prescribed level and at the specified location that was in existence at the time the right was perfected. Impairment concerning these kinds of parameters of a right may be of diminishing importance, suggest Brown, et al., if they constitute a tradeoff with "maximum economic development". As the real economic importance of water rights transfers becomes more important, the courts will make more use of the more narrow definition of impairment in their decisions.

Waste Water As It Affects Claims To Conserved Water: Radosevich observes that ...(f)ortunately the Kovacovich decision (based on appurtenancy) is not the majority opinion among the western states.[24] It is suggested that courts in other states have held emphatically that waste should be curtailed or prevented.[25]

The case of In re Willow Creek established that waste prevention could be implied as a condition to the actual granting of a right and failure to do so was grounds for reduction of the right.[26] Brown, et al. suggest that if the Oregon court faces the transfer of conserved water, this strong emphasis on preventing waste may lead to departure from the traditional view.[27] Also in In re Hood River, the court held that waste of water is

prohibited and when the water is not used then the water must be shut off from the ditches and laterals.[28] The end result of this strong wording about eliminating waste water is the permitting of some flexibility in reclaiming it as conserved water. Since the statutes do not provide definitions of "waste", the definition of waste water in Vaughn v. Kolb -- "...water that is ... not needed by the claimant..., water which, from unavoidable causes, escapes from ...works of the lawful claimants." is a starting point.[29] The consequence can be seen in the holding of the court in Cleaver v. Judd.[30] An irrigation district constructed a ditch to recapture water seeping from irrigated lands. Downstream appropriators filed suit to stop the district's recapture. The court framed the the issues of the case as dealing with waste water as defined here, but adding the caveat that in order to establish an appropriation on it, the waste must be recaptured within the boundaries of the appropriator. The consequence of not convincing the court of the validity of characterizing the water in question as waste water can be seen in Jones v. Warmsprings Irrigation District.[31] Here, in a situation similar to Cleaver v. Judd, the court held that since the district had not in the preceeding eight years recaptured return flow, they had abandoned the right to do so: "...The intent to recapture the water must be present at the time it is discharged from control... The intent to recapture is essential and without it the water is abandoned and cannot be reclaimed..." There are several more cases dealing with facts similar to those discussed here. In each case, the water in dispute is either characterized as waste (a term which includes surplus water) or as unappropriated water (as a consequence, for example, of someone who was held to have abandoned a right). The courts' characterization of the water seems to be entirely arbitrary, but once it is made the resultant decision is entirely predictable. Should there be a

specific definition of waste water given in the statutes? Such a modification would have to address the then apparent contradiction of the beneficial use doctrine and a new waste water definition since under strict interpretation of the former, there can be no waste. Changing beneficial use may necessitate other changes. Perhaps the statutes are the way they are is to provide the courts with flexibility.

Another commentator has observed that the enforcement of nonimpairment clauses in the statutes has been increasingly treated more liberally by the courts:

> ...Where a statute permitting some degree of infringement of senior rights is not available, many courts have found unflinching application of the priority doctrine impossible in practice; therefore they have used a variety of practical remedies to achieve a reasonable accomodation among conflicting uses and thus permitted desirable junior uses to begin or continue. Even where an injunction was held to be proper, the order was usually qualified to permit the junior use to continue with physical protection for the senior right. However, the cost fell on the junior user predominantly, if not solely. [32]

Although Schaab bases his observations largely on groundwater cases. In that area, he offers the opinion that "right of replacement" rules will supercede nonimpairment rules. As a aside, he believes that there will be less emphasis on water project implementation in the allocation of public resources, more attention to assembling the requisite technical data necessary to development and use mathematical models of watersheds and groundwater basins as key resource management tools

Measurement Ambiguities in Transferring From "Return Flow" Users to Non-Return Flow Users: In attempting to transfer water from agricultural

to non-agricultural users, significant problems may arise concerning the difference in the definition of the right as the amount diverted and the definition of the amount consumptively used. A Colorado case, Green v. Chaffee Ditch Company, dealt with the attempted transfer of a portion of decreed right -- the individual was entitled in the decree to divert 16 cfs to irrigate 72 acres.[33] The negotiated transfer was for 8 cfs leaving the individual to irrigate a part of the 72 acres. The point in this case (and countless many others) is the consequence of quantifying the right: It turned out that the quantity of water diverted by the city (discharge x allowable time / consumptive use percentage was equal to the entire amount (or more) than had ever been consumptively used on the transferror's farm. In effect the entire right was transferred when the intent was only to transfer the consumptive use involved in irrigating say 36 acres.

Administrative Procedures for Transferring Water: The water rights transfer application form used by the Oregon Department of Water Resources (ODWR) is included in Appendix A. The form requires the individual requesting to make a transfer to enter a considerable amount of information about the nature of one's right. This can be intimidating for anyone contemplating a transfer and thus often necessitates the retaining of an attorney. Indeed the caveat in the Water Rights information booklet issued by ODWR is even less assuring: ...If a water right is not valid due to an undetermined forfeiture at the time a water right transfer application is filed, approval of the transfer application will not serve to reinstate the right..."[34] Following the submission of an application for a transfer, the administrative procedures are taken directly from statutes:

(1) the application shall include the name of the applicant, the use being of the water, a description of the property(-ies) involved, proposed use, and the reasons for making the change.

(1') The OWRD carefully scrutinizes the application and may even conduct a preliminary field inspection and advise the applicant the probability of success in achieving the requested transfer.

(2) The director, OWRD, shall upon the filing of the application give notice by publication in a locally-printed and locally circulated paper the time and place of a hearing on the matter.

a. the notice shall be published for at least 3 weeks and at least once per week.

b. hearing must be accomplished within 30 days of the last notice.

c. the hearing must be held in the same county where the proposed transfer is located.

d. the cost of the notice publication must be paid for by the transfer applicant.

(3) Any person(s) having objections to the proposed change is obligated to file his objections with Director, OWRD at least 10 prior the date set for the hearing.

(3') It appears that the familiarity with this part of the statute is very minimal, since quite frequently interested parties appear for the hearing only to find there is no hearing which has been officially set in the prescribed manner. Legislation has been proposed which would make the minimum period five days instead of ten.

(4) Once all objections are heard (and even if there are none) the water division of OWRD must determine whether there is potential injury to third parties.

(5) Once the proposed works which signify accomplishment of the proposed change are installed, the applicant must file proper proof of complete application of the water to the new use.

(6) Upon review of proof submitted, the director shall issue a new certificate preserving the priority of rights theretofore established.

As the statutes completely specify the process for the application and the granting of a water rights transfer, the administrative rules in the Oregon Department of Water Resources relating to transfers leave the administrators with little discretion for affecting the process.

Survey of Water Rights Transfers in Oregon, 1970 to 1980

In 1981 a reconnaissance survey of all legal water rights transfers in the state of Oregon in a recent 10-year period was undertaken. In all there were 2258 completely processed applications contained in a chronologically-ordered file in the water rights section of the Oregon Water Resources Division.

Transfer Files: Each water right transfer file contained the following information: (a) applicants name and address, (b) name of the party who originally secured the right to the water under question, (c) proposed type of transfer and amount of water in cfs or sec.-ft. and/or acres irrigated, (d) the land affected by the transfer, (e) the name of the stream from which the water is diverted, (f) a copy of the original water right certificate, (g) a notice sent from the OWRD acknowledging receipt of the application and the required fee, (h) order that the proposed change should be undertaken with a stipulation that the change should be accomplished by a certain date, (i) documentation of a land survey done by OWRD ensuring that the proposed transfer will not interfere with other water rights, and to determine which kind of construction must be done before the transfer can be carried out, (j) a copy of the newspaper publication of the required notice of a public hearing on the proposed transfer, (k) a copy of the new or revised water right, (l) miscellaneous documents such as protest manuscripts, correspondence, etc. The details involved in a transfer application are substantial and case specific. Since the object of this survey was simply to classify accomplished transfers, a rather basic data base scheme was devised. Information recorded included (a) file number, (b) status of file, (c) county, (d) transfer type, (e) acreage involved in in a place of use transfer, (f) total acreage in the original right(s), (g) type of applicant including ownership status, (h) date of final order. In

the following paragraphs we briefly summarize the finding of this reconnaissance survey. Appendix A contains the tabularized results.

Examining the status of the transfers applied for in this ten-year period reveals that 1818 transfers were completed, 180 applications were still in process, 78 applications were completely processed but were awaiting a decision, 57 applications had been withdrawn, 55 applicants were found to be requesting a change on a right which was no longer in existence or no longer valid, 39 applicants failed to take action on the proposed change within the prescribed period, 13 applications had been disallowed as a result of protests of one or more other individuals, 12 applications were refused on the grounds that the water had not been applied to a beneficial use in the preceding five years (without forfeiture), 5 applications were refused prior to a hearing because of well-evidenced injurious effect(s) on third parties, 1 application was terminated because the right was forfeited for nonuse.

Transfer applications were distributed fairly evenly across the state with all counties being represented except Clatsop County. This distribution was contrary to the expected result that the drier eastern region would account for a disproportionately high number of transfers.

Three main types of transfers are possible: (a) change in the point of diversion -- designated hereafter as POD, (b) change in the place of use -- POU, and (c) change in the use of the water being put to beneficial use -- USE. For groundwater appropriators, it is usual to apply for (d) change in the point of appropriation -- POA. In addition, several combination of changes are possible under a single transfer application.

POD transfers are generally accomplished within the boundaries of the applicant's property and are carried out to achieve a better diversion

system, replace an old diversion works, etc. A straightforward POD transfer is a technical adjustment and is of minimal interest in regard to this study. In fact many changes in the point of diversion involve short distances along a watercourse. There were 793 of these approved (40 percent of the total approved) in the time period examined.

A water rights transfer is more likely to be thought of as involving a change in the place of use. There were 870 POU transfers, most of them taking place within organized water districts in Deschutes and Umatilla Counties (473 and 56, respectively). The subdividing of land in these districts has meant configuring the place of use to fit the subdivision plats. Appurtenant lands as depicted in the proof maps often have the shape of landscaped gardens and lawns. POU transfers are often made in combination with POD and/or USE transfers. There were 223 POU+POD transfers, with a large number being accomplished in Jackson County water districts.

Use changes are also of interest in this study. There were 51 USE, 17 POD+USE, 17 POU+USE and 16 POU+POD+USE transfers, mostly involving the acquisition of agricultural water by municipalities and/or industrial firms although some changes went the other way.

On a statewide basis, transfers were predominantly made by individual rights holders: a total of 1362 individuals applied for applications. Irrigation districts were responsible for 613, and 29 were filed by municipalities. Individuals mostly filed for POD transfers, while irrigation districts filed predominantly for POU transfers. Municipalities applied for a variety of reasons with the combination POD and USE transfer being most frequently (7) accomplished.

The kind of transfer thought to be extremely interesting in the context of this study are those involving two separate parties. As

mentioned above, nearly all of the POD transfers were accomplished on the property belonging to one indivdual. Of the 607 POU transfers, including POU & POD types and POU & USE types, 437 involved land belonging to two different parties. It is notable that 407 of these were transfers on lands within organized irrigation districts. The remaining were two-party transfers along watercourses -- 2 were transfers filed by municipalities (transferring water to individuals) and the remaining 28 were filed by individuals, 6 of whom transferred water to municipalities.

The quantities of water involved in these recorded transfers could be ascertained directly, many of them being stated in CFS or second-feet of discharge. Instead, the acres of land appurtenant to the right (or part thereof) that was being transferred was recorded in the case of POU transfer. For POD and USE transfers involving irrigation water rights, the acres appurtenant to the original right or set of rights was recorded. In many transfers, applicants were attempting to consolidate several rights at one point of diversion or otherwise adjusting lands appurtenant to several rights that they held. One could discern a pattern that as ownerships of lands changed, individual were making necessary adjustments in water entitlements.

Concerning the 28 so-called "A to B" transfers in ten year, it is remarkable that so few occurred from a standing file of some 50,000 rights in the state of Oregon. If further research were to indicate that most of these individuals knew each other as a result of land sales, or family ties, the suggested conclusion is that the transfer mechanism in Oregon is minimally effective as a means of allowing the decentralized exchange of rights along a single watercourse.

Concerning the 407 transfers among members of organized water

districts, we suspect that here, too, the main impetus is the resolution of property claims being initiated as a consequence of land sales or other legal transaction.

NOTES -- SECTION II

(1) The statutes governing water rights transfers in the state of Oregon are:

- o ORS 540.510 -- Appurtenancy of water to premises; restrictions on change of use or point of diversion
- o ORS 540.520 -- Application for change of use, place of use, or point of diversion
- o ORS 540.530 -- Hearing on Proposed Change
- o ORS 540.540 -- County acquiring land in irrigation district; transfer of water rights to other lands
- o ORS 540.550 -- Ratification of prior transfer of water rights to irrigation district

(2) Or. Laws 1909, c. 216, sec. 65.

(3) W. Schaab, Prior Appropriation, Impairment, Replacement, Models and Markets, 23 Natural Resources J. 25, 30 (1983).

(4) Id. at 31.

(5) Or. Laws 1927, c. 219.

(6) If the application for a change in the place of use or point of diversion less than 1/4 mile from the original site and there are no intervening diversions between the original site and the proposed site, no notice need be published. ORS 540.520.

(7) ORS 540.520 to 540.530 (1977).

(8) The following discussion is primarily taken from Joint Legislative Task Force on Oregon Water Law, Research Report No. 19, 7, Proposed Revision of Oregon Water Law (1976).

(9) ORS 537.250, 537.700, 539.140 (1977).

The term "water right" is neither defined or explained in the code. However, in ORS 540.530 (2) there is language which supports the opposite conclusion that pre-1909 vested rights were intended to be covered by the change in use statute. In discussing the issuance of new certificates reflecting the new change, the statute refers to the possible existence of an old certificate: "If a certificate hasd been theretofore issued ... " (emphasis added). This seems to imply that the right may or may not have been evidenced by a certificate. However, the wording may refer to the situation where although rights have been adjudicated, certificates have not yet been issued pending appeal. Subject to appeal, holders of rights under an adjudication, not yet finalized are allowed to transfer their interests. Proposed Revision, supra at note 10, Research Report No. 19.

(10) Wash. Rev. Code Sec. 90.03.390; NM Stat. Sec. 75-40-1 to 75-40-7;

Colo. Rev. Stat. 37-83-105.

(11) C. Clark, Survey of Oregon's Water Laws, 18 Water Resources Research Institute, Oregon State University (1974)

(12) W. Hallmark, Oregon's Water Management Districts, 47 Oregon Law. R. 16 (1967).

(13) F. Trelease, The Concept of Reasonable Beneficial Use in the Law of Surface Water Streams, 12 Wyoming Law J. 1 (1957).

(14) Comment, Water Law, Conservation, Installation of Water Saving Devices as a Means of Enlarging an Appropriation, 46 Oregon Law R. 243 (1967).

(15) Hutchinson v. Stricklin, 146 Or. 285,296-97,300,28 P.2d 225 (1933). See also, Vanderberg v. Wheeler, 13 Or. App. 25, 46, 507 P2d 831 (1973) (no change in point of diversion allowed without going through the statutory procedure for change.), Oliver v. Skinner and Lodge, 190 Or. 423, 448, 226 P.2d 507 (1951) (appropriator has no right to change manner, method, and period of irrigation without permission of the State Engineer), Broughton v. Stricklin, 146 Or. 259, 271, 28 P.2d 219 (1933) (it is a condition precedent to the right to change the place of use that the State Engineer's approval be obtained).

ORS 540.530 (2) provides that if the Director finds that the change will not prejudice rights, he shall make an order approving the change.

(16) In re Deschutes River, 134 Or. 623, 642, 286 P. 563 (1929), modified, 294 P. 1049 (1930) (point of diversion, inchoate right), In re Silvies River, 115 Or. 27, 49, 237 P. 322 (1925) (point of diversion), Blanchard vs. Hartley, 111 Or. 308, 312, 226 P. 436 (1924) (Purpose of use), Haney vs. Neace-Stark Co., 109 Or. 93, 116, 216 P. 757 (1923) (place of use), Squaw Creek Irr. Dist. v. Mamero, 107 Or. 291, 300, 214 P. 889 (1923) (that the owner of a water right may change the place of its use, provided such change does not injuriously affect the rights of others, cannot be disputed), In re Umatilla River, 88 Or. 376, 396-97, 168 P.922, modified 172 P. 97 (1918) (Place of user, inchoate right).

(17) In re Deschutes River, 134 Or. 623, 639-40, 286 P. 563 (1929), modified, 294 P. 1049 (1930) (point of diversion). See also Broughton v. Stricklin, 146 Or. 259, 276-77, 28 P.2d 219 (1933) (change in the place of use is not abandonment), In re Silvies River, 115 Or. 27, 49, 237 P. 322 (1925). See also note 3, supra, for cases which held that water rights are not lost when change is made, thereby, logically, inferring priority is not lost, although not specifically mentioning priority.

(18) 1 W. Hutchins, Water Rights Laws in the Nineteen Western States, 624, (1974). Broughton v. Stricklin, 146 Or. 259, 28 P.2d 219 (1934). In re Umatilla River, 88 Or. 376, 396-97, 168 P. 922 (1917), modified, 172 P. 97 (1918).

(19) 3 Ariz. App. 28, 411 P. 2d 201 (1966).

(20) Id., 411 P. 2d at 206.

(21) 51 Ore. 275, 95 P. 200, 97 P. 539 (1908)

(22) 167 Ore. 126, 164 P. 2d 680, hearing denied, 178 Ore. 156, 165 P. 2d 770 (1946)

(23) L. Brown, et al., Water Reallocation, Market Proficiency, and Conflicting Social Values, Weatherford, ed., Water and Agriculture in the Western U.S.: Conservation, Reallocation, and Markets 191 (1982).

(24) G. Radosevich, Western Water Laws and Irrigation Return Flow, 600/2-78-180 US Environmental Protection Agency 100 (1978).

(25) Cf. Little Cottonwood Water Co. v. Kimball 76 Utah 243, 289 P. 116 (1930); Glen Dale Ranches v. Schaub, 94 Id. 585, 494 P. 2d 1089 (1972); Tongue Creek Orchard v. Town of Orchard City, 131 Colo. 177, 280 P. 2d 426 (1955); Twin Falls Land and Water Co. v. Twin Falls Canal Co., 7 F. Supp. 238, Dist. Ct., Ida. (1933).

(26) 74 Or. 592, 637, 144 P. 505 (1914), 146 P. 475 (1915).

(27) Brown, et al., supra n. 23, at 216.

(28) 227 P. 1065, 114 Or. 122 (1924).

(29) 130 Or. 506, 515, 280 P. 518 (1928).

(30) 238 Or. 266, 393 P. 2d 193 (1964).

(31) 162 Or. 186, 91 P. 2d 542 (1939).

(32) W. Schaab, supra n. 3, at 31.

(33) 150 Colo. 91, 371 P. 2d 775 (1962).

(34) Oregon Water Resources Department, Water Rights Information (1982).

III. ECONOMIC RATIONALIZATION OF WATER RIGHTS TRANSFERS

The purpose of this section is to assume an unapologetic economic stance toward surface water resources and explore techniques for measuring the differences in water productivity that are presumed to constitute adequate incentives for exchanges of water rights. Most public discussion (and a great deal of academic discussion) on incentives for exchange usually begins with strong reservation about treating water as a marketable resource. The approach of this section is to briefly summarize the literature in three basic subtopics and additionally summarize research findings found in Appendixes B and C. The three basic subareas referred to here are (1) conceptualizations of water exchanges in general, (2) conceptualizations of water exchanges with emphasis on agricultural productivity differences, (3) resolution of problems with measuring differences of water productivities in irrigated agriculture.

Conceptualizing Exchanges of Water Rights

Basic Concepts

It is not the intent to completely develop basic exchange theoretic and production theoretic concepts here. We wish only to indicate that much work in water rights transfers is grounded in the concepts of economic efficiency and the inherent value judgements implied in this statement.

Equimarginality: Neoclassical economic theory posits the principle of equimarginal value as characterizing an "efficient" solution of the problem of the allocation of resources: all users of a resource should derive equal value from the last unit of the resource each user has consumed. It can be shown that in an economy with some initial random allocation of endowments, individuals will seek out mutually advantageous trades.

Trading will continue until the last (or marginal) unit of water is valued equally (in terms of the greatest amount of dollars that any one party is willing to pay) based on the use that can be made or benefit derived from the marginal unit. A corollary of this general tenet is that, ceteris paribus, efficiency is prevented if free trade is inhibited. The concept of marginal cost pricing is closely related to the equimarginal value principle. If endowments of a good, e.g., water, are only realizable through investments, the same equimarginal principle holds. In this case, users of the water as a group take water up until marginal willingness to pay for an incremental unit equals the marginal cost of that unit.

Competitive Equilibrium: Implicit in the foregoing discussion was the assumption of a market for water. Attainment of economic efficiency is contingent on this market behaving perfectly. Perfect information, rationally motivated traders are some of the key assumptions. With regard to developing water supplies, however, there are important factors weighing against the use of models assuming competitive equilibrium.

Departures From Marginality: Some economists have argued that where the economy as a whole does not conform to all conditions for optimal resource allocation, then attainment of a "second-best" set of conditions (achieved by forcing economic optimization in one sector) may not necessarily mean a move toward total system efficiency. In fact, it may worsen conditions as a whole. However, it has been suggested that if the sector is reasonably distinct from the rest of the economy, then movement toward optimality may still be desirable. Some of the reasons for departures from marginal theoretic exchange theory concern the existence of unpriced inputs and outputs, changes in the system of property rights, existence of natural monopolies.

Allocation in an Exchange Economy With Production: In production, the principle more precisely holds that the value of the contribution of the last unit of a good used in a production process should be the same across all production processes. Since water is used in irrigated agriculture as a factor of production and because this study is oriented toward the applicability of the transfer process to allocate water within this particular economic setting. Economic exchanges of water involving municipal and industrial uses, instream uses, etc. with agriculture should theoretically be amenable to this approach. Application of production-theoretic concepts, however, may result in severe problems with measurement. Our approach is to first introduce a direct agricultural production model with exchange framed in the context of agents situated along a single watercourse. This model is introduced here to emphasize the production theoretic basis for water rights exchanges. This model is employed more intensively in the following section.

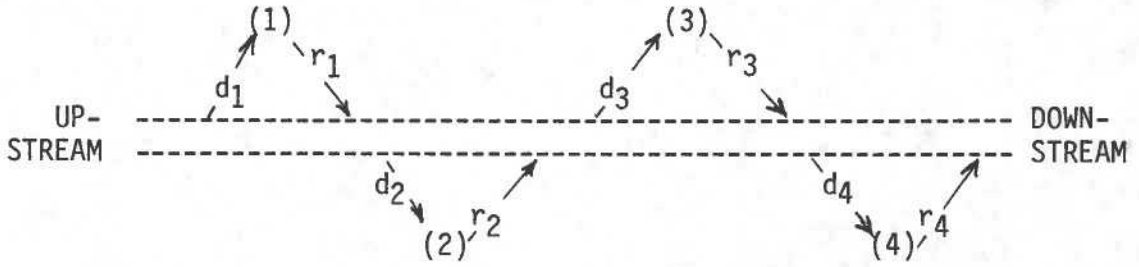
Models of (Intra-Agricultural) Exchanges of Water Along a Watercourse

The analysis in the models developed by Tolley and Hastings and most notably by Hartman and Seastone involve the exchange of property rights to water along a single watercourse where each individual diverter seeks to maximize private economic gain.[1] As noted above users of water are linked to one another by the productivity of water used to produce marketable crops. One can derive the value of marginal product for water from knowledge of the demand for crop products in the competitive marketplace If these productivities of water (or VMPs for short) inherent in the operations of farmers along a water course are measured and compared, they will be partial determinants of the relative amounts of water used by those

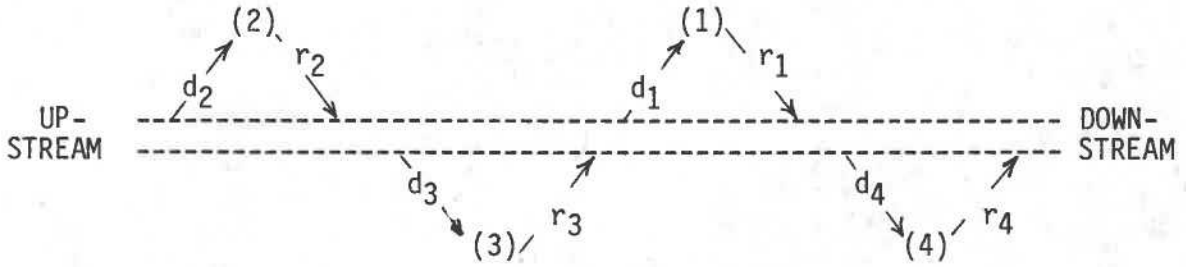
applicators in a regime of efficient allocation. It thus becomes important (in this study of surface water allocation) to ascertain the theoretical properties of marginal productiveness of water and to devise means of measuring it. The other issue in allocation of water along a single watercourse concerns the external effect of irrigated production, namely the return flow from an applicator's operation, the excess of diverted water over consumptive use. In a modeled system without explicit property rights, the nature of the watercourse specifies that external effects pass from upstream diverter to downstream diverter. In this way the return flow (tailwater, etc.) of each applicator, expressed as percentage of water diverted, takes on a special significance. As water in the modelled system is made more constraining, interesting conclusions can be drawn concerning the relationship of applicators along the watercourse.

In Appendix B, pp. 137 - 147, we replicate the development of the conditions necessary for efficient use of water on the stream. Here, consider that there are 2 uses on a stream. The marginal value of the upstream use would include the value of the marginal product at the upstream site plus the the contribution of the return flow to the production at the downstream site. Conditions for efficient use of water would be that marginal productivity at the downstream site must be at least equal to an amount 1/(1-R) times as much as the marginal productivity at the upstream site. Suppose this is the initial state of the system. Some exogenous product price increase could cause the value of marginal product for one user to increase, stimulating an effort to acquire more water. After the negotiation and transfer of water, the efficiency condition is regained. The enlightening aspect of this model comes after it has been generalized to N diverters along a watercourse. This is accomplished in Appendix B at page 142.

After demonstrating the implications of attaining a state of efficient allocation of water along a modeled watercourse, it becomes desirable to test the consequences of alternative property rights regimes on the watercourse. Transfers between any two non-contiguous parties creates external effects on other diverters. So if one diverters marginal value of product increases, transferring water to that site may impair others. A simple example shows this effect.



In the modeled system above, the priority of users is 1 (most senior), 2, 3, 4 (most junior). If the value of marginal product at 3 increases, so that an offer for the senior right at 1 is the most desirable transfer possibility, this would cause an impairment at 2 due the curtailment of the return flow from the operation at 1. The diverter at 4 could secure the extra return flow coming from increased use at 3. Resolution of this problem is accomplished by having user 4 purchase the extra return flow from user 3 -- who in turn would buy the water rights that user 2 previously secured as return flow from user 1.



In this example (again with priority 1, 2, 3, 4), low streamflow conditions may necessitate user 2 and user 3 having to let all water bypass in order for user 1's right to be satisfied. This allows user 4 to exercise the full extent of his right. Any transactions on this system would have to come as a result of the value of marginal product (VMP) at 2 and/or 3 being sufficiently larger than that at 1 in order for the water to be bid away. If user 1 were to transfer his right to a nonagricultural use such that the consumptive use (traditionally used in the agricultural operation at 1) at this point became the amount diverted, then user 2 and user 3 would apparently have first claim on the then unappropriated water More precisely, the amount would be that by which the amount diverted as per the right exceeded the historical average consumptive use). But if these tranfers caused any injurious third party effects, the prior appropriation doctrine would disallow them. This might very well happen since user 4 enjoyed the full extent of his right.

The basic model sketched above is extended to a generalized form with N users on stream in Appendix B, p. 144.[4] Such generalizations allow the modeller to deal with many variations of the situation just discussed. For example, consider when all of the streamflow is diverted at one point on the watercourse. Any flow below that diversion can only result from the return flows of the user at that point. It can be shown that equating the

"effective" value of marginal products of water throughput the length of the watercourse will not not necessarily result in an optimal allocation of water. Points where flows are diminished to zero acquire a special significance -- a diverter at that point is likely not able to use water to the fullest extent and thus the MVP at this point will be greater than zero. In the case where water is not constraining, VMPs are everywhere equal (and if the cost of water is zero, VMPs are every equal to zero). Continuing the analysis of constraining case further raises some questions about the definition of water rights from an economic point of view. Johnson, et al. in a recent paper indicate that

> ...one solution would be to define rights in terms of the diversion coupled with a complete specification of the downsteam user's rights to the return flows of each upstream user. In a world of positive transactions costs, defining rights in terms of consumptive use with protection against third party impairment alleviates the need to define explicitly the numerous possible patterns of entitlements to return flows...accordingly, ... a water right will specify all three dimensions C (consumptive use), R (return flow), and S (existing streamflow)...[5]

While the definition of a right explicitly in terms of three dimensions listed above seems to be desirable from a modelling point of view, it does not conform well to existing practice. What could be done is to focus attention on more expedint determinations of value of marginal product of water in actual agricultural use.

Consider the defining elements of a water right which are at issue when applying for a transfer: (1) the time period in which water may be withdrawn, (2) the maximum discharge of water through a diversion works (in cfs or sec.-ft.), (3) the acreage appurtenant to the right, and (4) the duty of water. We have discussed the appurtenancy issue in a previous

section. Time and discharge rate are the elements which can be easily monitored and policed. As it is a largely technological matter and as it is related to the cost of production, a discussion of the duty of water has been postponed until now.

Duty of Water, Beneficial Use, Maximal Use

The concept of beneficial use (and its opposite, waste) were discussed previously as legal terms. Here, it is necessary to elaborate on their economic relevance. We have introduced the term value of marginal product (VMP) as a theoretical tool to address the issue of equimarginal value as a measure of efficiency in allocating water. Are these operationally meaningful devices that someone could use to determine the potential for exchanges of water in a given system? It is desirable to ascertain the measurements leading to an estimation of VMPs of water within a basin where exhanges are feasible and how they are made in practice.

Duty of Water: The term "duty" of water can be considered as an element of a water right. When this information is combined with the appurtenant acreage and the time period/maximum discharge restriction, the periodic and annual consumptive use/return flow figures can be computed. The duty of water can be an objective measure of water use (measured in feet of water applied) or it can be more subjective. A widely recognized method is the the Blaney-Criddle formula.[6] The formula calculates how much water should (using good agricultural practice) be used on a specific soil by considering altitude, natural precipitation, growing season length, and the type of crops grown). The principal difficulty is that the Blaney-Criddle method is seldom used outside of dispute resolution, project design. Rarely are the results known as a matter of record as information for

potential transferrors of water.

In Oregon court cases the duty of water has almost never exceeded one miner's inch or 1/40 of a second-ft per acre and was frequently fixed as low as 1/80 of a second-ft per acre. The courts, however, have provided a somewhat more subjective definition:

> It is that measure, which by careful management and use, without wastage, is reasonably required to be applied to any given tract of land for such period time as may be adequate to produce therefrom a maximum amount of such crops as ordinarily are grown thereon.[7]

In Oregon the following cases are relevant: "...(the) Duty of water depends on soil, the manner of application, climate, and other factors..."[8] On two occasions the court was lead to comment on the failure of the parties to introduce adequate evidence of the various factors so that a duty of water could be established.[9] Another decision specified that "...The crop desired must be one suitable to the area..."[10] In addition, the technology of application employed by users should be "relatively" efficient. In Foster v. Foster, the court acknowledged the relevance of technological development in defining "need" and "waste" by remarking, "...we have not arrived at the stage of irrigation when farmers can practically lay iron water-pipes, or construct concrete water ditches..."[11]

In using a water right, farmers are not bound by any efficiency criteria toward conservation per se. Presumably they are bound by rational profit-maximizing behavior. The encouragement for greater water conserving effort may possibly be based on a doctrine of selling or extending water conserved. In order to begin this process users must determine a reasonably accurate estimate of historic consumptive use, preferably one that realistically expresses crop needs, since crops do not necessarily require a steady flow of water. Potential transferrors could

indicate at what intervals water is required.

Estimating the Ex Ante Requirements for Water as a Residual: Estimating the "requirements" for water at the most cursory level of analysis is a matter of simply examining the the anticipated gross returns and the costs of all measurable fixed and variable inputs. The difference between the two -- a residual -- will usually consist of returns to owner-operator management and water. In most new irrigated farming situations, the object of the analysis is aimed at determining the feasibility of the proposed irrigation development with regard to the ability to pay for electricity (at different rates). Calling this a determination of the demand for water is probably a misnomer. What really happens in fact are that a finite number of plans are analyzed in such an analysis but that the combinations of factors including irrigation technology are fixed -- i.e. stated in terms of engineering estimates or the best estimates of agricultural specialists. These feasibility analyses are valuable exercises in that they are the best approximation of what will happen in the actual development.

Estimating the Derived Demand for Water Through Optimization Modelling: The application of the theory of the firm to agricultural production has focused on either determining the means by which production (say a particular crop) can be maximized in terms of the required factor inputs, determination of the least cost linear combinations of factor inputs required to produce a given output. There have been significant efforts by agricultural economist to apply linear programming to a wide variety of agricultural production problems. An important development stemming from the application of linear programming techniques to the

analysis of the cost of production is that it has allowed the estimation of the elasticity of demand for any factor input.[12] For water, the cost of the resource is principally the cost of delivering it to and applying it on farm-level units of production. Linear programming studies have tended to support the hypothesis that the on-farm demand for water is price inelastic (i.e. unresponsive to price changes).[13] The inelastic price responsiveness hypothesis conforms well with what might be called the "water is different" hypothesis. Coined by Professor M.M. Kelso, it hypotheses that the characteristics of water as a productive input lead to extensive market failure and that even if these problems could be internalized, pricing systems will be largely ineffective as allocation mechanisms for irrigation water.[14] Critics of this position claim that these empirical studies make unreasonable assumptions that the elasticities of demand for the products of irrigated agriculture are also inelastic. Quadratic programming techniques have recently been employed resulting the estimation of greater (i.e., more price responsive) elasticities.[15] The practical advantage of quadratic programming over linear programming is that the former can be made to accomodate the phenomena of rising product prices as less of the product is produced for sale (as a consequence of higher factor input prices). Moreover

> ...(t)he critical difference between LP and QP regional models is that the LP optimal solution is conditional on constraints. Thus the crop mix in the LP solution is only changed by the changes in the single crop with the lowest value of marginal product for water. Other non-marginal crop activities which are subject to rotational and other constraints will be unaffected in acreage by increased water price, until they become the marginal cropping activity....
>
> ...the water price rise that will drive the marginal crop from the optimal basis in LP will cause a smaller change in the marginal crop water use under price responsive QP ... but will

also result in a reduction of water use by the other (m-1) nonmarginal crops...[16]

The consequences of this finding are significant in that at least one assumption about the efficacy of the market place in water allocation is clarified. It is still possible to agree that "water is different", but perhaps less reason to believe that rational individuals if given the opportunity will not readily engage in transactions for it.

Estimating Demand for Water in Agricultural Processes: As noted above, the LP and QP analyses of the use of water in agriculture address regional, multi-product situations. Analysis of regional problems introduces a difficulty which may be important. The problem concerns the error that is introduced when one attempts to imply that the aggregate stock of inputs (land, water, machinery, labor, etc.) can be combined in production to produce an aggregate stock of outputs (crops) with a single technology (linear combinations, quadratic forms, etc.) that might be at best applicable to a single unit of production. This error is called aggregation bias and it is the subject of a detailed investigation which is attached as Appendix C. In this special investigation the object is the pursuit of a methodology which would permit econometric investigation of the demand for water (and hence value of marginal product).

Does the use of aggregate data on agricutural crop output, use of factor inputs in itself, etc. color the analysis. If prices for the same factor input or product output in a regional model are known to exist, what are the consequences for the analysis of the demand for one of the inputs (say water) if the aggregation is not carried out properly. Hick's aggregation theorem enables the definition of a composite input commodity -- an aggregation of each of a group of close substitutes -- if the price

of each individual input moves in exactly the same proportion. If these price changes are not in the same proportion, the use of such aggregate variables in the production function estimation will result in aggregation bias. Moreover the problem of proper aggregation may be a result of the way production itself is aggregated up from micro-level unit to fictitious "regional unit". As noted above, neoclassical production theory likens production to a mixing pot of factor inputs. Some recent work has suggested that a more structured approach to production is desirable.[16] In particular, recognizing the dynamic nature of crop production has merits. For, example a few studies have asserted the need to explicitly consider water application regimes rather than the aggregate water input. By functionally separating production functions at the microeconomic level into intermediate production functions, that is introducing well-defined mathematical conditions for "separability in production", aggregated data on crop output, water and other factor inputs could be more precisely analyzed. In Appendix C, the results of an investigation into the use of separability in production are presented. The object of the investigation is to develop a means of estimating values of marginal products from aggregate data with minimization of aggregation bias. Further exploration into this method of aggregating across processes may prove to be valuable for determining a locally-relevant measures of beneficial uses and the prices of water in those uses solely on the use of aggregate data.

NOTES -- SECTION III

(1) L. Hartman and D. Seastone, Water Transfers: Economic Efficiency and Alternative Institutions (1970).

(2) Id. at 10.

(3) L. Brown, et al., Water Allocation, Market Proficiency, and Conflicting Social Values, Weatherford, ed., Water and Agriculture in the Western U.S.: Conservation, Reallocation, and Markets 191 (1982).

(4) Cf. R. Johnson, et al., The Definition of a Surface Water Right and Transferability, 24 J. of Law and Econ. 27 (1982); J. Callaway, The Optimal Use of Surface Water with Return Flows Present: A Theoretical Model for Deriving Alternative Allocation Rules, unpublished thesis, U. of Minnesota (1979).

(5) R. Johnson, supra n. 4, at 30.

(6) Blaney and Criddle, Determining Water Requirements for Settling Water Disputes, 4 Natural Resources J. 29 (1964).

(7) Farmers Highline Canal and Reservoir Co. v. Golden, 129 Colo. 575 at 584, 270 P. 2d 629 (1954).

(8) Cf. Little Walla Walla Irrigation Co. v. Finis Irrigation Co., 62 Or. 348, 351, 124 P. 666, 125 P. 270 (1912); Hough v. Porter, 51 Ore. 318, 417, 95 P. 732 (1908), 98 P. 1083 (1909).

(9) Cf. Porter v. Pettingill, 57 Or. 247, 110 P. 93 (1910); Whited v. Cavin, 55 Or. 98, 109, 105 P. 396 (1909).

(10) Donnelly v. Cuhna, 61 Or. 72, 76, 119 P. 331 (1911).

(11) 107 Or. 291, 213 P. 895 (1923).

(12) Id. at 363.

(12) The price elasticity of demand is defined as the percentage in quantity demanded resuting from a one percent change in price.

(13) Cf. Moore and Hedges, Method of Estimating the Demand for Irrigation Water, 15 Agricultural Economics Research 131 (1963); Heady, et al., National and Interregional Models of Water Demand, Land Use, and Agricultural Policy, 9 Water Resources Res. 777 (1973); Hedges, Water Supplies, and Costs in Rel.tion to Farm Resource Decisions and Profits on Sacromento Valley Farms, Giannini Foundation Research Report 322 (1977).

(14) R. Howitt, et al., A Reevaluation of Price Elasticities for Irrigation Water, 16 Water Resources Research 623, (1980).

(15) Id. at 625.

(16) N. Georgescu-Roegin, The Analytical Representation of Process and the Economics of Production (1971).

IV. JOINT LEGAL THEORETIC AND ECONOMIC APPROACHES TO WATER RIGHTS AND WATER RIGHTS TRANSFERS

In the preceding sections we have indicated that pursuing legal redress to the question of water allocation shows the need to specify economic values of water in beneficial use with regard to the technology that is usual and accustomed for an area. While economists have made attempts to provide operationally meaningful estimates of the value of water being used in agriculture, there is skepticism over how meaningful these estimates will be in a legal setting. In other words, it is believed that until the resolution of some fundamental issues concerning how property rights to resources have been and are currently established, a lot of work (particularly economic research on water values) will go unnoticed. This section briefly summarizes work attached as Appendix B concerning legal decision-making in the area of water resources and the apparent existing relevance of economic and alternative "norms" for a theory of decision-making. The ideas summarized are: (1) hypotheses about economic content in water law; (2) theories about legal decision-making; (3) the economics of property rights; (4) a model of a simplified appropriation doctrine water law operating on a simple watercourse.

Hypotheses About Economics and Water Law

Even though the attempted synthesis of economics and water law has been attempted several times [1], there have been few contributors who have effectivly laid any sort of framework from further analyses could begin. One exception is S. V. Ciriacy-Wantrup's contibutions in the 1950s and 1960s.[2] Wantrup is especially careful to state his concurrance with the sociological school of legal theory and hedges on claiming any normative

role for economic theory. He does, however, claim, that economics can point out the the essential features of conflict situations and the probable consequences of changes in statutory provisions, judicial decisions, and administrative regulations.

According to Wantrup, there are economic criteria "contained in" water law (particularly the statutes), but there also exist economic criteria serving as the "basis for" water law. He believes that these criteria fall into two major categories: those that ensure tenure security and those that ensure tenure flexibility. These are discussed with some care in Appendix B, p. 123 - 136. We call attention, however, to the tenure security issue insofar as it pertains to the security of investment.

Agricultural use of water involves considerable expenditure for diversion and storage dams, main canals, distribution systems, land leveling. A private user will make these expenditures only if they seem warranted by the income flow that the durable assets are expected to yield. Once these investments are made, there are no contractual terms to insure that expected inputs such as fertilizer and seed will be available or that electricity will be sold at the same rates. The reason that Wantrup suggests that water is different in this case is the existence of public benefits from water development "...resulting from flood control or ground water recharge..." [3] From this he concludes that

> ....(t)he foregoing argument in favor of protection of investment in water resources is based on two necessary conditions: (1) that expenditures for durable assets are in the public interest although they may not be economical for private water users, and (2) that the most economical alternative for public policy to develop water resources is a guarantee just sufficient to induce private development... [4]

Wantrup obviously neglects the possibility of public costs of

private water development, so it is advisable to modify his first condition accordingly. The second condition applying to aggregate use of water in a watershed seems reasonable but this may not bear any relationship to the priority of rights along that watercourse. That is, what appears to be a reasonable guarantee for senior rights-holder may be different than that for the most junior right-holder. The former enjoys security from anyone of a number of juniors, while the latter only enjoys an overall security given in the case of other parties attempting to secure a transfer.

The argument for tenure security as used by Wantrup and others [5] seems to read stronger in the sense of defining the right than one can glean from the economic content "contained in" the law.

Sax observes that water rights have the "...limitation that the use must be in the public interest..." [6] This limitation causes problems:

> ...property rights are ordinarily rather specific in their content. They contain the attributes of a fee simple, a lease for a certain time, or the right to exclude, or to make, certain uses of the property. But the right to operate in the public interest has no such specificity...

Moreover,

> ...there may very well be some point at which the question of whether there is a property right to be protected ought to be answered by looking at economic facts, rather than the language of any document or statute. If public property is made available for private use under circumstances where large investments are induced, and where the reliance on some kind of security of use and tenure are implied, perhaps those facts themselves suggest that a property interest ought to be recognized...[7]

Theories of Legal Decision-Making

In the first section above we were careful to distinguish between statutory law, administrative rules, and case law at the appellate court level concerning water rights transfers and related matters. The popular conception of the "law" encompasses all three of these realms. In order to find out what lies behind these facets of the law, one finds the political process most relevant to the first two categories while the last is the province of jurisprudence, the study of legal systems.

An Outline of Schools of Thought in Jurisprudence

One of the problems that a scholar of jurisprudence must address is the positive fact that in almost every conflict submitted to an authority for resolution at the appellate level, the decision-maker is faced with a choice among different rules and their interpretations. Alternative schools of thought have emerged each with a theory as to why decisions turn out the way they do. In Appendix B, we discuss these alternative viewpoints in some detail. A very brief outline of each is listed below:

Analytical School: Proponents of this school look to the law as it is manifested in the statutes, judicial opinions, administrative decisions, etc. A hierarchy of norms is thought to constitute the law, beginning with some basic norm which is undefinable, but leads all other norms. At the bottom of the hierarchy are newly-created individual norms specific to each case.

Teleological School: This school of thought has two major branches: natural law and value-oriented jurisprudence. Each adheres to a belief in some absolute law at a high level. Natural law theories date from the time of Aristotle. The natural law theories derive their rules from universal

norms, and insist on the normative content of those rules in the manner of the analytical school. Value-oriented jurisprudence relies on the assumption of certain values which the legal system should promote, rather than assuming that there are underlying "natural laws". Example of some of the values suggested by adherents of this school are power, wealth, well-being, enlightenment, skill, affection, etc. In view of the number and kinds of values that the law is supposed to promote, economic criteria would only be a small part of the standard to which the law would be compared.

Functional School: Included here is what has become to be known as the school of legal realism. In general the realist position places great importance on the examination of the social effects of a decision. The crucial difference between the realists and the other views of the law expressed here (and Appendix B) is their insistance on the lack of normative content of the law in many situations.

What makes the consideration of norms in legal rule making (and the antithesis that there are no such norms) interesting is the potential role that economic theory has in the law. Where the law has normative content, economic theory provides criteria for the evaluation of the effect of different rules. Where the law is assumed to not have normative content, economic theory provides only a method of predicting the decision rules which could be used by the decision-maker. This emphasis on prediction is of vital importance to those who want to know how their actions are to be viewed by the state. The question then becomes: at any point in time, is economic theory (rationally motivated individuals acting in self-interest; diminishing returns; equimarginal principal, etc.) of any value to those

(or more specifically, their counsel) who happen to be before a decision-maker or judge. We think the answer to this (at least in water law) is "yes" -- economic theory may in fact influence the riskiness regarding which decision rules may be invoked in a case. The next question is how does this happen?

We have tried to indicate (Section B) that neoclassical economics is itself far from being a completely positive (value free) science. This is widely accepted even with regard to the most fundamental tenets of economics, e.g., the equimarginal principal, law of diminishing returns, etc. However, there is disagreement in these areas. When it comes to areas of economics that deal with property rights and market failures and the role of the government, there is much less agreement. In the following paragraphs, we briefly describe the nature of this issue.

Rules Related to the Protection of Property Rights

The shift to the nature of property rights here is for expository reasons. Later on in this section, we describe how an analogous situation, i.e. involving uncertain economic criteria, with regard to "beneficial use" and "waste" is applicable to water rights transfers.

Property rights are an important antecedent of economic theorizing. According to one source, they are "...the expectations a person has that his decision about the uses of certain resources will be effective. The stronger those expectations are held,...the stronger the property right.[8] Two general kinds of rules are invoked to protect property rights: property rules and liability rules.[9] The former is characterized by voluntary transactions between individuals while the latter involves the prerogative of someone to abrogate a property right provided he is willing to pay an objectively determined value for it. In contrast with a property

rule, a third party is allowed to set the transfer price. In addition, under a liability rule, the owner of the property right is forced to accept this price without the veto power over the agreement afforded by the property rule. There is a third remedy to disputes over property rights disputes that we do not consider here: tax/subsidy solutions.

The problem at hand is this: in a dispute over property rights, which of the two general rules will be used by a decision-maker and why? This issue has become part of economic theory since at least 1960.[10] This article represents a merging of the economic theory of externalities and the common law tradition concerning torts and nuisance. [11] Coase provides insights on the question just raised, but left it to others to attempt generalizations of these views. These generalizations have become known as Coase theorem(s). The basic idea is that the structure of the law which assigns property rights and liability rules does not matter so long as transactions costs are nil; bargaining will result in an efficient outcome no matter who bears the the burden of liability. In this example and the application to follow, we pay closer attention to the expectations of litigants as to whether a property rule or a liability rule will be chosen in arriving at a decision.

In the cases that Coase cited, one observation is that the litigants could have had little idea of who would prevail. That is, on both sides, there was perhaps a 50-50 chance of winning. However, it would seem that when the court decided on the question of whether a property rule or alternatively a liability rule was at issue, the matter became decided. Since the cases considered by Coase reached the appellate court level it should not be surprising that the matter hinged on this kind of an issue.

What is interesting is the apparent relationship of economic criteria to this legal decision-making. It is suggested in Appendix B, pp. 109 -

122, that most economic models of allocational efficiency consider but one regime concerning the enforcement of property rights. In a more realistic setting it may be possible for parties to be both liable for damages stemming from the disposition of a resource in use, and at the same time to possess substantial rights to enjoy the benefits of using that resource. (This appears to be very descriptive of water law). As litigation over the use of the resource unfolds, it may be that there are different classes of economic agents in existence: (1) recipients of external effects who receive no liability; (2) generators of external effects who bear no liability because of their strong property right; (3) recipients who are compensated under liability rules; (4) generators of external effects who must pay compensation under liability rule. Suppose at the same time there are conditions (based on production theoretic concepts) specifying the economically efficient allocation of resources. What can we say about the manner in which that economic model has affected (or has not affected) the allocation of resources? At best it seems we can only say that in the sense of a legal realist, economic models allowed some prediction (by economic agents and their counsel) of what would happen under alternative legal decision rules. At the same time, however, one concludes that the theory was not a norm for the decision-makers in choosing the ultimate outcomes. The law lacks normative content, but normative devices such as economic theory are invaluable for what happens under the law.

Since we are suggesting that rule uncertainty (and the behavior of economic agents as a result of it) is a significant factor in legal decision-making and the allocation of resources, one might be tempted to ask how this uncertainty evolves over time. Some have argued that the law is becoming more certain on the basis that "...an advanced legal system is

thick with constitutional rules and practices, and dense with precedents and statutes." [12] The implication is that this increasingly fine-meshed web of rules can answer all legal questions that can arise. Another agrument for this point of view is that the legal system behaves like a homeostatic production system for generating legal precedents. [13] The argument is first that a legal system that contains a great deal of law is characterized by greater legal certainty, secondly that there is a state of equilibrium with regard to the desired certainty in the law, and third there are continual changes in the stock of law caused by (a) a depreciation or lapsing of relevance of legal precedent and (b) an-investment like generation of new precedents (something like a capital-producing production function). Both depreciation and investment in precedents are driven, so to speak, by the relative level of legal uncertainty.

There is a countervailing argument that the legal system is characterized by increasing uncertainty. [14] This opinion is based on the belief that judges may act in a self-interested fashion -- rendering decisions against the party that was expected to win and writing decisions ostensibly for the clarification of the law. Do leading cases mark an end to a particular path in litigation or do they in fact spawn new streams of controversies? D'Amato indicates that most lawyers believe the latter is more correct. He believes, moreover that judges and legal scholars tend to seek recognition by challenging the results of a line of cases or by stating a new theory as opposed to just restating the law. "...a new theory has information value; a restatement, by contrast and almost by definition, is not noteworthy." [15] D'Amato relies heavily on the expository device of the ex ante probability of success of the court holding for a plantiff if a certain rule is argued. If this probability is 0.5, then the

rule is said to be uncertain. Going in with a probability of winning of 0.9 will induce forces which tend to drive this probability more toward 0.5 (the defendants counsel has equal opportunity to argue against it, etc.) Going in with a probability of 0.1 (probably against the strong advice of counsel) probably will result in the court acting charitably toward the plantiff --while still finding against the plaintiff, the court awards something or sympathizes. At any rate the strength of the rule increases as a result of this such that its probability is closer to 0.5 than before.

Application To Disposition of Water Conserved

In this study we are concerned with two alternative rules regarding this disposition of water conserved either incidentally to some other action or -- in what is important here -- overtly (by investment, say) so that the conserved water can be applied to more acreage, in other words an expansion of operations. We suggest that both rules have equal probability of success for the "conserver" (either as plantiff or defendant) based on the number of cases examined, however small that may be. As noted above, we contend that economics does not seem to come into play as a norm for the decision-maker. It comes into revelance as a means of calculating the expected payoffs to the litigants. The case does not involve a litigant's claim for cash (as in D'Amato's exposition), but rather the complex nature of a right to use water beneficially without injurious effects on third parties -- which if translated with the economic tools discussed in the previous section -- yield an estimate of the private and social benefits of the holding whichever way it is decided. It appears from the cases cited that conservers fare better if the court acts on a rule pertaining to waste water than if it acts on a rule pertaining to "unappropriated water". It is hard to say which rule was actually argued by conserver's counsel, we'll

just have to assume that the conserver never argued the wrong rule and won the case anyway. The records just show that the court merely cited the rule when handing down a decision.

It seems the term "legal uncertainty" as D'Amato uses it refers to outcomes of a certain rule, especially when there is a 0.5 probability that a litigant's cause can be argued successfully. "Rule uncertainty" as used here refer to the selection from a set of rules (maybe all exhibiting legal uncertainty -- maybe 0.7 , 0.5, or 0.3) a rule which will bring the desired result for the litigant. D'Amato seems to believe that because the law is becoming more uncertain, there is perhaps some merit in arguing with the 0.3 probability rule as a judge may choose to use this case to write a precedent-setting opinion and achieve fame (and no doubt, some notoriety).

Model of a Simplified Appropriative Doctrine

In Appendix B, we show that the Hartman-Seastone framework in a generalized mathematical form can be used to demonstrate the ramification of system of water rights. In the preceding sections, simple diagrams have been used to show how certain features of transfer statutes, namely the protection afforded to potentially-injured third parties. The results seem to indicate that the system viewed from this perspective, inhibits the attainment of efficient economic use of water. We believe that these representations are not indicative of understanding the way water is actually allocated. In other words, some starting point is assumed and we consequently see some glaring deficiencies (vis a vis economic efficiency) in the law. Understanding something about how water gets to be allocated may shed some light on how self-interested users would use economic incentives and the law to accomplish an evolution to some subsequent

reallocation. Notice, however, that no claim is being made about the new allocation being economically more efficient since we have proposed that economic theory does not constitute normative content in the law.

General Scheme of Water Allocation: Three statutes may be cited as as having major importance in determination of water allocation:

(1) "Beneficial use shall be the ... measure and the limit of all right..." [16]

(2) Waste water may be appropriated, and it may be recaptured the applicator. [17]

(3) A change in use or change in place of use will be allowed only if the change "...can be effected without injury to other rights..." [18]

In the second major section above, we have argued that Oregon's water statutes are not normative. As noted above they do contain economic criteria "contained in" and serving as the "basis for" the statutes, but these characteristics fall short of requiring efficiency or wealth maximization. This argument has its basis in coexistence of the terms "beneficial use" and "waste water" at key points in the statutes. They are mutually exclusive in a logical sense, but more important they constitute the crux of an issue dealing with legal uncertainty: one cannot be sure from the statutory definitions which term will be chosen by a court in support of a decision.

Consider now the definition of the value of marginal product of water at a particular point on a watercourse when the users are in competitive equilibrium (see Appendix B, p. 140). This is

$$L = \frac{VMP_k}{(1-r_k)} \quad \text{and} \quad L = L^*$$

where L = the social value of marginal product of water on the water course and also the private VMP of water for the last user who returns no water to the stream. Recall that the stream is constrained by the inflow S. Now the kth user, perceiving that L, the shadow price of water is higher than his VMP (lowered by a shock, say) chooses to sell water. Selling it to the nth diverter directly lowers L^*. But the point is to say something about the beneficial use statute (1). The regulatory body could find that lower valuation was evidence of non-beneficial use and reduce the allocation.

NOTES -- SECTION IV

(1) D. Shapiro, California Water Law and Its Economic Effects on Southern California, II Lexeconics, G. Sirkin, ed. (1981).

(2) Cf. Resource Conservation and Economic Stability 60 Quart. J. of Econ. 412 (1946); Some Economic Issues in Water Rights 38 J. of Farm Econ. 875 (1953); Benefit-Cost Analysis and Public Resource Development 37 J. of Farm Econ. 677 (1955); Concepts Used As Criteria for a System of Water Rights 32 Land Econ. 295 (1956).

(3) S. v. Ciriacy-Wantrup, Water Economics: Relations to Law and Policy, I Waters and Water Rights 397, R. Clark, ed. (1967).

(4) Id.

(5) M. Kelso, et al., Water Supplies and Economic Growth in an Arid Environment 52-54 (1974).

(6) J. Sax, Water Law, Planning and Policy 277 (1968).

(7) Id. at 278.

(8) A. Alchian and J. Allen, Exchange and Production, 151, 163 (1967).

(9) G. Calabresi and B. Malemed, Property Rules, Liability Rules, and Inalienability 85 Harvard L. Rev. 1089 (1972).

(10) R. Coase, The Problem of Social Cost 3 J. of Law. & Econ. 1 (1960).

(11) R. Cooter, The Cost of Coase 11 J. of Leg. Stud. 1 (1982).

(12) R. Dworkin, Taking Rights Seriously 39-45 (1977).

(13) C. Landes and R. Posner, Legal Precedent: A Theoretical and Empirical Analysis 19 J. of Law & Econ. 249 (1976).

(14) A. D'Amato, Legal Uncertainty, 71 California Law Rev. 1 (1983).

(15) Id. at 22.

(16) ORS §540.610.

(17) Implied in ORS §537.800; Cf. C. Clark, Survey of Oregon's Water Laws 168 (1974); Barker v. Skinner, 135 Ore. 75, 294 P. 2d 1053 (1931); Hutchison v. Stricklin, 146 Ore. 285, 28 P.2d 225 (1934); Cleaver v. Judd, 238 Ore. 226, 393 P.2d 193 (1964).

(18) ORS §540.530.

V. INCENTIVE STRUCTURES FOR TRANSFERRING WATER RIGHTS ALONG SINGLE WATERCOURSES

The aim of this section is to contrast the differences in transfer-making efficacy enjoyed by members of organized districts and by those who are unorganized diverters along single watercourses. In addition, we wish to comment on the information disseminating strategy of water resource management authorities with regard to transfers.

The Relative Importance of Districts and Individual Diverters

In the West organized water districts of all kinds are responsible for about 75 percent of all surface water diverted.[1] In Oregon, the percentage is 60 percent reflecting the smaller number of federal projects in the state. Also relevant to this study is the growing numbers of diversions from the Columbia River. It is evident that transfer issues are different for these diverters; more like pumping from a lake.

Transferring, Sharing, Water Banking, etc. in Organized Districts

Meyers and Posner coined the term "mutualization" in order to describe the unique kind of internalization of tranfer externalities that could be accomplished by water districts, using that term to describe all such entities. In each state, there are specific statutes governing the activities of these entities. They can be municipal corporations (irrigation districts, water control districts, conservancy districts, etc.), commercial irrigation companies, mutual irrigation companies, voluntary associations, and water user associations to name the most prevalent forms.[2]

The role of districts in facilitating transfers has been well

documented.[3]

Survey Approaches to Studying the Water Markets Along Single Watercourses

To our knowledge, a definitive empirical study of water users along a single watercourse had not been attempted. From the results of our reconnaissance survey, it had been discerned that only 28 "person A to person B" transfers had taken place. Because of the wide dispersion of these individuals across the state and because of the relatively small amount of acreage of irriagted land involved in the transfer, it was decided that survey of this group would not reveal much about the kinds of problems that we discussed thus far in this report.

As a result, it was decided that a relatively small area in the state would be selected for detailed survey of issues related to water rights transfers. The area selected was the North Powder watershed area loacted about halfway between Baker and LaGrande, Oregon generally west of Interstate Highway 5. The area consists of (1) a small (13,000 acre) organized water district, (2) an area where old unlined ditches served irrigators, but which was about to be organized into a water district, (3) an area proximate to the North Powder River where all users are individually diverting water from the North Powder River. This kind of diversity in the same general locality was projected to provide some control over agroclimatic conditions, crop selection, and marketing conditions. Comparing results within and among the three groups was believed to constitute a viable experimental design.

The survey was conceptualized with the objective of elicting responses to three general areas of questions: (1) given the predominant mode(s) of agricultural production, would we be able to detect and explain differences in on-farm productivities? (2) do farmers transfer rights or temporarily

share water plus related questions about information on transfers? (3) What are basic considerations in managing irrigated farms including including disposition of water conserved through efficient management or new technology. The questionnaire is attached as Appendix D.

The survey was administered by means of detailed interviews with 30 individual owner-operators. The sample was nearly evenly divided among the three target areas as listed above. In the district (Area 1) there were twelve respondents, in the new district area (Area 2) there were eight, and along the North Powder River (Area 3), ten. Only the respondents in Area 3 were individual appropriators.

Results For Productivity Questions

The mode of asking questions about crop rotations, acreage, yields, factor inputs, and costs was phrased in terms of asking respondents to state their estimate of how much their unit differed (in each category) from a hypothetical 500 acre farm in the area. This composite unit had been defined during the course of a previous research project in the area. Farm budget determinations (in the absolute) are difficult to develop, hence the use of comparative estimates in the present effort. The findings were that differences in the recorded variables pertaining to production were more tightly clustered in the district, and least tightly clustered in the area where there were single appropriators from the North Powder River. This was not unexpected. Nor was the conclusion that the performance of area 3 in annual production was significantly less than in the district (area 1) and somewhat less than the ditch area (#3). Total water applied throughout the season was significantly higher in the district due to the availability of storage water there in addition to normal streamflow rights. In Area 3, the season (1981) was rated as better than normal water

year; hence the relative fulfillment of the individuals' rights in this area was generally satisfactory (most indicated that water lasted longer).

Responses to Questions on Rights Transfers

In general the legal and administrative details of accomplishing water rights transfers in Oregon were vaguely familiar to all the respondents, although the operators in Area 1 were the most familiar with the constraints on transfers. In the 5 years since the project formation, there has been at least one circumstance where a place of use (person A to person B) exchange was accomplished presumably under the provision that the district is still in the process of perfecting its right to the storage water developed in the course of the project. On the other hand, one of the parties in the exchange holds a perfected water right which would ostensibly require a formal transfer. For that matter, all memebers of the district who are combining perfected water rights with the storage water of the district may at some future date have to perform some sort of "housekeeping-type" transfers. There had been no transfers of water rights among the sampled individual rights holders on the North Powder River. There is knowledge of informal temporary sharing of water, but little could be determined in the matter of when, where, etc. Informal observations on the water rights transfer process provided by the respondents indicates that if the process were locally controlled and administered, there would be a greater willingness to help tighten up the allocative mechanism. Several respondents, however, commented that the issue was simply not a problem. If a "serious" misallocation were to occur, it is believed that the watermaster's enforcement powers are sufficiently strong enough to solve the problem. Conversations about temporary sharing of water indicated that where monetary transactions were involved, water was sold in

the range of $10-$30 per acre-foot. Within the Wolf Creek Water Control District, the price of storage water charged to members of the district is currently $6.50 per acre-foot.

Managing Water For Conservation

The legal ambiguity over the disposition of conserved water was an item about which only 2 of 30 respondents were aware. Most (18) believed that if they could conserve significant ewater through technological advances, they would seek to apply the conserved amount to additional land. A few (8) indicated that they would probably seek to sell the conserved amount. They indicated that the going district charge for water was a fair price not indicate a preference for charging what the market would bear. Achieving surpluses through technology and management, however was not indicated to be an easy or trivial task. Since operators (Areas 1 and 2) had converted from flood irrigation to sprinkler irrigation only in the last five or ten years, many were still attempting to develop a management regime for that technology. Operators in Area 3 were irrigating principally with flood irrigation techniques. Several in this area claimed that with enough experience one could manage water just as effectively, if not more effectively than one could with sprinkler systems. One of the purposes of the questionnire was to develop information on how farmers and ranchers view methods and information sources pertaining to irrigation efficiency. Approximately half of the respondents did not express a desire to undertake tangible investment or seek expert advise in achieving greater efficiencies. Most of the others were not optimistic about the use of computers to help schedule water applications, but did indicate that they would be willing to purchase irrigation scheduling services. None of the sources of free information, Soil Conservation Service, Cooperative

Extension, etc. were thought to be the likely source of specific advice for achieving greater efficiency in the use of water. Respondents cited the logistical nature of providing assistance in this way, and their difficulty in translating general procedures into farm-specific plans.

General Observations on Informal Responses

At the outset of this report, it was hypothesized that changes in the way surface water was allocated depended significantly upon the incentives given to individual appropriators to work entirely within the prior appropriation doctrine system. As it is, there appears to be little incentive provided to (or perceived by) water users that we interviewed in regard to exercising the "flexibility features" in water law. The selection of the sample design is a matter of concern. The small area selected does on the surface exhibit many of the characteristics of watersheds in the West: high levels of early spring runoff, diminished or negligible runoff from mid-summer on, significant interest in implementing upstream or offstream storage for multiple purpose water utilization. The study of one watershed does not facilitate generalizations about surface water allocation throughout the state. We believe, however, that broader-based attempts to understand the allocation of water would not be able to perceive a certain "water use/water development" syndrome that we propose here. The interviews suggest that transfers of water from land appurtenent to decreed and long-standing certificated water rights are undesirable even if such rights could command high prices in some sort of water banking arrange. Transfer proceedings are more thought be applicable to relatively junior rights, many of which fall into the "supplemental irrigation" category. Certain water rights seem to be "grandfathered in" within many watersheds. In spite of desirable "seniorness" of such rights,

it appears to be a much more worthy venture to secure funding for a new projects than to seen as trying to transfer water from (and thereby impoverish) lands that have traditionally had water rights.

In a way we observe some parallels with the hypothesis proposed by Martin, et al. in a retrospective article about water allocation and water development in the Central Arizona Project.[4] The main idea is that water is different (than other resources) because problems involving it are always amenable to a structural remedy. Even if such remedies are extremely costly, it remains in the perceived self-interest of each potential beneficiary to avoid all other possible remedies (such as transfers) and simply wait until (1) the structural means to solve the problem are built, and (2) wait until the repayment terms are negotiated to a reasonable level. This behavior was termed the "willingness to play":

> The political support that agricultural interests have given to the Central Arizona Project represents a willingness to play, not a willingness to to pay...In the bargaining and negotiation to build support, potential costs are purposely left vague and generally are ignored. When the choices are so structured, farmers support simply signalled a willingness to stay in game...Water is a priceless possession, or, at least so it traditionally been used in the West...Westernersdo not calculate the value of water on the basis of its contribution to production as they do other renewable natural resources. Instead water is believed to give rise to a Midas Touch, creating wealth and guaranteeing a prosperous future wherever it is present in ample quantities...
>
> Whatever the development of water supply is estimated to cost, Westerners tend to think that it is worth the price. They believe that is water becomes too expensive, everything will become yet more dear, and were they to lack a sufficient supply of this basic ingredient they would become unable to reap the profits that come with enterprise and development. In short water is conceived by Westerners as a coveted commodity, a worthy prize for which they are willing to engage in

demanding political games, where payoffs may come only far off into the future...[5]

Although the foregoing hypothesis is often privately voiced it has seldom ever been systematically researched. While the questionnaire and results discussed above did not overtly pursue a rigorous analysis of this sentiment -- a preference for upstream storage implementation over the water rights transfer process -- it is pervasive throughout the irrigated agriculture and soil and water conservation alliances in Oregon. Implementing upstream storage in the form of small watershed projects draws issues of social benefit-cost analysis into this report, something that was not intended and will, therefore, not be attempted.

NOTES -- SECTION V.

(1) U.S. Bureau of the Census, IV Census of Agriculture -- Irrigation 23 (1973).

(2) G. Radosevich, Western Water Laws and Irrigation Return Flow 72-79, U.S. Environmental Protection Agency 600-2-78-180 (1978).

(3) Cf. Maass and Anderson, And the Desert Shall Rejoice: Conflict, Growth, and Justice in Arid Areas (1978); Angelides and Bardach, Water Banking: How to Stop Wasting Agricultural Water (Institute for Contemporary Studies 1978); Kohler-Kennedy and Wrigley, An Economic Water Market as an Alternative to Reduce Return Flow from Irrigation (Idaho Department of Water Resources 1979); Alexander and Howe, The Performance of the Appropriative Water Rights System in the Western States During Drought, 22 Natural Resources J. 379.

(4) Martin, et al., A Willingness to Play: Analysis of Water Resources Development, 7 Western J. Agricultural Econ. 133 (1982).

(5) id. at 137.

VI. CONCLUSIONS AND RECOMMENDATIONS

This investigation has focused principally on depicting a positivistic representation of water allocation processes in Oregon. The positive analysis (as we define it) is meant to provide considerably more than provide descriptive statistics, cite the statutes and the case law, determine feasible market values for water, etc. We wished to call attention to the inevitable value judgements and normative premises that usually trivialized the findings of previous studies. In the water resources area, we find little precedent for work of this type.

The main premise of the work is that the legal system governing the allocation of water in the West (the doctrine of prior appropriation) can be examined from the point of view of a modelling technique (albeit a provisional one) in which key elements of the law are superimposed on a selected hydrologic framework. The initial conclusion from this exercise is that even though the statutes are related to economic norms (both as a "basis for water statutes" and as specific elements "contained in" the statutes, it appears that these statutes together with other legal material (principally appellate court rulings) permit wide interpretation as to being able to predict how water (in a dispute, for instance) will be allocated. The key corollary in this analysis is that economically efficient allocations are not precluded in this system, but then neither are any other allocations. We suspect the often-cited high levels of transactions cost are in fact significant, but are probably not prohibitive as suggested in most analyses of the prior appropriation system.

We suggest that this modified explanation is consistant with the observed small number of transactions that occur in Oregon each year. The statistic to which we especially call attention concerns the number of

"person A" to "person B" transfers, occuring at an average rate of 3 per year out of a reported 50,000 water rights in the state. Even if most exchanges of rights are concomitant with sales of land which are appurtenant to valid water rights, one would expect the transfer mechanism to be used more often.

Although the premise of the modeling work is that the system as whole may not be automatically tending toward an equilibrium at a point of economic efficiency, it is a conclusion of this report that water rights transfers (person A to person B) will be contingent on net gains in water productivity. Although transfers may involve individuals assembling rights for some ultimate end use purpose (and thereby transferring them to a temporary use in low-valued crop production), it is expected that the determination of crop productivities in different zones of potential transfers will play an important part of any enhanced water rights transfer mechanism. To this end, a detailed analysis of an method of determining aggregate (e.g., sub-basin specific) agricultural production functions was included in the agenda of this research.

As a final item, the results of a survey of farmers and ranchers in an eastern Oregon watershed concerning productivity of water in crop production, water transfers and related issues, and on-farm water management are provided in this study. Although this survey encompassed only a small number of respondents, it was believed that integration of the three areas of inquiry enabled a significant insight into the perceptions of water rights transfers as a less-preferred method of obtaining the maximum benefit from the annually recurring stock of water. The overwhelming preference is the implementation of upstream storage in the watersheds in question if not in all similar basins. This conclusion

(insofar as perceptions of farmers and ranchers are concerned) holds even the costs involved are one or two magnitudes greater than would be the case if water was available in an exchange system.

We conclude, then, that there are reasons to be both optimistic and pessimistic about the future viability of the water rights tranfer mechanism as a means of helping to accomplish an allocation of water resources in Oregon that is considered fair and reasonable, that eliminates "serious" misallocations, and that tends toward maximum beneficial use.

APPENDIX A

SURVEY OF LEGAL WATER TRANSFER RECORDS IN OREGON

Table 1. Status of Transfer Files

Status	Number of Files
Completed	2,258
Missing	180
Pending	78
Withdraw	57
Misfiled	55
Closed	39
Protested	13
State Canceled	12
Refused	5
Owner Canceled	1
Total Files Examined	2,258

Table 4. Total Acreage Affected by Transfers

	Number of Acres
Region 1	1,238
Region 2	13,722
Region 3	12,001
Region 4	15,873
Region 5	11,641
Region 6	4,713
Region 7	4,186
Region 8	15,982
Total	79,371

Table 2. Transfer Types in Each County

COUNTY	Type of Transfer								
	POU	POD	POD + POU	USE	POA	POD + USE	POU + USE	POD, POU + USE	POU + POA
Baker	15	32	9	1	0	0	0	0	0
Benton	3	8	0	1	1	0	0	0	0
Clackamas	9	16	2	2	1	0	0	0	0
Columbia	1	1	0	1	0	0	0	0	0
Coos	1	7	1	1	0	0	1	0	0
Crook	21	12	7	0	0	0	1	0	0
Curry	3	2	1	1	1	0	0	0	0
Deschutes	473	2	6	5	1	0	4	1	0
Douglas	21	85	19	3	0	9	4	4	0
Gilliam	0	2	2	0	0	0	0	0	0
Grant	3	35	6	2	0	0	0	0	0
Harney	4	4	12	0	0	0	0	0	0
Hood River	5	10	0	0	0	0	0	0	0
Jackson	46	164	47	6	0	1	3	9	0
Jefferson	2	8	3	0	0	0	0	0	0
Josephine	27	123	20	7	0	1	1	0	0
Klamath	3	4	0	0	0	0	0	0	0
Lake	19	2	4	0	1	0	0	0	0
Lane	4	12	2	1	3	1	0	0	0
Lincoln	2	4	2	0	0	0	0	0	0
Linn	12	20	4	0	0	0	0	0	0
Malheur	7	17	1	0	0	0	0	0	0
Marion	28	24	1	3	3	1	0	0	0
Morrow	12	13	7	0	5	0	0	0	8
Multnomah	0	1	0	2	0	0	0	0	0
Polk	22	15	19	1	0	0	1	0	0
Sherman	1	2	0	0	0	0	0	0	0
Tillamook	2	6	1	2	0	1	0	0	0
Umatilla	56	55	9	1	8	0	0	0	0
Union	6	11	2	1	0	0	0	0	0
Wallowa	1	23	3	0	0	0	0	0	0
Wasco	18	14	6	2	0	0	0	0	0
Washington	27	21	13	5	0	0	2	1	0
Wheeler	1	12	4	1	0	0	0	0	0
Yamhill	15	26	10	2	0	2	0	1	0
Total	870	793	223	51	24	17	17	16	8

Table 3. Transferred Acres

Type of Transfer	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8
POU	60	2,550	5,949	2,553	679	201	2,409	1,083
POD	10	128	1,257	5	832	37	0	191
POU + POD	28	1,550	664	905	1,094	220	25	1,394
USE	6	155	52	0	1	0	0	60
POA	0	107	0	0	0	0	0	0
POD + USE	38	1	0	0	0	0	0	69
POD + POU + USE	0	8	13	0	0	0	0	198
POU + POA	0	0	0	373	0	0	0	0
Total Acres (25,123)	142	4,499	8,025	3,836	2,606	458	2,434	3,123

Table 4. Total Acreage Affected by Transfers

Type of Transfer	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8
POU	143	4,838	6,299	1,607	3,956	1,421	4,186	4,846
POD	973	4,648	3,321	6,292	5,313	2,427	829	5,106
POU + POD	39	2,865	2,044	1,446	2,371	865	324	5,336
USE	32	745	112	0	1	0	0	192
POA	6	315	225	4,988	0	0	23	0
POD + USE	48	38	0	0	0	0	0	119
POU + USE	0	28	0	0	0	0	0	125
POD + POU + USE	0	245	0	0	0	0	0	258
POU + POA	0	0	0	1,540	0	0	0	0
Total Acres (79,371)	1,238	13,722	12,001	15,873	11,641	4,713	4,186	15,982

Table 5. Transferred Acres

Region	Number of Transfer Cases (in acre amounts)									
	0-10	11-25	26-50	51-100	101-200	201-300	301-400	401-600	601-1,000	1,000 +
1	6	3	2	0	0	0	0	0	0	0
2	57	56	43	16	5	0	0	0	0	0
3	426	70	33	16	7	2	1	0	1	0
4	29	22	22	10	9	0	1	0	0	0
5	14	5	7	11	2	3	0	0	0	0
6	8	8	5	1	0	0	0	0	0	0
7	6	8	4	4	3	2	0	0	0	1
8	144	41	17	7	4	0	1	0	0	0
Total	690	213	133	65	30	7	3	0	1	1

Total Cases = 1,143

Table 7. Type of Applicant

Applicant	Type of Transfer									Totals
	POU	POD	POD + POU	USE	POA	POD + USE	POU + USE	POD, POU + USE	POU + POA	
Individual	293	755	212	42	22	9	10	12	7	1,362
Irrigation District	565	30	7	4	0	1	5	1	0	613
Municipal	3	5	4	4	1	7	2	3	0	29
										2,004

Table 6. Range of Acres Served by New Diversion Points

Range of Acres	Number of Transfer Cases
0 - 50	587
51 - 300	127
301 - 600	17
601 - 1,000	2
Total	733

Table 8. Ownership Transfers

Location	Transfer Made Within Same Property Or On Same Farm	Transfer Made From A to B
Individuals	450	28
Irrigation Districts	152	407
Municipalities	5	2
Totals	607	437

Table 9. Concentration of Transfer Orders

Region	Year											
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Totals
1	1	8	2	2	2	2	7	3	4	5	4	40
2	7	22	18	41	24	20	36	63	31	30	17	309
3	17	45	36	39	40	28	64	65	91	54	83	562
4	4	2	2	4	5	4	15	23	42	29	19	149
5	2	2	3	1	5	4	10	18	24	17	20	106
6	2	0	0	2	1	1	4	5	18	6	1	40
7	8	1	1	2	2	0	9	14	4	6	9	56
8	17	28	19	53	48	23	80	82	92	83	34	560

APPENDIX D

QUESTIONNAIRE USED IN INTERVIEWS WITH FARMERS AND RANCHERS IN THE NORTH POWDER RIVER BASIN, UNION AND BAKER COUNTIES OREGON

NORTH POWDER VALLEY MANAGEMENT STUDY

Department of Agricultural and Resource Economics
Oregon State University
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September 1981

MANAGEMENT STUDY

In 1979, OSU studied the costs and benefits of irrigation development in the North Powder Valley. The Wolf Creek Project was found to be very successful.

This study is aimed at finding out more about irrigated crop production and stock-raising in this area.

MANAGEMENT is seen to be the key factor which must be combined with irrigation technology.

MANAGEMENT, however, is an elusive factor. It is hard to value.

By looking at the operations of farmers and ranchers of this area, the management process may be defined a little better. This will

- help to design and build better cost-shared agricultural water projects
- contribute to knowledge about agricultural production in Oregon
- help development of agricultural potential in the North Powder Valley

We highly value the association between OSU and Oregon's agricultural producers. Thank you again for your assistance.

ALL ANSWERS PROVIDED FOR THIS QUESTIONNAIRE WILL BE HELD IN STRICT CONFIDENCE.

If questions arise, please do not hesitate to call

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I. GENERAL QUESTIONS ABOUT CROP PRODUCTION

1. In 198__, how many acres did you OPERATE ? _____Acres

   Number of ACRES OWNED? _____Acres

   Number of ACRES RENTED ? _____Acres

2. In 198__, were the following grain and hay crops part of your operation ?

	Irrigated	Dryland
Winter Wheat	_____ Acres	_____ Acres
Barley	_____ Acres	_____ Acres
Alfalfa Hay	_____ Acres	_____ Acres
Meadow Hay	_____ Acres	_____ Acres
Pasture	_____ Acres	_____ Acres

II. DETAILED QUESTIONS ABOUT YOUR CROPS

IRRIGATED WHEAT IN 1980

1. Please provide some information about the irrigation systems that you use in producing **IRRIGATED WHEAT.**

	Acres	Water Applied (Season Total)	Yield
Side Roll - Hand Move	_____ac.	_____in.	_____bu./ac.
Side Roll - Wheel Move	_____ac.	_____in.	_____bu./ac.
Total Flooding	_____ac.	_____in.	_____bu./ac.

2. It has been estimated that the average cost for producing **IRRIGATED WHEAT** in the North Powder Valley in 1980 was **$225 PER ACRE.**

   How did your costs in 1980 compare to this average? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
a lot lower	lower	slightly lower	ABOUT THE SAME	slightly higher	higher	a lot higher

3. If you were to REDUCE water application on **IRRIGATED WHEAT** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
25bu less	20bu less	15bu less	10bu less	5bu less	SAME	more how much?

4. If you were to INCREASE water application on **IRRIGATED WHEAT** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
less how much?	little less	SAME	5bu more	10bu more	15bu more	20bu more

II. DETAILED QUESTIONS ABOUT YOUR CROPS

IRRIGATED BARLEY IN 1980

1. Please provide some information about the irrigation systems that you use in producing **IRRIGATED BARLEY.**

	Acres	Water Applied (Season Total)	Yield
Side Roll - Hand Move	_____ac.	_____in.	_____bu./ac.
Side Roll - Wheel Move	_____ac.	_____in.	_____bu./ac.
Total Flooding	_____ac.	_____in.	_____bu./ac.

2. It has been estimated that the average cost for producing **IRRIGATED BARLEY** in the North Powder Valley in 1980 was **$250 PER ACRE.**

   How did your costs in 1980 compare to this average? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
a lot lower	lower	slightly lower	ABOUT THE SAME	slightly higher	higher	a lot higher

3. If you were to REDUCE water application on **IRRIGATED BARLEY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
25bu less	20bu less	15bu less	10bu less	5bu less	SAME	more how much?

4. If you were to INCREASE water application on **IRRIGATED BARLEY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
less how much?	little less	SAME	5bu more	10bu more	15bu more	20bu more

II. DETAILED QUESTIONS ABOUT YOUR CROPS

IRRIGATED ALFALFA HAY IN 1980

1. Please provide some information about the irrigation systems that you use in producing **IRRIGATED ALFALFA HAY.**

	Acres	Water Applied (Season Total)	Yield
Side Roll - Hand Move	_____ac.	_____in.	_____tons/ac.
Side Roll - Wheel Move	_____ac.	_____in.	_____tons/ac.
Total Flooding	_____ac.	_____in.	_____tons/ac.

2. It has been estimated that the average cost for producing **IRRIGATED ALFALFA HAY** in the North Powder Valley in 1980 was **$270 PER ACRE.**

How did your costs in 1980 compare to this average? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
a lot lower	lower	slightly lower	ABOUT THE SAME	slightly higher	higher	a lot higher

3. If you were to REDUCE water application on **IRRIGATED ALFALFA HAY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
1 1/2 T less	1 T less	3/4 T less	1/2 T less	1/4 T less	SAME	more how much?

4. If you were to INCREASE water application on **IRRIGATED ALFALFA HAY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
less how much?	SAME	1/4 T more	1/2 T more	3/4 T more	1 T more	1 1/2 T more

II. DETAILED QUESTIONS ABOUT YOUR CROPS

IRRIGATED MEADOW HAY IN 1980

1. Please provide some information about the irrigation systems that you use in producing **IRRIGATED MEADOW HAY.**

	Acres	Water Applied (Season Total)	Yield
Side Roll - Hand Move	_____ac.	_____in.	_____tons/ac.
Side Roll - Wheel Move	_____ac.	_____in.	_____tons/ac.
Total Flooding	_____ac.	_____in.	_____tons/ac.

2. It has been estimated that the average cost for producing **IRRIGATED MEADOW HAY** in the North Powder Valley in 1980 was **$125 PER ACRE.**

   How did your costs in 1980 compare to this average? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
a lot lower	lower	slightly lower	ABOUT THE SAME	slightly higher	higher	a lot higher

3. If you were to REDUCE water application on **IRRIGATED MEADOW HAY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
1 1/2 T less	1 T less	3/4 T less	1/2 T less	1/4 T less	SAME	more how much?

4. If you were to INCREASE water application on **IRRIGATED MEADOW HAY** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
less how much?	SAME	1/4 T more	1/2 T more	3/4 T more	1 T more	1 1/2 T more

II. DETAILED QUESTIONS ABOUT YOUR CROPS

IRRIGATED PASTURE IN 1980

1. Please provide some information about the irrigation systems that you use in producing **IRRIGATED PASTURE.**

	Acres	Water Applied (Season Total)	Yield
Side Roll - Hand Move	_____ac.	_____in.	_____aum./ac.
Side Roll - Wheel Move	_____ac.	_____in.	_____aum./ac.
Total Flooding	_____ac.	_____in.	_____aum./ac.

2. It has been estimated that the average cost for producing **IRRIGATED PASTURE** in the North Powder Valley in 1980 was **$125 PER ACRE.**

   How did your costs in 1980 compare to this average? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
a lot lower	lower	slightly lower	ABOUT THE SAME	slightly higher	higher	a lot higher

3. If you were to REDUCE water application on **IRRIGATED PASTURE** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
2.5 AUM less	2 AUM less	1.5 AUM less	1 AUM less	0.5 AUM less	SAME	more how much?

4. If you were to INCREASE water application on **IRRIGATED PASTURE** by 6 inches, what would be the effect on your yield? Check one.

(___)	(___)	(___)	(___)	(___)	(___)	(___)
less how much?	SAME	0.5 AUM more	1 AUM more	1.5 AUM more	2 AUM more	2.5 AUM more

III. QUESTIONS ABOUT LABOR FOR IRRIGATED CROP PRODUCTION

1. Did you employ any full-time hired help?

   ( ) yes (continue) ( ) no (skip to 2)

   a. How many full-time employees did you hire? _____

   b. How many months were they employed? _____

   c. How much were they paid? $_____/month

   d. What kind of work did they perform? (Please describe)

   _____

   _____

   _____

2. Did you employ part-time labor for irrigation?

   ( ) yes (continue) ( ) no (skip to 3)

   Did you hire a part-time employee under age 19?

   ( ) yes (continue) ( ) no (skip to 3)

   a. How many employees under age 19 did you hire? _____

   b. How many hours on the average were they employed? _____hours per _____

   c. How much were they paid? $_____/hour

   d. What kind of work did they perform? (Please describe)

   _____

   _____

   _____

3. Did you hire a part-time employee over age 19?

   ( ) yes (continue) ( ) no (skip to 4)

a. How many part-time employees over age 19 did you hire? _____

b. How many hours on the average were they employed? _____hours per _____

c. How much were they paid? _____/hour

d. What kind of work did they perform? (Please describe)

_____

_____

_____

4. Did you use any family labor for irrigated crop production?

( ) yes (continue) ( ) no (skip to next page)

a. How many family members were employed? _____

b. How many hours were they employed? _____hours per _____

c. How much were they paid? $_____/hour

d. What kind of work did they perform? (Please describe)

_____

_____

_____

IV. QUESTIONS ABOUT FACTORS AFFECTING CROP PRODUCTION

1. How would you describe the situation regarding your irrigated crop operations operations?

   Last 5 years ( ) expanding ( ) stable ( ) decreasing

2. How would you describe your plans for irrigated crop production over the next 5 years?

   ( ) want to expand ( ) want to stabilize ( ) want to decrease

3. Which of the following reasons are important to your plans for irrigated crop production? (Circle as many that apply)

   a. availability of land
   b. availability of water
   c. skill required for irrigated crop production
   d. constraints on your time
   e. availability of labor
   f. availability of credit
   g. depressed crop prices
   h. existing level of debt

   Which are most important? _____ _____ _____ _____ _____

   1st 2nd 3rd 4th 5th

4. If you marked "depressed crop prices" as a limiting factor, what are your expectations about future prices?

   ( ) will improve ( ) will remain depressed

   ( ) will be more depressed ( ) don't know

5. Suppose the prices remain depressed in the future, which of the following are you likely to pursue?

   ( ) Continue growing the present crops anyway

   ( ) Shift to other crops

   ( ) Quit farming altogether

   ( ) Don't know

6. Now given your current irrigation water supply, what is the best way to increase the revenue from your irrigated crops?

( ) By improving water application on the present crop mix

( ) By simply changing the present crop mix

( ) By changing present crop mix and improving water application

( ) By none of the above

( ) Don't know

( ) Other (specify)

_____

_____

7. If you think that you can increase earnings by changing your irrigated crop mix, what is the optimum crop mix that you would like to have?

Alfalfa _____ac Pasture _____ac Meadow Hay _____ac

Wheat _____ac Barley _____ac

V. QUESTIONS ABOUT WATER MANAGEMENT

1. How many years have you been producing irrigated crops? _____years

2. How much water are you regularly entitled to (annually)?

	Period of Use		Quantity of Water
	Begin	End	(acre-foot/acre)
Direct water rights which go with your property	_____	_____	_____
Groundwater	_____	_____	_____
Storage water from the district	_____	_____	_____

3. Have you ever obtained water by means of a temporary transfer (1 year) from someone else's water right?

( ) yes ( ) no

4. Have you ever obtained water by means of a temporary transfer from someone else's storage allocation?

( ) yes ( ) no

5. Have you ever obtained water by means of a permanent transfer from someone else's water right?

( ) yes ( ) no

6. Have you ever obtained water by means of a permanent transfer from someone else's storage allocation?

( ) yes ( ) no

7. If your operation had water left over from the amount to which you are entitled, what would you do with it? (Check one).

a. Transfer (sell) the extra amount _____(go to question 8)

b. Irrigate more land _____(go to question 12)

8. Have you transferred (sold) water to someone else or have you thought about it at the present time? (Answer for each type of water).

Storage water_____ Rights water_____

9. Which of the following reasons do you feel prevent you from transferring?

a. Rights water?

( ) too much red tape

( ) probably need an expensive lawyer

( ) a large filing fee is required

( ) somebody would probably protest

( ) the buyer would probably not pay me what it's worth

( ) I do not manage this water separately from my storage water

b. Storage water?

( ) too much red tape

( ) I can only transfer within the district boundaries

( ) Too complicated for the district management to do

( ) I don't manage this water separately from my rights water

( ) Buyers would probably not pay me what it's worth

10. In a year of average rainfall, what percent of your water would you be willing to transfer for a price?

Temporary (1 year) transfer		Permanent transfer	
Rights water	_____%	Rights water	_____%
Storage water	_____%	Storage water	_____%

11. I could transfer water at these prices.

Temporary (1 year) transfer		Permanent transfer	
Rights water	_____$/ac-ft	Rights water	_____$/ac-ft
Storage water	_____$/ac-ft	Storage water	_____$/ac-ft

VI. QUESTIONS ABOUT MANAGING ON-FARM IRRIGATION SYSTEMS

1. Describe your on-farm irrigation system.

   ( ) all sprinkler (continue)

   ( ) some sprinkler (continue but also complete 2a through 5a)

   ( ) all flood (skip 2 through 5 but complete 2a through 5a)

2. How many years experience do you have in managing sprinkler-irrigated fields? _____years

3. For pressurization, do your systems use

   electric motor pumps? ( ) yes _____ ( ) no
   number

   diesel/gasoline engine pumps? ( ) yes _____ ( ) no
   number

   gravity? ( ) yes _____ ( ) no
   number of systems

4. Describe your sprinkler systems. Do you have any of the following?

	Number	Acres Served by Each
(a) center-pivot?	_____	_____
(b) side roll-wheel move?	_____	_____
(c) side roll-hand move?	_____	_____
(d) portable set	_____	_____

5. Do you have any of the following problems in irrigation system operation? Check all that apply.

   ( ) insufficient water to irrigate for the season

   ( ) not enough pressure all season long

   ( ) not enough pressure at certain times

   ( ) too much pressure at certain times

   ( ) maintenance of sprinkler heads

   ( ) getting proper spacing on side-roll system sets

   ( ) on-farm mainlines not sized large enough for needed peak use

5. (continued)

( ) have difficulty in detecting under irrigation or over irrigation

( ) other (please list)

_____

_____

6. How do you make decisions on irrigation water management?

	Decisions on when to start applying water		Decisions on how long to apply water	
Pre-determined schedule	( ) yes	( ) no	( ) yes	( ) no
Feel the soil	( ) yes	( ) no	( ) yes	( ) no
Experience with the soil, weather, crops, etc.	( ) yes	( ) no	( ) yes	( ) no
Computerized service	( ) yes	( ) no	( ) yes	( ) no

7. Suppose professional consulting services were available to help in managing irrigation. Would you be interested in any of these service items? (Check all that apply).

( ) regular aerial photography of fields and analysis

( ) determination of moisture content of soil

( ) direct regulation of water application

( ) combining fertilizer and pesticide with water

( ) other (describe) _____

( ) would not be interested

8. How much would you be willing to pay for such a service if it suited your needs?

( ) not interested

( ) less than $.50/acre

( ) $.50 to $2.00/acre

( ) more than $2.00/acre

9. Would you be willing to buy equipment (sensors for soil moisture, electronic monitors, micro-computers, etc.) which would help to manage your systems?

( ) yes ( ) no

10. Have you ever received any information on on-farm irrigation management from these organizations? (Please circle your responses).

Soil Conservation Service	No	Seldom	Some	A Lot
Extension Service	No	Seldom	Some	A Lot
Fertilizer and Pesticide Supply Companies	No	Seldom	Some	A Lot
Irrigation Consultants	No	Seldom	Some	A Lot
Farm Product Marketing Firms	No	Seldom	Some	A Lot
Magazines and Books	No	Seldom	Some	A Lot
Other Farmers	No	Seldom	Some	A Lot

2a. How many years of experience do you have in managing flood-irrigated fields?

_____years

3a. How many people involved with your operation can properly manage your flood irrigated system?

_____

4a. Do you have any of the following problems in flood irrigation system operation? (Check all that apply).

( ) insufficient water for the season

( ) fields do not have the proper grade or slope

( ) insufficient absorption rate

( ) insufficient drainage

( ) too many turnouts to manage effectively

( ) other _____

5a. Can you estimate approximately how your water gets used?

plant uptake _____%

evaporation loss _____%

subsurface drainage _____%

tailwater _____%

VII. GENERAL QUESTIONS ABOUT LIVESTOCK

1. Is livestock production part of your farm operation?

   ( ) yes (continue) ( ) no (skip to Part XI)

2. How many years have you been producing livestock? _____years

3. Which of the following categories best describes your livestock operation in 1980? (Check those that apply. If more than one, estimate percent of total livestock income).

   ( ) Cow-calf _____%

   ( ) Cow-yearling (sell yearling) _____%

   ( ) Feeder stock _____%

   ( ) Other _____ _____%

4. What is the average size of your herd?

   Head of cows _____

   Head of bulls _____

   Head of replacement heifers (to be bred) _____

   Head of yearling heifers (to be sold) _____

   Head of weaned heifers (to be sold) _____

   Head of yearling steers (to be sold) _____

   Head of weaned steers _____

   Head of horses _____

   Head of other animals (specify) _____

VIII. QUESTIONS ABOUT LABOR FOR LIVESTOCK PRODUCTION

1. Did you employ any full-time hired labor?

   ( ) yes (continue) ( ) no (skip to 3)

   a. How many full-time employees did you hire? _____

   b. How many months were they employed? _____

   c. How much were they paid? $_____/month

   d. What kind of work did they perform? (Please describe)

   _____

   _____

   _____

2. Did you employ part-time hired labor for livestock?

   ( ) yes (continue) ( ) no (skip to 5)

3. Did you hire a part-time employee under age 19?

   ( ) yes (continue) ( ) no (skip to 4)

   a. How many part-time employees under age 19 did you hire? _____

   b. How many hours on the average were they employed? _____hours per _____

   c. How much were they paid? $_____/hour

   d. What kind of work did they perform? (Please describe)

   _____

   _____

   _____

4. Did you hire a part-time employee over age 19?

   ( ) yes (continue) ( ) no (skip to 5)

   a. How many part-time employees over age 19 did you hire? _____

   b. How many hours on the average were they employed? _____hours per _____

   c. How much were they paid? $_____/hour

   d. What kind of work did they perform? (Please describe)

5. Did you employ any family labor?

( ) yes (continue) ( ) no (skip to 20)

a. How many family members were employed? _____

b. How many hours were they employed? _____hours

c. How much were they paid? $_____/hour

d. What kind of work did they perform? (Please describe)

_____

_____

_____

IX. QUESTIONS ABOUT FACTORS AFFECTING LIVESTOCK PRODUCTION

1. What is the regular source of feed supply to your livestock operation? (If more than one, estimate percentage supplied from each source).

   Own pasture _____%

   Own hay production _____%

   Public rangeland _____%

   Leased pasture _____%

   Purchased hay _____%

2. Regarding herd size, would you consider yourself to be building, stable, or declining? (Check one).

   ( ) Building ( ) Stable ( ) Declining

3. Do you feel your operation is developed to its maximum animal carrying capacity?

   ( ) yes (skip to 7) ( ) no (continue)

4. Which of the following reasons are important to your plans for livestock production? (Circle all that apply)

   a. availability of land
   b. availability of water
   c. skill required for livestock production
   d. constraints on your time
   e. availability of labor
   f. availability of credit
   g. livestock prices
   h. existing level of debt

   Which are the most important?

   Enter the appropriate letter _____ _____ _____ _____ _____

   1st 2nd 3rd 4th 5th

5. If you marked "depressed livestock prices" as a limiting factor, what is your expectation about future prices?

   ( ) will improve ( ) will remain depressed

   ( ) will be more depressed ( ) don't know

6. Suppose the prices remain depressed in the future, which of the following courses are you likely to pursue?

( ) Continue raising livestock

( ) Shift to grain crop production

( ) Quit farming altogether

( ) Don't know

7. What percent of your household income is realized from agriculture?

_____%

8. What percent of your income from agriculture is realized just from livestock?

_____%

9. In your opinion, from which of the following will a farmer make more money in the Valley? (Check one).

( ) Raising crops only

( ) Raising livestock only

( ) Raising crops and some livestock

( ) Raising livestock and some crops

10. In your opinion what is the outlook for overall livestock production in the Valley? (Check all that apply).

( ) More farmers will get into livestock production

( ) Fewer farmers will get into livestock production

( ) Herd size size per farm will increase

( ) Herd size per farm will decrease

( ) Don't know

( ) Other (specify)

_____

_____

X. QUESTIONS ABOUT TRADE-OFFS BETWEEN CROP PRODUCTION, LIVESTOCK PRODUCTION AND OFF-FARM EMPLOYMENT

1. If your farm income can be increased, which of the following is the most economically efficient way to proceed? (Rank)

   ( ) Reduce livestock enterprise and increase grain crop enterprise

   ( ) Reduce grain crop enterprise and increase livestock crop enterprise

   ( ) Increase yield on grain crops by improving water application

   ( ) Increase yield on pasture by improving water application

   ( ) Increase productivity of crop land through better fertilizer and water application

   ( ) Improve pasture management for better livestock gain

   ( ) Other (Please describe)

   _____

   _____

2. Do you like more or less dealing with the livestock than the irrigated crops?

   ( ) More ( ) Less ( ) the same

3. Which of the following give you greater satisfaction? (If both, rank by importance).

   ( ) Get a high yield on your major crop

   ( ) Get a rapid gain on the production of your livestock

4. What qualities do you associate with successful agricultural production in the North Powder Valley? (If both, rank by importance).

   ( ) Achieving high yields on irrigated crops

   ( ) Run a high productive herd of livestock

   Make any comments you feel necessary.

   _____

   _____

   _____

6. Which of the following best describes the business organization of your ranch or farming operation?

   ( ) Individually owned

   ( ) Partnership (Specify) _____

   ( ) Incorporated family farm

   ( ) Corporation

   ( ) Soon to be a partnership

   ( ) Soon to be an incorporated family farm

7. Who makes the major decisions relative to your farm business?

   ( ) Yourself ( ) Someone else (Specify) _____

   ( ) Jointly made with someone else

8. If you don't mind, would you tell us your age? _____

XI. QUESTIONS ABOUT YOURSELF

1. Did you grow up on a farm?

   ( ) yes ( ) no

2. What is the highest level of education you have completed?

   Elementary school (0-8) ( )

   High school (9-11) ( )

   High school graduate (12) ( )

   Some college ( )

   College graduate ( ) Major _____

   Graduate degree ( ) Major _____

3. Did you have any vocational or technical training (If yes, specify training and number of years).

   ( ) yes _____

   ( ) no

4. What is your major reason for being a farmer? (Rank by order of importance).

   ( ) It is a way of making a living

   ( ) It is a good way of life

   ( ) It is a way to keep the family property together

   ( ) It is a challenge

   ( ) Other reasons (Specify)

   _____

   _____

5. What is the percent of your household income that is realized from off-farm employment? (Check all that apply).

   By yourself _____%

   By your spouse _____%

   By your children _____%

   By your relatives (Specify) _____%

XII. OPTIONAL QUESTIONS

1. What would you estimate the value of your irrigated crop land per acre?

   _____/acre

2. Estimate the total value of your machinery as if you were going to sell it for cash today. $_____

3. What is your annual payment on farm debt? $_____

4. What would you estimate your family's total revenue from the sale of agricultural products?

   ( ) $10,000 or more but less than $20,000

   ( ) $20,000 or more but less than $30,000

   ( ) $30,000 or more but less than $40,000

   ( ) $40,000 or more but less than $50,000

   ( ) $50,000 or more but less than $100,000

   ( ) $100,000

5. What would you estimate your family's revenue from sources other than agriculture to be?

   ( ) $10,000 or more but less than $20,000

   ( ) $20,000 or more but less than $30,000

   ( ) $30,000 or more but less than $40,000

   ( ) $40,000 or more but less than $50,000

   ( ) $50,000 or more but less than $100,000

   ( ) $100,000