Environmental Water Transactions: Lessons Learned & Future Prospects

Proceedings of a workshop held September 2, 2007 in Brisbane, Australia as part of the *10th International Riversymposium* and *Environmental Flows Conference*

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The organizers wish to thank all of the expert panelists and workshop participants for their contributions. Participants from six countries and private, public, and academic sectors contributed to a rich exchange of ideas and experiences. The workshop helped to forge an international network that links practitioners using transactional approaches to acquire water for environmental flows.

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EXECUTIVE SUMMARY

Water markets and environmental water transactions have become increasingly prevalent components of efforts to protect and restore environmental flows. Although the application of market-based policy approaches to ecosystem services remains limited in extent, legitimacy, and institutional capacity, environmental water transactions have proliferated across diverse social and ecological contexts, and interest continues to grow.

Responding to these trends, a one-day workshop on environmental water transactions was held on September 2, 2007 as part of the *10th Annual Riversymposium and Conference on Environmental Flows.* The purpose of the workshop was to convene practitioners and regulators engaged in environmental water transactions, as well as a group of outside experts, to: (a) elaborate the lessons learned from nascent transactional programs and (b) chart future directions for expanding and transferring such approaches to other suitable contexts. Geographically, the discussion centered on two regions with extensive experience implementing environmental water transactions - the Columbia River Basin (U.S.A.) and Murray Darling Basin (Australia).

Transactional approaches are shaped by legal and regulatory settings for water allocation that vary significantly across countries and regions, requiring careful assessment of the exportability of lessons learned in any given context. The workshop panel discussions nevertheless identified several shared lessons and key findings regarding: transactional tools; transaction programs; enabling conditions; water user perspectives; barriers and impacts to successful transactions; reducing environmental and social impacts; and future directions.

Environmental water transactions take diverse forms and have led to flow enhancement through a gradual process of innovation, experimentation and adaptive management. Transaction types include temporary and permanent acquisition, irrigation efficiency savings, and acquisition of partial interests in the time or place of use and diversion. Successful implementation of transactional approaches requires establishing credible environmental flow priorities; navigating complex agency procedures and transfer rules; and engaging willing sellers.

Transactional programs have advanced markedly since initial experiments with water transactions in the early 1990s. Over the past five years, the governments of the Murray Darling Basin have developed and expanded transactional programs to meet water requirements for environmental assets in the Murray Darling Basin. The New South Wales RiverBank program is one such model. Australian transactions programs abide by market rules under a cap-and-trade system and have utilized "expressions of interest" to identify willing sellers and priorities for environmental water acquisition. These programs have stirred strong interest from irrigators and have quickly been over-subscribed. In the Columbia River Basin, a host of transactional efforts are nested within the Columbia Basin Water Transactions Program, including water trusts, basin conservancies, and state agencies involved in environmental water acquisition. These programmatic efforts have illustrated the importance of partnerships between the buyer and seller and between the buyer and regulators. Effective monitoring must both ensure compliance *and* document the ecological benefits of acquired water. Discussions regarding the interplay of the public and private sectors in environmental water transactions suggest a more pronounced emphasis on a primary role for non-profit organizations as implementing organizations in the U.S. than in Australia.

Enabling conditions for transactional approaches are often developed in response to crises, such as drought or endangered species. Environmental water transactions depend on a mixture of suitable laws,

funding, and collaboration among government agencies, non-profits, and water users. Water rights systems enable transactions by establishing a cap on water allocations; authorizing environmental uses as legally protected rights; and monitoring and enforcing water rights.

Water users and associations, such as irrigation districts, are focal players in environmental water transactions who present unique opportunities and challenges for larger scale programs seeking to meet environmental flow needs. By paying close attention to irrigator incentives and infrastructure debt, managing agencies can improve the design and implementation of transactional approaches in a manner that simultaneously bolsters trust and cultural acceptance. As such, environmental water transactions efforts must carefully weigh the role of exit fees imposed on permanent transfers out of irrigation districts.

Barriers to transactional programs stem from several sources, such as the incentives and fears that motivate water users and associations. Legal and regulatory barriers to environmental water transactions arise from requirements to prevent or mitigate any "injury" experienced by downstream water users who hold legal rights to the return flows no longer available when water is transferred to a new place of use and withheld for environmental purposes. In the U.S., the legal right of downstream users to access return flows is an important constraint on the amount and distance downstream that the acquired water right can be protected for instream purpose. The Australian system requires an environmental assessment that may limit the quantity transferable to environmental uses in cases when transactions entail a change in the place of use.

Measuring success in transactional programs involves regular evaluations of ecological, economic, and social costs and benefits. Work remains to fully integrate flow transactions with other efforts to restore habitat and ecological integrity while maximizing the environmental benefit per dollar spent on environmental water acquisitions.

The potential for negative environmental and social impacts from environmental water transactions can be avoided or minimized if these impacts are foreseen and included explicitly as part of transaction planning. Environmental impacts of concern include the complex interactions of groundwater and surface water, such as changes in the spatial distribution of groundwater discharge and recharge. Sensitivity to social impacts requires explicit attention to the sustainability of agriculture and the need to pursue broad-based community engagement. Drought has become an important factor in legitimizing water transactions, as society learns of the social and environmental impacts associated with shortages and business-as-usual approaches.

Future prospects for environmental water transactions suggest the need to link socially-supported environmental flow goals, policy reform, and funding mechanisms. Careful attention to the transferability of transactional approaches can serve to identify enabling conditions, limiting factors, and common pitfalls in the design and implementation of transactional approaches. Veteran practitioners concluded the workshop by calling attention to the most pressing short- and long-term needs, such as adapting to climate change, exchanging knowledge, developing information systems, and refining market and institutional settings to better define property rights and reduce the costs of environmental water transactions.

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1. Introduction

1.1 Background

The use of transactional approaches and water markets for the acquisition of water rights to meet environmental flow needs has long been acknowledged but has taken time to gain traction and legitimacy.[1] Even today the use of such approaches is limited in extent. Still, interest and efforts are proliferating and maturing. Bonneville Power Administration established a regional brokerage administered through a partnership with the National Fish and Wildlife Foundation that funds transactions with 11 partner state agency and non-profit organizations in the Columbia Basin. Numerous water trusts and conservancies are springing up across the Western United States. In Australia, government funds have been set aside to acquire water licenses for environmental purposes and organizations such as Waterfind Environment Fund (in South Australia) are also starting to use the market to receive water donations or buy water using financial donations. In Mexico, in 2005 and 2006 the federal government, ProNatura, and the Sonoran Institute collaborated on the first purchase of water rights for instream flow protection in the Colorado River Delta, showing that this approach has applications outside Organization for Economic Cooperation and Development economies.

1.2 Rationale

Experiences to date have emerged out of state and local policy and legislative frameworks. There has been minimal sharing of experiences across geo-political boundaries, and even less across international boundaries. While transactional approaches will always need to be adapted to local water law and socio-economic conditions, it is likely that general approaches, principles and obstacles can be identified by the body of practitioners, agencies and academics that work, regulate and study this evolving movement.

As already experienced through the regional approach taken in the Columbia Basin, such sharing has a number of benefits. First, this work is often difficult and the knowledge that one is not alone in promoting water reallocation is essential to the morale of those involved. Second, sharing of lessons learned from approaches underway can assist practitioners and agencies in exploring and defining what constitutes best practice. Third, initiating an international dialogue can also assist those countries and states that are examining the potential of a transactional approach to 'leapfrog' ahead (i.e. not repeat failures experienced during previous efforts). Finally, exposure to cross-state and cross-country experiences may ultimately lead to guidance for countries as they develop or refine their water code and as they undertake water policy reform – so as to provide a framework that enables water reallocation for environmental flows.

1.3 Objectives

The workshop had as its principle aim to initiate an international dialogue and promote exchange of experiences in planning and implementing environmental water transactions. The workshop provided an opportunity to share experiences among practitioners, agency officials, and academic researchers involved or interested in environmental water transactions. Chief objectives were to (a) stimulate lateral thought through cross-country comparisons and information exchange and (b) develop networking opportunities to advance future prospects of transactional approaches. This exchange was organized around four general questions.

[1] For conceptual background on water markets and environmental flows, see Colby (1990), Willey (1992), Thompson Jr. (2000), or Young (2000). See Landry (1998), Neuman (2004), or Scarborough and Lund (2007) for samples of historical and empirical surveys of instream flows and water marketing in the American West.

1. What has practical experience with environmental water transactions taught us about the design and implementation of effective transactional approaches?
2. What lessons can the U.S.A., Australia, and other emerging efforts impart about enabling conditions, limiting factors, and common pitfalls in environmental water transactions programs?
3. What are the future prospects for environmental water transactions in different political and socioeconomic settings?
4. Which research topics merit further attention as transactional approaches expand to address environmental water needs in diverse social and environmental contexts?

1.4 Core Themes

The meeting featured topical panel discussions that included remarks from panelists followed by time for questions and discussion with participants. In total, eight panels were structured around four thematic sessions as follows:

1. Environmental Water Transactions
2. Acquiring Water for the Environment
3. Designing Successful Transactions
4. Future Prospects and Needs

The *first* session introduced and defined environmental water transactions through case studies of sample transactions. This session also convened a panel of practitioners from the Pacific Northwest U.S. to survey programmatic efforts that utilize transactional tools to acquire environmental flows. The *second* session elaborated enabling conditions for transactional approaches and considered water user perspectives regarding environmental water acquisition. The *third* session presented a series of evaluation techniques used to measure the success of transactions and transaction programs. This session identified factors that limit transactional effectiveness and also included a panel that explored techniques for avoiding and reducing the social and environmental impacts of environmental water transactions. The *final* session gauged future needs and prospects by soliciting input and recommendations from practitioners and outside experts regarding the design and implementation of environmental water transactions in old and new contexts.

1.5 Participants

Sixty people from six countries participated in the workshop (see Appendix 8.1 for the full geographic distribution). The workshop incorporated 21 panelists and 34 participants distributed across five major audiences, including:

1. Practitioners engaged in water transactions
2. Regulators charged with approving, enforcing and monitoring water transactions
3. Agencies and not-for-profit organizations engaged in planning and funding water transactions
4. Academics researching environmental, social and economic aspects of water transactions
5. Consultants servicing each of the above groups

Many participants also attended the *10th International Riversymposium* and *Environmental Flows Conference* held September 3-6, 2007 in Brisbane, Australia, which provided an opportunity to build on the workshop by networking, pursuing further dialogue, and participating in sessions with in-depth presentations on the topics and programs introduced during the workshop panels.

1.6 Proceedings Overview and Organization

The proceedings report seeks to accurately and succinctly summarize workshop contributions from expert panelists and audience discussions regarding a set of session themes. The report is organized into seven sections. Following this introduction, Section 2 establishes additional context and motivation for the workshop by offering an overview of drivers and trends in environmental water acquisition, and this section also sketches the basic features of the legal and regulatory frameworks for environmental water transactions in the Western U.S. and Southeastern Australia. Sections 3 through 6 are dedicated to the four session themes enumerated above. Each thematic section featured two panels, and each panel is summarized in three parts: panelist remarks, discussion summary, and key findings. Section 7 distills the major findings and research needs identified by panelists and participants during the workshop panels and ensuing discussions.

These proceedings have undergone a multi-stage review by panelists and external reviewers. Panelist commentaries are generally reported in the first-person and represent the first-hand experiences shared by practitioners and regulators during the workshop.

2. Environmental Water Acquisition

2.1 Drivers and Trends

A diverse set of *drivers* has catalyzed policy reforms and implementation innovations to advance environmental water transactions. Drivers include physical and environmental factors, such as drought, climate change, and the loss of habitat and ecosystem services. In a context of growing municipal demands and new technology for improving irrigation efficiency, another set of drivers involves social, political and economic factors, including policy measures that address endangered species and ecosystems, water quality, and water scarcity. Changing societal values have increasingly recognized the cultural, economic, and environmental importance of freshwater ecosystems and the goods and services they generate. These drivers have underscored the need to confront tradeoffs when allocating water across different uses.

The establishment of environmental flow goals has also led to the acknowledgement that many river basins have been over-allocated and that, with hindsight, these allocations have been made disproportionately to relatively low value uses. Therefore, environmental water needs frequently require that water resources be reallocated from low value uses to high value environmental purposes. This requires reducing or redistributing the location and time of water diversions and uses.

These drivers and water scarcity challenges provide context for prevalent *trends* in environmental flow acquisition and water transfers. Two processes allocate water for environmental flows: regulatory allocations and market-oriented reallocation. Regulatory tools implement laws, court decisions, administrative rules, and other political decisions that mandate environmental flow targets. These approaches typically involve reserving flows, reducing water entitlements, altering dam operations, or condemning water rights. The hallmark of these approaches has historically been centralized command-and-control implementation, although more recent efforts have promoted collaboration and increasing local control in recognition of the legitimacy of community-centered approaches. These approaches often start from the recognition of the legitimacy of existing uses. This limits their ability to reallocate water where it is already oversubscribed – unless regulations place a higher priority on environmental uses, which in turn may lead to shortfalls for existing users.

Market-oriented tools seek to reallocate overcommitted water resources to environmental purposes through collaborative, voluntary exchanges among willing buyers and willing sellers involving government and private sector actors. In practice, regulatory and market-oriented approaches are applied in concert, such as a cap-and-trade program, which requires regulation to establish the cap as well as a legal and regulatory framework to facilitate market-oriented trades. The transactional approach is an outgrowth of market-oriented allocation mechanisms, but this approach depends on legal and regulatory systems that vary across countries and sub-national jurisdictions. The intent is to facilitate the reallocation of low value uses to higher uses, in locales and circumstances where this may apply.

2.2 Legal and Regulatory Frameworks

This workshop examined past experiences and future prospects of environmental water transactions. In doing so it has drawn on the views and opinions of practitioners from two regions that have had extensive experiences with the approach: (a) the Western U.S., chiefly within the Columbia River Basin and (b) Southeastern Australia in the Murray Darling Basin. Because transactional approaches have evolved within local, state, and national legal and regulatory settings, this section will provide a basic primer on the legal and regulatory frameworks shaping environmental water transactions within these two regions.

2.2.1 Western U.S.A. and the Columbia Basin (MAP)

Authority to allocate water is vested at the state level in the United States, although federal, tribal, and local governmental and non-governmental entities all wield substantial influence on allocation decisions relating to environmental flows. Owing in part to differing climatic conditions and irrigation water use patterns, the Eastern and Western United States have evolved distinct water institutions. The Western U.S. region is demarcated by the 100th meridian on its eastern boundary, and it is the region where environmental flow needs first surfaced in response to federal legislation for endangered species and water quality, tribal treaty protections for fisheries, and other state and local initiatives. The Western U.S. encompasses 11 full states and parts of six additional states where annual rainfall is insufficient for most dryland agriculture.

Two major legal doctrines frame environmental water acquisition efforts in the Western U.S.: prior appropriation and beneficial use. *Prior appropriation* provides usufructuary, or use-based, water rights according to the familiar adage "first in time, first in right." Although the state retains ownership of the water itself, this priority-based system of water rights copes with water scarcity and variability by protecting the earliest, or most "senior," water users when insufficient flows exist to satisfy all of the appropriations along a stream. For example, in theory, a right established and maintained since 1890 will trump a right dating from 1990 if inadequate flows are present to satisfy both. A key corollary to the prior appropriation doctrine is the doctrine of *beneficial use,* which stipulates that water rights owners must maintain a beneficial use as the basis, measure, and limit of the right. This doctrine requires the establishment and maintenance of a legitimate water use, a set of uses that has historically required diversions to off-stream uses, such as irrigation or mining. The consequence of this priority-based, beneficial use system is that water use rights are satisfied even if the stream is de-watered as a result. Over-allocation of water rights to out-of-stream uses have led to chronic seasonal de-watering of stream reaches throughout the U.S. West, particularly during periods of peak water use for irrigation during the summer.

From the 1960s onwards, a wave of water policy and legal reform recognized instream values as beneficial uses and allowed for new appropriations aimed at conserving or restoring stream flow. Because many Western U.S. river systems had already been fully appropriated, new appropriations for instream flow were "junior" to established uses and therefore provided an unreliable source of environmental water during the dry time of year when such water is often most critical. The current

framework for environmental water transactions therefore hinged on another set of reforms enabling existing water use-rights to be changed, or transferred, to instream uses that would maintain the underlying priority of the original water right. These two sets of reforms have proceeded unevenly across the Western U.S and have authorized varying roles for private sector entities seeking to convert water rights to environmental uses. The Pacific Northwest U.S. states, and especially Oregon (1987) and Washington (1989), were the first to secure enabling legal and regulatory conditions for environmental water transactions, namely the ability to transfer senior water rights instream (without loss of priority). This framework has fostered a diverse suite of transactional tools for securing environmental flows. Transactional tools include permanent and temporary transfers, irrigation efficiency improvements, as well as modifications to components of water rights aimed at improving environmental flows, such as changes to the time of use, place of use, or point of diversion.

2.2.2 Southeastern Australia: Murray-Darling Basin[2] (MAP)

Australia is a federation of six states, plus Territories of the Commonwealth (including two territories on the mainland). Under the Australian Constitution, responsibility for managing water resources remains with the states. Because there are six states and two main territories, eight different approaches to managing water resources have developed. Due to various national policy reforms starting in the early 1990s, there is increasing alignment between states in water planning, allocation and reallocation. In each state, the government owns rights to all water and grants licenses to access water.

In each state, there are statutory management plans informed by consultation with communities that determine: (a) consumptive water use requirements and (b) environmental requirements. The plans attempt to balance water allocation to these needs. Since most systems are overallocated, there is typically a desire to redistribute water from consumptive to environmental use. There are three common mechanisms for acquiring water for the environment: (1) buy back entitlements; (2) invest in irrigation efficiency (3) use a regulatory approach.

The framework for environmental water transactions in Australia has involved national and regional policy initiatives centered in the Murray-Darling Basin. A turning point in Australia's water policy occurred in 1994, when the Council of Australian Governments (COAG) agreed to a water reform framework. A key feature of the 1994 reforms included the proposed introduction of a cap on diverting water from the Murray Darling Basin, the area with the largest agricultural water use in Australia. The cap on diversions and the provision of water for the environment have been accompanied by the separation of water access entitlements from land titles and the establishment of a market for water trade.

A water access entitlement (often referred to as a water license) refers to an ongoing entitlement to exclusively access a share of available water. A water allocation refers to the specific volume of water that is allocated to an entitlement in a given season. Like a share in a public company, the return on a water entitlement has an average yield and is associated with a level of reliability (determined by the average allocation of the entitlement). For example, a 100 ML entitlement may have an average yield of 90% (i.e. 90 ML).

Within an irrigation district there will be a few classes of water entitlements (with classes defined by a mixture of priority and purpose). The average yield for water entitlements will vary between irrigation districts, and between classes of entitlements within an irrigation district. For example, in New South

[2] The editors would like to thank Megan Dyson and Sharon Page (ABARE) for their assistance in preparing this brief overview. The Murray Darling Basin is located in Southeastern Australia and extends across the jurisdictional boundaries of New South Wales, Victoria, South Australia, Queensland and the Australian Capital Territory.

Wales, a "high security" entitlement within an irrigation district may have an average yield of 90%, compared to 60% for a 'general security' entitlement.

For a particular class of water entitlements within an irrigation district the entitlements are all the same, that is, they are homogenous. This homogeneity means that a particular class of entitlements within an irrigation district will have a similar market price. As the reliability of a class of entitlements varies across irrigation districts the water prices across irrigation districts also vary. Water trade includes the sale and purchase of water access entitlements (referred to as permanent trade) or annual water allocations (temporary trade).

2.2.3 Comparison of Instream versus Off Stream Environmental Water Uses

To understand the implementation of environmental water transactions and flow restoration projects in the Western U.S. and Southeastern Australia, an important distinction is warranted regarding the location of the environmental uses. Environmental water use can include *instream* uses for aquatic habitat and water quality and *off stream* uses for floodplains and wetlands. While Australia and the U.S. have both instream and off stream environmental uses, Australia's programs for environmental water transactions often have a strong focus on off stream environmental benefits (e.g., inundating floodplain areas to initiate and maintain water bird nesting), while Western U.S. transactions have emphasized instream flow for migratory and resident fisheries.

Table 1. Water Rights Systems and Environmental Water Transactions, Differences between the Western U.S. and Southeastern Australia

Characteristic	Western U.S.	Southeastern Australia
Geographic Focus	Columbia River Basin	Murray Darling Basin
Priority System	Continuous by priority date	Grouped by security level
Appurtenance	Water rights are tied to land title but may be severed and transferred	Water rights have been unbundled from land title
Types of Use	Fish recovery; tribal fisheries; water quality	National environmental assets; wetlands; rivers
Primary Place of Use	Instream (e.g. fish habitat)	Offstream (e.g., wetlands)
Organizational Form of Buyer	State agency; prominent NGO role (water trusts, conservancies)	State agency
Statutory Influences (Federal)	Endangered Species Act; Clean Water Act	National Water Initiative
Third Party Impacts	No injury; exit fees	Environmental assessment; exit fees

3. Transactions – A New Option for Flow Restoration?

A diverse set of environmental water transactions are possible, and the first panel provided examples of several major types of transactions in the Western U.S. The second panel traced the evolution of different environmental flow programs in the U.S. and Australia.

3.1 Examples of Environmental Water Transactions in the U.S. West

The purpose of this panel was to identify defining features of environmental water transactions. Panelists presented case studies of different transaction types to demonstrate the diversity of transactional tools and innovations. The presentation of each panelist and the ensuing discussion are summarized below. Volume and rate figures were provided by participants in a number of forms and have been converted to both the metric form used in Australia and to US figures. U.S. flow measures are converted to gigaliters using a 214 day irrigation season. Dollar figures are left in the home currency, with Australian dollar figures denoted as "AUS$". A table of unit conversions is provided in Appendix C.

3.1.1 Short-term One-party Transaction: Instream Lease with Rural Landowner
Brianna Randall, Montana Water Trust, U.S.A.

This type of transaction works by entering into a one-party contract with one water user (typically an irrigator) to forbear water use temporarily. This transaction occurred in Montana, the fourth largest state in the country, and a state that is relatively new to water transactions. Although a simple transaction on paper, this transaction required negotiations between the Montana Water Trust and a fifth-generation rancher accustomed to using water from a given creek. It is often quite difficult to convince rural landowners to change the way they use water or to leave water instream. The transaction process involved several steps. Given Montana's large size, the first step was prioritizing acquisition efforts by working with state and federal biologists. When working with one farmer, it is most effective to target small de-watered tributaries because adding a little water can lead to major improvements for fish and aquatic habitat. This sample transaction occurred in a priority area that was chronically de-watered (cannot support fish 8 out of 10 years). The next step was to approach the senior water right holder who had a storage right to a small reservoir (full capacity of 10 GL) at the headwaters of the creek, and the right to divert the majority of water in the creek. After a year of (bad) coffee, pie, jokes, and negotiation, the landowner was convinced to forgo a portion of his right, approximately 0.1 m^3. We paid \$0.01/m^3 based on the income from the hay crop he lost by forgoing irrigation. The next step required monitoring with partners from local tribal entities. This monitoring informed negotiations for a long-term deal, and we learned that we needed only one-tenth of the original water quantity to meet our flow restoration objective for minimum biologic flow needs. The results are encouraging, as this tributary is flowing during dry months and reconnecting habitat for fish. Word of mouth has led to trust in the community and to an additional four transactions with nearby neighbors. The transaction has also helped to establish the yardstick for price in the region.

Transaction Summary			
Tool:	Short-term lease (one-party contract with rural landowner)		
Location:	Montana, U.S.A., Dayton Creek Watershed		
Buyer:	Montana Water Trust	Seller:	Rancher
Quantity:	0.1 m^3/s (3.5 cfs or 1.8 GL)	Price:	\$16,200/GL (\$20/AF)
Term:	1 year, then renewed for six years to acquire one-tenth of initial quantity		

3.1.2 Short-term Multi-party Transactions: Leasing Program with Irrigation District

Genevieve Hubert, Deschutes River Conservancy, U.S.A.

In the Deschutes River Basin (17,000 sq km), the Deschutes River Conservancy has been using the transactional tool of instream leasing since 1998. In doing so we work with the 9 irrigation districts in the basin. Here, I will use the example of the Central Oregon Irrigation District – one of the largest in our Basin. We started temporarily leasing water rights to improve stream flow by working with 12 patrons within the District, and we have increased that to 110 landowners in the District and 236 landowners basin-wide. We have an agreement with the District, and they promote this transaction program with their patrons. The District educates water users about their water rights and their beneficial use – that they must use their water once every 5 years or risk losing their water right. Many farmers do not have multi-generational farms and have less knowledge about their resources than farmers from longstanding operations. The district works with those water rights holders to lease their rights to instream use through the state's administrative process. We offer a modest payment of $5,670/GL to the landowners via the District, though some choose to donate their water. Through this effort and similar ones in other area districts we have improved stream flows threefold in the main stem of the Deschutes River. The leasing program works with other districts in the basin in a similar manner in addition to working directly with landowners. We use the program to build trust with the landowners to work toward permanent deals. Our leases are from one to five years long with potential for renewal.

Transaction Summary	
Tool:	Temporary lease (multi-party agreement with irrigation district)
Location:	Deschutes River Basin, Central Oregon Irrigation District, Oregon U.S.A.
Buyer:	Deschutes River Conservancy Seller: District Members
Quantity:	1.1 m^3/s in COID (40 cfs or 21 GL), 2.5 m^3/s total (90 cfs or 47 GL)
Price:	offer price in COID $5,670/GL ($7/AF), program average of $3,440/GL ($4.25/AF)
Term:	1 – 5 years

3.1.3 Short-term Water Conservation Transaction: Irrigation Efficiency with Rural Landowner

Laura Ziemer, Trout Unlimited, U.S.A.

The goal of this Trout Unlimited restoration project was to reconnect quality native fish habitat. Across the rural West, tributaries are often dewatered in their lower reaches before reaching their mainstem rivers as irrigation diversions take their toll. In the case of Poorman Creek in the upper Blackfoot River Basin in Montana, the creek went dry. This transaction sought to provide connectivity from the mainstem to upper reaches, which offered high-quality spawning and rearing habitat. The barrier was a mile of river that was completely de-watered within habitat for an imperiled native fish, the Bull Trout (*Salvelinus confluentus*), listed under the federal Endangered Species Act. We worked with the lowermost irrigator to improve this habitat and remove the barrier by restoring flow. We attempted to maintain the landowner's agricultural operation, which historically relied on flood irrigation. The conversation with the irrigator started by proposing to change the way water is diverted and applied to the field. We also offered to pay for changing the infrastructure to a more efficient system by piping and changing from flood irrigation to a sprinkler. It was a tough decision for the farmer because he followed several generations of family members who practiced flood irrigation.

Trout Unlimited conducted a hydrologic analysis to ask where the water went and when it arrived. This analysis convinced us we would be adding water to this de-watered reach by making this investment. We conducted the analysis to ensure that the leaky ditch's and flood irrigation's return flows were not already returning to the lower reach of the dewatered creek. The study confirmed our belief that the return flows came back to the mainstem Blackfoot River, and not the lower portion of Poorman Creek. Because the

water on the small tributary was of a relatively small magnitude compared with the rest of the main stem, the changed timing would not have adverse impacts on other users. Here is my one cautionary tale: some irrigation "efficiency" projects exacerbate dewatering, rather than adding flows. Trout Unlimited has also had to file formal "objections" to ranchers switching from flood to sprinkler irrigation, because that change in their operations consumed more water. Not every irrigation "efficiency" project will actually return water to a stream, and a site-specific analysis of return flows and consumptive use must be made in each, individual case.

This transaction resulted in 0.43 m^3/s restored. The water supports the Bull Trout, as we used radio collar analysis to monitor bull trout migration. The deal was cost-effective at $2,550/GL, which is one-seventh of the cost of replacing the lost agricultural production.

Transaction Summary		
Tool:	Temporary lease of conserved water	
Location:	Poor Man Creek (Blackfoot River), Montana, U.S.A.	
Buyer:	Trout Unlimited	Seller: Irrigator
Quantity:	0.43 m^3/s (15 cfs or 7.8 GL)	Price: $2,550/GL ($3/AF)
Term:	15+ years (life of irrigation infrastructure)	

3.1.4 Permanent Transaction: Transfer Program with Irrigation Districts

Zachary Tillman, Deschutes River Conservancy, U.S.A.

The Deschutes River Conservancy (DRC), in partnership with local irrigation districts, has developed a program that responds to changing land use patterns in the Deschutes River Basin. We have tried to take advantage of land use changes to work with irrigation districts and provide incentives to work with us to meet instream flow needs. District incentives are often tied to the expansion of urban areas. If urban demands are not met, people will buy farms to buy the water rights, causing a spike in prices that would make crop production more difficult, especially because crop values (e.g., alfalfa) are relatively low. Instream flows are restored using permanent purchase/conveyance agreements conducted as part of the DWA Bank (Deschutes Water Alliance Bank). The Bank is a cooperative agreement between the DRC, irrigation districts and municipal water suppliers. In the project area, establishment of new groundwater rights is accomplished through a state-mandated cap-and-trade system for surface and groundwater such that only through the retirement of a corresponding surface water right can a new groundwater right be established. Meeting municipal demand has meant facilitating a switch from surface water to groundwater with the additional benefit of improving instream flow. The DRC entered a cooperative agreement with two Districts to evaluate and set annual supply targets for municipalities and for environmental flows to restore flow for endangered species. The agreement addresses water needs for the City of Bend, City of Redmond, Avion Water Company and instream flow, and it has also stabilized prices. Over the past two years, transactions conducted under the program have provided 8 cubic feet per second by retiring 400 acres of irrigation rights.

Transaction Summary	
Tool:	Permanent purchase and instream transfer
Location:	Deschutes River Basin, Oregon, U.S.A.
Buyer:	Deschutes Rivers Conservancy Seller: Irrigators
Quantity:	0.22 m^3/s (8 cfs or 4.2 GL)
Price:	$2,000-$3,000 per acre, $400,000/GL ($500/AF)
Term:	Permanent

3.1.5 Discussion

Monitoring

Is it necessary to monitor rights – either because of state requirements or to ensure the water that is leased is not diverted downstream? In Oregon state employees known as watermasters monitor and enforce water rights, but watermaster districts cover too much territory to maintain comprehensive monitoring and enforcement. Some water transfers are located in areas that are either controlled by one right holder and/or have clear ecological benefits. These transfers do not require as much monitoring to ensure compliance and protection of the transferred right along the full stream reach designated as the beneficiary of the water. In other cases, the Oregon Water Trust will actively monitor when it is necessary to ensure compliance or document biological outcomes (Kim Schonek).

Regulatory mechanisms

Are there regulatory means to restore de-watered rivers, or do you need to rely on irrigators to give up water? In the Western U.S., water is generally already allocated to individual owners of private property, so regulatory approach may require condemning rights through eminent domain and paying for them, but that is very unpopular politically. Regulatory approaches enter into a world of contentious politics that creates a different dynamic and set of challenges, as demonstrated by the conflict over water in the Upper Klamath River Basin (Andrew Purkey, Laura Ziemer).

Flow targets and the public domain

Is there a quantity of water you are targeting to transact back to the river, and is that quantity in the public domain? The Deschutes River has flow targets as proposed by the Oregon Department of Fish and Wildlife and approved as instream water rights by the Oregon Water Resources Department, but there is also new science that informs these targets. Such instream flow targets are usually determined based on the water needed to cover the stream bank and provide riffles, or habitat for fish feeding. Finally, landowners demand to know that environmental flow targets have been established based on approved scientific methods; these targets are a key component of developing trust with landowners and communities (Bruce Aylward, Zachary Tillman, Brianna Randall, Laura Ziemer).

3.1.6 Key Findings

Based on the panel presentations and discussions a number of key findings regarding environmental water transactions tools emerged:

- Credible, science-based environmental flow targets are important for prioritizing efforts, communicating with landowners and irrigators, and cultivating both trust and political support.
- Even simple transactions take time, trust, and knowledge of agency transfer rules.
- Water acquisition through irrigation efficiency requires close attention to the impacts on hydrological return flows and downstream water users.
- Irrigation districts, urban centers, and government agencies are key partners for larger scale programs to reach environmental flow targets.
- Environmental water transaction opportunities often arise from changing land uses, such as urban growth and fluctuations in global agricultural markets.

3.2 The Scope of Existing Transactional Programs

The purpose of this panel was to learn how different programmatic efforts have developed in the Western U.S. and Southeastern Australia. Panelists outlined environmental water transaction programs along several dimensions, including the transactional tools used, justification for transactional approaches,

funding considerations, and mechanisms for protecting acquired water rights for instream and offstream environmental purposes.

3.2.1 The New South Wales RiverBank

Justen Simpson, New South Wales Department of Environment and Climate Change, Australia

RiverBank is a state-based program in New South Wales, and it follows from over 10 years of water reforms and policy planning. Socioeconomic considerations limit the water that can be recovered, through these processes, from consumptive users, so we have to become active in the marketplace to buy water for the environment. The program began in 2006 for a five-year term. The project received AUS$ 105 million of funding through a state levy on major industry. In addition, the federal government will contribute approximately AUS$ 46 million to water purchase by NSW RiverBank.

An important mechanism for getting water is through an "expression of interest" process conducted every year to determine who wants to sell water. We rank the expressions of interest against one another using a number of criteria. If an offer is attractive, we will buy the water. We are now in the 18th month of operation and have finished our second expression of interest process. We have been over-subscribed, and there is not enough budget to buy all of the water offered. By December 2007, we will have 27 GL of water, and by the end of the program we hope to recover in excess of 100 GL.

We target water entitlements that provide "paper" ownership of water. Currently, there are only permanent trades, but we are investigating other options such as leases and temporary trading arrangements. There are three major water entitlement products available: (1) high security entitlements (water satisfied every year); (2) general security entitlements (lower reliability allocations made after high security entitlements are satisfied); and (3) supplementary access for large flows that cannot be captured by storage.

New South Wales RiverBank	
Managing Agency:	New South Wales Department of Environment and Climate Change
Goals:	Buy water for the environment from willing sellers through an equitable and open process, which addresses the over-allocation and overuse of water
Started:	2005, operational 2006
Funding:	AUS$ 105 million over five-year term
Transaction Types:	Permanent transfers, exploring temporary leasing
Selected Functions:	Administer "expressions of interest" to identify willing sellers; Rank expressions of interest to address environmental water acquisition goals
Water Acquired:	27 GLs anticipated by December 2007 (21,900 AF)

3.2.2 Waterfind Environment Fund

Mark Siebentritt, Waterfind Environment Fund, Australia

Waterfind Environment Fund is a not-for-profit organization located in Adelaide, South Australia, which started in 2004 based on the idea of a water broker and an environmental scientist. The program provides a way for businesses and communities to get involved with environmental projects on Australian rivers. We run Australia's first online water delivery and management system and focus our activities in the Murray Darling Basin. The system contains approximately 10,000 lines of code and links to a computer-based water trading engine governed by about 8,000 rules.

We seek water donations and financial donations. We have two options for water donations. *First*, we can accept allocations (i.e., temporary water or leases) to provide water for our projects. There are currently eight projects with an expected increase to 15 in the near future. Our current projects require approximately one GL of water in total, and there will be roughly three or four GL required when we reach 15 projects. *Second,* we encourage irrigators to permanently donate their water (i.e., the entitlement) to our organization. To optimize the use of donated water, we are developing time-share flooding arrangements to spread water entitlements across wetlands that require flooding in alternate years.

So why would people want to donate water? Prices have been rising, which provides less of an incentive to donate, but many irrigators are part of multi-generational farms and want to see a healthy environment. People may make financial donations if they cannot donate a water license (i.e., entitlement). With these funds, we will most likely target temporary or permanent water purchases. We act as a facilitator for water and financial donations and can source water for multiple programs – whether for environmental managers at the government level or for non profits. *Finally*, we are trying to get tax concessions established for water donations to encourage license holders and irrigators to provide water for an organization such as ours.

Waterfind Environment Fund	
Managing Agency:	Waterfind Environment Fund (non-governmental)
Location:	Murray Darling Basin
Started:	2004
Goals:	Provide a way for businesses and communities to get involved with environmental water projects on Australian Rivers
Funding:	Financial and water donations
Water Acquired:	Seeking 1 GL (810 AF), expected to reach 4 GL (3,240 AF) by end of 2007
Transaction types:	Permanent and temporary transfers
Functions:	Seek water and financial donations to conduct environmental projects on Australian rivers.
Selected Outcomes:	Australia's first online environmental water delivery and management system; eight environmental projects; development of time-share flooding program

3.2.3 The Living Murray

Lindsay White, Murray Darling Basin Commission, Australia

The Living Murray Program is investing AUS$ 700 million for environmental water acquisition through infrastructure improvements (efficiency gains) and entitlements. This program will return about 6% of diversions from irrigation for environmental use. Additionally, the Living Murray includes construction of environmental works (such as fishways) to increase the environmental benefit from available environmental water allocations.

The Murray Darling Basin Commission has been implementing a program called the Pilot Environmental Water Purchase Project (PEWPP) as part of the Living Murray. The design of the pilot was based on learning from other programs, such as the New South Wales RiverBank program. We needed to communicate with irrigation districts in advance of the pilot to increase the likelihood of acceptance. This pilot operates under existing market rules. We have had a non-binding expression of interest processes that can be entered directly by entitlement holders or by agents. We compare these expressions of interest to an independently assessed market price for that entitlement. We have a rapid turn around and notify those who submit expressions of interest within a week. As with the RiverBank program, we anticipate being over-subscribed and reaching our 20 GL target within 11 weeks of the pilot.

Living Murray & Pilot Environmental Water Purchase Project (PEWPP)	
Managing Agency:	Murray Darling Basin Commission
Location:	Murray Darling Basin, South East Australia
Goals:	Buy water for the environment from willing sellers to meet Living Murray's water recovery objective.
Started:	|Living Murray program began in 2004, PEWPP in 2007
Funding:	$AUS 700m on Living Murray, up to AUS$ 36m on PEWPP
Transaction Types:	Permanent transfers
Functions:	Administer "expressions of interest" to identify and rank willing sellers (relevant to the market price)
Water Acquired:	Up to 20 GL (10,620 AF) under PEWPP

3.2.4 Whychus Creek Restoration Program

Scott McCaulou, Deschutes River Conservancy, U.S.A.

The Deschutes River Conservancy operates in a large watershed in Oregon and one of the largest sub-basins of the Columbia Basin. This program addresses Whychus Creek- a small tributary in the Columbia Basin that represents approximately 5% of the sub-basin. Geographically it is small, but it is disproportionately important ecologically – representing up to half of historical steelhead (*Oncorhynchus mykiss*) spawning habitat in the upper portion of the basin. Steelhead are endangered and are a major driver of public policy and funding for these transactions. Whychus creek is interesting because of the diversity of transaction types used to get a relatively small amount of water. The portfolio of water rights in the Whychus is 0.56 m^3/s, which is a flow target based on the state of Oregon's water quality and habitat suitability targets. This scientific determination of flow targets is being updated through analysis of monitoring data obtained so far. We have used five different transaction types, listed in order of significance (from prevalent to rare): (1) leasing; (2) large-scale conservation savings by piping canals; (3) permanent acquisition; (4) surface-to-groundwater switches; and (5) changing points of diversion downstream. The cost is approximately $5 million to date for permanent measures. Annual leasing costs vary but average $25,000 per year. Resources come from four sources: (a) federal grants, (b) hydropower mitigation funds, (c) state funds, and (d) private fundraising. Federal funds have come through Bureau of Reclamation appropriations to the DRC. The majority of state funding for projects comes through the Oregon Watershed Enhancement Board, which grants funding tied to lottery revenues. The Columbia Basin Water Transactions Program and the relicensing of the Pelton-Round Butte hydropower project provide major sources of hydropower mitigation funding. Finally, wealthy individuals moving to central Oregon are taking advantage of amenities and care about the work DRC is doing to restore the rivers.

Whychus Creek Restoration Program	
Managing Agency:	Deschutes River Conservancy
Location:	Whychus Creek in Deschutes River Basin
Goals:	Acquire water to meet flow requirements.
Started:	1998
Funding:	$5 million (permanent acquisitions); $25,000 (average cost of annual leases)
Acquired / Sought:	0.56 m^3/s (20 cfs or 10.5 GL)
Transaction types:	Leasing; irrigation efficiency savings; permanent purchase; surface-to-groundwater switch; point-of-diversion change
Functions:	Identify willing sellers; negotiate, monitor, and enforce transactions

3.2.5 Columbia Basin Water Transactions Program

Andrew Purkey, National Fish and Wildlife Foundation & Columbia Basin Water Transactions Program, U.S.A.

The Columbia Basin Water Transactions Program is a partnership of the National Fish and Wildlife Foundation, the Bonneville Power Administration (BPA), and the Northwest Power and Conservation Council, which provides input to the BPA to direct funding of fish and wildlife projects. BPA is part of the federal government and was established in the 1930s to distribute and market the electricity generated by hydropower facilities within the Columbia River system – a relatively large drainage that comprises much of the Pacific Northwest region of the U.S. and parts of Southwest Canada. BPA spends upwards of $145 million per year on fish and wildlife projects to mitigate for the fact that dams have impacted fish and wildlife. $4 million is budgeted for the CBWTP in fiscal year 2008. $2.2 million of that $4 million is budgeted for water acquisitions, and $1.8 million is budgeted for programmatic support of organizations doing this type of work. Those organizations receive the funds to put together these water transactions.

The program grew out of efforts by the Oregon Water Trust and then the Deschutes River Conservancy and Trout Unlimited as well as other entities. The program currently involves a set of 11 entities, including seven non-governmental organizations and four state agencies. It is essential to go through state agencies to ensure transactions conform to state law and policy. An important value of the program is to develop partnerships between state agency and non-governmental organizations to work in collaboration. There is a lot a discussion about collaboration between the buyer and seller, but collaboration between the buyer and regulator is equally important.

There are three major objectives of the program: (1) acquire water that is ecologically significant; (2) build the capacity of organizations and others to do this work and provide technical, emotional, and moral support to these organizations; and (3) increase awareness about this approach and the set of tools among Pacific Northwestern communities, water users, and others. These organizations get together twice a year to learn from each other and exchange ideas and explore options to replicate successes and learn from failures.

From the program's inception in 2003 through 2006, we have funded 153 water transactions. One hundred and twenty of these were short in duration (5 years or less); 16 of those were long term (10-30 years); and 17 are permanent. We are beginning to increase the number of permanent transactions. In year 4 (2006) of the program, there were 124 GL (100,000 AF) instream as a result of the transactions funded. Looking out to 2050 to consider the water that will be instream due to long term and permanent deals, there will be about 62 GLs (50,000 AF) instream in 2050 – not that much water in the big picture, but in the context of the streams these organizations are working on, it is significant and can make a difference in the small tributaries critical for fish habitat.

Columbia Basin Water Transactions Program	
Managing Agency:	National Fish and Wildlife Foundation
Location:	Columbia River Basin, U.S.A.
Goals:	1) acquire ecologically significant water; 2) build organizational capacity; and 3) increase awareness
Started:	2002
Funding:	$4 million for transactions and organizational capacity Nested within $145+ million fish and wildlife program
Acquired:	100,000 acre feet (124 GL) in 2004, including temporary transactions
Transaction Types:	Primarily temporary leasing and permanent purchases

3.2.6 Discussion

Role of cap
To clarify the concept, did the establishment of a cap and water marketing begin before the government became active buying water for the environment? Severing water rights from land was a crucial factor. The government has always held licenses but changes in government policy mean that additional water will be added to those licenses for environmental projects (Mark Siebentritt, Justen Simpson).

Multiple buyers
What is the thinking behind multiple organizations entering the water market to acquire environmental water entitlements in the Murray Darling Basin? While multiple government entities are actively buying water in the Murray Darling Basin, governmental agencies avoid competing with one another by operating in different states and regions (Justen Simpson, Lindsay White).

Drought and transactions
How has the sixth year of drought affected acquisitions? Water users are facing decisions whether to let trees [various species of horticultural plantings] die, and it poses challenges for non-profits becoming active in water markets. The drought assists acquisitions in the sense that some water rights become less reliable and thereby make some license holders more willing to sell (Mark Siebentritt).

Environmental uses
While you've mentioned the amount of water acquired, how is that water applied to benefit the environment in Australia? There are number of ways to use the water, but primarily we are prioritizing environmental assets in state programs. The intent is to leave the water in storage and then release the water to target those environmental assets, primarily wetlands but also for fish passage. Just as an irrigator has to put the water entitlement to use on a crop, we also need to identify the environmental assets that will be targeted. There is a whole planning process that needs to be done for us to actually use our environmental water, and we are only in the very early phases of that now (Justen Simpson).

Beneficial use
How has the use-it-or-lose-it requirement of the beneficial use doctrine been overcome to avoid forfeiting water rights left instream? Is a similar doctrine relevant in Australia? The states engaged in transactions in the Pacific Northwest have authorized instream uses as a valid beneficial use, although other states in the Western U.S. have not made this reform yet. In Australia, the use-it-or-lose-it doctrine does not apply, instead there are sleeper rights, which are licenses or parts of licenses that remain largely unused until drought conditions and increasing values of water cause rights holders to activate them (Megan Dyson, Andrew Purkey, Mark Siebentritt).

3.2.7 Key Findings

The panel presentations and discussions suggest the following key findings and lessons learned from each country as follows:

Australia
- Ten years of water reforms and policy planning efforts have created the current framework for environmental water transactions
- Separating water entitlements from land has been crucial
- "Expressions of interest" - a form of reverse auction - are the prevalent way to identify willing sellers and rank water acquisitions to maximize environmental water investments
- Australian experiences have elicited strong interest and rapid response from license holders leading to over-subscribed environmental water acquisition programs

United States

- Partnerships have proven critical between the buyer and the seller *and* between the buyer and the regulatory agencies
- The temporary nature of certain transactions underscores the need to build toward longer term or permanent agreements and to closely monitor effectiveness through principles of adaptive management under changing climatic and ecological conditions
- A diverse set of transactional types *and* a diverse array of funding sources have been used to meet flow targets

Comparison of the experiences in the two countries lead to some initial conclusions by participants in terms of similarities and differences between the contexts:

- Cultural resistance to instream water rights transfers has perhaps been more pronounced in the Western U.S. but is also evident in Australia
- Risk management has become an important factor in environmental water transactions, e.g. irrigation efficiency projects in which *either* the buyer *or* seller bears the risk of ensuring water savings targets are realized and re-directed to the river
- The issue of scale is important because small amounts of water can make a big difference if added to tributary systems at the right place and time
- The non-governmental role seems more pronounced in the U.S. context, while the Australian and state governments' role is relatively larger than in the Western U.S.

4. Acquiring Water for the Environment

This session draws from the collective experiences of regulators and practitioners engaged in environmental water acquisition, seeking to identify enabling conditions for transactional approaches. After a panel discussion on enabling conditions, this session convenes a second panel that considers the fears, incentives, and general perspectives of the water users and water users associations who sell or lease their water rights for environmental purposes.

4.1 Enabling Conditions

The purpose of this panel is to use the experiences from two countries – the U.S.A. and Australia - to identify enabling conditions for using transactions to acquire water for environmental flows. This panel describes the framework of driving forces, legal and regulatory systems, and political economic factors that facilitate environmental water transactions.

Hedia Adelsman, Washington Department of Ecology, U.S.A.

The Department of Ecology allocates water and is required to protect environmental flows. It always helps to have a crisis, because government tends not to act in a very strategic way if there is not a crisis. We have had several crises in the Pacific Northwest: (a) drought; (b) listings of species as threatened and endangered, such as salmon – the icon of the Northwest; (c) threat of lawsuits by tribes against the state to assert tribal water rights and protect tribal fisheries.

All of these crises caught enough public attention and led to political actions that enable water acquisition for environmental flows through the Washington Water Acquisition Program. First, we have passed laws that are very favorable to environmental flows, some as early as 1949, and in the 1990s, some very strong

laws were passed to allow us to acquire and protect environmental flows. Second, we are fortunate to have adequate funding to acquire flows. Third, we have cooperation among agencies, as both our Department of Fish and Wildlife and Department of Ecology, Water Resources Program work together. We make sure the agencies responsible for fish recovery and water management work together to develop a strategic approach for restoring flows.

Megan Dyson, Megan Dyson Environmental Law and Policy, Australia

Regarding the legal and regulatory framework for a market-based approach to acquiring water for the environment, first, you need to impose a limit ("cap"), on the quantity of water that may be extracted through water rights. Where surface and groundwater resources are connected, they should be treated as one. Second, you need a secure titling system so that ownership of water rights is clear and accounted for. Preferably, the titling system would "unbundle" the water rights. Unbundling is the separate expression of components of water rights, and potentially enables components to be traded separately. For an effective market to develop, you must first separate land ownership from ownership of the water licence. Other components of the right that may be unbundled include delivery (or location and manner of taking), timing of delivery or taking, quantity, access to capacity of infrastructure, and water quality of return flows. The more unbundled the rights, the more options for the environment to target parts of the rights that affect the timing of flows for the environment. Third, you need good monitoring and an enforceable (and enforced) system. It is necessary to be able to account for the quantity of water allocated (including for the environment) and quantity taken.

Laura Ziemer, Trout Unlimited, U.S.A.

First, the initial condition is the legal capacity to protect water instream through water rights transfers. Out of our 17 state jurisdictions in the Western United States, seven states do not allow legal transfers of water designated for an instream beneficial use that serves environmental purposes. Trout Unlimited is active in three of those jurisdictions – Idaho, Wyoming, and Utah – to achieve the basic initial condition that would permit legal protection of water instream. In Montana, it took us 15 years, and now we have a strong statutory and regulatory system. Second, the veracity, or the legal accountability, of water rights is uneven across the Western US. In many areas we have adjudications in which the courts will assess how valid rights are, what the history of use is, and how perfected, or valid, the rights are. An efficient transactional framework is difficult to establish without a quantification process to identify what water rights are worth on the ground. There is a large difference between "paper water" and "wet water." Third, water rights must be enforceable, and this condition also varies widely across the Western U.S. It is often up to non-profit organizations to create our own enforcement when government entities are absent, and this adds to the cost of the transaction.

Chris Schweizer, Department of the Environment, Water, Heritage and the Arts, Australia

First, there is a need for good policy settings at the federal level, and there is nothing like a crisis to create opportunities for policy reform agendas. With the National Water Initiative, it has been an issue of clear and secure titles, which separate land licenses from water entitlements. The separation is patchy across the country, but it is starting to happen. Second, there is the ability to trade. We are assessing barriers to trade, and some are hard to spot until you get into the market. Third, there are the registers of entitlements. It is very hard to trade if one of you does not know who owns the water or how it moves. If every irrigation districts has a different system, it becomes a significant impediment to quickly move water to your assets. Fourth, market maturity is important, and it is necessary to carefully examine the potential for market distortion due to a federal presence in the market given the scale of investments. Finally, climate change has been a great catalyst for us to look at reduced allocations and reduced reliability, and this has emphasized the need for clear risk assignment and risk management.

4.1.1 Discussion

Role of non-profits

In terms of the legislative framework in the Western U.S., how have non-profits shaped the models that have developed? Non-governmental organizations (NGOs) have the opportunity to serve as catalysts through concerted efforts that create some of the statutes and regulations facilitating transactions. If left to state government, we might be decades away from doing this. On the other hand, in Washington, the NGO sector has not been as much of a motivator. Responding to crises has often motivated legislation (Hedia Adelsman, Laura Ziemer).

Unbundling water rights

In the American West and Oregon, water rights are tied to the land. Could you expand on the process of unbundling water rights? Title to water was linked to land in Australia until the early to mid 1990s in most states. Domestic and stock watering rights are still tied to land. National economic reforms during the early 1990s involved water reforms, and part of these reforms caused land and water rights to be separated. Problems persist in some jurisdictions, and particularly within irrigation districts, where the separation of land and water rights is incomplete. National level action is attempting to remove barriers to trade while avoiding the problem of water barons or water monopolies (Megan Dyson, Chris Schweizer).

Implementing Environmental Water Uses in Australia

Could you explain how Australia implements the environmental water uses of acquired water? We have three ways of establishing an environmental use: (1) planned environmental water (each state must have statutory plans in place that establish environmental water requirements for the water resource); (2) acquire a license from consumptive use and hold it for environmental use; (3) alter the terms of the irrigator license to allow for some environmental benefits, such as changes to the manner and timing of extraction (Megan Dyson).

Value of Environmental Flows

Does environmental flow generate profit and/or economic value, or is it a non-profit activity? Restoring flows falls under both scenarios by generating ecological services that have both intrinsic values *and* generate services valued economically. In Washington, fisheries, recreation, and water quality protection all provide major economic values for which people are willing to pay, sometimes more than the value of existing irrigation values (Hedia Adelsman, Laura Ziemer).

Coordination of non-profit and governmental roles

Any comments on the organizational forms involved in environmental water acquisitions, including the relative roles of non-profit and government efforts? In Washington, we have carefully considered the role of agencies and non-profits, since we have authority to buy water, transfer water, protect water, and monitor. We identified five key activities in water acquisition and determined whether the agency or non-profit partners are suited: (1) prioritizing where and when to buy water (Government); (2) finding willing sellers (Non-profit partners); (3) water rights verification (Government); (4) negotiating contracts and deciding how much to pay (Non-profit partners); (5) monitoring (Government) (Hedia Adelsman).

4.1.2 Key Findings

The panel presentations and discussions suggest the following key findings and enabling conditions for environmental water transactions:

- Crises (e.g. drought and endangered species) catalyze government programs and actions.

- A combination of strong laws, sufficient funding, and collaboration among government agencies and non-profits is necessary.
- Environmental, or instream, water uses must be legally recognized as beneficial uses.
- A cap on water allocations is a precondition for market transactions.
- Acquiring water rights from irrigators may be simpler where water rights are separated from land ownership, a process known as unbundling rights. Secure land and water titles are required. Water rights veracity must be legally quantified through adjudication processes or administrative registries.
- Monitoring and enforcement must account for the water quantity allocated, quantity consumed, and quantity allocated to the environment.

4.2 Working with Water Users and their Associations

The purpose of this panel is to consider the fears, incentives, and perspectives of the water users and water users associations who sell or lease their water rights for environmental purposes.

The panelists examine the role of farmer and irrigation district attitudes regarding water transactions, such as their key fears and incentives. They also discuss social and economic impacts of water rights transferred permanently out-of-district for environmental purposes, and the concept of irrigation district exit fees and their influence on environmental water transactions activity.

4.2.1 Farmer and Irrigation District Attitudes Regarding Environmental Water Transactions
Scott McCaulou, Deschutes River Conservancy, U.S.A.

What are the attitudes of farmers and irrigation districts toward water transactions? As a market emerges in the Deschutes River basin in Oregon, the interest and issues for individuals and districts are diverging. Individuals are motivated to sell their water to make money. Demographically, there are multi-generational farms realizing – in part due to economic reasons – that their farm operations may not be continuing into the next generation. If offered a fairly good deal relative to their farming income, there is an incentive to sell these rights. Farmers choosing to remain on the land can become distrustful, as there is social pressure in irrigation districts to keep people from exiting and selling their water rights because the districts want to maintain a cohesive unit in the face of increasing pressure from environmental litigation and economic trends in agriculture. Therefore, irrigation districts tend to discourage members from selling so the districts can maintain (1) operational capacity to deliver water through irrigation works, and (2) critical mass to fend off third party lawsuits or attacks on water rights.

What are some of the incentives for working with irrigation districts? Working with the irrigation districts can reduce transaction costs caused by the need to resolve uncertainties about water rights and their validity because you are dealing with the same rights over and over again. Districts add value by maintaining records, tracking the usage of water rights and maintaining the water rights all of which simplifies the due diligence necessary prior to a purchase. This is compared to working with individual water rights where the individual may not have any records or proof of validity since the right was developed over 100 years ago.

4.2.2 Economic Incentives of Environmental Water Transactions for Irrigation Districts
Zachary Tillman, Deschutes River Conservancy, U.S.A.

Do irrigation districts own and control their water rights? What are the implications for environmental water transfers within districts? There is no clear legal precedent on the first question in Oregon. However, at the Deschutes River Conservancy, we have a policy of collaboration and will not transfer water out of a district without the district's consent. With that as a starting point, we looked at the barriers to acquiring a water right from a district and transferring it instream. First, there is a

philosophical objection to doing such transfers. Farmers may consider water left instream a waste that just flows to the ocean. This perspective is becoming less and less prevalent. Second, the other major barrier is about dollars and cents: economic incentives. We addressed this barrier by looking at irrigation districts' balance sheets to assess costs and revenues. Major costs are paying staff, maintaining canals, and paying their debt component for the infrastructure that helped them to establish their water rights. Operations and maintenance, in addition to district debt, are serviced through assessment fees tied to the acreage irrigated. Removing acreage from production could undermine the ability to cover these costs. We developed a one-time payment tied to a low-risk, government security (the 10-year Treasury bill) that contributes to an endowment for the district to meet its financial obligations into the future. This persuaded the districts not only to sanction instream (out of district) transfers, but to endorse a cooperative agreement to set and achieve annual targets for municipal and environmental buyers of water rights.

4.2.3 Tender Programs as a Means to Farmer Participation

Erin O'Donnell, Department of Sustainability and Environment, Victoria, Australia

At the Department of Sustainability and Environment we created a pilot program, the Stream Flow Tender Pilot Program, that establishes a competitive tender process for environmental water. We asked people to think of two different ways of changing their license conditions: (1) reduce license volume or (2) reduce water use if environmental flow thresholds are reached.

What are the key issues and conditions for working with water users to help them participate? First, we have to know what *we* want, by defining what the environmental flows targets should be. In the past, it has been very difficult to get community agreement on the flow requirements, but we have developed a community-based approach to build understanding of what the flow requirements are. Second, the voluntary nature of the tender process is very important. Water users chose if and how to participate, and choice is important. Third, it is important to build a partnership with an agency that water users can trust. In the pilot catchment, water users are used to receiving information from Melbourne Water and know the people involved, and that trust relationship allowed us to run a tender pilot in a relatively short amount of time. Fourth, there is the notion of culture change. We have seen a very rapid cultural change with regards to the willingness of water users to accept going into the market to buy and sell water. Finally, people feel very strongly about potential reductions in productivity, so we have focused on win-win situations.

4.2.4 Discussion on Exit Fees

What are exit fees? Exit fees are surcharges imposed on water purchases that permanently transfer water rights out of an irrigation district or water users association. Exit fees are designed to counterbalance the economic impacts of permanent transfers because water users who remain within the district must continue to contribute toward the operation, maintenance, and debt service of irrigation ditches and canal systems.

The Australian experience with exit fees. In regards to exit fees in the Living Murray pilot, we need to play by the same rules of trade as irrigators. The Minister of Environment and Water can remove barriers to trade, such as exit fees, although such measures would be the last resort (Lindsay White, Justen Simpson).

Economic perspectives on exit fees. There is an economic argument to support payments of exit fees because irrigation districts are akin to clubs. On the other hand, in Australia, water infrastructure has been primarily state-funded. Irrigators may never have thought of themselves as members of clubs when

they began farming, and the state can redistribute funds to address difficulties caused by stranded assets (Bruce Aylward, Erin O'Donnell).

Community perspectives on exit fees. While exit fees are a barrier to market activity, it may not be cost-prohibitive to pay them. The Deschutes River Conservancy adopted a policy of collaboration with irrigators and municipal water users. Given the uncertainty over water ownership within districts, we can get around such barriers by paying the exit fees in the spirit of cooperation. In the Deschutes, it is very much the local water users, including new water users, making decisions rather than a centralized state decision (Bruce Aylward, Zachary Tillman).

There is a need to address social impacts to get social and environmental settings right for markets. Based on experiences with community involvement in water planning and reform in New South Wales, communication is very important for three reasons: (1) reaching mutual understanding (2) overcoming vested interests and inertia; and (3) preventing policy agendas from being hijacked (Chris Schweizer, Justen Simpson).

4.2.5 Key Findings

The panel presentations and discussions suggest the following key findings and insights into perceptions regarding environmental water transactions among water users and water user associations:

- Individual irrigators and irrigation districts have divergent sets of incentives and fears surrounding water transactions. Individual irrigators may respond to monetary compensation to sell or lease water rights, while irrigation districts fear loss of political clout and/or control over water rights if individuals defect from the group.
- Working with irrigation districts lowers transaction costs where the district actively maintains the water rights, thereby reducing uncertainty over the validity of water rights.
- By understanding the economic incentives tied irrigation districts' infrastructure debt, it is possible to design compensation packages and change incentives in ways that simultaneously strengthen collaboration and overcome reluctance to engage in environmental water transactions.
- Building trust with water users can develop cultural change and greater acceptance of market mechanisms for acquiring water for the environment.
- Trust and cultural acceptance accrue through community-based processes to establish flow targets, implementation of *voluntary* transfer programs, and development of win-win transactions.

5. Designing Successful Transactions: Barriers and Impacts

The third session examined legal and regulatory barriers to trade, metrics for gauging success in transactional efforts, and the social and environmental impacts of water trading.

5.1 Injury Analysis

A number of barriers and limiting factors can constrain transactional approaches. The legal concept of injury refers to the potential for a change in the use of one water right to adversely affect the use under another right. Injury may be regarded as necessary protection of property rights or as a barrier to trade in the water market, given the cost of assessing injury and the dampening effect it may have on trading.

David Pilz, Oregon Water Trust, U.S.A.

What is the legal concept of injury, and how does it impact environmental water transactions? Three concepts of Western U.S. water law are important for understanding injury as a barrier to environmental water transactions. First, we allocate water on a priority system based on when a water right was established. Second, we have a concept called return flows that limits the amount of water protectable as an environmental flow. The return flow portion of a water right is the portion that returns to the river after application, that is the amount of water applied to a field but not used by plants, or percolated to deep groundwater, or evaporated. Third, water rights are appurtenant to land. Creating environmental flows often involves severing the water right from the land and submitting the water right to a state regulatory process for instream transfer of the right. This process can take an out-of-stream use and convert it to an environmental flow. One barrier to this stems from the legal definition of "injury" under Western U.S. water law: other water users – both senior and junior water right holders – are legally entitled to return flows off of upstream fields. The question is whether downstream users are injured by requiring an environmental flow to pass their water diversions. If some portion of this flow would have been return flows, the state will reduce the environmental flow by that portion. Therefore, because of the legal entitlement to return flows, the state often does not allow us to protect the full former quantity of the right as an environmental flow during a transfer. We try to get as much water as possible protected for the river, working closely with the landowners and state agency to avoid any "injury." However, in many cases we believe the state is too conservative and penalizes environmental flows.

Megan Dyson, Megan Dyson Environmental Law and Policy, Australia

How do environmental uses fit into the Australian system of water rights, and how are issues of injury, third party impacts and return flows addressed? First, environmental water is provided for in a number of ways – through statutory plans identifying water that is to be available for environmental purposes; by allowing water to be held under licenses specifically for environmental uses; and by expressing conditions of consumptive water licenses so as to allow for some environmental benefit. This means that potential impacts of environmental use of water have been taken into account in the provision of the consumptive rights. Second, water trading rules are developed in each jurisdiction that are intended to specify rules for trading water rights or components of rights in such a way as to avoid third party impacts (e.g., impacts on reliability of a third party's water). Third, once an environmental purchaser has acquired a right to water, a further decision involves whether to use water instream or pump to a wetland. A transfer in rights that involves a change in the place from where water is diverted or where it is used may require an environmental assessment prior to granting the transfer. This process can identify and mitigate third party impacts. Fourth, return flows appear to receive more recognition in the United States, they are not yet acknowledged explicitly in water rights in Australia. Salinity and water quality impacts of return flows have however led to efforts to minimize return flows.

5.1.1 Key Findings

The panel presentations and discussions suggest the following key findings regarding the barriers to trade arising from legal protections that seek to prevent injury to water rights holders as a consequence of environmental water transfers:

- In the U.S system, the legal concept of "injury" can present a barrier for environmental transactions which change rights from consumptive irrigation water uses to instream uses because downstream water users – junior and senior – are legally entitled to irrigation return flows.
- The legal right to return flows prevents environmental water transactions from converting the full quantity of the original water right to instream uses.

- Several aspects of Australian water rights and the system of water planning and allocation that underpins those rights determine how injury is addressed in environmental water acquisitions. Key elements include the water entitlement, water allocation, the permit to use the water at a specific place, and the terms of the relevant statutory water plan. Changing the place of use can require an environmental assessment and can entail a reduction in the water license volume.
- Transferring water in the Australian system may involve an environmental assessment to address impacts caused by changes in the place of use.

5.2 Measuring Success and Identifying Limiting Factors

Evaluating the success and effectiveness of environmental water acquisition programs is central to learning and continuous improvement. Evaluations also serve to identify additional limiting factors that can constrain environmental water transactions.

5.2.1 Third Party Evaluation of the Columbia Basin Water Transactions Program

Andrew Purkey, National Fish and Wildlife Foundation, U.S.A.

The Columbia Basin Water Transactions Program has a culture of adaptive management and learning by doing. The program began in 2003 with a commitment to conduct a third party evaluation of the program after the first five years. This evaluation began in January 2007. The evaluation involved interviews and data analysis of information compiled by the program. The evaluator assessed three objectives of the program since its inception: (1) testing open market transactions for acquiring water rights; (2) increasing flow in reaches within the Columbia Basin; and (3) restoring habitat for threatened and endangered fish. Their conclusion is that we succeeded in testing market mechanisms for acquiring flow. Not surprisingly, however, we fell short in documenting how the acquired water benefited habitat and species. We are striving to do a better job of linking acquisitions with other activities that restore habitat and monitoring ecological impact. Instead of measuring success in terms of the number of cubic feet per second (cfs) or GL acquired, ecological output (e.g., habitat value, species productivity) is the most important outcome.

The need to identify limiting factors is just as important a part of evaluation. Much like a chain, the program evaluators argue that the program is only as strong as its weakest link. They identified eight major factors that can constrain the effectiveness of the program:

1. Scientific Understanding: Where is flow is needed, what benefit it will have, and what trends in hydrology exist that could change how that water would perform over time?
2. Public Policy and Regulatory Framework: Needed changes include adjudication and quantification water rights; better enforcement; equal status afforded to instream rights.
3. Institutional Capacity: Can environmental water buyers act in the marketplace?
4. Economic Pressure: Can environmental buyers keep pace with market prices as competition increases from other water buyers in growing urban areas?
5. Compliance and Enforcement: Can you ensure water you acquire is there and not being used downstream?
6. Stakeholder and Cultural support: Are you effectively integrating with local landowners and groups to ensure success?
7. Financing: Are there sufficient financial resources to make environmental water acquisitions possible at the needed scale? What are innovative ways to bring public and private funds to support this work?
8. Market Maturity: Are there willing sellers/leasers? Will transaction costs remain high until markets mature and deals become frequent and regular?

The evaluation made the following recommendations to the program:

1. Augment existing performance metrics to assess biological targets and habitat restoration
2. Integrate deals into efforts by other organizations to address other ecological factors, such as degradation of riparian areas or uplands, other land use management issues
3. Develop guidelines and standards for habitat monitoring (not just flow)
4. Support full range of temporary and permanent transactional tools, since it is not always desirable for permanent transaction giving changing climatic and ecological conditions.
5. Continue to provide organizational support due to the intrinsically high transactions costs to environmental water acquisitions caused by imperfections in the market.
6. Integrate land and water conservation deals.

5.2.2 Economic Concepts for Evaluating the Success of Environmental Water Transactions

Brenda Dyack*, Australia Bureau of Agricultural and Resource Economics, *Australia

How do we ensure that value for money is achieved in publicly financed water transactions? Let's say we are focused on the sustainability outcome for the Murray Darling Basin, how do we measure whether a transaction by the Commonwealth Environmental Water Holder improves this outcome? The new programs of the $10 Billion National Plan for Water Security (Plan) are being introduced into a system where markets have already made progress in encouraging the movement of water from low value to high value agriculture. Hence, agricultural activities are becoming more sustainable and water is being valued more in line with its marginal return in agriculture. What we want to do now is evaluate the success of the Plan in achieving further sustainability gains for agriculture and also for the environment. We want to be able to assess whether planned market acquisitions of environmental water under the Plan are likely to achieve the greatest gain. Over time, we also need to assess whether transactions have been successful at the margin such that a megalitre of water used in agriculture is as socially valuable as a megalitre of water used for the environment.

In evaluating policy approaches to acquire water for the environment, a major goal is to maximize the environmental benefits per dollar spent on acquiring water. There are two justifications for thinking about our accountability and success in this way: (1) guiding policy and planning, and (2) maintaining accountability for the water acquired and applied to environmental projects during program implementation.

Under scarcity of resources, tradeoffs must be assessed, valued and weighed to ensure society's goals are met. Setting up a value for money framework to assess these tradeoffs in choosing among multiple objectives makes sense, but the challenges have been, and will continue to be, significant.

The three basic challenges in measuring success are the following: First, there are significant information gaps about the outcomes of moving water out of agriculture and into the environment. Losses to agriculture are easier to identify because they can be measured largely in dollar terms. However, for the environment, there are benefits directly related to applying water such as more bird breeding events and also reduced costs through reduced salinity, for example, when some agricultural activities are reduced in some areas. Both of these responses present measurement challenges. Furthermore, there are non-market valuation challenges in determining social values for greater environmental integrity including non use values such as bequeath values and use values such as recreation values. There are both revealed preference and stated preference techniques for estimating these values but they are time consuming and costly to undertake and at times controversial. Second, establishing metrics for success is a challenge because in measuring the net cost and benefit of each alternative we need to add monetary indicators to non-monetary ones. The third challenge is to find a prioritization framework and weighting system that is acceptable to stakeholder groups and society in general and that can help indicate if public funds are

being directed in a cost-effective fashion towards rights acquisitions that provide the greatest net societal benefit.

5.2.3 Discussion

Metrics of Success

What metrics of success have been developed in the Living Murray program, where some non-monetary indicators are used, and how were these measures developed?

In the effort to develop a portfolio of water to achieve outcomes on six environmental assets on the river, we are developing a framework to conduct feasibility assessments, design and consultation processes, and an implementation record. The water acquired is managed in accordance with an environmental water plan. There are annual and longer term environmental water planning processes that take into account the location of supplies and environmental water demands (Lindsay White).

5.2.4 Key Findings

The panel presentations and discussions suggest the following key findings regarding the limiting factors that constrain transactional approaches as well as the evaluation approaches used to measure the effectiveness of environmental water transactions:

- Regular evaluation is needed to adaptively manage and to learn by doing in environmental water transactions programs.
- Transactions should be integrated with other efforts to restore habitat and ecological integrity.
- Measuring the success of flow acquisition requires more than accounting for quantity of flow acquired. Establishing baselines and conducting regular monitoring are necessary to measure success in terms of ecological output.
- Evaluating transaction success must consider limiting factors and barriers that constrain effectiveness, as well as key strategies and needs for overcoming these factors.
- Maximizing the environmental benefit per dollar spent to acquire water for the environment is as a major criterion of successful environmental water transactions programs.
- Three key barriers to measuring success are: Information gaps about benefits of applying environmental water; a lack of generally acceptable and tested metrics for adding up a variety of relevant monetary and non-monetary benefits and costs at different sites; and, challenges in setting up a generally acceptable framework for ranking priority purchases and applications of water consistently across heterogeneous alternatives.

5.3 Reducing Negative Environmental and Social Impacts

Successful transactions often include strategies for addressing and reducing negative social and environmental impacts of transactions. The discussion of environmental impacts focuses on the role of groundwater, land use change, and drought, while that on social impacts emphasized community perspectives and stakeholder engagement.

5.3.1 Groundwater and the Environmental Impacts of Transactions

Eloise Kendy, Sustainable Waters Program, The Nature Conservancy, U.S.A.

Groundwater recharge and discharge are critical to the efficacy of water transactions. First, in over-allocated basins that are closed only to new surface water – but not groundwater – appropriations, groundwater pumping can undo the gains made by acquiring environmental flows. Second, managing groundwater and surface water conjunctively can improve stream flow conditions. Groundwater pumping

and recharge can be managed either to maintain existing flow conditions or to change hydrologic conditions. For example, improving irrigation efficiency restores natural hydrology by reducing groundwater recharge. However, return flows from inefficient irrigation systems commonly feed seeps and streams. Although these are not natural systems, many are ecologically significant and would be threatened by irrigation efficiency improvements. In this case, managers may choose to maintain existing conditions, even though they are not natural. Third, because groundwater temperatures are relatively stable, groundwater discharge to surface water can foster ecological recovery in degraded systems.

5.3.2 Environmental Impacts and Community Engagement

Mark Siebentritt, Waterfind Environment Fund, Australia

Environmental impacts depend on the type of use. There is a tradeoff in the environmental benefits and impacts between: (a) water acquired for *instream* environmental purposes, such as fish habitat, and (b) water acquired for *off-stream* environmental purposes, such as wetlands restoration. Fish advocates may favor in-channel flows while others want water in the floodplain, for example, to support water for bird species.

Community engagement is a central issue in environmental flow transactions. First, there is a need to balance large water acquisitions for important environmental assets with smaller projects that use less water but offer potentially greater opportunities to engage with communities. While it is very important to work on large iconic sites that are of international significance, such as those in the Living Murray program, many of these sites are geographically distant from people and communities. To engage communities, we may need to develop environmental projects that are physically closer to them. Second, we need to look at the role of drought and social impacts. The question arises, how does an organization engage with a community to seek donations of water and finances during drought conditions? Can we instead approach urban communities to put financial donations to environmental projects since farmers are already suffering? If money can be sourced from urban communities, it may help in addressing the "blame game" that can arise between rural and urban areas regarding environmental issues. Everyone has a role to play, but the balance of roles depends on drought conditions. Finally, in our broad definition of community, we include corporations and businesses. It is important that the corporate sector get involved because of the growing relevance of triple bottom line reporting.

5.3.3 Groundwater-Surface Water Interactions and the Role of Agricultural Sustainability

Kevin Scribner, Walla Walla Watershed Alliance, U.S.A.

Environmental impacts associated with groundwater are a key part of fish recovery and environmental water transactions efforts in the Walla Walla Watershed. Basin hydrology and geology force us to focus on interactions between groundwater and surface water. We have been able to address environmental impacts of groundwater pumping and interactions between groundwater and surface water in several ways, although the presence of a state boundary within the watershed complicates our efforts by requiring us to work with two different state agencies. On the Washington side of the basin, we have established a rule to limit diversions and impacts of exempt groundwater wells; started to form a water bank to mitigate impacts of wells used for rural residences; limited the amount of water use for rural residences; and examined recharge projects in shallow aquifers as a tool to change the timing and flow of our water.

Considering the social impacts of acquiring water for fish using environmental water transactions, sustainability is the great question in our valley. The solutions include sustaining agricultural into the future, and sustaining agriculture involves more than just water. Proposals to sustain agriculture through temporary or rotational land fallowing have raised an important question regarding impacts on the land. A stewardship program is needed to plant native grasses and prevent the land from becoming a weedy

patch. Such programs demonstrate the importance of water trusts, alliances, and conservancies developing partnerships with land trusts and land management agencies.

5.3.4 Discussion

Land Issues and Drought in Australia:
Environmental water acquisition during drought years has become a social issue, since the reliability and access to entitlements declines for some users while the environmental needs for threatened species tend to rise. How do we cope with drought impacts in environmental flow acquisition? Drought forces restructuring in irrigation, but irrigators may not sell their whole license necessarily but will instead sell components of their water license. There is a social challenge associated with restrictions on water use during drought because there is often more passion to avoid impacts on home gardens than to acquire water for the 75% of floodplain vegetation that have died back on the Lower Murray. In a search for general principles, we must determine how to build political interest to do things beyond our own backyards (Mark Siebentritt, Justen Simpson).

5.3.5 Key Findings

The panel presentations and discussions suggest the following key findings regarding the social and environmental impacts meriting consideration in transactional approaches to environmental flow acquisition:

- Groundwater pumping and groundwater-surface water interactions raise environmental impacts to consider when designing successful environmental water transactions.
- Conjunctive management of groundwater and surface water will lessen the environmental impacts of transactions by protecting surface flows from groundwater pumping and by maintaining the timing and seasonality of groundwater discharge as a part of the flow regime.
- Environmental impacts of transactions imply a trade off between uses for instream (fish) and off-stream (e.g. wetlands) environmental needs.
- Reducing social impacts requires engaging communities through projects in their backyard; balancing the contributions of urban and rural sectors during drought; and engaging corporations within the definition of community.
- Stewardship programs are needed to manage the land fallowed from agricultural production during environmental water transactions.

6. Future Prospects and Needs

In the final session panelists were asked to address the prospects for this approach to environmental flows in terms of upscaling within existing areas or expanding the reach to other regions. In addition, panelists were asked to identify the key needs and actions that would be necessary to improve transaction approaches and increase their reach and effectiveness.

6.1 Future Prospects in New Contexts

Considering transactional approaches within the context of broader water management and reallocation efforts this panel sought to generate a list of research needs and to explore potential for environmental water transactions in diverse political economic and physical contexts. The panel included some panelists who are not directly engaged in environmental water transactions, in order to provide external perspectives on the potential for transferring and adapting transactional approaches to new contexts.

6.1.1 Case Study of the Walla Walla Water Management Initiative
Kevin Scribner, Walla Walla Watershed Alliance, U.S.A.

In the Walla Walla, a critical mass of key leaders in the Basin have a vision that we can create and re-establish environmental flows or flows for fish while sustaining our patterns of agriculture and growing municipalities. Two forces shaped the context for applying water transactions tools to restore flows while sustaining our community. The *first* one is a federal law – the Endangered Species Act (ESA) – that has been invoked for two different species: a resident trout and an anadromous salmonid. We have worked on a habitat conservation plan to come into compliance with the ESA and the Clean Water Act, and we have focused on a watershed-wide plan involving three irrigation districts and one of the major cities. The *second* stimulus is a tribal treaty. The Treaty of 1855 obligates us to sustain a local tribe's native and customary fishing rights, and we are reintroducing salmon stocks that were extirpated in the 1920s.

The Walla Walla spans two states, Oregon and Washington. Water transactions occur in collaboration with the state regulator, and in Washington, the water code has inhibited transactional tools. We established a key partnership with the Washington Department of Ecology (DOE) that led to the Walla Walla Management Initiative. The Initiative is an offer from the director of DOE: if water users can commit to provide needed environmental target flows and resolve conflicts locally, the state will seek the needed authority to allow water to be managed locally. DOE requests target flows based on the precipitation for a given year, an approach to provide these flows, and some extent of local management. At the same time, we are developing the science to examine conjunctive use of groundwater and surface water. We also want to find out from the fish biologist when and where the fish need flows. We are at the generative stage of that, and we have a commitment from the Governor and the director of DOE to make Washington water law progressive for the Walla Walla Basin.

6.1.2 Enabling Conditions: Blue Sky Thinking about Environmental Flow Goals, Policy Reform, and Funding
Brian Richter,* Sustainable Waters Program*, The Nature Conservancy, U.S.A.

My comments present blue sky thinking about the enabling conditions for the work you are all trying to do. There are three topics to cover: goals, policy reform, and funding.

Regarding goals, the work you are all doing has been inhibited by a lack of clearly defined goals and targets, especially socially supported goals, that would help define environmental flow needs: how much water is needed, where, and when. It has been very difficult and costly to conduct site-specific environmental flow needs assessments for every river that needs protection or restoration. The good news is that a group of scientists have been working on a scientific approach that will help determine environmental flow needs across entire regions (e.g., all rivers and streams within a region). We have been calling this approach "ELOHA," for Ecological Limits of Hydrologic Alteration. There is a lot of thought going into designing it in a way that can better express social values that are connected with environmental flows. We are trying to move beyond simple linkages between flows and fish, and explicitly develop environmental flow recommendations that link to ecosystem services and the things that people care about. If we are ever going to get the point when societies at large support the work we do, we are going to have to make a much more explicit connection to the things they care about.

Once we have the ability to define environmental flow needs across all river basins, there will be an effective motivator, stimulus, or trigger point for policy reform and funding. Regarding policy reform, we are ultimately going to need caps on withdrawals in all river basins. The imposition of caps on withdrawals leads to favorable responses in local governance systems, and caps stimulate better water accounting. A cap system enables the type of water market and trading you are trying to advance. These

caps lead to increased efficiency and productivity of use – all of which can free up water for environmental flows. Examples include the Murray Darling as an early example; the Edwards Aquifer in Texas is a more recent experience. These caps have stimulated a local economy centered around water efficiency, water conservation, and new technologies for use in farming and urban water conservation. We hope that many other river basins will impose a cap in the next 10, 15, 20, or 50 years.

The last topic is the funding to enable transactions. In order to get to the scales of financial investment necessary to adequately protect environmental flows, we should look to the big pots of money. Considerable investments are being made in economic development activities. Because the public understands that such development can be damaging to ecological services valued by society, we should be able to create compensation funding mechanisms, tied to these development activities, that can be used for environmental protection or restoration. As an example, there is a lot of transfer of water use from agricultural to urban areas in the American West. We should try to influence the terms of these transactions, such as by taxing them to generate funding for environmental flow restoration, or by requiring that a portion of the transferred water be returned to environmental flows. From a public policy standpoint, the public is more willing to go along with those sorts of things because there is a direct connection to the development activity that is compromising ecosystem services, so the public perceives that it is appropriate to allocate some funding to offset the impact of development. Whether it is the $4 million in the Columbia River Basin or the $3 billion in the Murray-Darling Basin, large state or federal appropriations are on the horizon, and we will see more of that as we have clear definition of goals that are tied to socially valued ecosystem services.

6.1.3 Transferability of Transactional Approaches: The Importance of Identifying Enabling Conditions and Limiting Factors

Nick Davidson,* Ramsar Convention*, Switzerland

The Ramsar Convention on Wetlands has a particularly keen and ever increasing interest on how and what to advise our now 155 Contracting Parties – our member countries – on managing water for ecosystems and achieving wetlands-wise use. I have a keen interest in learning about the cutting edge ways of handling these issues with water resource management, but I have little background on the pros and cons of transactional approaches.

The *first* challenge is to examine transactional approaches relative to other management options. As it is a new and evolving approach, we must ensure that the benefits of the solutions that the approach may yield outweigh the possibly unanticipated costs and risks of this approach.

The *second* challenge is that it looks like that this approach is being developed so far in a relatively small number of countries at the moment, and particularly in what we call developed countries, so there is a key question of how transferable this approach is, particularly in countries with very different socioeconomic conditions such as in developing countries. How much resource capacity will be necessary, and what are the preconditions for these approaches being successful? Whilst the approach may work well in countries such as the U.S., Australia, or Mexico, it may not work in many less developed countries, so it is important to map out clearly what the enabling conditions might be. For example, do you need legislative frameworks like the ones you have discussed, or is that a hindrance? Really clear guidance would be helpful. It would be key to avoid going down a blind alley and so end up undermining an otherwise viable tool in the toolkit. Workshop panelists and participants could put together some really powerful, step-wise guidance regarding whether this is a good approach to try and, if so, what you need to have put in place or anticipate if you are going to try it.

6.1.4 Key Findings and Future Needs

The panel presentations and discussions suggest the following key findings and research directions for adapting transactional approaches to new contexts:

- The Walla Walla Watershed's experience highlights the importance of establishing the local context of political support for environmental water transactions.
- Developing the context for transactional approaches depends on reaching a shared vision of the need to both restore ecological needs and sustain the local economy base in agriculture.
- Clear socially endorsed goals for environmental flows can lead to the policy reform and funding needed to enable transactional approaches.
- Policy reforms will involve some form of cap on withdrawals in all river basins.
- Funding mechanisms will generate greater public and private investment by linking into the mega trends in development activity perceived by the public to be compromising ecosystem services.
- There is a need to examine the costs and benefits of transactional approaches through comparisons with alternative approaches to manage water for ecosystems.
- An assessment of the transferability of transactional approaches is needed to determine whether environmental water transactions are viable in developing countries.
- Assessing transferability requires the identification enabling conditions for transactional approaches, including resource capacity and legislative frameworks.

6.2 Future Needs in Old and New Contexts

This panel includes closing remarks from non-profit and agency practitioners regarding further research needs and other steps necessary for advancing environmental water transactions programs. Panelists proposed institutional, technical, and research needs for improving existing transactional efforts and enhancing prospects in new contexts.

Hedia Adelsman, Washington Department of Ecology, U.S.A.

First, we are conducting an assessment of the impact of climate change on water resources in general and on fisheries and environmental flows. We need to determine whether acquired water will be there in the future. *Second*, we need to conduct studies on groundwater-surface water interactions. We are doing extensive monitoring to make sure that we do not acquire surface water that is undermined by pumping groundwater. *Third*, we are striving to get local government, such as country commissions to buy into approach, and a good example is the rule in Walla Walla, where a county commissioner stated that even without the state we would need to do something anyway. *Finally*, it is important to leave the impression that states and regulators can be innovators and collaborators.

Chris Furey, Bonneville Power Administration (BPA), U.S.A.

Bonneville Power is a hydropower marketing agency in the Northwest, and we pursue and fund environmental water transactions as part of our Fish and Wildlife Program. What are the future needs? *First*, given the increasing scale of efforts underway in Australia, a major need will be to learn from the experiences you are having with the water auction mechanisms you have presented today, such as the tender programs and expressions of interests. *Second*, because we are still in the early stages of implementing a water transactions program, we need to advance mechanisms to acquire water in focused locations and to document the results, particularly the biological and ecological benefits of putting water instream. It is important for us to link these flows to some type of biological improvement through habitat monitoring and to learn from new research. *Third*, more linkages with land trusts and land agencies are necessary to deal with the land issues tied to environmental flow acquisition. *Finally*,

continuing to talk with one another is a significant future need. This is an ongoing, long-term effort, and people have seen improvements each year. You will see increasing trends to make this approach more efficient and more effective.

Lindsay White, Murray Darling Basin Commission, Australia

These comments highlight an institutional regulator's perspective in a cap-and-trade context for water allocation. *First*, the cap should be periodically changed through water recovery to address new understanding of what is sustainable, to address such issues climate change and groundwater diversions. *Second*, there is potential for the design of better market-based approaches. In Australia we have had some successful pilots, but experimental economics tools could be used to examine to increase efficiency of purchasing approaches as much as possible. *Third*, there is a need better information systems to assess environmental demands, assess the reliability of water entitlements, and ensure acquired water addresses the environmental uses for targeted sites and outcomes.

Regarding the institutional context, *first*, we need to think of the institutional form of the government as an environmental water buyer in different institutional contexts, such as the need to exercise discretion during droughts. *Second*, there are needs for the institutional context to minimize transaction costs, respect existing property rights, and support the development of new types of entitlements.

Chris Schweizer, Department of the Environment, Water, Heritage and the Arts, Australia

How can state regulators best support transactions? First, there is the role of large amounts of money – federal money – flooding the markets and distorting the markets, and we have also started thinking about other ways of acquiring water licensing without purchasing water entitlements, such as offsets for development activities. Because of this federal money, partnering with communities and irrigation districts becomes more important to cultivate local ownership of these issues. *Second*, we need to resist the potential for political fluctuations during droughts that would make environmental water entitlements the first to lose even though they are supposed to receive equal protection. *Finally*, as a regulator, we need to get the market settings right by addressing adverse social impacts and unforeseen environmental consequences. This need can be accomplished by revising the parameters from time to time without disturbing market operations.

6.2.1 Discussion

Financing

How can we foster private sector investments of funds and organizational capacity in a government-led system such as Australia? In the Pacific Northwest U.S., the values of the hydropower customer base recognize the importance of environmental flows so that provides opportunities, but private sector involvement will likely be smaller scale unless there is a regulatory pathway, in our case driven by the Endangered Species Act and Northwest Power Act. Government money is especially important to get it started at the beginning, and in the state of Washington there is increasing emphasis on mitigation for various activities that is spurring development of water markets. The second issue is a response to climate change that could lead to contributions to non-profits to participate in environmental flows. It is still difficult in Australia to get non-governmental money into something such as environmental flows because it is perceived as a government role. Regarding the transferability of this approach, not all countries will have the capacity to raise such large amounts of public funds for this purpose. So government may take the lead until the capacity of the non-governmental sector can play a larger role. Allowing non-profits to assume this role may seem risky as it requires a degree of loss of control by the government. However, the U.S. experience suggests that non-profits are more adept at using the full range of tools for generating financing and, thereby, expand the pot of money available for transactions.

Examples of private sector involvement in the Deschutes include sales charges on new development lots that go into a fund for investments in water acquisition that restore the river adjacent to the development. Another mechanism is working with a local municipal water provider to promote voluntary contributions as part of monthly billing (Hedia Adelsman, Bruce Aylward, Chris Furey, Chris Schweizer).

Transacting without a cap

Is it possible to develop transactional mechanisms even if the systems are not overallocated yet? In the Living Murray, the focus was on infrastructure first until infrastructure became considerably more than the market price, and then it flipped over to greater interest in market-based measures (Lindsay White).

6.2.2 Key Findings and Future Needs

The panel presentations and discussions suggest the following key needs for learning from the lessons of past experience to realize the potential for existing and emerging transactional efforts:

- Ensuring the reliability of acquired environmental water rights requires continued research into the impacts of climate change and groundwater-surface water interactions.
- Gaining local community support is a critical need during and after government efforts to initiate and invest in environmental water transactions.
- Exchanging information and experiences remains a key need as Australian and U.S. efforts gain traction and experience growing pains.
- Partnerships with land-based agencies and non-profits are a major future need.
- Research and applications are needed to monitor the link between flow acquisition and biological improvement.
- Major gaps for future attention include evolving caps on allocations, further improving market design based on experiences with pilot programs, and developing information systems that gauge the reliability of environmental water rights and their effectiveness in meeting targets and outcomes.
- Regulators must focus future attention on the role of federal money in water markets, the impact of drought on environmental water entitlements, and the need for periodic reforms to market conditions to consider adverse social and environmental impacts.

7. Conclusions: Summary of Major Findings

The proceedings recount panelists' insights, key findings, and future needs shared by practitioners, regulators and other parties engaged in environmental water transactions within Australia, the Western U.S., and other regions. Despite varying levels of experience in nascent and maturing transactional programs alike, the field of environmental water transactions is still in its early years and is drawing increasing interest across the world, as represented by workshop participants from China, India, New Zealand, and South Korea as well as pilot experiences or proposals for market-oriented flow acquisition in the United Kingdom, Mexico, and parts of South America.

Growing interest coupled with proliferating efforts to design and implement environmental water transactions have illustrated the value in expanding networks in which practitioners, government officials, and academic researchers can pursue further information exchange on the topics covered during the workshop.

The workshop also revealed the need for careful identification of the enabling conditions, limiting factors, and future prospects for transactional approaches across diverse regional and national settings, including both developing and developed countries. As an initial step toward these goals, the themes, enabling conditions, and constraining factors identified within the workshop proceedings are summarized below.

1. Environmental flow targets are goals and benchmarks that underpin strategic transactional approaches by prioritizing where and when water is needed and how it can be acquired. The process for establishing and evolving targets should engage local communities, regulators, and other stakeholders on an ongoing and adaptive basis to generate trust, political support, and financing for environmental water acquisitions.

2. Caps are a necessary precondition for environmental water transactions. By establishing limits on allocations, market mechanisms can be developed to allocate water for the environment. Caps must be revisited periodically to accommodate changing values and evolving understandings of climatic and ecological processes.

3. Water rights systems exhibit several attributes that can either facilitate or hinder transactions. Environmental uses should be legally acknowledged and accountable, and water rights must be quantified, enforceable, and transferable. Reforming water rights through a process known as unbundling can enable environmental water transfers by separating water rights from land title. Unbundling may also entail the partitioning of water rights into their constituent parts, such as delivery, place of use, and timing of use. Each of these water right attributes could become a target of new transactional tools seeking mutual benefit for rights owners and the environment.

4. Environmental impacts are tied to groundwater-surface water interaction, climate change, and land use change. Such impacts require careful consideration when designing, implementing and evaluating environmental water transactions. Uncertainties arising from complex interactions of environmental factors reinforce the need for adaptive learning and rigorous third-party evaluations of transactional mechanisms for restoring environmental flows.

5. Social impacts arising from environmental water transfers elevate the importance of maintaining close working partnerships with communities and local governing arrangements. Establishing flow targets, coping with drought, and sustaining local economies dependent on irrigated agriculture provide contexts to address social impacts encountered during transactional approaches by entering voluntary, collaborative, and win-win agreements built upon shared vision and widely endorsed goals.

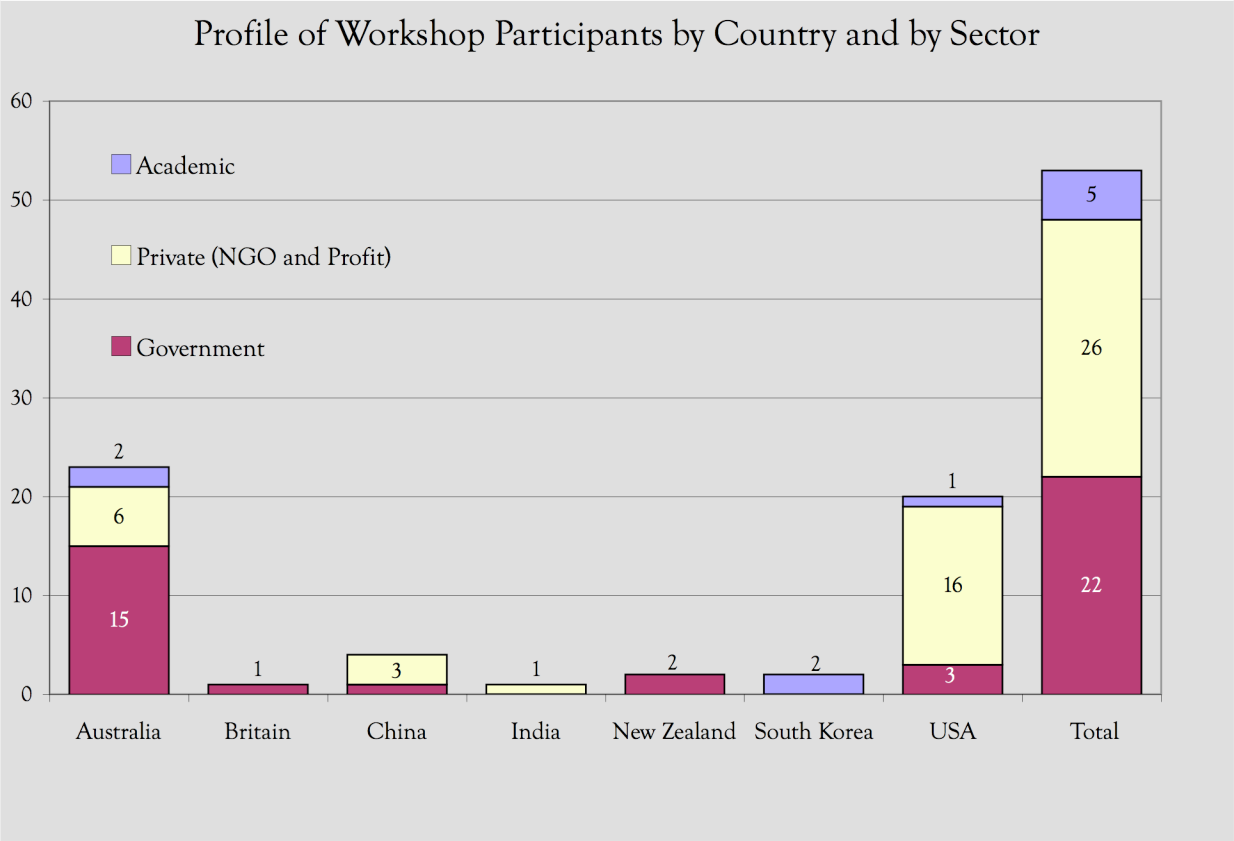
6. Clear and transparent metrics for success are needed to gauge effectiveness and to identify the obstacles encumbering transactional approaches. Measures of success must provide fine grained assessments of performance along social, economic and ecological criteria. Economic metrics will seek the maximum environmental benefit per dollar spent acquiring water for environmental projects, while ecological metrics are needed to correlate enhancements in flow with improved ecological conditions. Baselines and regular monitoring are integral to this process.

7. Assessing the transferability of transaction-oriented environmental flow protection will require close attention to enabling conditions and limiting factors to such approaches across the full spectrum of political and economic development conditions. Further investigation into enabling conditions and limiting factors represents a ripe area for future research that warrants detailed consideration and regular reexamination before planning and adopting transactional programs in new contexts.

8. Networks and partnerships of practitioners, regulators, and academics need to provide regular opportunities for information exchange and offer venues for sharing experiences, lessons learned, and mistakes to avoid within and across disparate countries, cultures, economies, and environmental conditions.

8. Appendices

8.1 Appendix A – Profile of Workshop Participants by Country and by Sector



8.2 Appendix B – Glossary of Key Terms

Special Terms	Meaning	Usage	Definition Source[3]
Appurtenance	Attachment of water rights to land ownership.	BOTH	Proceedings
Beneficial Use	A cardinal principle of the prior appropriation doctrine that has two components: the nature or purpose of the use and the efficient or non-wasteful use of water. State constitutions, statutes, or case law may define beneficial uses of water (including instream use), may vary from state to state, and may change over time.	U.S.A.	Instream Flows Council
Cap and Trade	A common approach to environmental management. In the context of water allocation, a cap prevents additional water entitlements, while rules of trade are established to permit transfers of existing rights toward higher valued uses.	BOTH	Proceedings
Environmental Asset	In context of Australian environmental water management, environmental assets refer to "high-conservation water assets," such as wetlands and rivers that may merit statutory protection as implementation targets for the National Water Initiative.	AUS	Australian Government National Water Commission
Environmental Water Transaction	Agreement in which a water right user commits to protecting the water right through legal or other means into a water course or body for the purpose of enhancing ecosystem health and function.	BOTH	Aylward
Exit Fees	Exit fees are surcharges imposed on water purchases that permanently transfer water rights out of an irrigation district or water users association. Such fees seek to counterbalance the economic impacts of permanent transfers for water users who remain within the district and who must therefore continue to contribute toward the operation, maintenance, and debt service of irrigation ditches and canal systems.	BOTH	Proceedings
Expression of Interest or Auction Bids	In context of environmental water acquisition, an important mechanism for finding water right sellers. Expressions of interest or bids are ranked against one another using a number of criteria.	BOTH	Simpson / Proceedings
Prior Appropriation	The system of water law dominant in the Western U.S. where (1) the right to water use was acquired by diverting water and applying it to beneficial use; (2) a right to water acquired earlier in time has priority over a right acquired later in time; (3) the right is limited to the amount beneficially used; and (4) the water will be lost if not used.	U.S.A.	Instream Flow Council

[3] Working definitions based on discussion during workshop have been labeled "proceedings" and attributed to the appropriate panelist when applicable.

Unbundling	Unbundling is the separate expression of components of water rights, and potentially enables components to be traded separately. With respect to water rights often involves separating land ownership from ownership of the water license. Other components of the right that may be unbundled include delivery (or location and manner of taking), timing of delivery or taking, quantity, access to capacity of infrastructure, and water quality of return flows.	AUS	Dyson / Proceedings
Water Entitlement	An ongoing entitlement to access a share of water (analogous to a water right in the U.S. as the amount actually received will depend on hydrological conditions).	AUS	Page/ Proceedings
Water License	See water entitlement.	AUS	Proceedings
Water Right	Usufructuary right to water (analogous to a water entitlement in Australia).	U.S.A.	Proceedings
Water Trust	Non-profit or government-run organization that acquires water rights or interests in water rights to enhance environmental flows.	U.S.A.	Proceedings

8.3 Appendix C – Unit Conversions

Volume Conversions

1 acre foot (or AF) of water covers 1 acre (43,560 ft^2) to a depth of 1 foot
1 AF = 43,560 ft^3
1 cubic meter (or m^3) = 1000 liters and 1 gigaliter (or GL) = 1 million m^3
1 AF =1234 m^3 = 0.001234 GL
1 GL = 810.37 AF

Rate Conversions

1 cubic foot per second (or cfs) = 0.02832 m^3/s
1 m^3/s = 35.3 cfs

At the time of the meeting the U.S.-Australian dollar exchange rate was approximately:
AUS$ 0.85 to US$ 1

8.4 References

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