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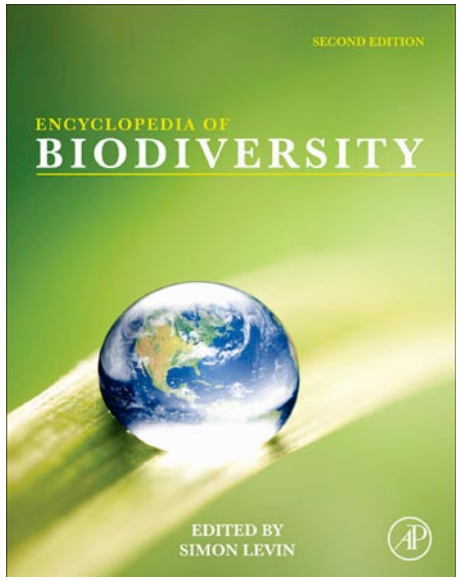

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Water Funds: A New Ecosystem Service and Biodiversity Conservation Strategy

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Glossary

$ All $ are US dollars unless otherwise stated.
Biodiversity The diversity and variety of life on earth.
Direct payments An exchange of money where a consumer of a service pays the provider for provision of that service.
Ecosystem services The benefits that ecosystems can provide to people.
Forest enrichment Planting trees in degraded or damaged forests to help recover forest density and/or to improve biodiversity by planting species otherwise unable to colonize and regenerate or that are threatened or vulnerable.
Global environment facility (GEF) An independent financial organization providing grants to developing countries and countries with economies in transition for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.
Indirect payments An in-kind payment in the form of materials, labor, or time rather than payments of money.
Livelihood investments A nonmonetary payment to compensate for opportunity costs of a change in land use can include alternative livelihoods, alternative food sources, and education investments, among others.
Payments for ecosystem services (PES) Defined in purely economic terms as a voluntary transaction where a well-defined ecosystem service(or a land-use likely to secure that service) is 'bought' by a (minimum one) ecosystem service buyer from a (minimum one) ecosystem service provider if and only if the ecosystem service provider secures ecosystem services provision (conditionality).
Payments for watershed services A subset of PES that involves a similar financial transaction but the focus is watershed-based hydrologic services.
Revegetation Replanting grasses, bushes, and other types of vegetation on cleared and bare soils.

Introduction

Water funds are an innovative ecosystem services-based approach to conservation that use a sustainable finance mechanism created through investments by water users and other stakeholders to ensure the long-term provision of critical hydrologic services from a watershed. Investments are essentially paid into an endowment fund. Fund contributions are used to improve management of small-scale farms and ranches in the watershed and to strengthen the conservation of protected areas. Through such investments, water funds ensure the long-term protection of critical terrestrial and freshwater systems while providing a clean, reliable source of water – the key hydrologic services for the downstream water users. Tailored to local conditions, these funds are rapidly replicating throughout Latin America, most prominently in Ecuador, Colombia, and Brazil (**Figure 1**).

Biodiversity in Peril

Latin America and the Caribbean (LAC) are among the richest regions in biodiversity worldwide (FAO, 2011). South America alone accounts for half of the terrestrial biodiversity in the world and contains the world's most biodiversity-rich region: the eastern slope of the Andes. LAC includes some of the world's most biodiverse countries, for example, Brazil, Colombia, Ecuador, Mexico, Peru, and Venezuela (Mittermeier *et al.*, 1997; Bovarnick *et al.*, 2010), and contains one quarter of the 33 global biodiversity hotspots – regions of high species endemism and high rates of habitat loss – in only 15% of the Earth's land area. Additionally, the region contains close to 800 million hectares of forested areas (more than 35% of the world's forests), 570 million hectares of wild savannas, 700 million hectares of agricultural lands, and 27% of the planet's available drinking water. From timber and nontimber forest

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products to water and nutrient regulatory services, biodiversity is of strategic importance for conservation and development in LAC.

Globally, human impacts are intensifying across Earth's lands and waters, leading to unprecedented biodiversity loss. In all, 33–50% of the Earth's land surface has been altered by the human action (Vitousek *et al.*, 1997) causing huge biodiversity losses, and declines in biodiversity are greater in fresh waters than in the most affected terrestrial ecosystems (Sala *et al.*, 2000). As a result some 10–30% of all mammal, bird, and amphibian species are threatened with extinction (Levin and Levin, 2004; Kiesecker *et al.*, 2004). Despite occupying only a tiny percentage of the planet's surface (0.8%), on a hectare-to-hectare basis, freshwater ecosystems are richer in species than the more extensive terrestrial and marine ecosystems (Revenga and Mock, 1999), and yet, freshwater habitats and species are proportionally more severely degraded and threatened than ecosystems on land or in the ocean.

Of protected areas worldwide, 20% are located in LAC (ECLAC, 2010) and are under threat due to poor governance, small budgets, and weak enforcement of legislation. One major threat is land conversion for agriculture and livestock (Barbier, 2004; CEPAL, 2005) as LAC, especially Central America and the Andes-Amazon region, has long been one of the cradles of global agriculture (Diamond, 2002; Purugganan and Fuller, 2009). Overexploitation also causes huge losses in marine and aquatic systems due to overfishing, more fleets, and permissive government incentives. Another growing cause of biodiversity loss that has not been thoroughly researched or noted is the spread of invasive species largely as a result of trade but also because of human travels via airplane or road. The roads themselves are highways for invasive species. Other threats to biodiversity include development and tourism. Direct threats to freshwater systems include dams, water abstraction, flow modification, overexploitation, overharvesting, pollution, deforestation, and invasive species (MA, 2005; Dudgeon *et al.*, 2006). Additionally, water quality and water flows are impacted by surrounding land uses.

Population growth and climate change further threaten LAC biodiversity. Population growth will require greater investments in resource development (IEA, 2007), but there is increased pressure to find ways to balance development needs with those of biodiversity conservation (Kiesecker *et al.*, 2009). Climate change could cause major ecosystems to shift and species to attempt to migrate, and indirect impacts such as storm intensity and frequency can provide further opportunities for previously nonthreatening exotic species to become invasive species. Additionally, climate change threatens to alter seasonality and annual precipitation patterns, further exacerbating threats to water resources (Vörösmarty *et al.*, 2000). For example, about 50 million people in the Andes could lack dry-season water for drinking, irrigation, sanitation, and hydropower. These threats require attention.

Freshwater systems are intimately tied to surrounding terrestrial systems, so conserving one requires conserving the other. Despite numerous efforts to protect watersheds or establish drinking water projects, few programs address the link with protected areas that were often created to protect water sources (McAlpine and Wottom, 2009; Nel *et al.*, 2009). While evidence suggests that it is more cost effective to protect than mitigate, the costs of watershed management have been almost universally neglected in water pricing. Worse still, these costs have not been evaluated against operational costs for water treatment or investment costs for new infrastructure. Recent evidence of shrinking clean water supplies and perceived water insecurity have made businesses and water utilities look at freshwater as they never have before: a valuable good that is produced, sold, and consumed and deserves investment. Increasingly, this investment is in the form of payment for ecosystem services (PES) projects to conserve freshwater systems.

Ecosystem Services and Payment for Ecosystem Services: Rapidly Expanding Conservation Approaches

In the latter half of the 1990s, researchers began using ecosystem service values to demonstrate the importance of natural capital (e.g., Costanza *et al.*, 1997), and with the publication of the Millennium Ecosystem Assessment (MA, 2005), the importance of biodiversity to secure livelihoods became increasingly evident, particularly through the delivery of ecosystem services – the benefits that nature can provide to people (Daily, 1997). In the past decade, more studies have looked at ecosystem service values and at the biodiversity values either directly associated with ecosystem services such as the economic benefits to pollination from conservation (e.g., Ricketts *et al.*, 2004) or the indirect, all-inclusive values such as the economic benefits and costs avoided by not creating protected areas (e.g., Bezaury-Creel, 2009). These have led to an increasing understanding of the relationship between biodiversity conservation, ecosystem services, and human well-being.

Inevitably, ecosystem service approaches to biodiversity conservation will require trade-offs that might imply that the conservation of one service is done at the expense (degradation) of another (e.g., Heal *et al.*, 2001; Pereira *et al.*, 2005; Rodríguez *et al.*, 2005, 2006). Of particular interest is the possibility that the recent emphasis on ecosystem services could actually detract from biodiversity conservation. For example, if projects are designed and managed with special attention to how people benefit, will that take attention away from biodiversity (Kareiva *et al.*, 2008)? Naidoo *et al.* (2008) found that locations selected for conserving ecosystem services would conserve only 22–35% as many species as locations selected for preserving biodiversity. What's more, only 16% of World Bank biodiversity-focused development projects resulted in a win–win for biodiversity and human well-being (Tallis *et al.*, 2008). That said, optimizing an ecosystem for one or a few services can prove beneficial provided the ecosystem can function as a whole (e.g., Tallis and Kareiva, 2006). As such, ecosystem services are one of many biodiversity conservation approaches.

Despite such trade-offs, ecosystem service approaches to conservation confer advantages, not the least of which is providing opportunities for conservation in new areas. Thinking in an ecosystem services framework can broaden the scope for conservation by expanding where we view conservation opportunities and what those opportunities are (Tallis *et al.*, 2009;

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Goldman *et al.*, 2008). Additionally, that approach can diversify stakeholder interest in and funding streams for conservation (Goldman *et al.*, 2008), so it is one of many useful approaches for conservation. While there is still uncertainty about what factors are likely to contribute to successful ecosystem service projects (Perrot-Maître, 2006; Asquith and Wunder, 2008; Engel *et al.*, 2008; Jack *et al.*, 2008; Daily and Matson, 2008) and debates about their use continue (e.g., Goldman and Tallis, 2009), these approaches continue to proliferate.

Ecosystem service projects can take a wide variety of forms and serve a variety of functions (Tallis *et al.*, 2009), but in applied conservation, PES projects are widely touted as an innovative finance mechanism (Salzman, 2005; Wunder, 2007; Jack *et al.*, 2008). In the last decade, PES schemes have received considerable attention (e.g., Landell-Mills and Porras, 2002; Pagiola *et al.*, 2007; Jack *et al.*, 2008; Sommerville *et al.*, 2009) with their focus on providing financial incentives to land owners or managers whose conservation actions benefit others when those benefits would otherwise not be compensated (Sommerville *et al.*, 2009).

Payment for watershed services (PWS) projects, a subset of PES approaches, are a significant portion of ecosystem services schemes (many others relate to carbon) and often involve water users paying "suppliers" for the delivery of clean, consistent water supplies (Brauman *et al.*, 2007; Krchnak, 2007; Asquith and Wunder, 2008; Porras *et al.*, 2008). Numerous case studies of these approaches exist in the developed (e.g., Perrot-Maître, 2006) and developing (e.g., Stanton *et al.*, 2010) world. In 2002, there were only 41 proposed and ongoing PWS schemes in developing countries (Landell-Mills and Porras, 2002), but the number more than doubled in 6 years as a recent review documented 50 ongoing, eight advanced proposals, and 37 preliminary proposals (Porras *et al.*, 2008). Both freshwater ecosystems (wetlands, aquifers, rivers, and lakes) and terrestrial ecosystems provide hydrologic services (MA, 2005) and help to regulate the quantity and quality of water accessible to people, but the value associated with this service is difficult to capture; there is no easily obtainable market value. Water funds are a mechanism that uses the value of these hydrological services to enable biodiversity conservation. **Figure 1** is the map of ongoing and proposed water funds.

Water Funds: Protecting Biodiversity Through Ecosystem Service Payments

The Nature Conservancy (TNC), in collaboration with numerous partners, has successfully replicated a series of PES projects called water funds across Latin America. In these funds, payments from water users help protect the ecosystems that provide important hydrologic services and help improve management of working landscapes to ensure regular supplies of clean water. TNC has partnered with the Inter-American Development Bank (IDB), the Global Environment Facility (GEF) and FEMSA Foundation to improve the water funds model, to further replicate it, and to explore new sources of private and public funding for watershed conservation and management. The US Agency for International Development (USAID) has been another critical partner in replicating water funds, particularly in Ecuador.

Through water funds, TNC has more than matched the rapid advancement of watershed-based ecosystem service payment schemes in the global developing world in just one region (the Northern Andes) using just one project approach. In addition to funds not supported by TNC, today there are about 45 TNC-supported water funds in some stage of development in LAC (**Figure 1**; **Table 1**) ten of which are operational. What makes the water fund model so successful? Water funds are driven by water users, and the approach has the potential to be successful in a variety of political and institutional settings throughout the world. They have many of the elements for success identified in similar schemes (Porras *et al.*, 2008; Landell-Mills and Porras, 2002) but they go beyond the basics to become truly participatory, long-term, adaptable, multi-institutional, sustainable watershed conservation projects that with strong leadership and advocacy set them apart from the others.

History of the Water Fund Concept

About 80% of the water for the city of Quito, Ecuador (nearly two million people) comes from three protected areas and their buffer zones: Cayambe-Coca Reserve, Antisana Reserve, and Cotopaxi National Park. These areas contain about 5% of Ecuador's land area, include headwaters of more than 20 rivers and six larger watersheds, and provide critical habitat for many of Ecuador's bird and mammal species, but a variety of activities threaten this biodiversity and the availability of the clean, regular water supply. These threats include insufficient budgets to adequately control and conserve protected areas and buffer zones to prevent ecosystem conversion, illegal logging, and deforestation, among others. Much of the pressure on the land is from the people living in the watershed, as they depend on natural resources for their livelihoods. Available productive land is diminishing as soils lose nutrients, forcing families to move up the watershed into the natural ecosystems – a mixture of forest and *páramo* (high altitude grasslands) – that are the key hydrologic regulators of the system. Conversion means diminishing water services to people downstream, but keeping watershed communities out is unjust and unsustainable.

In the late 1990s, with the results of the USAID- and Fundación Antisana-funded SUBIR I and II projects in hand, TNC approached the mayor of Quito to demonstrate that protecting Quito's watersheds was crucial if citizens were to continue to enjoy the same regular supply of clean water in the future. TNC wanted to create a finance mechanism for

Figure 1 TNC water funds in Latin America and the Caribbean – mature, created, and in design. An illustration of mature, created, and in-design water funds throughout Latin American and the Caribbean where blue dots indicate mature, operational water funds; green dots indicate water funds that have been formally created but are only just starting operations; and red dots indicate water funds that are currently in the process of being designed. Data for this figure comes from Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community.

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Table 1 Current status, location and number of beneficiaries of water funds projected portfolio in Latin America and the Caribbean

No	Water fund name	Country	Status of WF				Population
			Idea	Feasibility	Created	Consolidated	Beneficiaries
1	Agua por la Voda(East Cauca Valley)	Colombia					920,000
2	*Cartagena*	Colombia					892,545
3	*Medellin*	Colombia					2,700,000
4	*Sierra Nevada de Santa Marta*	Colombia					TBD
5	*Bogota Agua Somos*	Colombia					6,840,116
6	*Cali*	Colombia					2,100,00
7	*Manizales*	Colombia					TBD
8	*Barranquilla*	Colombia					TBD
9	FONAG, *Quito*	Ecuador					2,300,000
10	FONOPA, *Cuenca Paute*	Ecuador					800,000
11	Tunguahau/*Ambato*	Ecuador					350,000
12	Guayas, Guayaquil	Ecuador					TBD
13	Procuencas, Zamora	Ecuador					25,000
14	Ayampe, *Puerto López*	Ecuador					16,000
15	Merida	Venezuela					630,000
16	Sixaola River	Panama					10,000
17	Terraba	Costa Rica					TBD
18	Sao Paulo/PCJ Watershed	Brazil					9,000,000
19	Sao Paulo/Upper Tiete Watershed	Brazil					TBD
20	Paraiba do Sul Watershed	Brazil					100,000
21	Guandu/Rio de Janeiro	Brazil					8,000,000
22	Camboriu Watershed	Brazil					1,000,000
23	Pipirupau/Brazilia	Brazil					350,000
24	Taquarussu/Palmas	Brazil					100,000
25	Minas Gerais PES	Brazil					TBD
26	Espirito PES state Program	Brazil					300,000
27	Sao Paulo State PES	Brazil					TBD
28	Parana PES State PES	Brazil					TBD
29	Rio de Janeiro PES State Program	Brazil					TBD
30	La Tigra, Tegucigalpa	Honduras					2,000,000
31	*Guatemala City*	Guatemala					2,900,000
32	Rivera Maya-Cancún	Mexico					2,000,000
33	*Monterrery*	Mexico					4,000,000
34	Sierra Madre de Chiapas	Mexico					800,000
35	Aquafondo, *Lima*	Perú					9,000,000
36	Arequipa	Perú					1,000,000
37	Trujillo	Perú					751,000
38	Piura	Perú					500,000
39	Santiago/Valparaiso	Chile					TBD
40	La Paz	Bolivia					2,300,000
Total							58,098,166.00

watershed conservation, and then Ecuador Program Director, Roberto Troya, obtained the support of the mayor, the municipality and the Quito water company (Empresa Municipal de Alcantarillado y Agua Potable de Quito – EMAAP-Q – the key water user) to do so.

The financial approach was carefully evaluated and selected because it was ecologically sustainable, legal, politically viable, efficient, and participatory (Krchnak, 2007). In January 2000, it was decided that voluntary donations from stakeholders would go into a trust fund that would form the financial basis of the water fund. The Quito Water Conservation Fund – Fondo para la Conservación del Agua or FONAG – was thus created as an endowment fund now receiving money from government, public utilities, electric companies, private companies, and nongovernment organizations. The donations were invested and managed by an independent organization through a trust, and initially, only the interest was used to fund activities. Over time, the financial model has shifted; now some contributions go into the endowment and some immediately finance conservation activities.

FONAG initially had two main members: TNC and EMAAP-Q. Other water users have since joined such as the Quito Electric Company (La Empresa Eléctrica de Quito – EEQ) in 2001 and private organizations including a beer company (Cervecería Andina) in 2003, the Swiss Agency for Development and Cooperation (COSUDE) in 2005, and a water bottling company (Tesalia Springs Co.) in 2005. Incentives for participation vary but are complimentary. The main incentive for EMAAP-Q and the other major water users was avoiding or reducing future costs for water treatment and

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supply, functions provided by the conserved ecosystems. For TNC, the incentive was long-term financing for conserving protected areas (Goldman *et al.*, 2010a).

FONAG is governed by a board of directors comprised of water users who have contributed to the fund. The board approves the annual operational plan and reports, conducts audits, and reforms the bylaws. It also has a technical secretariat that acts as executive director.

In 2004, TNC invited the mayor of Quito to visit the PES mechanism in New York City, the example upon which FONAG was created. As a result of this visit, the mayor helped support and pass a municipal ordinance dedicating 2% of water fees to FONAG. TNC and the FONAG secretariat have been instrumental in helping explain and explore the benefits nature can provide to people, in this case, hydrologic services. USAID was another critical component of FONAG's success and has been a key player in strengthening FONAG and in financing a variety of the fund's activities.

The water fund concept has been improved dramatically since FONAG. Several have used cutting-edge science to meet challenges like the funds in Bogotá and the Cauca Valley of Colombia and in the Paute watershed near Cuenca, Ecuador. New users like major hydropower companies and big agricultural producers are involved and are beginning to understand and learn about the value of nature to their business operations. TNC has proposed a model and a business plan to replicate water funds in new places around the world.

The Institutional Workings of Water Funds

Clean water is a basic human necessity: not only do people require it for drinking, but many industries require it for production including everything from electricity to beer. In many watersheds, this life-supporting service comes from surface flows and aquifers. Nowhere is this truer than in the Northern Andes region of South America. Here, surface flows from high altitude head waters supply water to diverse users most notably several large cities (e.g., Bogota and Quito), hydropower companies, and in some cases, agricultural producers. These users have a vested interest in maintaining clean, regular water flows at the lowest cost and in managing supply risks. Water funds emerged from these concerns.

Water Funds are an innovative way to pay for nature's services – clean freshwater and biodiversity – by investing in conservation projects that protect the healthy habitat from which the services derive. Each water fund has its own set of objectives and goals, but in general, they invest to: (1) improve or maintain water quality and water quantity for downstream users; (2) maintain regular flows of water throughout the year; (3) maintain or enhance natural ecosystem biodiversity, both freshwater and terrestrial; and (4) improve or maintain human well-being and quality of life for upstream human communities (Goldman *et al.*, 2010a).

Historically, water flows and water cleanliness have been naturally regulated by predictable precipitation patterns and natural vegetation, but deforestation and the degradation of natural ecosystems, increased human demand for water, and a changing climate are all threatening and disrupting the ability of ecosystems to provide these services. Thus, water purification and storage services are now increasingly provided by water filtration plants or regular dredging of reservoirs to remove unwanted sediments. Water funds aim to restore or maintain nature's ability to provide these critical hydrologic services. In the long run, it could be cheaper and more sustainable than investing in business as usual, that is, gray infrastructure.

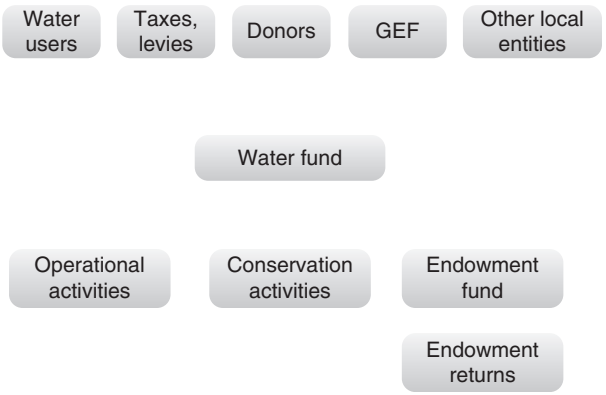

Figure 2 Water fund general model including financial flow and operational process. A wide variety of water users and other donors have invested money in water funds. Depending on the fund, portions of investments are directly invested in operational activities and conservation activities (protection and restoration) while the rest of the fund money is invested in an endowment fund. Capital from the endowment fund similarly funds operational and conservation activities.

Figure 2 summarizes the basic water fund model. The funds attract contributions from water users such as water utilities and local industries. These contributions build the funds' capital, including an endowment fund. In turn, endowments are invested in a wide range of assets (e.g., money market, bonds, and stocks) and the revenue generated from those investments provides long-term, secure funding for conservation projects like creating and strengthening protected areas, helping neighboring landowners switch to conservation-friendly management practices, paying for conservation easements, and financing environmental initiatives for local communities. Species benefit from having larger and better protected territories, communities benefit from a healthy watershed and improved land management, and large water users benefit from the resulting reduced water treatment costs. In addition, investments in watershed management reduce the risk of future clean water shortages that promotes long-term economic growth. With watershed conservation as a common objective, water funds create a governing body often bringing together public and private partners to manage it.

Investing in Watersheds: Providing the Hydrologic Services

Water funds invest in nature and in people by resolving potential conflicts between the resource needs of watershed communities and the conservation needs for water-service supply. Thus, investments focus on:

1. Managing public protected areas; and
2. Implementing best management practices on productive systems.

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Ensuring good conservation management and providing incentives to conserve and restore natural ecosystems can provide long-term protection for the watershed but only if the incentives are sufficient to compensate people for any negative impacts.

Public Protected Area Management

The Northern Andes Region contains 20% of the World's biodiversity in an area that covers only 0.2% of the world's surface; 17% is protected and a relatively intact mixture of native forests and *páramo*. However, growing demand for land and access to resources to support livelihoods is increasingly threatening protected areas, and the level of government investment is not sufficient. For example, in 2005 according to the Ministry of Environment in Ecuador, there were 31 legally declared protected areas and there was a budget shortfall of ~$9.5 million (all $ as USD unless otherwise stated). For even the most basic management the gap was still ~$3.6 million. Despite numerous efforts, few programs address the link between managing protected areas and drinking water (Echavarria, 2002; Benitez *et al.*, 2010). *Páramo*, in particular, is a crucial water regulator; disturbance can damage or destroy its hydrologic functioning (Buytaert *et al.*, 2006, 2007). Water funds do address the link between drinking water and protected areas and can supplement budgets by cofinancing park guards, creating community-based ecotourism programs, and improving infrastructure management (**Table 2**). Park guards paid by the water fund are from the local communities ensuring community participation and acceptance, and providing a stable source of income for participating families.

Implementing Best Management Practices

In the watersheds, families rely on crop and ranchlands for income in and around protected areas. Managing these lands can have major impacts on water quality, the timing of flows (particularly floods), fires, and freshwater biodiversity. Water funds seek to minimize these impacts by providing direct and indirect payments to families for land management that includes setting aside conservation areas (e.g., fencing off riparian areas and headwaters), restoring and revegetating priority areas, silvopastoral management (e.g., live fences, forage plants, and rotating pastures), creating agroforestry systems, and/or creating tourism facilities (**Table 2**).

Specific conservation management practices supported by the water funds will vary by location, but investing in land management is essential for providing ecosystem services.

Table 2 Conservation activities of water funds

Activities	*Description*	*Type of strategy*	*Relation with water and biodiversity*		
			Area maintenance (conservation)	*Best practices*	*Restorations*
1. Public protected area management plan implementation					
1.1. Co-finance park guards	Improve control of high-risk conservation areas	Threat abatement	■		
1.2. Community-based eco-tourism programs	Reduce threats to buffer zones through income substitution	Threat abatement	■	■	■
1.3. Improve infrastructure management	Support best practices on management of current and new infrastructure in the park	Threat abatement	■	■	■
2. Best practices at the farm or productive unit					
2.1. Set aside conservation areas	Environmental payment for areas set aside for conservation on farmland: along streams, headwaters or forest connectivity	Conservation	■		
2.2. Set aside areas and restoration	Restoration payments and future environmental payments for areas set aside for conservation and restoration	Conservation			■
2.3. Silvopastoral systems	Improve productivity of farm with more environmentally-friendly cattle ranching practices such as live fences, forage plants, rotation of pastures	Best practices		■	
2.4. Agroforestry systems	Introduce environmental practices in the farm	Best practices		■	
2.5. Tourism facilities	Income substitute for land use practices	Conservation	■		■

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These services can benefit the landholder (by enhancing soil stability and nutrient cycling), other people in the watershed (by providing clean and consistent water flows), as well as the broader ecosystem (by protecting habitat and biodiversity). Changing management practices is not, however, without cost. Restricting access to fertile soils in natural ecosystems and encouraging conservation management on productive lands involves trade-offs. Families are left with less land, so adequate, appropriate compensation is necessary.

The Payments: Compensating Impacts

Water funds must be flexible as they are established in geographically diverse places and in different legal and institutional settings. This includes the type of compensation provided to watershed communities. In the Northern Andes, indirect payments and livelihood investments have worked best. Indirect payments are in the form of materials and training to improve land management such as supplies for fencing and seeds for revegetation. Ideally, conservation management will enhance farm/ranch productivity by producing on-farm ecosystem services such as soil stabilization and enhanced soil fertility, but these benefits will not be immediate and are not guaranteed. In the shorter term, conservation management agreements include livelihood investments such as environmental education programs, alternative income sources like guinea pig farms, alternative food sources like organic vegetable gardens, and expanded capacity for production like building a milk bottling plant in the community to reduce shipping costs and payments for outside bottling fees, among others. As described later (*see* The Case of Brazil), in addition to indirect payments, Brazil uses mostly direct payments to landowners to compensate them for the opportunity costs of their traditional land uses.

Financial Sources and Management

Flexibility is also required in financial management, as are transparency and longevity, to ensure success under different legal and institutional frameworks. The core financial mechanism is a trust fund or endowment fund (**Figure 2**). This unique fiduciary structure involves an independent financial institution. A trustee (nonpartisan) manages and distributes payments to recipients (e.g., watershed communities and/or park guards) based on decisions made by the trustors, that is, the water fund board that generally comprises the main water users and other stakeholders. National and regional rules and regulations dictate the preferable investment scheme for the fund (private, nongovernment, etc.). All the trust funds have long-term contractual arrangements explicitly defining their use.

Water user contributions to the trust create a principal that accrues interest revenue for conservation projects. Ideally, the principal is untouched and only the interest is used. TNC and partners have learned, however, that in order to secure more partners and more contributions, at times it is important to use part of the principal in the first few years to demonstrate tangible progress as interest takes time to accumulate (**Figure 2**). Thus, the initial financial arrangement must include what percentage of the fund, if any, can be used. Some of the water funds, Fondo del agua para la conservación de la cuenca del río Paute (FONAPA – Water Fund for the Conservation of the Paute river watershed), for example, have designated a portion of the trust to go directly to conservation activities. This makes sense in smaller watersheds that are less likely to have large capital investments earning significant interest in a reasonable time.

Water funds can be financed from a variety of private and public sources including the following:

- *Water users* (*e.g., water utilities, bottling companies*): potentially the largest beneficiaries, the users are also often the largest financial contributors.
- *Citizens:* a fundraising proposal for the Bogota water fund was to get donations from citizens through their water bills. Contributions from the general public (low contribution, high volume) can be a significant source of funding.
- *Taxes, levies, and public programs*: working with existing local regulations, taxes, fees, or special-purpose contributions can be a strong source of funding. In FONAG, a municipal ordinance requires the water company to direct 2% of tariffs to the fund. In countries such as Colombia and Brazil, water laws obligate water users, municipalities, and environmental regional authorities to invest resources in the watershed, and water funds have managed to capture their interest since they leverage other money, are participatory, and can function as implementation arms for public funding. In some cases, this might be an ideal revenue source for water funds.
- *Grants, international organizations, and private foundations*: funding from bilaterals, multilaterals, or independent foundations can play a strategic role in the first 2 years of a water fund by helping to establish it including funding feasibility studies. TNC has provided this support in the past. Grants are also used to fund specific activities in the conservation plan. USAID, for example, has been very important in supporting water funds in the Andean region.
- *GEF*: funding will be directed to critical start-up costs, specifically to the endowment fund, and will co-finance outreach and feasibility studies. In Brazil, money will be spent only on technical support and conservation activities.
- Financial returns generated from the endowment fund.

Revenue sources vary from one water fund to the next depending on a variety of factors such as the legal framework for water policy, private sector opportunities, environmental service provisions, and governance strategies. Based on current experience, the majority of funding will come from the public sector and from water users. Funding through grants, international organizations, and private foundations, while proportionately small, is essential in ensuring that the water funds have a solid foundation.

Governance

Water funds are governed not by a separate nonprofit or nongovernment entity; rather, they are governed by contractual partnerships which create a collaborative, stakeholder-based, decision-making board that elects and approves

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a technical secretariat that calls meetings and implements decisions. In addition, the board can establish technical committees to help guide its investment decisions. The main contributors to the fund necessarily have a voice on the board, but noncontributors and indirect contributors can also participate. For example, in the Procuencas water fund in Zamora, Ecuador, the Ministry of the Environment, a noncontributor, has a seat on the board as their input and support is essential. In Tungurahua, Ecuador, numerous, important indigenous communities in the watershed will be affected by the water fund and have invaluable knowledge about the watershed, so the German Technical Cooperation Agency GIZ donated money in their names so they have representatives on the board. TNC contributes both directly and indirectly, and in many cases has a representative on water fund boards. In the Cauca Valley in Colombia, each of the nine watersheds that feed the East Cauca Valley has a grassroots, nonprofit organization that has been working with the communities for many years. The directors of these organizations have seats on the technical committee to ensure community input.

The board sets priorities and makes decisions on investments and approves activities, but a lesson learned from FONAG was to ensure a scientific or technical basis for those decisions; thus, most are now based on feasibility or analytical studies and often on advice from a technical committee composed of scientists and engineers. The overall obligation of the board, with input from the committee(s), is to create and implement a strategic and an operational plan that include specific objectives and the means to achieve them.

How is a Water Fund Created?

While there cannot be a single formula for creating a water fund given the diversity of their features, there is a set of general steps that should be followed to establish a successful one. These steps are the result of a decade of lessons learned by TNC in replicating, improving, and advancing funds across Latin America (see Calvache *et al.*, 2012 for more detail).

Step 1: Can We Even Think About a Water Fund Here?

The first step is to determine if the right service users and service providers exist in the same area. This requires an ecosystem services assessment to determine if specific areas for generating the hydrologic services upon which a specific set of water users depends can be defined. There must be an explicit, measureable relationship between a specific area, the services the ecosystems in the area can provide, and the stakeholders in the area. Three important questions guide this step: (1) What is or are the service(s) that the water fund will prioritize for protection, conservation, restoration, and where is the long-term opportunity? (2) What is the area of influence for generating these services? and (3) Who are the key water users interested in these services, what is their interest, and how might the value of these services be internalized in their cost-benefit analyses? This type of work is best done by establishing a core working group that includes a main water user when possible.

Step 2: Will a Water Fund be Successful Here and How?

A water fund will most likely be effective if technical, financial, and legal studies are conducted beforehand to demonstrate the importance of the water fund to water users and to provide information for setting investment priorities if and when the fund is created. Determining what studies are needed is best done by creating a working group that includes the key stakeholders identified in Step 1. Work can then be divided among the participants. The detail and depth of the studies will depend to a great extent on available data and resources, but they should attempt to answer the following questions: (1) What is the demand and supply status of current hydrologic services? (2) What are the potential benefits or impacts – environmental and socioeconomic – of the water fund? (3) Where are priority areas for water fund investments? (4) What is the cost of maintaining or improving hydrologic services? (5) How will the provision of hydrologic services change as land use and climate change? and (6) What services other than hydrologic services can the water fund maintain? There are a growing number of tools (e.g., InVEST, SWAT, and ECOSAUT) to analyze the feasibility of a water fund and the potential impacts of its investments.

A final critical study is a legal and institutional assessment/analysis. Water funds ideally need to be transparent, independent, and permanent. An institutional analysis can help to identify legal hurdles and opportunities and to define the most appropriate financial and governance structure for the fund given the particularities of the country. National, regional, and local laws are all important to consider and follow in water fund design.

Step 3: Designing and Negotiating the Fund

With the stakeholder analysis and the feasibility studies in hand, the structure of the fund can be designed, contracts can be negotiated, the governance mechanism can be determined, administrative principles can be defined, and a contact can be signed. As water funds involve stakeholders from a wide variety of institutions, it is essential to have a clear definition of roles and responsibilities. The structure should be specified in a contract that formalizes the partnership. From experience, TNC has found that a useful structure is the previously described board of directors, technical secretariat, and technical committee(s). The board is a formal public–private partnership working under a mutually agreed, legal contract to ensure that each stakeholder has a role and the obligation and incentive to carry it out.

Finally, a process for handling administrative details must be determined. These include managing fund activities, the money in the fund, and other administrative matters that arise during formation and implementation.

Step 4: Details, Details, Details

Taking into account the studies in Step 2, the basic components that will allow the fund to achieve its social, environmental, economic, and institutional goals are then decided. The goal is to establish the first board of directors that will then appoint the technical secretariat. In addition, a

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technical committee should be created to help guide decision making.

After these entities are functioning, the board should develop a strategic plan and a financing plan. The strategic plan lays out the basic components of the fund's operational plan that should reflect the priority areas and activities in the feasibility assessments. The strategic plan should highlight the objective of the investments, the goals and how they will be achieved, a timeline, and costs. Fundraising is a critical part of water funds particularly to finance current activities, and bringing more water users into the fund can increase the amount of money in the trust thereby enhancing sustainability.

Step 5: Activities Begin

Operationalizing the fund means executing the plans created in Step 4, that is, implementing the proposed investments and all the activities needed to achieve the goals. Execution is mainly the responsibility of the technical secretariat, but this should be supported by the technical committee that can provide advice and suggestions to improve implementation.

Actual implementation means further prioritizing activities for investment with a view to maximizing efficiency – achieving the greatest impact for least cost. Scenario-based, land-use change analyses can help determine the best activities for achieving the goals. The major activities implemented thus far by water funds have been described previously.

The financial management plan created in Step 4 should include goals and a timeline for acquiring future funding and for capitalizing the trust. Implementation includes launching communication and fundraising plans. Interest in participating in a fund can increase or decrease, so it is important to constantly attract new donors and participants.

Finally, a plan should be developed to disseminate results beyond just the stakeholders in the water fund. This can often be done by contracting a marketing and communications firm. Fundraising can also be done by contracting an appropriate organization.

Step 6: Evaluating and Monitoring

A final, but very important, step is to monitor and evaluate outcomes to ensure the goals are being achieved and to promote adaptive management. A monitoring plan is a tool to help maintain and expand the technical and financial support for the water fund effort. It should cover socioeconomic, biophysical, institutional, and economic impacts. Monitoring outcomes can help to do the following: (1) ensure activities implemented are achieving desired goals; (2) make adaptive management possible allowing for changing and adjusting activities; (3) improve communications about the fund's activities and benefits; and (4) improve water fund transparency.

Examples of Water Funds: Ecuador and Colombia

As described previously, water funds are flexible ecosystem-services-based payment mechanisms adapted to different localities, regions, and countries. The following are two examples of water funds that have succeeded in different contexts. FONAG in Quito, Ecuador was the first water fund and is now demonstrating its impact. The Water Fund for Life and Sustainability – Fondo de Agua por la Vida y la Sostenibilidad – FAVS in Colombia is a water fund in the Cauca Valley whose water users are an association of sugarcane farmers.

FONAG – Quito, Ecuador

Previously we described FONAG; here we focus on outcomes. In 2000, FONAG had $21,000 invested in the trust fund – money from EMAAP-Q ($20,000) and from TNC ($1.000). By 2008, the trust fund had grown more than 250 fold to about $5.4 million and is now (2011) nearly $9 million. In 2008, this endowment yielded about $800,000 in interest to spend on conservation projects (FONAG 2008). In 2007, FONAG, with the support of its board members, helped to pass a municipal bylaw requiring the Quito water company (EMAAP-Q) to provide 2% of its revenue to the water fund (an increase from the initial 1% commitment).

FONAG was initially structured so that only endowment interest was used on conservation activities along with other money leveraged by the fund but not invested in the endowment. These investments were often substantial. From its initiation through 2008, $7.1 million was donated to FONAG as matching funds from a variety of other donors. USAID, in particular, has been one of the most important supporters of FONAG throughout; other donors include InWEnt – Capacity Building International, Germany; IDB, and EcoFund (FONAG 2008). This past year, the board decided to change the financial model and in the future, 30% of funds will be invested in implementing current and future activities and 70% will remain in the endowment.

FONAG uses the revenue from the water fund to finance various programs and projects. The programs currently underway are controlling and monitoring conservation areas, restoring natural vegetation, environmental education and outreach, training in watershed management, communications, integrated watershed management, and hydrological monitoring. The main beneficiaries of the activities are the communities close to the water sources. They receive permanent support from FONAG through various programs. From 2000 to 2010 FONAG has achieved the following:

- helped to conserve the watersheds that provide 80% of Quito's water (population of about 2 million);
- had a positive impact on 500,000 ha/1.2 million acres of land;
- enrolled 30,500 children in environmental education programs;
- enriched standing forest to improve forest density and quality on ~600 ha of land/year from 2006 to 2010;
- reforested 2033 ha/5023 acres of land with over two million trees;
- hired, trained, and salaried 11 park guards from local communities to help conserve protected areas; and
- engaged over 200 families in community development projects in rural basins.

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Recent monitoring and evaluation projects have helped to demonstrate FONAG's impact. By analyzing the biodiversity of conservation areas supported by water fund investments and comparing them to areas with no such investments and a "pristine" reference site, it was found that the species composition of water fund-supported conservation areas are similar to the reference site but differ considerably from areas without water funds. There have also been reductions in grazing impacts and fire damage in several vast areas where the water fund supports protection. Finally, the analysis demonstrated that the conservation activities of the water fund helped maintain the ecology of the sites intact in an economically efficient manner (Boucher, 2011).

An analysis of water-related impacts revealed that waterways with water fund investments have greater ecological integrity, improved riparian and aquatic habitat quality, reduced erosion, and a more balanced temperature than waterways without fund investments. Additionally, the richness and diversity of macroinvertebrates in water fund waterways were greater than waterways with no water fund investments indicating better water quality and increased ecosystem integrity. These results were not true for each individual site analyzed (eight sites were compared with eight similar nonwater fund sites) which helped to demonstrate where adaptive management might be needed to ensure that more goal-appropriate activities are implemented in those areas (Encalada *et al.*, 2011).

In terms of impacts to the people living in the watershed, communities not affected by FONAG were compared socioeconomically with communities affected by the water fund across a number of variables. The results revealed that communities with FONAG interventions had the following: (1) a great diversity of plant and animal species in the watershed area; (2) greater investments in subsistence farming particularly in horticulture and meats that had lead to a reduction in expenditures by households in the market and increased food security; and (3) improved agricultural management. Communities impacted by FONAG also had a better understanding of their legal rights and had fewer community conflicts (Delgado and Mosquera, 2011).

As the oldest of the TNC water funds, FONAG has demonstrable results both in terms of actions implemented and outcomes. FONAG is only now developing studies to help prioritize investments; thus, the positive outcomes of the fund could potentially increase.

Fondo de Agua Por La Vida y La Sostenibilidad – Cauca Valley, Colombia

The FAVS water fund – Water for Life and Sustainability – in the Cauca Valley of Colombia lies near the city of Cali and serves a watershed that contains a huge number of sugarcane producers, an important export and domestic crop for the country. The water users are these sugarcane growers and about 900,000 people residing in cities in the watershed. As in FONAG, providing hydrologic services is dependent on conserving upstream natural ecosystems and managing the lands of rural watershed communities.

Led by TNC in June 2009, FAVS was launched by bringing together a variety of partners: ASOCAÑA (Colombia's sugarcane producers association), CVC (Corporación Autónoma regional del Valle del Cauca, the local environmental authority), Vallenpaz (a peace and justice organization), and nine grassroots organizations representing nine subwatersheds that feed the valley. Other stakeholders have since joined including the sugarcane growers association (Procaña), the technical branch of the sugarcane association (Cenicaña), and two other grassroots organizations representing two additional subwatersheds. In 2009, the fund contained $1.8 million in capital from the sugarcanes producers association (ASOCAÑA). In the first 2 years of its operations, FAVS raised more than $5 million from both the private and public sectors (UNICEF, PAVCO, Colombian Oil Company ECOPETROL, Regional Environmental Authority CVC, others). Current negotiations with the sugarcane growers association (Procaña) are likely to bring in an additional $2.3 million per year to the fund.

The principle objectives of FAVS are to increase the natural vegetation in the watersheds in order to maintain their hydrologic services, to conserve biodiversity, to provide water for consumption and for industry, to irrigate lands, to provide recreation, to generate energy, and to protect fishing resources. The Cauca Valley has the most productive sugarcane land in the world; damage to the region's forests and water resources threatens to reduce production significantly, which could cost the industry $33 million each year, according to the sugarcane producers association (ASOCAÑA) (based on TNC estimates of water yield and climate change that basically indicate that the length of irrigation cycles will decrease).

Activities in the watersheds that the fund is helping to support include isolating riparian areas to keep cattle and crops from riversides, protecting headwaters, reforesting and restoring landscapes, revegetating pasturelands, and conserving natural ecosystems. Ultimately the aim is to conserve and restore about 30,000 ha of land. In addition, through livelihood investments the water fund is promoting food security for local communities, environmental education, and capacity building to ensure sustainable production. FAVS aims to benefit 1500 families directly and to help provide water for 1.25 million people. To date, FAVS has spent more than $1.4 million on conservation projects: $0.1 million on the first water fund project; $ 0.6 million in the first call for proposals cycle and $ 0.7 million in the second proposal cycle. With these investments, FAVS has built more than 80 km of protected river fences; protected more than 87 headwaters; conserved over 250 ha of land through restoration and natural regeneration; converted more than 80 ha of critical land along streams to sustainable cattle ranching, supported the Las Hermosas Natural Park, supported nine schools by promoting environmental education, and supported at least 24 families.

FAVS has also helped to demonstrate the feasibility and importance of doing analytical studies to set priorities for water fund investments. In addition, it was the first water fund to test a methodology for ensuring that priorities for activities were based on cost and return on investment. The goal was to identify priority areas for FAVS investment, establish quantitative ecosystem service goals, and develop a portfolio of the most efficient activities. To achieve it TNC and partners used a watershed scoring process and a modeling tool called InVEST (Integrated Valuation of Ecosystem Services and Trade-offs),

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developed by the Natural Capital Project (Tallis *et al.*, 2010). This evaluation involved several steps. First, a conservation activity (forest enrichment, reforestation, fencing, or silvopastoral practices) was assigned to each part of the landscape based on the behavior of landowners in the region and successful investments made in the watershed over the last 20 years. These assignments implicitly considered factors such as opportunity costs and land owners' willingness to change their activities (this willingness was evaluated in collaboration with the watershed grassroots community organizations). The landscape was ranked to highlight the places where possible conservation investments were likely to yield the greatest improvement in water yield and erosion control. Factors included in the ranking were those known to affect the hydrological response of the services such as slope, soil depth, distance to stream or water body, aspect, elevation and precipitation. Data from historic conservation investments in each watershed were used to estimate how much the proposed conservation activity in each location would cost (Goldman *et al.*, 2010b).

Then the landscape ranking and cost information were combined to select the highest ranked locations for each activity, tallying costs until the target budget level was met. The activities selected across the landscape formed the water fund's investment portfolio. This process was repeated for five budgets ranging from the level of investment currently committed by the fund ($10 million) to double that amount. With this set of investment portfolios as scenarios for future management, InVEST was used to estimate the ecosystem service returns from each (Goldman *et al.*, 2010b), specifically for erosion and annual water yield providing preliminary estimates of return on investment. The model provides a relative change (%) expected as spending progresses. One of the model's results demonstrated that for one watershed, erosion control benefits would increase from 1% in year 1 to 14% in year 5 based on water fund investments (The Natural Capital Project, 2011). Basically, InVEST helps to determine the most efficient investment portfolio for providing the two main services of interest: annual water yield and avoided sedimentation.

Work is now being done on this water fund to incorporate the impacts of climate change into the scenarios and the activity assessment. This impact assessment helps to determine if current activities promoted by the water fund are adapted for climate change and will allow for the design of activities to promote resilient ecosystems (Goldman *et al.*, 2010a). In particular, new ecosystem services maps incorporating suggested changes based on climate vulnerabilities were prepared and discussed with key stakeholders. These maps will complement the water fund portfolio in order to make sure that FAVS activities will be aligned with climate change analysis. This information was complemented with a local expert's suggestions in terms of the main problems related to land management and best practices. A complete conceptual model was developed for this workshop with local communities to help them to understand the links between land use practices and problems derived from climate change, and priority strategies for climate change adaptation were identified.

Not only did FAVS use studies to guide the investments of the water fund, but the fund also includes community members on the governing board. The watersheds that feed the Cauca Valley have suffered extreme levels of violence and disruption in the last decade; thus, providing the communities with a voice in how the fund operates ensures sustainability and equity. FAVS is also unique in that the main water users are agricultural producers, which demonstrates the potential for including a variety of stakeholders in water funds. A final characteristic that contributed to the fund's success is that investments are building on a legacy of watershed conservation projects already underway in the region funded by ASOCAÑA in collaboration with the grassroots community organizations. The water fund is helping to formalize and expand these prior investments by bringing the water users and providers together in a partnership to ensure joint decision making and scientifically sound investment choices.

The Case of Brazil

In the Atlantic Forest and other biomes of Brazil, TNC and partners have had great success in replicating a similar watershed conservation model called the water producer concept that has now been added to the water fund portfolio of TNC (*see* Water Fund Platform). The water producer concept was first developed by the National Water Agency (ANA) and first implemented by ANA, TNC, and several state and local partners. It recognizes the positive externalities generated by landowners living in the headwaters of watersheds when they implement forest and soil conservation and restoration activities and that people downstream benefit from these positive externalities. The concept is based on the premise that those who benefit should pay directly for that which benefits them, in this case watershed conservation. Thus landowners are compensated for their opportunity costs for generating the hydrologic services downstream users require.

Brazil's Atlantic Forest is the most densely populated region in Latin America as it is home to 11 major cities including Sao Paulo and Rio de Janeiro and 70% of Brazil's population. Since 2006, TNC and partners have been working in the watersheds of the Atlantic Forest that provide 50% of Sao Paulo's drinking water and 80% of Rio de Janeiro's. Brazil holds more water than any nation, but only 1/12 of that water can be found along the southeastern coast where nearly half of the population lives (Bradley, 2010). The forest is also one of the most biodiverse areas on earth, with 5% of the earth's vertebrates and 8% of the planet's plants. Unfortunately, much of the forest is becoming rapidly degraded and only 12% remains. Clearing and fragmentation is the main threat to its viability in the long term.

Deforestation threatens the provision of a clean, reliable water supply and signals an urgent need to protect and restore Brazil's Atlantic Forest. Water producer projects involve direct payments from water users that go toward maintaining and enhancing watershed forest cover. The incentive for water users is sustainable clean, regular water supplies at a lower cost. In Sao Paulo, for example, pollution and sediment in the water have doubled treatment costs in 8 years (Bradley, 2010). Investments in reforestation provide a natural pollution and sediment filtration system that can help curb these costs in the future.

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The implementation of water producer projects in Brazil has followed three main routes (Veiga and Gavaldão, 2011). The first one is a result of the National Water Policy that established a water-user fee and required the proceeds to go toward maintaining and increasing watershed health. In addition, it created watershed committees that comprise water users and representatives of governments and civil society and have the legal power to decide the best way to spend the proceeds. The implementation of the policy and the creation of the watershed committees is ongoing gradually throughout Brazil and has started with more urbanized states such as São Paulo, Minas Gerais and Rio de Janeiro where the water-use conflicts are more prominent. The fundraising potential of these watershed schemes is significant. One example is the Piracicaba-Capivari-Jundiaí Watershed (PCJ), one of Brazil's key watersheds, which raises approximately $25 million per year in water user fees.

Creating a water producer project from this policy arrangement involves several steps. The concept is presented to the watershed committees as one of the best investments that the committee could make to guarantee water in quality and quantity from the watersheds in their jurisdiction by explaining that the concept is based on direct payments to compensate watershed landowners for the positive externalities they generate when they restore and protect their lands. The first water producer project created this way began in 2006 in the PCJ Watershed where the watershed committee allocated $250,000 for a first pilot in the watershed matching the funds allocated by a coalition of partners including ANA, the Environmental and Agricultural State Agencies of São Paulo State (SMA-SP and SAA-SP), and TNC (Veiga, 2009). These same partners created a project management unit that manages the pilot and creates plans for its replication within the watershed. Since this first pilot, more initiatives have been replicated in PCJ and other watersheds in the country, including the Guandu Watershed which provides water for the Rio de Janeiro metropolitan area.

A second means by which water producer projects have been created requires municipal and state legal approval explicitly for developing PES schemes. These laws are important for two reasons. They can provide a legal framework for PES implementation, and they can enable and facilitate the use of public funds for PES schemes. For example, one water producer project was based on a 2005 law in Extrema, Minas Gerais, that gave the municipality the ability to pay landowners who achieved specific targets related to soil conservation measures, rural sanitation, and forest conservation and restoration. In addition, this law allowed the first direct payment to a water producer to be made in Brazil in February, 2007. This initiative was a partnership between the municipality, ANA, the State Forestry Agency, and TNC, and support was also received from the PCJ watershed committee. In addition to direct payments for environmental services, the landowners also receive financial, technical, and in-kind support to reach conservation targets. Another example at the state level occurred in 2008 in Espírito Santo where a law was passed that created a water fund called FUNDÁGUA that was primarily funded by a percentage of the oil royalties collected by the state. FUNDÁGUA stipulates that most of the fund's revenues should go toward paying landowners in priority watersheds for the water services they provide. The first payments started in March 2009; by July 2011 approximately 300 landowners received direct payments from FUNDÁGUA.

With these examples, several other municipalities and states have been discussing and implementing laws and PES programs. TNC has been a partner in nearly all of the initiatives, especially those at the state level realizing the great potential these mechanisms have to conserve watersheds throughout the region. At the federal level in Brazil, there is a PES bill proposal under discussion at the National Congress that was informed by these first municipal and state initiatives.

A third means through which a water producer project has been created is more similar to the water funds in other parts of Latin America and has emerged more recently in Brazil. Here a key water user such as a water utility company takes the lead to implement a PES scheme. One example is a project headed by the Balneário Camboriú Municipality Water utility (EMASA), located in one of the most important touristic cities in Southern Brazil. This utility understood the benefits of investing in watershed conservation to reduce its water treatment costs and so has allocated $1.5 million to the PES scheme. Using other water fund projects as examples, the utility and their partners (the municipalities of Camboriú, Balneário Camboriú, ANA, TNC, and the local watershed committee, among others) intend to create a municipal PES water fund to guarantee the initiative's sustainability in the long term. These schemes are also starting to be replicated. For example, SANEATINS, the water utility company of Palmas, the capital of Tocantins state, is now initiating a water fund.

A final, very nascent method for creating a PES scheme similar to a water fund in Brazil involves companies that are trying to offset their water footprints. One mechanism by which they can offset water consumption could be to invest in a water producer project. This possibility is still under development but can be considered another important source of funding for the long term, especially if the project is set up like other water funds in Latin America.

In short, the financial mechanisms in Brazil are slightly different from those of the water funds of the Northern Andes region. In general, however, the funds use an annual distribution model where fees or other sources of funding are collected and distributed each year rather than going into a trust. The payments are direct and are used to both conserve standing forest and to reforest critical areas, and they are generally based on opportunity costs to the farmer from having to reforest and/or protect and/or improve management of their land. Payments tend to range from $29–$100 per acre per year depending on the project site and on institutional arrangements. There are additional criteria that are specific to the sort of scheme proposed such as a landowner's willingness to participate, slope intensity, and forest quality among others that can be combined with opportunity costs. The water fund supplies materials and capacity (hiring local people) to enable reforestation. Restoration costs also vary but are round $1600 to $2800 per acre. The landowner's responsibility is to protect and maintain reforested or forested areas in exchange for a payment based on the location and size of restored and/or conserved parcels.

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Water Fund Platform

With all the valuable experience it has gained in developing diverse approaches to watershed conservation through PES schemes, TNC in collaboration with three main partners – IDB, GEF, and FEMSA Foundation, the largest Coca-Cola bottling company in the world – is launching a water fund platform. Using this platform, the characteristics of the water funds in the Northern Andes and the PES approaches in Brazil will be extended to water funds more broadly throughout Latin America, thereby conserving and enhancing valuable freshwater and terrestrial biodiversity while providing important hydrologic services to people.

In the next 5 years TNC and its partners under the Latin American Water Funds Partnership aim to create, implement and capitalize at least 32 water funds (**Figure 1**; **Table 1**). This will comprise investments of over $27 million to protect seven million acres of water sheds in Ecuador, Colombia, Peru, Brazil, Mexico and other countries in the LAC region (Marx, 2011).

The goals of the platform include the following:

- a total of 32 self-sustaining water funds of which 20 are new;
- conservation of more than seven million acres of important ecosystems;
- effective mechanisms for adapting natural ecosystems that supply water to climate change;
- secure access to water supply for more than 50 million people, industries, and rural areas;
- savings in water treatment costs and reduced productivity loss because of water shortages and reductions in energy supply in rural areas and for industries;
- water funds capitalized with at least $27 million (total across all funds) from public and private local funds after 5 years;
- at least $143 million in conservation projects, total across all water funds, on watersheds leveraged from other institutions.

As of December 2011, the platform encompassed 45 water funds in various stages of implementation (**Figure 1**; **Table 1**), most of which were just starting operations or were in the initial stages of assessing feasibility and viability.

See also: Biodiversity and Ecosystem Services. Conservation and People. Economic Value of Biodiversity, Measurements of. Economics of the Regulating Services. Ecosystem Services. Human Impacts on Ecosystems: An Overview. Impact of Ecological Restoration on Ecosystem Services. The Value of Biodiversity. Valuing Ecosystem Services

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