Benefits to Fish, Benefits to Farmers: Improving Streamflow and Water Allocation in the Northwest

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Prepared by:

William K. Jaeger
Associate Professor
Department of Agricultural and Resource Economics
Oregon State University

and

Bob Doppelt
Director, Center for Watershed and Community Health
Institute for a Sustainable Environment
University of Oregon
(541) 744-7072 or (541) 346-0687
E-Mail: bdoppelt@darkwing.uoregon.edu
Website: http://cwch.uoregon.edu
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BACKGROUND AND ACKNOWLEDGMENTS

The citizens of Washington and Oregon today face a number of important environmental challenges. For example, a majority of streams fail to meet water quality standards, that streamflows in many waterbodies in the region often do not have sufficient water to sustain fisheries during the dry season, and that many salmon stocks are listed as threatened or endangered regionwide. In addition, the Oregon State of the Environment Report, published in 2001 by the Oregon progress Board, identified a number of areas where Oregonians can expect continued problems under current policies and programs including: poor water quality, especially in urban and agricultural areas, inadequate water supplies, loss of wetlands, degraded riparian areas, depleted fish stocks, invasion of exotic species, diminished biodiversity, and waste and toxic releases. Similar problems exist in Washington State.

These environmental issues threaten the quality-of-life of communities throughout the Pacific Northwest. The public and decision makers want to take appropriate steps to resolve these problems, but often hesitate because they fear the economic consequences will be too severe.

In the spring of 1999, The Center for Watershed and Community Health (CWCH), a research institute affiliated with the University of Oregon Institute for a Sustainable Environment (formerly affiliated with the Mark O. Hatfield School of Government at Portland State University), initiated a project to help decision makers throughout the region better understand the economic issues and facts associated with developing a more environmentally sustainable economy. The CWCH's aims is to provide accurate, objective, and easy-to-understand information about the potential costs and benefits associated with adopting practices and policies that can resolve pressing problems such as endangered salmon and lead to a more efficient economy. The CWCH has developed collaborative research partnerships with a number of academic institutions in Washington and Oregon, provides grants to a number of leading economists, and completes its own research, to accomplish this goal. This assessment is one in a series of reports to be produced as a result of this effort. The project is an integral part of PSU CWCH's focus on developing new, more effective and efficient approaches to environmental governance.

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I. Background and Introduction

This paper is intended to outline a framework and provide policy recommendations for expanding the tools and approaches available to transfer water between out-of-stream and instream uses and also among out-of-stream uses. The document is an outcome of a multi-year effort to assess the costs and benefits of water acquisition strategies, begun in 2000 by the PSU (now UO) Center for Watershed and Community Health. The report suggests that one key to expanding water transfers in the region is to frame the goal, when possible, as a means to help all users of water—both farmers and other water right holders—to meet their objectives. This approach may be viewed more positively than ones which has at times been interpreted by some agricultural interests as involving only costs without any offsetting benefits for them or their communities.

The project began with the publication of *Increasing Stream Flows to Sustain Salmon in the Northwest: An Economic and Policy Assessment (*Jaeger and Mikesell for the PSU CWCH, 2000). This report identified the broad outlines of a strategy to protect and enhance streamflows in the Northwest by purchasing or leasing irrigators' water rights. The report suggested that acquiring water to increase streamflows in *all* years and/or at *all* times of the year will frequently be unnecessary if: a) the benefits to fish come from maintaining a minimum streamflow during critical months, and b) the critical minimum streamflow is currently being achieved in some, and perhaps most, years. The report emphasized the potential use of contingent contracts to reduce the costs of water transfers in a flexible manner that increases the benefits for irrigators. Using data from market transactions for individual water rights, sales of irrigated farmland, and from a number of economic studies and cost estimation techniques, the report found that the costs of acquiring water to augment streamflow are likely to be modest if an efficient approach, such as the use of contingent contracts, is taken. Costs were estimated to be between $1 and $25 per acre-foot, which would translate into annual costs of between $1 and $10 per person in Washington and Oregon for a comprehensive program.

Following the publication of this first report, Jim Waldo, water policy advisor to Washington Governor Locke, asked the CWCH to analyze strategies to assist efforts to increase streamflows in Washington during the 2001 draught in a manner that could help economically distressed farmers. In response to this request, we reviewed 2000 and 2001 water acquisitions by the Washington Department of Ecology, the Roza Irrigation District, and U.S. Bureau of Reclamation. This review found that if specific changes were made to the way leases were advertised, solicited, acquired, held and monitored, water leasing could be a very viable short and long-term approach to resolve water shortage problems and economic problems faced by certain farmers. One key finding was that water right holders seem to be most comfortable leasing water rights to other farmers or irrigation districts. The review also found that the long-term monitoring of leases must involve more than visual approaches. In addition, we found that increased communication and outreach were needed to gain better awareness within the irrigated community of the opportunities for, and benefits of, water leasing. For more information see *Assessment Of Water Leasing Activities In Washington State* (PSU Center for Watershed and Community Health, November 1, 2001).

In addition to our review of 2001 water acquisition activities, we produced an initial economic model to guide water transfers (see *Streamflow Augmentation Strategy: Initial Framework and Economic Model,* Bob Doppelt & William Jaeger for the PSU CWCH, November 1, 2001).

This paper, *Benefits to Fish, Benefits to Farmers: Improving Streamflow and Water Allocation in the Northwest,* builds on our previous work. It seeks to provide a framework for encouraging water transfers in a way that expands the opportunities for farmers and other water-right holders to achieving their own economic goals, rather than viewing transfers as an infringement on their economic well-being.

II. The Need for an Inclusive Approach and an Expanded Framework

A fundamental assumption behind any effective water transfer/market system is that voluntary transactions must benefit both buyer and seller (or leaser and lessee), and that obstacles that block voluntary transactions limit the ability of individuals, and society generally, to get the most benefit from water. Of course, there are exceptions to this rule, situations where individuals other than the buyer or seller are affected beneficially or adversely, and these kinds of situations arise due to the special characteristics of water that make it different from other commodities and other markets. Indeed, the depletion of instream flows and fish population is a direct result of one of these special characteristics.

Water transfers in the form of leases, purchases, dry-year options, split-season contracts, or water banks involve the creation of markets where market activity has historically been absent. Water transfers therefore represent a new market, one that is unlikely to function well in its nascent stages, but one where, with some attention to those aspects of markets which foster efficiency, could function well in the future.

Economic theory includes a well-developed way of thinking about the necessary conditions for markets to function efficiently. The principles from this analytical framework can be easily applied to water for identifying currently existing obstacles, and also for pointing out the direction of possible policy solutions or other remedies.

Standard economic theory finds that efficiency (defined here as the absence of waste) will occur in a strict sense only if eight conditions hold with respect to property rights and markets. Four of these conditions pertain to ensuring that non-attenuated property rights exist and the other four conditions pertain to ensuring that markets are perfectly competitive. Of course, none of these conditions holds perfectly in the real world, but the closer we are to these conditions the more efficiently a market is likely to function. The obstacles which currently constrain water transfers in the Pacific Northwest involve shortcomings related to all eight of these conditions. The eight conditions are:

1. **Individual Ownership, Control, Impact**. Ownership rights must be exclusive, that is all rewards and penalties from any action involving the resource will accrue directly to the individual empowered to take that action—the owner. No other individual is affected by the owner's actions.

2. **Completely Specified Rights**. The rights associated with ownership must be completely specified so that there is perfect information about the ownership rights, the restrictions on those rights, and the penalties for their violation.

3. **Transferable Rights**. The rights must be transferable so that through markets the use of the resource may gravitate to their highest-value use (this implicitly assumes transaction costs are zero).

4. **Complete Enforcement**. The rights must be completely enforced (and at zero enforcement cost).

The second set of four conditions for efficient ("perfectly competitive") markets being:

5. **Standardized Product**. The products being sold in a given market must be identical; there must be no differentiation (e.g., with respect to quality, timing, access) across buyers, sellers, or locations.

6. **Perfect Information**. All information is available at zero cost to buyers and sellers.

7. **No Market Power**. No individual buyer or seller can influence the price; their role is too small in relation to the size of the market to influence the price.

8. **Other Resources Are Mobile**. Any other resource, factor or input used in combination with the good being marketed can be moved to other locations and put to other, equally valuable uses.

The first of these conditions provides an explanation for the under-provision of instream uses: the benefits of increasing streamflows for protection of fish population, recreation, and other benefits due not accrue to specific individuals, rather they represent "public goods" from which we all may benefit but for which none of us can be easily compelled to pay. Therein lies the problem of inadequate instream flows, and the decline of fish populations in the Northwest.

Our research suggests, however, that this problem can be overcome in certain locations and at certain times by not focusing exclusively on how to increase instream flows, but to also look generally at water allocation and the obstacles for reallocating water in ways that would generate more public benefits as well as more individual benefits.

The reasons for this focus are several. First, there are many examples of inefficient water allocation, and removing the obstacles to reallocation of water can generate large benefits from water in several kinds of uses, not just for increased streamflow. Second, the obstacles to increasing instream uses include the perception in agricultural communities that they have nothing to gain and everything to lose when increased streamflow is discussed—even in the context of voluntary transactions. As a result, there is frequently strong opposition to reallocation of water among agricultural users and rural communities, and this opposition has already impeded efforts to increase instream flows.

In the sections below, we try to make the case that much more is to be gained, for all parties concerned, by promoting the efficient allocation of water both among agricultural and other uses, and between those uses and instream uses. Mechanisms to reallocate water that involve an expansion of the range of opportunities for *all* interested parties, rather than as a reduction in opportunities or the confiscation of property, are likely to be more successful in the long-run. There is a great deal of uncertainty, and potential for learning-by-doing, regarding water transfer mechanisms and the effects of such transactions. We believe that an environment in which all parties can explore new and potentially beneficial opportunities will be one that is more conducive to progress than an environment which gives the appearance of placing limits on, or directing benefits to, one group at the expense of another.

Many of the economic issues raised in this paper are not new, nor are they unique to the Pacific Northwest. Indeed, many of the issues have been assessed in other contexts (see, for example, Easter et al. 1998). For that reason, this report is not intended to be a comprehensive survey of the steps required to make water markets a reality. Many of the important and practical issues about how to make water markets function have also been addressed elsewhere. For example, see "Saving our streams through water markets: a practical guide" Clay Landry (1998) for a very useful discussion. Our goal in this paper is to build on the previous work by offering a way to think about broadening the common framework used to approach water transfers in the Northwest.

To begin our discussion about means to broaden the framework for water transfers, the next section reports on a recent study of the 2001 irrigation curtailment that occurred in the Upper Klamath Basin. We then discuss a second example, this time from Salmon Creek in the Okanogan River basin in Washington. These case studies highlight both the constraints on, and the potential for, more efficient allocation of water. Clearly, not all of the eight conditions listed above are fully satisfied in the case of water – or for any other product or resource for that matter. In some cases there is no remedy to the problems, or the effect is slight. In many cases, however, improvements are possible that could lower the barriers to mutually beneficial transactions involving water. We believe these two case studies demonstrate this potential.

Following these illustrative case studies, we return to the eight conditions for efficient water markets, and provide a more detailed discussion of each as it pertains to the obstacles that limit efficient allocation and transfer of water in the Northwest. A set of provisional recommendations for addressing these obstacles is also proposed.

III. Illustrations Of Water Allocation Problems And Potential Solutions

A. The Upper Klamath Basin, Oregon

The Upper Klamath Basin, and the water crisis that occurred there in 2001, illustrate in dramatic fashion both the current limitations and future potential for water transfers. The results of an economic study of the region are summarized here focusing on the role that water transfers might have played in mitigating the socio-economic costs of the irrigation curtailment implemented under the requirements of the Endangered Species Act. The analysis provides a concrete and striking illustration of the potential benefits from water transfers to both fish *and* farmers by enlarging the set of opportunities for both groups.

The Upper Klamath Basin includes about 500,000 irrigated acres including about 200,000 on the Federal Klamath Reclamation Project ("the Project") (see figure 1). In the 2001 drought year, the US Fish and Wildlife Service and the National Marine Fisheries Service determined that given requirements for lake levels in Upper Klamath Lake and streamflow in the Klamath River to meet ESA requirements for endangered suckerfish and coho salmon, that there would be little water left to serve the 195,000 acres in the Project. The subsequent dramatic economic, social and political fall-out of that decision has been described in detail in the media throughout the past year. The economic cost to irrigators from the initial irrigation curtailment – in the absence of any public or private mitigation – has been estimated at around $33 million. Government responses included Federal and State mitigation efforts (primarily well drilling and groundwater) as well as emergency payments and compensation. These public responses included between $34 and $36 million in federal and state emergency payments to farmers, plus an additional $10 million for well drilling and aid to other members of the affected communities.

Closer examination, however, reveals that the farms in the Klamath Project that were cut-off from irrigation include a disproportionate share of the most productive agricultural lands in the region. Based on data for market land prices, soil classification, and crop rotations, the value of applying water to the lands in the region is estimated to vary by more than a factor of 20 between the Class II soils on the Project where potatoes, grains, and alfalfa are grown, and the Class V soils in the higher reaches of the watershed dominated by pasture. See Table 1 for a breakdown of the value of irrigation water across these different locations and soil classes.

Short-run losses from "surprise" curtailment of irrigation is more costly to irrigators than the long-run values reflected in Table 1 because they lose their net revenues but still have "fixed costs" including such things as idle capital equipment, taxes and insurance. Estimates of these short run losses in Table 2 are shown to be as high as $312 per acre and as low as $25 per acre. Thus, the variation in the value of water in irrigation in the Upper Klamath Basin ranges from $312 per acre per year under short-run conditions to less than $12 per acre per year in the long-run. This range, varying by nearly a factor of 25, demonstrates just how important it can be to take account of the differences in the value of water at a particular time or place when reallocation is at issue.

Indeed, analysis based on simulation models of irrigated agriculture in the Upper Klamath Basin indicate that the same reductions in irrigation diversions required in 2001 could have been achieved at a cost as low as $6.3 million dollars rather than $33 million – a reduction in cost of about 80 percent (see Jaeger 2002 forthcoming). In fact there may be other options not taken account of by these simulation models that would reduce these costs even further.

In order to achieve this result, however, water must be allocated efficiently. Yet the conditions for efficient allocation do not currently exist in the Klamath Basin. Each of the eight conditions described above is violated to lesser or greater extents in the Klamath Reclamation Project and in the Upper Klamath Basin more generally. Obstacles include:

- Ownership rights to water in the Upper Klamath Basin are not clearly or completely specified. The process of adjudicating these water rights is currently in process, but may take several years to complete. Conflicts exist between Tribal rights, irrigators rights, and instream uses.
- Rights are poorly specified in some respects, and transferability is uncertain. There is confusion across State and Federal jurisdictions regarding the temporary or permanent transferability of water among users, especially the possibility of transfers from the Federal Reclamation Project to uses outside the Project.
- Enforcement of water rights does not currently benefit from gauges or metering devices. Control and transfers of partial allocations of irrigation water would require installation of devices to precisely measure the amount of water applied to different fields, and this would involve a significant initial investment.
- Water is differentiated by location, timing and quality. Water diverted above Upper Klamath Lake may affect water quality in the Upper Klamath Lake and Klamath River. Water diverted into portions of the Project contribute runoff that is beneficial to the National Wildlife Refuge. Early spring water may be more beneficial to some agricultural crops whereas water in mid- and late-summer may be more critical to fish.
- Information about the willingness of irrigators to transfer water at different times and locations to other irrigators or for instream uses is not easily available. And the value of being able to apply water on a particular plot of land at a particular time is likely to be known only to the individual farmer.
- The resources used in combination with water to produce agricultural products and income are relatively immobile. When water is unavailable, capital equipment, labor and the local economies dependent on agriculture suffer from a decline in demand and underutilization. Although some farm labor may find work elsewhere, these relocations are costly. (Of course, a similar immobility makes fish and other species dependent on adequate supplies of water in particular locations at particular times.)

In general, not only are there serious shortcoming with respect to the efficiency of property rights for water, but markets for water do not exist at this time. The 2001 restrictions on irrigation to protect endangered fish were imposed directly on the Federal Reclamation Project in large part because that was the place where federal agencies had the authority to do so. Since the Project lands are among the most productive in the region so that the costs imposed by this shut down were very high. However, had there been markets for water, the irrigators on the Project might have had the option of replacing the water denied them by the Bureau of Reclamation with

water purchased from other irrigators who are not part of the federal project – especially if the value of water when used on those non-Project lands are significantly lower than the value of water when used on the Project. The data in tables 1 and 2 indicates that the differences in these values are very large.

To allocate water efficiently in the Upper Basin, some kind of market mechanism is needed, one that utilizes detailed information about the differences in the value of water across different locations, soil classes, and crops: the kind of knowledge that only irrigators can be expected to possess. Since farmers are in the best position to know the value of water when used on their own lands, a decentralized mechanism that relies on their knowledge and choices—such as a water bank or market—is likely be the most efficient way to take advantage of these differences.[1]

The obstacles to a functioning market for water in the Klamath basin include the lack of fully-adjudicated water rights in the region, multiple jurisdictions involving the State of Oregon, State of California, federal control of the Klamath Reclamation Project, and Tribal rights. In addition, many Project irrigators are wary that if some irrigators were able to sell their water rights off-Project (for example to instream uses), that the burden of operating and maintenance costs (e.g., for canals) would fall more heavily on those remaining, thereby raising their overhead costs. Community members, agricultural input suppliers, and processors, also fear that transfers of water to instream uses would undermine the local economy and the viability of agriculture in the region.

Despite these constraints and concerns, the analysis suggests if some water transfer mechanisms could be put in place to achieve more efficient allocation of water, the costs of a drought situation like the one in 2001 could be reduced by 80% compared to a "no-reallocation" scenario. This result however would require the completion of the water rights adjudication process and it would benefit from the installation of meters and gauges to accurately monitor and control water use. The 2001 reduction in irrigation was equivalent to a reduction in irrigated acreage of 180,000 acres. This same reduction, if achieved using water markets or water banks, would allow growers on the Project to offer to buy water from growers outside the Project. The economic data suggests that many individuals who irrigate Class V pastures would likely be willing to sell their water to irrigators, and that both buyers and sellers would benefit significantly from these transactions. The result of these transactions (whether negotiated collectively through the irrigation districts or by the Bureau of Reclamation for the entire Project) would bring water to the high value lands on the Project while leaving areas of low value pasture un-irrigated. The resulting efficient allocation would involve moving water from the upper portions of the Basin (the Sprague, Williamson and Wood Rivers) into Upper Klamath Lake, and then into the canals of the Project at the outlet of Upper Klamath Lake.

[1] While farmers are in the best position to know the value of water when used to irrigate their land, they often are unsure of the market value of their water if put to other uses. In some cases irrigators may be willing to sell water at a price corresponding to its value to them. In other settings they will want to know what the going rate is, based on information about potential buyers, other sellers, and the kinds of uses to which land and water will be put (e.g., residential, industrial, instream).

This particular kind of transfer would be unlikely to create injury to intermediate irrigators because it moves additional water downstream (Injury is more likely if the point of diversion is moved upstream.) It would also generate additional biological benefits for fish since it would mean more water being kept instream (and in lake) for a longer period of time. Clearly this kind of movement of water from individual irrigators on the Sprague or Williamson River to the Project would require the collective involvement of the US Bureau of Reclamation who operates the canal gates, and also the various irrigation districts within the Project who oversee the distribution of water among fields. Therefore it would be essential to involve the collective representatives of the Irrigation Districts. In this kind of situation a water bank, which involves a cooperative or collective allocation arrangement, is likely to be an attractive alternative (See Bromley 2000). This would give the District the ability to negotiate collectively, and to buy or sell water on behalf of its members.

The irrigation curtailment of 2001 imposed a very large cost on the communities in the Upper Klamath Basin, and this event represents one way to provide additional water for fish. What is also very clear from this analysis, however, is that the way in which efforts were made to protect fish imposed unnecessarily high costs on the local communities (as well as on taxpayers who financed more than $45 million in emergency payments and mitigation efforts). The introduction of water transfer mechanisms in this particular case represents a way to avoid these kinds of very high costs on agriculture, while also offering a mechanism for protecting fish and other ecological benefits in direct and indirect ways, at much lower costs.

This is a very important point given the very large costs imposed on these communities in 2001 and the need to provide flows to achieve ecological goals. To the extent that water transfers can reduce the costs of irrigation reductions like the one that occurred in 2001, the political opposition by farming communities to protecting instream resources is likely to lessen. The threat of an action which will cost $6.3 million to the area is likely to get a very different response than one that will cost at least $33 million. Moreover, given the uncertainty faced by junior water right holders in the area (in the face of drought and conflicting biological opinions about the precise requirements necessary to comply with the ESA), there will likely also be a role for permanent retirement of irrigated lands. This kind of proposal, however, also raises concerns in the local community.

The permanent retirement of irrigation water rights will increase instream flows in all years, but it will also reduce the frequency of additional restrictions on the remaining irrigators in the region. The fear that permanent retirement of irrigated lands in the area poses a threat to the viability of the agricultural community is probably not serious when talking about, say, a 20 percent reduction in irrigated acreage. A water market would facilitate finding the least-cost way to reduce irrigation diversions, and in the case of the Upper Klamath Basin, it is estimated that a 20 percent reduction in irrigation diversions would reduce incomes from irrigated agriculture in the region by only about 10 percent (by retiring the least productive lands). This level of reduction is unlikely to produce significant contractions in the local economy, especially if it occurs gradually over a period of a few years.

A central point of this illustration is that water markets can benefit all users, or potential users, of water. By focusing on how water transfers can benefit both agricultural and in-stream

uses, the objections to water transfers in rural areas are likely to be reduced, and those concerned with instream uses and irrigation can potentially work together in a constructive manner.

Indeed, during recent negotiations on the US Farm Bill, an amendment that would have provided $150 million for purchase of water rights to protect fish and other species was strongly opposed by the farm lobby because of the widespread view that these kinds of voluntary transactions pose a serious threat to rural communities and the agricultural industry generally.

B. Salmon Creek in the Okanogan Basin, Washington

In order to restore salmon and steelhead in Salmon Creek, a tributary of the Okanogan River in north central Washington, the Colville Confederated Tribes (CCT) and the Okanogan Irrigation District (OID) formed a partnership.[2] The lower portion of Salmon Creek is dewatered in normal years, blocking access to a 12-mile reach of excellent spawning and rearing habitat above the dewatered section. The Tribes were interested in restoring salmon and steelhead and the OID was interested in continuing to serve the 5,000 acres of orchards and farms.

In this setting, the lack of clearly defined, individual property right for the Tribes and environmental interests meant that their instream uses of water were being adversely affected by irrigation uses.

Following a contentious beginning, these two groups began to work together and eventually formed a successful partnership. This included a joint study of feasible restoration options, funded by BPA and the Washington State Governor's Salmon Recovery Office. An independent consulting firm was hired to conduct the study, and this resulted in a determination that 10,000 additional acre feet of water would be needed to meet the needs of irrigators and fish. A set of measures were developed, including modifying the district's water use practices, upgrading facilities, and constructing new facilities. Greater flexibility was required, and the remedies included allowing water to flow down Salmon Creek under more natural conditions (rather than diverting water for irrigation). The Salmon Creek water would be exchanged for Okanogan River water which would be pumped back up to the irrigation district. Other elements of the project included channel modification, and construction of a fish ladder.

The irrigation district had not initially viewed water use curtailment due to the ESA as a real threat. However, they recognized that other districts had faced large increases in overhead (assessments) to deal with planning and legal fees to oppose NMFS and ESA issues. To avoid these kinds of costs, the district took a "proactive" approach and entered into the non-binding partnership with the tribes to study ways to meet both the needs of irrigators and of fish.

For their part, the Colville Tribes could have used the courts to assert the federal government's trust responsibilities toward Indian tribes or to assert the tribes' "Winters' Doctrine" rights on the Okanogan River. They probably understood that they would prevail in court, but that this would require a lengthy and costly court battle. Instead, they elected not to do

[2] This section is based primarily on "Irrigators & Tribe Partner to Aid Salmon Recovery in Okanogan River Tributary", by Hilary Lyman, Big River News, volume (3), 2000 (published by the Northwest Water Law and Policy Project).

that, and promoted an approach which resolved the conflict sooner and also seems to have built some goodwill within the community. Recently the Washington Water Trust has become involved as well, creating a Salmon Creek Trust Water Right to protect smolt migration.

Among other things, this example demonstrates two important points. First, cooperation can be successful in situations where confrontation might only have led to impasse. Second, water transfers were not the single, or primary tool, in this case. Although a change of diversion point was a component of the plan developed, and a transfer of water rights might have been considered as a component of alternative versions of the plan, the expected success of this arrangement appears to come from a set of complementary tools to resolve disputes involving instream and out-of-stream water uses, rather than relying on a single tool such as water purchases or leases.

IV. Lessons Learned: Obstacles and Recommendations

We now move to a discussion of how the lessons learned from the two case examples discussed in Section III underscore the obstacles facing improved water allocation as they relate to the eight conditions for efficient markets listed in Section II. Situations like those in the Upper Klamath Basin, in Salmon Creek, and elsewhere help to reinforce the nature of the obstacles, the potential gains from flexible approaches, and the ways that specific interventions may help overcome some of those obstacles.

Condition 1: Individual Ownership, Control, Impact.

Water use or transfers can affect other individuals. One users action can affect the availability of water for other users. This kind of third-party effect or injury arises due to the interdependency of flows and diversion at different locations from a common stream. This represents a fundamental attribute of water allocation, and thus violates condition #1. This issue is widely recognized, and is addressed in Oregon and elsewhere with legal and regulatory conditions for a determination of "no-injury." Unlike other kinds of goods where exclusivity is more straightforward, in the case of water there is uncertainty about whether injury may occur. For example, if I sell my water right to somebody upstream, there may be a water right holder in-between the old and the new diversion points who will no longer be able to divert their entire amount of water (the streamflow at their diversion point will be insufficient). This potential problem can produce high transaction costs related to a determination of whether, or when, injury may occur. Some of these costs are born by government regulators (who evaluate proposed transfers), but private costs and risks associated with uncertainty are also present for potential buyers, sellers, and third-parties. Currently in Oregon and Washington the burden of proof requires a "positive finding of non-injury."

Another kind of third-party effects is relevant to water markets. Water allocation infrastructure and procedures sometimes involve common-pool resources where irrigation districts manage and maintain commonly used canal and ditches, as well as staff. The timing of allocations among participants in a irrigation district also creates the potential for third-party effects. If one user sells his water right, the burden of operation and maintenance costs must then be born by a smaller group of users, raising the cost per individual. In addition to standard 'third-

party' effects, irrigators are sometimes interdependent in ways that make collective contracting appropriate. A common system of canals and ditches, operation, maintenance costs, and complex scheduling arrangements, are all ways in which irrigators depend on "common-pool resources" associated with water delivery (Bromley 2000).

<u>Recommendation #1:</u> Develop Solutions That Rely On Collaboration And Communication with Irrigation Districts, Farmers, and Communities on the Mutual Benefits of Water Transfers.

Due to the many ways in which irrigators depend on "common-pool resources", it is essential for those interested in water transfers to work with representatives of a group (such as an irrigation district) whenever possible when seeking to develop transactions involving the water used by members of this group. Water banks or other 'clearinghouse' arrangements developed and/or managed at the local level are likely to be viewed as less of a threat, have lower transaction costs, and achieve better results for all concerned, than will individual contracts in these situations.

Educating and promoting mutually beneficial solutions with irrigation districts is likely to be important for locations such as the Upper Klamath Basin, and on Salmon Creek in the Okanogan Basin, and elsewhere in the Northwest. Working with state-wide organizations such as the Oregon Water Resources Congress and the Washington State Water Resources Association (the trade organizations for irrigation districts) may also be beneficial. The reluctance of some irrigation districts to work with NGOs or government agencies is often due to a lack of familiarity and uncertainty about the potential benefits of these collaborations.

Transfers involving Federal irrigation projects present some special legal obstacles. Efforts should be made at OWRD and WDOE to remove obstacles for instream transfers involving Federal Reclamation Projects. Again, close collaboration aimed at seeking mutually beneficial outcomes may help reduce opposition to the resolution of these obstacles.

<u>Condition 2</u>: <u>Complete Specification of Rights</u>.

Ownership rarely means that you can do anything with the item owned. I may own a dog, but I cannot torture it. I may own a house, but I cannot set it on fire. A "use-right" for water may be defined in terms of a specified amount and diversion point, but it may be poorly defined in terms of the flow or duty (volume) that may be transferred from one use to a different use. In fact, different specifications may be applied to different uses. For example, many "decree rights" have no limit on volume (duty) allowed over the course of a year, whereas a diversion at the maximum allowed flow for 365 days in a year could produce a volume many times greater than what would reasonably be used in agriculture. These kinds of rights can produce anomalies and create loopholes for transfers where out-of-stream consumptive use is unchanged.

The problem of poorly-defined or poorly-specified rights is particularly relevant to instream uses. Whether or not the water right amount listed on paper will be transferred to instream flow, or whether only the consumptive use amount (the amount previously diverted less

the amount returned to the stream by subsurface flows) may be transferred, is a source of uncertainty which may discourage potential buyers who are unsure of what they will get from the transaction.

This issue is related to the non-injury condition discussed above, where individuals other than the owner of the right (the seller) may be penalized by the sale of the right to streamflow use. In agricultural diversions, there are frequently subsurface flows from a given diversion that return to the stream (water that is not used by the crops). These may provide some instream benefits and they may be relied upon for a downstream water right. It is very difficult to know how much return flow occurs for a given diversion, and whether that return flow occurs at a time when water in or out of stream is scarce. (The return flow may be delayed for months or years in some cases). In the case of a water right transfer from agriculture to instream use, it is important to determine the amount of return flow that occurred with the agricultural use during the relevant time period so that the "net" change in streamflow can be accurately quantified.

This amount will be somewhere between the full diversion amount and the consumptive use amount. Using too small an amount will discourage the potential purchaser (instream or out-of-stream); too large an amount may create injury to downstream junior water right holders. Currently the Oregon Water Resources Department is required to make a finding of no-injury to allow a water right transfer to proceed, erring on the side of caution. An approach which transferred the full paper amount of a water right to instream use would implicitly take the opposite starting-point, assuming no injury will occur due to differences between the full paper water right and the consumptive use. This alternative approach would essentially reverse the burden of proof now being applied by OWRD. Reasonable arguments can be made for both approaches. It is currently not clear how this controversial question will be resolved in Oregon. But there is economic support for the position that all types of water rights should be treated similarly in this regard. If irrigators are generally allowed to transfer the full paper water right between different diversion points, then transfers to instream uses should be treated similarly. To do otherwise would bias water allocations away from precisely those kinds of beneficial uses (the collective or public benefits from instream flows) that tend already to be underprovided by market allocations.

It is much easier for water to be transferred within established irrigation districts in Washington, as farmers with water rights held by a district can buy and sell water among each other. Informal reallocation within districts is also common in Oregon.

The question of the quantity of water pertaining to a given right is also at issue with respect to the length of reach in which a given augmentation of streamflow should be ensured due to the acquisition of a specified water right. In some circumstances it will be reasonable to recognize channel losses over some distance from the previous diversion point, but how those channel losses are determined is currently unclear. Transferability is constrained by location, geology and landscape, but also by the legitimate concerns in rural communities about how reallocation of water might affect their economies.

<u>Recommendation #2:</u> Develop and Clarify Standards For Determining How Much Water (Flow) Will Be Associated With The Transfer Of A Given Instream Water Right.

State regulators need to develop standards for determining how much water will be associated with the transfer of a given instream water right. It is essential that these standards are fair to the potential buyer (whether it is an instream or out-of-stream user) while at the same time avoid injury to other users. The OWRD's Transfer Rules Advisory Committee is currently looking into these issues, and Oregon Water Trust has submitted a proposal to have the full "paper water right" amount be the transferred amount unless injury (e.g., corresponding to return flows that would no longer be available to downstream users)(see OWT Proposal for Transfer Injury Analysis).

The promotion of fair rules and regulation across types of uses should include allowing in-district water leasing to apply to instream leasing as well. In this regard, the Deschutes Resources Conservancy has proposed that the current legislation (OAR 690-021-000) that establishes the conditions that an irrigation district may follow to temporarily change the place of use of district-managed water rights be amended to allow for instream transfers (Gail Achterman, December 14, 2001, personal communication). In contrast, water districts in Washington can move water any way they want within the district. This flexibility allows farmers to buy and sell water to other farmers. In irrigation districts like Roza, for example, which has low flows every few years, farmers often buy and sell water among themselves. Moving water outside of the boundaries of irrigation districts, however, requires approval from WDOE.

These efforts also should promote installation of metering and gauging devices so that more precise information about water use, enforcement of water rights, and potential injury can be better assessed.

<u>Condition #3</u>: <u>Transferability and Low Transaction Cost</u>.

Under Oregon law water rights are transferable among different uses including beneficial instream flows. Washington has similar legislation. As a result, in those settings where individual water rights are adjudicated, there are no legal obstacles to water market transfers. In some regions, however, such as the Upper Klamath Basin, water rights are not yet adjudicated and this constrains the ability of water markets to function freely. There are physical limits to the transferability of water across different locations due to conveyance costs. More importantly for policy purposes are the transaction costs arising in the contracting and regulatory approval process for water transfers either temporary or permanent. Transaction costs include gathering of information, paperwork, delays, legal costs, or other aspects of a transaction that will diminish the attractiveness of the exchange to either the buyer or the seller. If these transaction costs are a 'fixed cost' per transaction, then their importance can be reduced by increasing the size or scope of a single transaction. This can make a permanent purchase more attractive than a one-year lease; and it can make a transaction involving a large acreage more attractive than one involving a small amount of water. Two approaches can be taken to reducing transaction costs: reducing the costs per transactions, and increasing the scale or scope of each transaction.

One way in which these transaction costs have been lowered in Oregon is the ability to renew a one- or two-year lease with a simple, one-page renewal form. This reduces the regulatory and processing costs. More generally, familiarity with water rights transactions will, over time, lead to efficiency gains, learning-by-doing, and simplification of the procedures which now are relatively cumbersome for many participants due to a lack of experience and information.

***Recommendation #3:* Promote The Establishment Of A Centralized, Online Database Where Information About Actual Water Transactions Are Summarized And Described.**

Water markets are new, and potential buyers and sellers face enormous uncertainty. Unlike the market for bread or blue jeans where people know what they are getting, what the price should be, and how and where to make the transaction, water presents such a high level of uncertainty that many individuals are repelled by those uncomfortable circumstances. Whatever can be done to reduce the uncertainty, to provide information about the product, the price, and the mechanism for processing a transaction, will reduce these costs and be highly beneficial by making individuals more comfortable with this particular kind of transaction. Information on actual water transfers can provide useful information and reassurances to uncertain participants, in the same way that information about what others have paid for a particular used car provide assurances to potential buyers who are hesitant because they are not sure that they are getting a good deal.

This information should try to distinguish between market transactions where the price reflects the seller's maximum "willingness-to-accept" price, and others that may reflect a very different, and idiosyncratic, willingness-to-pay price (e.g., BPA offers in WA in 2001, high-value residential or 'hobby farms'). One effort to provide broad information of this kind is the OregonWaterRights.com (sponsored by Groundwater Solutions, Schwabe, Williamson & Wyatt, LLP, in cooperation with the Deschutes Water Exchange). Other similar sites include WaterStrategist.com and WaterExchange.com. A public site, for example maintained by a State agency, may also be desirable.

***Recommendation #4:* Experiment With Flexible Contracts Such As Dry-Year Options and split-season transfers**

Where the value of water instream is higher than its value out-of-stream only in drought years, contingent markets or 'dry year options' should be developed. This can make augmenting streamflow attractive in situations where it otherwise would not be (e.g., if permanent purchases were the only alternative, or where repeated, single-year leases had to be renegotiated every time a dry year occurred). This kind of contract will not be appropriate where dry streambeds exist in late summer every year: in those cases permanent purchases are a more appropriate type of arrangement. In some cases, also, the option may run in the opposite direction. A water right may be purchased for instream use, but with an option for out-of-stream use under specified circumstances. These arrangements are important where the value of water in one use or the other is uncertain and fluctuates from year to year.

The Oregon Water Trust has developed a arrangement that mimics a dry-year lease. In 1998, OWT negotiated a 10-year deal with an irrigator in the Walla Walla Basin who grows spring wheat and peas. Irrigation only happens in dry springs, otherwise the crops do fine as dryland crops. Based on field data, OWT projected that in 3 out of 10 years the irrigator would have needed to water the fields in order to avoid reductions in productivity. OWT then projected, with the help of OSU Extension, how much production would be lost and the value of that lost production. OWT also subtracted out the costs of irrigating from the total. They then made a one-time payment to the right holder to exercise an option upfront on the projected dry years during a 10 year period. In essence, OWT has a 10 year lease with payments occurring for 3 of the 10 years and a donation occurring the other 7 (personal note from Andrew Purkey, OWT Executive Director, June 2002).

Split season transfers may also offer significant potential for benefits because they take advantage of differences in the marginal value of water at different times within a given season. To the extent that one or more users of water can shift the timing of their use (earlier or later) toward a time when water is more abundant, this may be a way to resolve conflicts over water at a much lower cost than a full-season transfer from one use to another. For example, water can offer benefits to irrigators in the early part of the growing season and then be transferred to instream use during the minimum flow period later in the summer. The potential benefits of this kind of reallocation may be substantial. For example, when the irrigation curtailment in the Klamath Reclamation Project was announced in 2001, some irrigators were able to "pre-irrigate" prior to the introduction of the curtailment. Since the soil profiles on these lands were fully saturated, grains and pasture were able to be grown without further irrigation on about 17,000 acres obtaining normal yields per acre. This approach is essentially an alternative to water storage, and may be especially beneficial in areas where water storage is not an option, but where shifting agricultural demand forward in time can reduce conflicts with summer low flow periods which may be critical to instream uses.

These kinds of arrangements face few obstacles currently under Oregon law and regulations. Oregon currently has a range of mechanisms for short-term instream leasing, pooled landowner leasing, district leasing, renewal for prior lease, and split season leases, as well as a conserved water program (which allows the landowner to use a portion of the conserved water). Washington has many similar mechanisms.

Transfers involving both instream and out-of-stream uses in which priority dates are 'swapped' may offer benefits in some areas. Contract payments can be based on the probable frequency that one or another contingent situation will arise. These kinds of agreements may have widespread potential.

Condition #4: Enforcement.

The transfer of water rights, especially for instream uses, is constrained in some areas by inadequate monitoring, which in turn limits enforcement. Our review of water acquisitions in Washington State in 2001 found that, except in the federal project in the Yakima basin, visual

monitoring was used almost exclusively. While appropriate given the crisis nature of the drought occurring at the time, visual monitoring alone will probably not satisfy those concerned with water transfers in the long-run, The lack of metering and gauging infrastructure limits the ability of water masters to adequately monitor the allocation of water, and the protection of the rights of both out-of-stream and instream rights. The installation of meters and gauges does not present a large cost compared to the value of water for most agricultural uses (usually far less than $1 per acre per year). As water becomes relatively more scarce, the waste and lack of accuracy using informal metering approaches will become increasingly unsatisfactory. The sooner a move toward meters and gauges is initiated, the sooner water right buyers and sellers can enter into contracts with a higher degree of confidence about what is being transacted. The State of Oregon has the ability to require that meters and gauges be installed at diversion points (Reed Marbit, OWRD, personal communication). Activities such as the grant received by the Oregon Water Trust to install a gauging station on Squaw Creek can contribute toward improved information about flows. Real-time on-line monitoring of instream flows and diversions is a reality in many Northwest locations. In the federal Yakima project in Washington there is a well-developed system of stream gauges, because court ordered flows have been established. Elsewhere in Washington, stream monitoring is spotty.

Recommendation #5: Improve the Monitoring and Gauging Infrastructure

The lack of metering and gauging infrastructure, which hinders monitoring and enforcement, may seriously reduce the comfort level of all parties as to the mutual benefits of water transfers. Government agencies should work with irrigation districts, non-profits, and others to expand and improve the metering and gauging infrastructure as rapidly as possible.

Condition #5: Standardized Product & Condition #6: Perfect Information.

Water is clearly not a standardized product. A given water right is associated with a specific location, at specific times, and with specific characteristics (temperature, nutrient content, etc.). Thus, we must recognize that a single, integrated market for the allocation of water cannot exist. Rather, there is the potential for many, highly differentiated water markets; some with many potential buyers and sellers, some with perhaps one or two. This reality has consequences for condition #6, because information is likely to be highly location specific, which makes it harder for potential buyers and sellers to feel confident that they have enough information to make and informed decision about entering into a contract, or making an offer. Unlike the market for a new car where it is easy to know exactly what the going price is, what the specifications of the product are, and how satisfied other consumers have been with a given product, information about water transfers and uses in other locations may be of limited use in evaluating a specific transaction.

Especially in the case of a commodity for which individuals have little market experience, the uncertainty created by ignorance about market values, what buyers (sellers) should be willing to offer (accept), makes risk averse individuals very cautions and unwilling to make transactions.

Some characteristics of a specific water right are known and these can be helpful (e.g., priority date). But a lack of easily available market information about similar transactions involving water rights gives rise to a high level of uncertainty, and therefore considerable hesitancy, on the part of both potential sellers and potential buyers.

Recommendation #6 (Repeat of #3): Promote The Establishment Of A Centralized, Online Database Where Information About Actual Water Transactions Are Summarized And Described. *(Details presented above)*

Condition #7: Market Power and Condition #8: Mobile Resources

Given the highly-differentiated and location-specific nature of most water markets, there is a clear risk of market power being exercised. This means the possibility exists for one or more individuals to act in a way that can influence the market price, and in so doing affect the opportunities of other buyers and sellers in the market. There is a fear, especially in some agricultural communities, that water purchases to augment streamflow could lead to water being controlled or monopolize by non-agricultural users such as urban areas. The implications of this possibility, real or imagined, is highly relevant to condition #8.

Many of the resources used in conjunction with water in agriculture are not mobile (such as buildings and other infrastructure, but perhaps more importantly, the less tangible assets such as the communities themselves that are highly valued by their members). Since there are no close substitutes for water in a given location, the threat of market control or loss of control, especially when putting water to other uses, could have a dramatic effect on a community, is a threat that must be taken seriously. This kind of threat represents a "third-party effect" of a kind that is not protected under water law in Oregon or Washington. Only injury to other water right holders is considered by WRD in Oregon and DOE Washington. If a significant share of water rights is transferred to non-agricultural uses, then individuals in that community (such as the fertilizer distributor, tractor mechanic) may be adversely affected and even lose their livelihood.

More than any of the other conditions described here, the combination of conditions #7 and #8 give rise to many of the social and political constraints—and hostility—toward water markets and instream transfers. In order to reduce these fears, and to the extent that they are unwarranted, more information is needed on exactly how water right transfers have affected (will affect) communities. Moreover, if agricultural communities only see the possibility of an adverse impact on them, then they have no reason to look at water transfers favorably. Therefore, it is very important to demonstrate to these groups the ways in which water transfers can *benefit* them as well.

For example, although there has been a 300 percent increase in instream leasing since 1998 (from 6 leases in 1994 to 151 in 2001), a large majority of these leases involved no compensation. The incentive for a majority of these was to avoid losing a water right due to non-use. Therefore, the majority of recent leases were undertaken because the water right holder benefited directly from the arrangement. Aside from water donations of this kind, the large majority of the remaining of lease arrangements involving payment are those initiated by Oregon Water Trust. This type of information must be widely shared with the irrigated community.

Of course, without water in a particular location fish may also be unable to relocate to different habitats, and other fish populations may not be substitutable (in terms of their ecological or social values) for the population in a particular location. Thus, instream uses are also location specific and lack resource mobility.

Recommendation #7: Significantly Upgrade Outreach and Communication Efforts

There is strong evidence that many of the skeptical or hostile reactions to water transfers in rural and agricultural communities can be replaced with cooperative, proactive approaches to conflict resolution with detailed information, examples of success, and better communication.

The full potential for expanding the framework for water transfers will be achieved only when most of those involved in the issue develop a common understanding of its benefits. Achieving a shared understanding of the potential benefits is very difficult, especially when people are skeptical. Getting a hundred, or 1000 people to understand and accept new information is an enormously challenging undertaking. It requires extensive communication delivered through multiple channels. It also requires that people walk the talk and avoid inconsistent messages.

People often vastly underestimate the importance of, or level of, work required to successfully communicate this type of information to irrigators, non-profits, government employees, stakeholders, and community members. This can delay or stop efforts to expand the framework for water transfers. Effective communication programs have been shown to be those that involve presentations designed to be accessible to all audiences, include examples and illustrations, and where presentations are made repeatedly and in multiple forums.

An Additional Issue

There is one additional obstacle facing potential instream users. There is simply an overwhelming lack of knowledge about the ecological benefits of incremental instream flows for any given reach in any given season or year. Given a budget with which to lease or buy water rights for instream use, there is very little information on which to make judgments about getting the most ecological benefit. Although most irrigators have a good idea about the value of water to them, potential buyers of water rights for instream uses are largely playing a guessing game.

Recommendation #8: Conduct Additional Research And Develop Careful Monitoring Programs Of The Biological Effects Of Changes In Streamflow.

Unlike irrigators who have a great deal of information on which to base their judgments of the value of water in agriculture, the value of incremental changes in streamflow in a given reach and for a given year is highly uncertain. That asymmetry puts instream users at a disadvantage, but this is not so much a regulatory, policy, or legal issue, as it is an ignorance issue pure and simple.

Additional research by fish biologists, combined with systematic long-term monitoring of fish populations in streams where changes have occurred (both increases and decreases) would appear to be the only way to gradually make judgments about when and where money is well spent protecting minimum flows. In the absence of careful monitoring using standard scientific methods and experimental design, this uncertainty will not be significantly reduced.

In the near-term, it makes sense to target situations where the benefits are most obvious such as fish-bearing streams that go completely dry on an annual basis, or ones where water temperatures regularly exceed lethal levels.

It should be kept in mind, however, that a correlation between minimum streamflow and fish abundance may not represent a large benefit if fish are merely moving from, or to, nearby tributaries or reaches.

VI. Concluding Comments

There is no single recipe for reducing impediments for water transfers. Different situations require different approaches. In some cases the constraint that is most limiting may be a lack of information or high coordination costs among individual water rights holders. In other cases the binding constraint may be a shortcoming in the regulatory framework used by government. Few quick fixes are apparent in Oregon and Washington, in part because the regulatory framework appears to be relatively conducive to water transfers and instream beneficial use.

One factor, however, remains a significant barrier--the perception by many irrigators that water transfers usually result in the loss of an economic asset to enhance a public resource. This report has tried to suggest that one key to expanding water transfers in the region is to reframe the goal, when possible, as a means to help farmers and other water right holders meet their economic needs while also benefiting instream uses. While this approach will certainly not be possible at all times and in all locations, it is much more likely to achieve mutually beneficial results for farmers, communities, fish, and the environment when it is pursued.

Figure 1. Key features and irrigated areas in the upper Klamath Basin and River system.

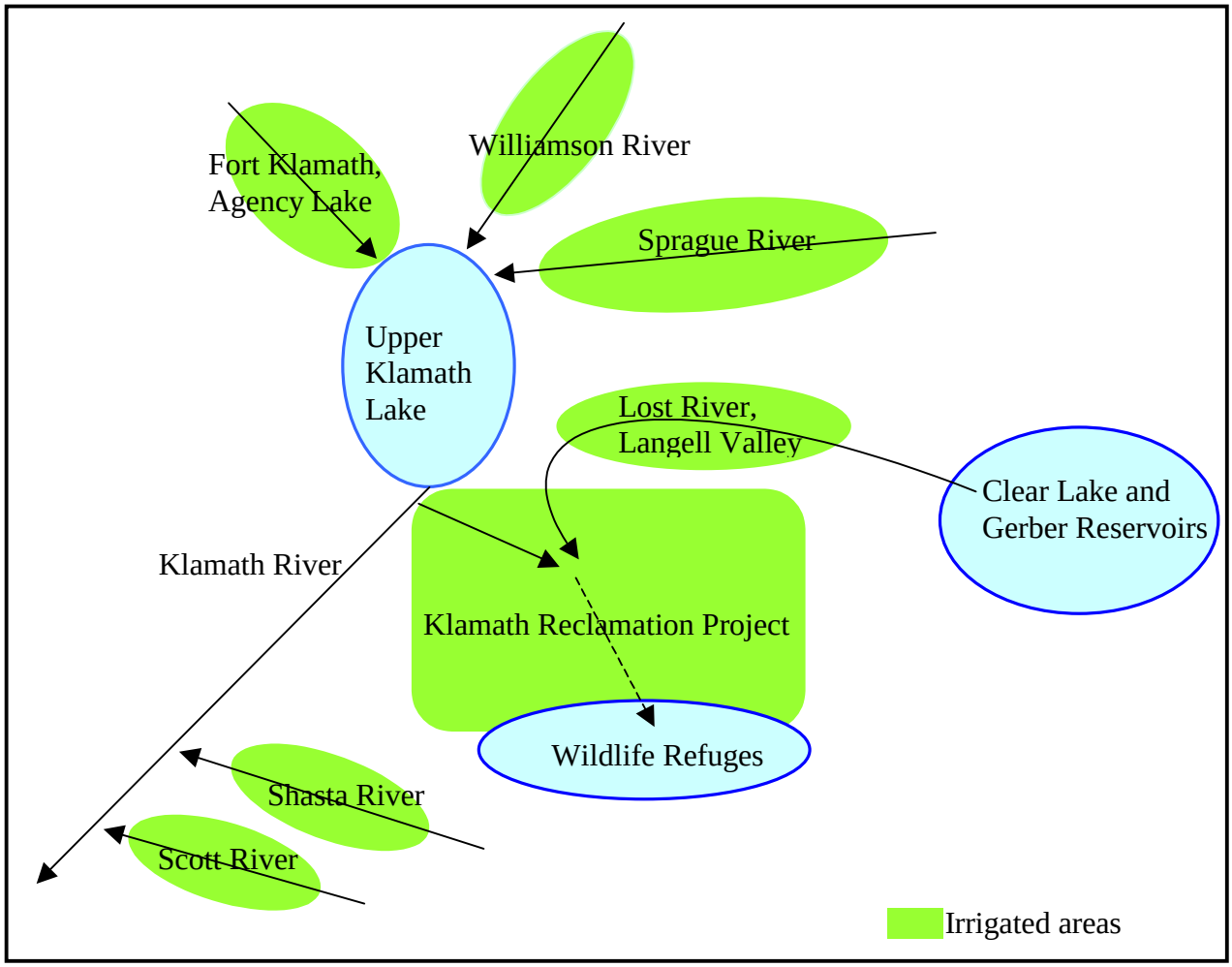

Table 1. Long-run marginal value of irrigation water in the Upper Klamath Basin by location and soil type. (annual values per acre estimated from market land values)

($ per acre per year)

Soil Class:	II	III	IV	V	Average (weighted)
Areas above Upper Klamath Lake:					
Fort Klamath Valley*	--	42	27	12	17
Modoc Point to Chiloquin	78	42	27	12	41
Sprague River Valley	--	48	33	6	33
North Country	--	33	33	3	31
Areas east and south of Upper Klamath Lake					
Swan Lake Valley	114	75	33	10	55
Bonanza (nonproject)	114	75	33	10	70
Langell Valley (nonproject)	114	75	33	10	67
Poe Valley (nonproject)	138	66	42	12	76
West of 97 to Keno (nonproject)	78	42	27	12	38
Lower Klamath Lake (non-project)	138	96	42	0	93
Klamath Reclamation Project Areas					
Merril-Malin area	138	63	42	12	64
Poe Valley	138	66	42	12	76
Midland-Henley-Olene	138	66	42	12	73
Bonanza-Dairy-Hildebrand	*114*	*75*	*33*	*10*	*70*
Langell Valley	*114*	*75*	*33*	*10*	*67*
Lower Klamath Lake	138	96	42		
Malin Irrigation District	144	102	48	6	104
Shasta View District	144	69	48	6	79
West of 97 to Keno	78	42	27	12	38
Tule Lake / California portion	138	90	48	--	87
Shasta & Scott Valleys	102	81	45	--	68
Average (weighted)					**60**
Average (unweighted)	**103**	**68**	**37**	**9**	
Estimates from Malheur County, Oregon**	**$105**	**$67**	**$35**	**$32**	

* Values based on agricultural use. Recreational demand has raised land values in this area.

** Based on hedonic price analysis (Faux and Perry 1999).

Table 2. Losses per acre from irrigation curtailment

	($ per acre per year)				
Soil Class:	II	III	IV	V	Average (weighted)
Areas above Upper Klamath Lake:					
Fort Klamath Valley	--	67	52	37	42
Modoc Point to Chiloquin	232	182	52	37	131
Spraque River Valley	--	210	58	31	59
North Country	--	58	58	28	56
Areas east and south of Upper Klamath Lake					
Swan Lake Valley	236	162	58	35	110
Bonanza (nonproject)	309	260	58	35	199
Langell Valley (nonproject)	242	106	58	35	115
Poe Valley (nonproject)	297	158	67	37	159
West of 97 to Keno (nonproject)	206	134	52	37	100
Lower Klamath Lake (non-project)	307	159	67	25	155
Klamath Irrigation Project Areas					
Merril-Malin area	312	232	67	37	193
Poe Valley	297	158	67	37	159
Midland-Henley-Olene	297	247	67	37	201
Bonanza-Dairy-Hildebrand	*309*	*260*	*58*	*35*	*199*
Langell Valley	*242*	*106*	*58*	*35*	*115*
Lower Klamath Lake	307	159	67	25	155
Malin Irrigation District	295	243	73	31	242
Shasta View District	299	217	211	31	232
West of 97 to Keno	206	134	52	37	100
Tule Lake / California portion	259	211	73	25	182
Shasta & Scott Valleys	273	228	70	--	167
Averages for non-California areas:	**$274**	**$173**	**$69**	**$33**	**$145**

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