
C Overseas buybacks

Key points

- Water rights and institutions in the western United States are substantially different from Australia. Most users have 'appropriative' rights to source water, and strong protection of third party interests makes trading water difficult and expensive.
- In many states, the development of irrigation has reduced the amount of water in rivers and lakes, which has damaged fish populations.
- In response, water has been administratively reallocated to the environment through legislation and voluntarily reallocated through numerous water buybacks.
- Some water buybacks are run by government agencies, while others are run by non-government organisations, like conservation trusts.
- Purchase mechanisms vary, with negotiation being commonly used. Temporary trades (leases) are more common than permanent trades (transfers).

The terms of reference ask the Commission to review mechanisms used internationally to purchase water entitlements. While there are many examples of water buybacks in the western United States, there do not appear to have been major water buybacks in other countries (except Australia). This is not surprising as there are only a small number of countries with developed water property rights and a high level of environmental concern (PC 2003).

This appendix covers buybacks from California, Oregon and Colorado (table C.1). These states were selected because their water institutions are relatively advanced, making the lessons from environmental water buybacks in these states broadly applicable to the Murray-Darling Basin. The case studies also highlight a range of approaches to buying environmental water.

Table C.1 Summary of water buyback organisations and programs covered in this appendix

<i>Organisation/Buyback</i>	<i>Water acquired (total holding)</i>	<i>Purchase mechanism</i>	<i>Organisation type</i>
Deschutes River Conservancy (Oregon)	360 ML per day	Mainly fixed rate payments, has experimented with tenders	Private
Freshwater Trust (Oregon)	390 ML per day	Mainly negotiation, including with individuals and groups	Private
Water Acquisition Program (California)	300 GL	Mainly negotiation	Public
Environmental Water Account (California)	340 GL	Mainly negotiation	Public
Instream Flow Program (Colorado)	970 ML per day	Most water acquired through donations (tax breaks)	Public
Colorado Water Trust (Colorado)	1 GL and 20 ML per day	Negotiation	Private

C.1 Water rights and institutions

The water buyback programs discussed in this appendix were designed with specific water rights and institutions in mind. In many cases, differences in the design and implementation of water buyback programs can be explained by differences in state water law, or other institutional characteristics. These institutional characteristics are also relevant in assessing whether some of the buyback mechanisms used in the western United States could be used in Australia.

Appropriative rights (defined below) are the most common type of water right in the western United States. Colorado and Oregon use appropriative rights almost exclusively, while California uses a mix of appropriative and riparian rights (PC 2003). Riparian rights in the western United States permit the owners of land adjacent to natural watercourses to divert water for ‘reasonable and beneficial’ use. Riparian users share water equally according to the area of land irrigated. Riparian rights are generally ‘senior to’ appropriative rights, meaning that riparian claims must be satisfied before other users are assigned water (DWR 2005). Water buybacks usually focus on appropriative rights since riparian rights cannot be traded separately to land. Hence, the institutions discussed subsequently in this section relate only to appropriative rights.

Appropriative rights allow water right holders to divert a specified flow or volume of water, subject to conditions. For example, appropriative rights must be used ‘reasonably and beneficially’ (that is, not wasted) (PC 2003). Moreover, the diversion and use of water must not cause unlawful injury to other water right holders (Rice and MacDonnell 1993). The ‘no injury’ rule is used by state agencies

and water courts to assess water transfers and leases, and to ration available water among competing right holders (box C.1).

While the owners of appropriative rights have a perpetual right to use water, the water resource remains in the public domain (Water Colorado 2009). Individual irrigators sometimes own appropriative rights, but these rights are more commonly owned by water wholesalers and retailers, with irrigators sourcing water through shares or other contractual rights (box C.2) (PC 2003).

Box C.1 Rationing water with appropriative rights

Suppose there are two appropriative rights over a river. Person S (senior) has a right that was established in 1880, with a nominal entitlement of 10 ML per day. Person J (junior) has a right that was established after 1880, with a nominal entitlement of five ML per day. To keep the example simple, irrigators are assumed to use all of the water they are entitled to. The complication of return flow is also ignored.

If streamflow exceeds 15 ML per day, both appropriative rights can be satisfied. If streamflow is between 10 and 15 ML per day, and person J was to continue to extract five ML per day, their behaviour would injure person S (who, having the older water right, would have first claim to any available water). Under these circumstances, person S would be entitled to initiate a 'river call', and the relevant state agency would order person J to reduce irrigation until sufficient water was available for person S (DWR 2009). Over this range, rationing would be borne entirely by person J. If streamflow is less than 10 ML per day, person J would cease diversions, and person S would have to reduce water use (being limited by streamflow).

This example can be generalised to the case of many appropriative rights, with people holding 1880 rights being allocated their full entitlement before people holding 1881 rights receive any water, and people holding 1881 rights being allocated their full entitlement before people holding 1882 rights receive any water, and so on.

In some states rationing is even more complex. In Colorado, for example, 'priority' is jointly determined by the date of appropriation and water use. Under this system, water for human consumption is given highest priority, followed by agricultural water, and then water for other uses (PC 2003).

Box C.2 Irrigation water supply chain

In Colorado, there are approximately 50 water wholesalers. Water wholesalers are responsible for operating water infrastructure, and source water through appropriations or leasing arrangements with government infrastructure agencies.

Water retailers are responsible for distributing water to end users, and are usually structured as public water districts (also known as irrigation districts) and mutual companies (also known as ditch companies). Unlike mutual companies, public water districts can raise taxes on property (Anderson and Snyder 1997). Water retailers sometimes own water rights, or alternatively, contract with wholesalers to access water.

Water users supplied by water retailers generally have rights to a share of (district or company) water by virtue of land ownership, contractual arrangement, or stock ownership (PC 2003).

What are the barriers to trade in appropriative rights?

In principle, appropriative rights can be transferred among users within connected river systems. However, in most states there are numerous institutional barriers that substantially limit the extent of permanent trade. These barriers also constrain environmental water buybacks, which are generally subject to similar institutional barriers as transfers among consumptive users.

As discussed in box C.2, irrigators may own water shares rather than appropriative rights. Since transfers of water shares within an irrigation district do not require appropriative rights (underlying the water shares) to be transferred, trade in water shares is a matter for irrigation districts and is not subject to state water law. While irrigators may require permission from their irrigation districts (or mutual companies), irrigators are generally able to trade water shares within their district relatively freely.

The transfer of appropriative rights, on the other hand, is subject to numerous (and sometimes prohibitive) rules. Proposed transfers are usually assessed on the basis of injury to third parties. Oregon and Colorado only consider ‘unlawful injury to water rights’ (box C.3), while California also considers injury to wildlife and rural communities.

Transfers may also need to be approved by government infrastructure operators. In California, the majority of water infrastructure is managed by the United States Bureau of Reclamation and the Californian Department of Water Resources.

Transfers that require the use of government infrastructure must be approved by the relevant operator, in addition to the standard assessment process outlined above.

Box C.3 The approval process for transfers of appropriative rights in Colorado

The transfer approval process in Colorado is long and complex. Buyers must first demonstrate their intention to divert water for beneficial use. A water right application is then submitted to the water courts. At the same time, buyers must publish a legal notice to announce their intention to buy appropriative rights. Interested parties then have two months to file a 'statement of opposition' on the grounds of injury.

The case is reviewed by the diversion engineer, who makes a recommendation to the water court. If there are no statements of opposition, the water referee will review the division engineers' recommendations and ask for clarifying information before making a ruling. In the absence of protests, the judge will sign the ruling. If there is opposition to the proposed transfer at any stage, and the parties cannot settle their differences privately, the case will be presented to the water judge at trial. The parties can appeal to the Colorado Supreme Court if necessary.

Sources: PC (2003); Water Colorado (2009).

In response to these legal impediments, water users have developed alternatives to the transfer of appropriative rights, such as leases. In Colorado, leasing water is relatively straightforward. Approval from the water court is usually not required, although written notice is needed and transfers may be challenged by other water users (PC 2003; Rice and MacDonnell 1993).

How common is water trade?

The limited extent of water trade in the western United States shows that there may be substantial transaction costs (and administrative barriers) associated with many leases and transfers of appropriative rights. Transaction costs can have a large influence on the net benefits of environmental water buybacks, and are a major consideration in their design and implementation.

There were around 2165 appropriative right transfers in the western United States between 1987 and 2005, with Colorado accounting for around three quarters of these transfers. By contrast, California had around 71 transfers over that period, while Oregon had around 12. California had around 365 leases, the largest number

of any state. Colorado and Oregon had around 90 and 60 leases, respectively (Brewer et al. 2007)¹.

The large number of transfers in Colorado relative to other states is mainly due to rules that partially exclude water users in the Northern Colorado Water Conservancy District (NCWCD) from some of the water transfer rules discussed above. The exemption is because the NCWCD sources water from another river basin (Rice and MacDonnell 1993). Moreover, appropriative rights in the NCWCD have equal priority — unlike in most other regions, where every right has a different (and sometimes uncertain) priority. In the NCWCD, the volume of water allocated to the consumptive pool is administratively determined, and then assigned to individual users based on the number of rights held. These features are similar to Australian water rights and tend to reduce the costs of trading appropriative rights, leading to substantial trading activity (Howe and Goemans 2003, p. 1056).

The institutional barriers to trade can be substantial outside the NCWCD. Some potential transfers do not satisfy legal requirements and are rejected or never attempted. The legal requirements also increase transaction costs and may cause long delays. In California, the broad interpretation of the ‘no injury’ rule can introduce substantial uncertainty over ‘who has standing to [contest a water transfer] and uncertainty over when interveners are entitled to block a transfer and when compensation should be paid’ (CWWM 1992, p. 223). In Colorado, the use of water courts means that water transfers generally require a water attorney and a water resource engineer (DWR 2009). Transfers usually take between four and 24 months. However, these delays compare favourably with Oregon, where it can take up to three years (Water Colorado 2009; WRD 2009a).

What are instream rights?

Most appropriative rights have diversion requirements. Without diversion, the water assigned to conventional appropriative right may be reallocated to other users, while the underlying water rights could eventually be cancelled. Environmental water is sometimes kept instream rather than being diverted, and hence, appropriative rights that have diversion requirements are unsuitable for many environmental uses. Instream rights are exempt from diversion requirements and often guarantee minimum streamflow over a river reach, or at a specific point, conditional on ‘senior’ appropriative right holders receiving a full allocation of water. Like appropriative rights, the priority of instream rights is determined by the date written

¹ These figures were collected by Brewer et al. (2007) from public sources and may not include all transfers and leases.

on the right. If an instream right has been established by converting an appropriative right, the instream right will retain the date of the initial right. If, on the other hand, an instream right has been created without cancelling an appropriative right, the priority of the instream right will be determined by the date that it was established.

In Colorado and Oregon, the ownership of instream rights is restricted to government agencies. However, Oregon in particular relies on private individuals and groups to buy environmental water. To comply with state water law, water rights are then donated to the State Government. In California, private individuals and groups can own instream rights (SWRCB 1999).

Are there administrative options for reallocating water to the environment?

The ability of governments to source appropriative rights is limited by state constitutions. For example, the Californian Constitution states that the Government must not deprive ‘any appropriator of water to which the appropriator is lawfully entitled’ (DWR 2005, p. 4.38). This protection has been lessened in California by an expansion in the public trust doctrine, which allows the Government to acquire compulsorily water for the environment. The Californian public trust doctrine requires the Government to allocate sufficient water resources for public uses, which were once limited to commerce, fishing and navigation, but now also include environmental protection. The new interpretation was established in 1983 by the California Supreme Court. In the Mono Lake case, the Supreme Court found that diversions by Los Angeles were harming wildlife and damaging recreational and aesthetic values, and therefore breached the public trust doctrine. The courts restricted Los Angeles’ appropriative rights by temporarily capping its diversions from Mono Lake at 15 GL per year and imposing other conditions (Anderson and Snyder 1997).

Federal Government regulation has also been used to reallocate water to the environment. For example, the *Endangered Species Act 1973* bans government and non-government actions that harm listed species, such as the wild summer steelhead and bull trout. During the 2001 drought, the Bureau of Reclamation allocated most of the water in Klamath Lake (a freshwater lake in south central Oregon) to support fish populations. This was challenged by local irrigators, who had existing water supply contracts with the Bureau of Reclamation. However, the federal district court ruled against the irrigators, saying that the Act took precedence over existing contracts (Pagel 2002).

Hence, some environmental needs take precedence over irrigator rights. This means that administrative reallocation can occur without agreement from irrigators, and voluntary mechanisms, such as water buybacks, may not be necessary to achieve environmental objectives. However, like the National Water Initiative's 'risk sharing principles', the conditions under which the coercive reallocation of water is legally possible are not always clear and are subject to dispute.

C.2 Water buybacks in Oregon

In 1995, total water use in Oregon was around 10 900 GL. Surface water use was around 9500 GL. The agricultural sector accounted for approximately 78 per cent of water use, with around two million acres of land being irrigated (Solley 1998).

Oregon has two main mountain ranges, the Coast mountains and the Cascades. There is substantial rainfall and snowfall in western Oregon, but eastern Oregon is typically dry (Schiller 1998). In the Deschutes Basin, rainfall varies from around 250 millimetres per year in the lower central region, to around 2500 millimetres per year in the eastern Cascades (CBWTP 2009). The main rivers in Oregon are the Klamath River (in southern Oregon), the Deschutes and Willamette rivers (in central and western Oregon) and the Columbia River (which marks the northern border with Washington). The Columbia River is the largest river in the Pacific Northwest region of North America.

Over the last century, the number of salmon in the Columbia Basin has fallen from around 16 million to around one million, and some species of salmon and steelhead have become endangered. This has been attributed to habitat loss and growth in consumptive water use, particularly in the agricultural sector (Garrick et al. 2009). The damage to salmon populations has caused widespread concern, with a poll conducted by an Oregon newspaper in the 1990s revealing that 60 per cent of respondents considered falling salmon numbers to be the largest environmental problem in the state (Schiller 1998).

The plight of salmon was a major consideration behind the development of basin plans in 1955. Basin level assessments were used to estimate diversion limits, and develop streamflow rules (Achterman 2008)². Water rights created before 1955 were exempt from the rules, and the rules were sometimes suspended to allow the owners of water rights created after 1955 to use additional water (Golden and

² In Oregon and other states the emphasis on saving habitat for fish tends to make environmental planning less complex than in Australia where there are a larger number of water-related environmental objectives.

Aylward 2006). The perceived ineffectiveness of streamflow rules in protecting the natural environment led to the introduction of instream rights in 1987.

In Oregon, there are currently over 1000 environmental instream leases and water rights, with a combined flow of 2200 ML per day. In 2007, the Water Resources Department received around 50 water rights through transfers and donations, with a combined flow of 600 ML per day. The Oregon Government does not buy or lease water directly. Instead, it relies on donations from conservation groups such as the Klamath Basin Rangeland Trust, the Deschutes River Conservancy, and the Freshwater Trust (WRD 2009b). But these groups are typically subsidised by state and federal governments (box C.4).

Box C.4 Government subsidies to private conservation in Oregon

Environmental water acquisition in Oregon is decentralised relative to other states. The Oregon Government does not buy water. The Oregon Watershed Enhancement Board (2001, p. 8) argues that 'local citizens and groups have the greatest understanding of watershed priorities in their local areas' and planning is decentralised to use this knowledge. The Board provides capacity building grants to conservation groups and funds environmental restoration projects, such as water buybacks. The commitment of private funds to any project must be at least 25 per cent. The total value of grants was around \$20 million in 1999, with the Board funding around 360 projects (Golden and Aylward 2006).

Private conservation groups can also receive grants through the Columbia Basin Water Transactions Program. The program was established by the Bonneville Power Administration, a federal government power company that operates throughout the Columbia Basin. Under the program, local groups submit proposals that are assessed within a competitive process and according to published criteria. The Columbia Basin Water Transactions Program operates at the basin level, and also buys water in Idaho, Montana and Washington.

There are a number of examples of water buyback programs in Oregon. This appendix will focus on the Deschutes River Conservancy's Instream Leasing Tenders and the Freshwater Trust's Water Acquisition Programs.

Deschutes River Conservancy

The Deschutes Basin is located in central Oregon, and supports one of the last remaining wild spring chinook salmon populations in the Columbia basin, as well as endangered bull trout and steelhead. Irrigation diversions in the Deschutes Basin have resulted in low winter streamflow along the upper Deschutes River, and low summer streamflow along the middle Deschutes River. During the summer

irrigation season around 90 per cent of streamflow is typically diverted from the middle Deschutes River (DRC 2009).

The Deschutes River Conservancy (DRC) was established in 1996 by environmental groups, a Native American group and local irrigation districts. The DRC receives around 45 per cent of its revenue from individuals, foundations and businesses. It receives a similar amount from state and federal governments. In 2003, several projects were funded under the Columbia Basin Water Transactions Program (CBWTP 2009).

The DRC has acquired and leased around 390 ML per day of instream rights and leases along the Deschutes River and its tributaries. This is a substantial increase from less than 100 ML per day in 2002. The DRC is around half way towards meeting its main water acquisition goal, which is to restore around 600 ML per day of streamflow to the Deschutes River.

In 2008, most water was sourced through a leasing program, which obtained 220 ML per day from around 230 landowners. Many landowners lease water to the DRC every year. A further 125 ML per day was sourced from water conservation programs (such as upgrading delivery infrastructure), while 15 ML per day was sourced from permanent transfers. The DRC also has a substantial habitat restoration program and has undertaken physical restoration work on around 160 km of streams, created a number of wetlands, and planted around 150 000 native riparian plants (DRC 2009).

The DRC uses a number of leasing arrangements, including:

- standard one year leases; split season leases (which allow irrigators to use water rights at critical times during the irrigation season)
- five year leases (which allow irrigators to withdraw before the start of each irrigation season).

Around 60 per cent of water in the leasing program is donated by landholders who are unable to profitably use water, but are nevertheless keen to retain their water rights for use or sale in the future (DRC 2009)³. The DRC leasing program has used a range of purchase mechanisms, such as tenders and fixed rate payments.

Instream leasing tenders

Before the introduction of instream leasing tenders in the Ochoco Irrigation district, the DRC used fixed payments to lease water from landholders. In 2002, irrigators

³ Under Oregon law, water rights must be used at least once every five years.

were offered a fixed payment of \$9 per ML, but this proved insufficient, with just one irrigator agreeing to lease water. The DRC realised that higher payments would be required to source additional water, but the ‘best’ payment was uncertain. Tenders were advocated as an alternative that would reveal information on irrigators’ willingness to accept (Hartwell and Aylward 2007).

The DRC used tenders in 2003 and 2004. In designing the tender mechanism a key motivation was to keep things simple. Discriminatory pricing was considered to be more intuitive than uniform pricing, while single round tenders were considered to be less complex than multiple round tenders. Single round tenders were also seen as a way of reducing transaction costs, compared with multiple round tenders (Hartwell and Aylward 2007).

The DRC used reserve prices to limit the costs of unexpectedly high bidding. The reserve prices were determined in advance and were not revealed to irrigators. The budget was \$50 000 in both years. Bids were ranked from lowest to highest (in terms of dollars per share)⁴, and successively higher bids were accepted until the reserve price was exceeded or the budget exhausted.

A similar process was used in both auctions. Initially, the DRC sent letters and applications to around 150 landowners in the Ochoco Irrigation District. Applications were only sent to landholders with more than 10 acres of water shares. Participants were given around three weeks to submit applications, while the assessment period was around two weeks.

In the 2003 tender, the reserve price was based on an analysis of fixed payment schemes in neighbouring irrigation districts, where the DRC had previously leased water, and ‘back of the envelope’ studies that valued water shares in the Ochoco Irrigation District. The studies suggested that the annual cost of leasing water could be around \$75 per share. The environmental benefits were the other main consideration in setting the reserve price, with the DRC concluding that the environmental benefits from an additional share were likely to exceed \$75 for most plausible levels of water purchases.

Seven landholders in the Ochoco Irrigation District submitted bids, ranging from \$29 to \$109 per share. In total, landholders offered 616 shares for sale and the total value of offers was just under \$50 000. Only three bids were below the reserve price

⁴ Landholders in the Ochoco Irrigation District source water through shares that are based on the area irrigated. For example, the volume of water available per (acre) share was 3.7 ML in 2003 and 4.9 ML in 2004. The allocation of water is still uncertain in February when the DRC tenders were conducted. Hence, the tenders were based on water shares that were specified in terms of acres (rather than volumetric allocations, which would have been specified in acre feet or ML).

of \$75 per share. These bids were accepted, securing 196 shares at a total cost of around \$10 500.

The DRC increased the reserve price the following season to \$91 per share. This was partly based on an assessment of the 2003 auction which revealed that increasing the reserve price to \$91 per share would have doubled the volume of water acquired. In 2004, nine landholders submitted bids, ranging from \$29 to \$85 per share, which were all under the reserve price. The total value of water shares offered was less than the budget constraint, so all bids were accepted, with the DRC leasing 642 shares at a total cost of around \$43 100. The average bid was \$67 per share (in volume weighted terms) — a 16 per cent decrease from the previous season. Irrigators who had participated in 2003 tended to cluster their bids in 2004 around \$60 per share (the highest price paid in the previous round) and \$75 per share (the reserve price in the previous round). Some irrigators who had submitted bids in 2003 above the reserve price revised their bids downwards, contributing to the convergence at \$60 and \$75 per share, while others did not participate in the 2004 tender.

In 2005, the DRC reverted to fixed payment water buybacks in the Ochoco Irrigation District. Under the tenders, the ‘cut off’ payment was around \$31 per ML in 2002 and \$22 per ML in 2003. (This is expressed in megalitres rather than shares so that the tenders can be compared with fixed rate payments using a common metric.) When fixed rate payments were reintroduced the offer was reduced to \$9 per ML. Despite a reduction in payments, the volume of water leased increased when fixed payments were reintroduced. While this could be attributed to the change in purchase mechanisms (although this is unclear), the additional leases could have also resulted from other factors, such as improved relationships with potential sellers.

Tenders versus fixed rate payments

The DRC has experimented with a number of different purchase mechanisms, including fixed payments and tenders, thus providing some evidence of the benefits and costs of these mechanisms in practice. Hartwell and Aylward (2007, p. 28) argue that the tenders were an improvement, and conclude that ‘compared with previous [fixed payment] methods, the auction was successful at increasing the amount of water leased and ensuring low restoration costs’.

However, while the volume of water leased increased under the tenders, some (or perhaps all) of this increase can be attributed to an increase in DRC payments from \$9 (under fixed payments) to \$31 (the cut off under the first tender) per ML (again, this is expressed in megalitres rather than shares).

As discussed above, fixed payments were replaced because the DRC was unable to determine in advance the number of water shares that would be supplied at different prices. While the instream leasing tenders did reveal information on landholder's willingness to accept, it was impossible to use this information to run a more effective tender since the reserve price was determined in advance. In this regard, the tenders did not contribute any additional flexibility.

The tenders could have been modified to introduce more flexibility. For example, instead of using a reserve price, the maximum payment could have been determined after examining landholder's bids. This would have allowed the DRC to respond to higher than expected bidding in 2003 by increasing its maximum payments. However, a potential drawback is that not using a reserve price could exacerbate overbidding in tenders with small numbers of participants.

Freshwater Trust Water Acquisition Program

The Oregon Water Trust was the first water trust in the United States. It was established in 1993 to address concerns that summer irrigation diversions were reducing habitat for anadromous⁵ and resident fish, limiting access to spawning grounds, and adversely affecting water temperature and water quality (Freshwater Trust 2009).

In 2009, Oregon Water Trust and Oregon Trout merged to become the Freshwater Trust with the aim of better coordinating water buybacks and watershed restoration. Oregon Trout was formerly a conservation group that undertook various watershed restoration programs, such as planting trees, restoring estuaries, resloping banks, and returning rivers to their historic channels.

In the late 1990s, the Oregon Water Trust received around two thirds of its water acquisition funding from private individuals and groups, and around one third from public agencies (Schiller 1998). Currently, the water acquisition program receives substantial funding from the Columbia Basin Water Transactions Program, which is run by the Bonneville Power Administration (a federal government power company that operates dams in the Columbia Basin).

In 2006, the Oregon Water Trust had around 390 ML per day of instream water, of which around 145 ML per day was sourced from water rights, with the remainder

⁵ Anadromous fish — such as Chinook salmon, steelhead, striped bass, American shad, white sturgeon, and green sturgeon — spend most of their lives in the ocean before returning to freshwater rivers to spawn.

being sourced through leases (Walker Foundation 2009). This water is acquired through donations and payments to landholders.

The Freshwater Trust is generally constrained when it uses money from foundations or government grants. For example, Columbia Basin Water Transactions Program money can only be used in the Columbia Basin. The Freshwater Trust must source alternative funding to buy water elsewhere. Within river basins, however, the Freshwater Trust has substantial discretion over which projects it undertakes.

The Freshwater Trust sources water mainly in basins that once supported substantial fish populations. Within these basins, it identifies streams where:

- additional water will increase the number of fish
- existing consumptive water rights can be transformed into secure environmental rights.

The Freshwater Trust specialises in buying water on small to medium size tributaries that provide spawning and rearing habitat for fish, and where the ecological benefits from small volumes of water can be substantial (Freshwater Trust 2009).

Purchase mechanism

The Freshwater Trust usually buys water from individual landholders. However, it has also leased water from irrigation districts. In 2005, for example, it struck an agreement with six ditch companies and 115 landholders, whereby landholders would be compensated for maintaining minimum streamflow in the Lostine River at 35 ML per day. This allowed adult Chinook salmon to migrate upstream to their spawning grounds. The Lostine River deal required majority approval within the six ditch companies, and passed with strong, but not universal, support from landholders.

When buying from individual landholders, the Freshwater Trust initially approached potential sellers through unsolicited letters and door knocking, which attracted only limited interest. An alternative, more successful method, has been working with local conservation groups who introduce the Freshwater Trust to landholders interested in selling water. The introductions build trust between buyers and sellers, which is valuable given the complexity of Oregon's water trading system.

Most acquisitions are negotiated and the Freshwater Trust will generally visit the landholder to learn about the business. They also discuss the landholders' objectives, since many landholders are motivated by non-financial considerations.

When developing an initial offer, the Freshwater Trust assesses the landholder's individual circumstances and the streamflow demands of the river. This introduces substantial flexibility, for example, a split season agreement was negotiated with Austin Ranch, which committed it to cease irrigating during July each year. The agreement contributes additional streamflow in the second half of the irrigation season, when water is more valuable to the environment than to Austin Ranch. The Freshwater Trust also uses payments to encourage:

- changes in land use, such as moving towards crops that use less water
- water conservation projects, such as installing new irrigation systems
- source switching from surface water to another source, such as groundwater
- point of diversion change (withdrawing water further downstream, meaning that additional environmental water is available between the initial and new points of diversion)
- rotational pooling agreements which involve neighbours sharing water rights on a rotational basis (Freshwater Trust 2009).

Landholders also have the flexibility to (temporarily) lease or (permanently) transfer water to Freshwater Trust. Leases are seen as having three main advantages. First, leases give landholders a chance to evaluate the costs of using less water, while retaining the ability to resume full water use in the future. Second, leases allow the Freshwater Trust to buy water on short notice in response to drought and other unexpected events. This has advantages because in Oregon permanent transfers can take a number of years. Third, there is generally less opposition to leases in rural communities. As mentioned above, the transaction costs of permanent transfers in Oregon are substantial, and may exceed the transaction costs of perpetually renewing leases.

As well as cash payments, the Freshwater Trust has used 'in kind' payments. For example, a landholder near Buck Hollow Creek agreed to sell water in exchange for hay as compensation for reduced pasture production.

Personal negotiation tends to have higher transaction costs than alternative purchase mechanisms for mass acquisitions, but in circumstances where only a small number of potential sellers are involved, negotiation may be more appropriate, thus reducing transaction costs and increasing flexibility.

Monitoring

The Freshwater Trust has an extensive monitoring program to ensure that environmental water is not diverted illegally. The Freshwater Trust monitors around three quarters of the environmental water sourced under its programs (mainly through irregular streamflow measurements and fixed gauges). The Freshwater Trust also monitors changes in the ecological condition of streams where water has been acquired or restoration activity undertaken. In the Lostine River example, ecological monitoring is conducted by the Fisheries Research Division of the local Native American Tribe, who run annual Spring Chinook Salmon surveys.

C.3 Water buybacks in California

In 1995, total water use in California was around 63 400 GL, with surface water use at around 43 200 GL. The agricultural sector accounted for approximately 80 per cent of fresh water use, with around nine million acres of land being irrigated (Solley 1998).

The buybacks discussed in this section occur in California's Central Valley, which extends around 650 km from north to south, and produces around 8 per cent of agricultural output (by value) in the United States. The northern half, also known as the Sacramento Valley, receives around 500 millimetres of rain annually. The southern half, known as the San Joaquin Valley, is substantially drier. The Sacramento and San Joaquin Rivers meet at the Sacramento-San Joaquin River Delta, which is the largest estuary on the west coast of the United States. The Delta also supplies water to the Central Valley Project, the State Valley Project (major infrastructure developments) and the San Francisco Bay Area.

Around 60 per cent of anadromous fish species in California are in danger of extinction. According to Lauer (2009), the pink and chum salmon, southern steelhead and coho salmon face the greatest immediate threat. The Californian Government conducts regular fish surveys in the Sacramento-San Joaquin River Delta. The most recent survey results, released in 2009, suggest that the populations of many fish species, including Delta smelt, were the lowest since records began. Lauer (2009) attributes this to increased long-term diversions for consumptive use, as well as the impacts of drought and climate change.

This appendix examines two Californian water buybacks — the Water Acquisition Program and the Environmental Water Account. Expressed in terms of value, these are among the largest environmental water buybacks in the world, yet are still very modest by comparison to *Restoring the Balance*.

Water Acquisition Program

The Water Acquisition Program (WAP) is administered by the US Department of Interior. The program was established to address commitments under the *Central Valley Improvement Act 1992* (US) to increase waterfowl habitat and fish numbers. Some WAP water is allocated to wildlife refuges to restore wetlands that provide habitat for waterfowl (USBR 2003a). WAP water is also used to implement the Anadromous Fish Restoration Program, which was introduced to double the natural production of anadromous fish.

Since 2000, the amount of water purchased annually under the WAP has varied from around 265 to 345 GL. Around one third is typically allocated to wildlife refuges, with the remainder being used to increase streamflow. Average annual expenditure on water acquisitions is typically around \$US15 million (USBR 2009).

Purchase mechanism

The WAP buys water mainly from major water users such as public irrigation districts through direct negotiation. The Department of Interior has expressed an interest in buying water from individual irrigators, but nevertheless recommends that people work with their irrigation districts to ‘develop coordinated water transfer proposals capable of providing substantial quantities of water’ (DWR and USBR 2008, p. 6).

Until 2000, the volume of water acquired under the WAP was highly variable, in part, because most purchases were conducted on an annual basis. This changed as a result of the San Joaquin River Agreement, which committed members of the San Joaquin River Group Authority (an alliance of major water users on the San Joaquin River and tributaries) to make water available for the River. There are complex rules governing the supply of water by the San Joaquin River Group Authority, with environmental releases varying throughout the year and depending on seasonal conditions (EAEST 1999). Water that is not sourced under this Agreement continues to be acquired on an annual basis.

Environmental Water Account

The Environmental Water Account (EWA) was established in 2000 by CALFED, a joint initiative of 25 government agencies that have responsibility for the Sacramento-San Joaquin River Delta. CALFED implements environmental pumping regulations that limit diversions from the Sacramento-San Joaquin River Delta at certain times. These regulations also reduce the overall volume of water

that can be diverted by Central Valley and State Water Project pumping plants in any season. The EWA was established to reduce the impact of pumping regulations on overall diversions by acquiring water from willing sellers, and delivering this water to the Central Valley and State Water Projects as compensation. The process was explained by Begley et al. (2006, p. 32):

When [fish deaths] are approaching limits set by the EWA regulatory agencies, a EWA panel can ask for pumps to be shut down. For example, Department of Fish and Game biologists monitoring the salmon populations on the Sacramento River could advise the Department of Water Resources to decrease pumping for a designated amount of time, allowing migrating fish to swim safely through. The Water Projects are then reimbursed for the loss of water associated with the periods of decreased pumping.

EWA acquisitions were around 340 GL in 2007 (CALFED 2008).

Purchase mechanism

The EWA trades with major sellers only, including water districts and groundwater banks — it does not buy water from individuals (Hollinshead and Lund 2006). EWA water is generally purchased north of the Sacramento-San Joaquin River Delta, where water tends to be less expensive. Moreover, this generates additional environmental benefits as water must pass through the Delta to be delivered to Central Valley Project and State Water Project pumping plants.

While the EWA could use a mix of long-term and short-term arrangements, it tends to use leases and single-year options contracts to source water. Options contracts are usually signed early in the year, before uncertainty surrounding water availability has been resolved. DWR (2002, p. 7) noted:

The price of the option paid to the seller will be negotiated and is typically small, paid early and non-refundable except in limited circumstances. The total price of the water if 'called' will include the option price as a downpayment. 'Call dates' for options are negotiable but should balance the needs of prospective buyers and sellers.

Water leases and options are generally purchased through negotiation. The EWA contacts water districts, inviting them and other interested parties to submit proposals. The EWA will then meet with potential sellers to negotiate (DWR 2002). Potential acquisitions are evaluated with reference to 'need, availability, and cost' (CALFED 2000).

The administrative complexity associated with water sales under the EWA can be considerable. For example, sellers may need to evaluate the socioeconomic impacts of the sale, and are encouraged to 'complete their own environmental documentation of the water [sale] in compliance with the *California Environmental*

Quality Act [1970]' (DWR 2002, p. 7). These costs may explain why large sales are more common than small sales.

Recent changes

The EWA has not reversed the decline in endangered fish numbers. CALFED conducted a review of the program in 2007, which concluded that 'it is uncertain whether EWA actions are having any favourable impact on [fish that reside exclusively in the delta]' and while 'actions taken to protect anadromous species have had a positive influence ... actions outside the Delta have been far more effective in improving populations than the EWA actions in the Delta' (CALFED 2007, p. 3). In response to the review, the federal court ruled that the existing biological opinion regarding the use of pumping facilities was inadequate. The federal court has since introduced new 'operational actions' on the Central Valley Project and State Water Project, and has relaxed the requirement on CALFED agencies to provide compensation. Because the EWA was established mainly to deliver compensation, the future of the program is uncertain. A limited version of the EWA is planned for 2009, while the program may be discontinued in 2010.

In 2003, a plan was developed to coordinate the WAP and EWA, with the intention of avoiding competition between the programs and increasing efficiency (USBR 2003c). The extent of coordination is not clear, but where possible water is acquired to meet the objectives of both programs (USBR 2003b).

C.4 Water buybacks in Colorado

In 1995, total water use in Colorado was around 19 100 GL, with surface water use at around 16 000 GL. The agricultural sector accounted for approximately 92 per cent of water use, with around four million acres of land being irrigated (Solley 1998).

Colorado has experienced many of the same environmental problems as California and Oregon. Colorado Trout Unlimited (2009, p. 1) noted that 'many rivers and streams in Colorado are heavily depleted and lack the flows necessary to sustain healthy coldwater fisheries'. Moreover, the number and size of wetlands has decreased, with Colorado losing approximately 50 per cent of wetlands between 1790 and 1990. The construction of dams and other barriers to fish movements, and the proliferation of introduced species have also contributed to environmental damage. In the Colorado River, 25 per cent of native fish are endangered (Upper Colorado Endangered Fish Recovery Program 2009).

To address these concerns, a number of water buyback programs have arisen. Some of these are run by conservation trusts, such as the Colorado Water Trust, while the Colorado Government also has a buyback program.

Instream Flow Program

The Instream Flow Program (ISFP) was established in 1973. The program is run by the Colorado Water Conservation Board (CWCB) (Charney 2005). The ISFP was intended to ‘correlate the activities of mankind with some reasonable preservation of the natural environment’ by sourcing water through appropriations, and hence creating new water rights (Merriman and Janicki 2009, p. 1). The program has been expanded to include acquisitions (permanent transfers and leases), with the CWCB being allowed to ‘buy or accept donations of water reasonably necessary to improve the environment’ (Malloch 2005, p. 52). There were four leases and 17 transfers under the ISFP between 1973 and 2005. The combined flow associated with these leases and transfers is almost one GL per day (Charney 2005).

Any person can apply to have a stream or lake considered for the ISFP, including state and federal government agencies. The CWCB then invites public comment, and assesses proposals within an annual review cycle. Once a stream or lake has been included in the program, there is another approval process for each appropriation or acquisition. Under existing rules, instream rights are held in public trust and cannot be sold.

Acquisition programs

Before 2008, CWCB did not have a budget to buy water, and instead acquired water through donations, which received a tax break (Landry 1998). In 2009, the CWCB was assigned \$1.5 million to buy water (CWT 2009a). The rules and guidelines governing the buyback were finalised in March and by September 2009, the CWCB was working on a number of proposals. The CWCB is collaborating with voluntary organisations, such as the Colorado Water Trust and Trout Unlimited. For example, the Colorado Water Trust is locating and negotiating with potential sellers, and may share the costs of some acquisitions.

In 2009, the Colorado Government also established a tax credit program. Under the program, the CWCB will allocate income tax credits to landholders who donate water rights to the ISFP. The tax credits will be up to 50 per cent of the value of the donated water right, as determined by the CWCB. These are more generous than the tax breaks that previously applied. Around \$2 million a year has been allocated to the program (CWT 2009).

Colorado Water Trust

The Colorado Water Trust (CWT) was established in 2001. It is a private, non-profit organisation ‘that engages in and supports voluntary efforts to restore and protect streamflows in the state of Colorado’ (CWT 2009b, p. 1). The primary mechanism for acquiring water has been (permanent) transfers, but with recent legal changes that reduce the costs of (temporary) leases, leases are now an option that they are considering. The CWT has completed transfers on Blue River and Hat Creek, and is currently working on two further deals.

Prioritisation

When it was established, the CWT surveyed a number of government agencies and conservation groups to develop a list of priority watersheds (Malloch 2005). The CWT is currently undertaking a more comprehensive state-wide assessment process. Within priority watersheds, water rights are assessed against the following criteria:

- **Conservation Benefits** — The water right must benefit a ‘water-short’, ecologically significant, water-dependent natural environment. Are there significant conservation benefits, such as providing an instream flow that will benefit a water short existing CWCB instream flow? Is it a stream reach that lacks a CWCB appropriation because of insufficient water? Will a trout or native fish stream reach benefit from the acquisition? Are there water-dependent natural areas, such as wetlands and riparian areas, or environmentally beneficial agriculture and wildlife habitat?
- **Credible Records** — There must be credible records of actual consumptive use of the water right. Except under extremely limited circumstances, the Colorado Water Trust will not accept conditional rights.
- **Public versus Private Benefits** — Will the acquisition provide greater public than private benefits?
- **Secondary benefits** — Is there public access to the protected stream reach that will benefit? Is there urban proximity? Are there recreation benefits? Aesthetic?
- **Support** — The Colorado Water Trust will also work to avoid the purchase of water rights whose change of water rights application will be hotly contested. Is there support from the local community and other stakeholders and water users?
- **Collaboration** — Does the acquisition provide the opportunity to collaborate with other conservation programs and organizations and local groups?
- **Duplication of Conservation Efforts** — The water right should complement rather than duplicate or compete with other established conservation programs.
- **Colorado Water Law** — If the water right is acceptable, the change of water rights application must comply with every aspect of Colorado water law, including the

law governing water development under interstate compacts and equitable apportionments (CWT 2009b, p. 1).

Acquisitions

In 2004, the CWT acquired a water right to 21 ML per day on Blue River for around \$130 000. As required under Colorado law, the water right was donated to the CWCB and an instream right was created over 12 miles of Boulder Creek (a tributary of Blue River). As mentioned above, the transaction costs associated with permanent transfers in Colorado are substantial. In the Blue River example, the transaction required around \$70 000 of donated legal and engineering assistance (Malloch 2005). However, this figure is somewhat misleading, because it was the first private environmental transfer in Colorado — subsequent transfers may not be as costly.