

CASE STUDY

Leveraging Citizen Action for Water Conservation

Reciprocal Watershed Agreements by Fundación Natura Bolivia

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Reciprocal watershed agreements—known as Watershared—allow downstream water users to engage with upstream forest owners and landowners to manage their watershed more sustainably and to directly negotiate incentives for upstream users. By providing a model for direct citizen-to-citizen negotiation such agreements can better align the interests of local stakeholders and offer a way to scale such actions across administrative boundaries. Sustainability is enhanced because Watershared agreements are funded by water users and local government and do not rely on external sources of funding.

Although the Watershared model has similarities to traditional payment for environmental services models, it differs in that it is not an economic incentive-based conservation scheme, but rather, it aims to strengthen local institutions so that they can build on motivations of reciprocity and co-responsibility between water users downstream and water providers upstream (see box 1). Watershared agreements are made typically between a limited number of upstream and downstream communities with relatively small landholdings. However, scaling such agreements with small landholders can add up to large areas of land under conservation in the aggregate.

Water Resources Management Context

Bolivia has extensive hydrological resources and is rich in biodiversity. However, a growing demand for agriculture and livestock farming has led to serious deforestation. From 2001 to 2021, Bolivia lost 6.67 million hectares, or 10 percent of its tree cover, causing the emission of 3.01 gigatons of carbon dioxide equivalent.¹ Reduced forest cover not only negatively affects

biodiversity, but also diminishes the quality and quantity of water, particularly for downstream users. Reduced vegetation on land means that rainfall runs off more rapidly, which in turn increases the risk of flooding and sedimentation. This can cause increased water pollution, which has long-term impacts on health, agriculture, and ecosystems. It also has effects on the economy, with studies showing that when organic pollution in water crosses a certain threshold, gross domestic product growth in downstream regions drops by as much as one-third (Damania et al. 2019).

To address such challenges, upstream farmers and water users are often asked to shift their practices—from leaving land fallow to serve as a natural filtration, to refraining from using fertilizers or cattle raising that can contribute to downstream water pollution—but they rarely have an incentive to do so. Governments often encounter challenges in coming to agreement across political or administrative lines. Watershared agreements offer a way to better align incentives and for citizens to take direct action around a shared resource.

About Watershared Agreements and Fundación Natura

Watershared agreements were first conceptualized and implemented by [Fundación Natura Bolivia](#), a nonprofit conservation organization based in Santa Cruz de la Sierra, in the Tropical Andes. Fundación Natura was established to help communities protect their water through the conservation of their forests and piloted the first Watershared program in the valley of Los Negros in 2003 (Asquith 2011). In this valley, conflict had been brewing because downstream water users complained that upstream deforestation was reducing their source of water, which they



BOX 1**Differences between the Watershed Model and Payment for Environmental Services**

- Payment for environmental services (PES) models provide economic incentives through monetary means. In contrast, Watershed incentivizes individuals and communities to conserve their forests and sources of water through environmental values and social norms of reciprocity.
- By being collaborative processes that use, for example, [social marketing tools](#) for watershed management (Rodríguez-Dowdell et al. 2014), Watershed can be more targeted and tailored to local social and environmental conditions and therefore result in more ownership, while traditional PES tend to be more standardized.
- By paying in-kind benefits that are environmentally friendly, such as fruit seedlings or beehives, Watershed programs incentivize and promote more environmentally friendly forms of agriculture and livelihoods.
- Watershed can be more inclusive of the poorest landowners because, in contrast to PES schemes, they do not require formal land titles. However, the opportunity costs to dedicate land for conservation for poor landowners may be higher, so they are typically less likely to participate in Watershed programs (Authélet 2021).
- Watershed circumvent the bureaucratic and logistical hurdles of traditional PES because they do not rely on extensive hydrological and economic studies.

needed to irrigate their lands. Facilitated by Fundación Natura, downstream irrigators negotiated a deal with the upstream landowners. For every 10 hectares of land conserved for a year by upstream communities, landowners would receive beehives and training on beekeeping. The beehives allowed upstream communities to produce sufficient honey to compensate for the conservation of their land, while downstream communities had access to water for their agricultural needs.

Because the Watershed pilot proved to be successful in benefiting both upstream and downstream communities, the model was replicated in neighboring communities. Two decades later, Watershed has been implemented across countries in Latin America (including Peru, Colombia, Ecuador and Mexico). Numerous organizations have adopted the model, including [Rare](#), a nongovernmental organization (NGO) which has introduced the Watershed model in various countries. The public entity for environmental resources in [Columbia, Corporación Autónoma Regional del Valle del Cauca](#),² has also introduced the model, and is implementing Watershed at scale across 14 municipalities. In Ecuador, the [FORAGUA water fund](#), an alliance of more than 30 municipalities, has incorporated reciprocity-based conservation into its watershed management programs.³

Since 2003, around 80 local Andean governments have adopted Watershed which has helped over 30,000 upstream landowners conserve 600,000 hectares of forest and fix over 80 million tons of carbon dioxide, in exchange for development projects approaching \$400,000 per year.⁴

How Watershed Agreements Work

Socializing Watershed Agreements. While both upstream and downstream communities in the Bolivian Andes appreciate the importance of water, they are often not aware of the links between downstream water quality and quantity, and upstream forest conservation and land use practices. Fundación Natura's first step in a given community is to raise awareness that communities themselves have the power to help resolve water issues. This process of socializing the reciprocal Watershed agreement ideally takes place with the municipal government, and can take several months. In this initial stage, Fundación Natura conducts assessments of the upstream land to determine the conservation challenge at hand and the measures required.

Striking a Deal on Conservation. A Watershed agreement is made between an upstream community or landowner and downstream water users that share a watershed. Typical watershed-related problems include upstream cattle grazing that contaminates water sources resulting in poor downstream water quality; and upstream deforestation disturbing water flows and thus reducing supplies into downstream irrigation systems. A Watershed contract stipulates that in exchange for making specific conservation commitments for at least five years, such as keeping cattle out of the area under conservation or committing to stop deforestation, upstream communities receive benefits from downstream users. The program offers a menu of options for in-kind transfers, ranging from improvements in water access (e.g., plastic piping and taps), to barbed wire to prevent cattle access to waterways, to honey production systems (beehives, smokers, and protective overalls), to fruit tree seedlings (see box 2). The menu also varies by context. For example, orange fruit tree seedlings are offered in the lowlands, and peach seedlings are offered at higher altitudes.

In each case, the agreement process involves representatives from the downstream communities discussing with the upstream communities what they would like to receive in return for conserving their land. The demand for in-kind transfers rather than cash payments came from participants in the pilot program in the valley of Los Negros. Because this modality has strong local support, it has never been changed since the initiation of the Watershed model (Bauchet et al. 2020).

Financing Mechanism. The funds to pay for the incentives provided to upstream communities come predominantly from downstream water users. In fact, each Watershed program is largely self-funded, with 70 percent of financial resources, on average, coming from local governments and water users (Asquith 2016).



Upstream communities receive conservation incentives.
Photo courtesy of Fundación Natura Bolivia

The contributing parties of a Watershared agreement establish a local water fund in which each party decides on the amount that they will commit. Water supply in the Santa Cruz de la Sierra region of Bolivia is largely managed by water cooperatives, whose members are the water users themselves. The water cooperatives thus directly represent the water users, and act as representatives of the local water fund. From the downstream water users, revenues for the water fund are collected in the form of tariffs. The rate of increase of the water tariffs is deliberated and voted on by the water cooperative, typically ranging between a 1 to 10 percent increase, which is then paid by all water users in the downstream. These revenues are kept in a dedicated bank account within the water cooperative's series of bank accounts. The specific amount paid as tariff to the Watershared program shows up as a dedicated item in each month's water bill, thereby, showing each water user how they are contributing to water conservation. Financial contributions from water users are typically matched by additional budget from the municipal government. Laws regulating public spending prevent the municipal government from contributing funds directly into the water cooperative's bank account. Its dedicated budget is kept separate, yet forms part of the agreed-upon local water fund.

Once the water cooperatives and municipal governments have decided on the budget, they contribute annually to the water fund. Fundación Natura matches the remaining budget required to complete the agreement. All contributing parties agree on statutes and regulations on how the budget from the local water fund will be managed and which party will be responsible for buying the type of material demanded by the upstream communities. For instance, the agreement may be that the water cooperative spends its contributions on barbed wire, while the municipal government is responsible for providing beehives with its allocated budget, and Fundación Natura, in turn, buys seedlings.

In rare cases when downstream communities cannot commit to increasing their water tariff (for instance, if they have not established sufficient trust in the upstream communities or in the Watershared process), or when municipal governments are unwilling to engage, Fundación Natura makes the initial full payment into the local water fund. However, the intention is that over time the community and the municipalities will be convinced to contribute, given that local funding is central to the program's sustainability. During all the steps and processes, Fundación Natura provides support and oversight.

BOX 2**What Can Be Included in a Watershed Agreement?**

Upstream landowners agree to:

- Designate area on their farm for strict conservation
- Prevent forest fires in the conservation area
- No deforestation in the conservation area
- No logging for commercial purposes
- Keep cattle out of conservation area
- Replicate good farming practices
- Attendance of training on conservation

In return, landowners receive the following from downstream water users:

- Beekeeping equipment
- Fruit tree seedlings
- Technical assistance (on beekeeping, fruit cultivation, and sustainable livestock farming)
- Water storage and distributions systems for consumption
- Irrigation systems (cement and tubing)
- Cattle management tools and material (fencing)

Signing the Contract. Different types of contracts exist, depending on the specifics of the type of conservation required, followed by varying forms of compensation packages. The value of the land and forest to be conserved is set against a pre-determined value of in-kind benefits, including beehives, fruit trees, barbed wire to fence off cattle, or pipes for improved access to water supply. Once the contract is written and agreed upon, it is signed by the upstream and downstream parties, with municipal governments and participating NGOs typically being co-signatories. After the contract is signed, the entire community is brought together to share the details of the contract, for these to be widely known and transparent.

Involving Local Governments. While upstream and downstream communities are at the heart of the agreements, the involvement of the local authorities, such as municipalities or water companies, is often the key to the success of Watershed. As well as providing political authority and guarantee to the initiative, local governments can support the creation and financing of the water fund and contribute to the long-term monitoring of the Watershed contracts. Public funds managed by local governments are often a critical source of funding to initiate a Watershed program. Contributions by local governments often support the sustainability of the agreements and increase the ownership and engagement of local authorities. However, the roles and levels of engagement of the local government are not prescribed but varies by local circumstances. This makes the Watershed model unique: each contract can be customized to the local conditions, thereby leveraging the technical, financial, and operational capabilities of the local institutions.

Monitoring Watershed Contracts and Conservation Impact.

Agreement compliance is monitored annually by members of the local water fund and is facilitated by Fundación Natura. In some programs monitoring comprises field visits by a representative of the cooperative. In other cases it is undertaken using remotely sensed data, such as satellite images by Fundación Natura. In cases of noncompliance, sanctions are imposed, as stipulated in the contract. However, according to Fundación Natura, noncompliance is rare. Of 415 contracts signed in 2011 and 2012, four cases of serious incompletion (less than 1 percent) had been recorded by 2013. Of these four cases, three were sanctioned as per the contractual agreement, and the landowner returned the value of the compensation back to their community. The fourth case followed the death of the landowner, and the community decided not to sanction his descendants, who claimed to have no knowledge of him signing the conservation contract. Since 2013, no case of incompletion has been judged serious enough to engage a sanctioning procedure (McWherter et al. 2022). Implementation of the incentive package is also monitored by Fundación Natura to verify that the agreed-upon benefits are being disbursed. Conservation impact (e.g., forest cover, water quality, surface runoff, or water flow) is also periodically monitored by third parties, such as conservation NGOs, to track changes taking place in the watershed (see figure 1).

Key Achievements

The effectiveness of Watershed has been explored through a series of studies and a randomized control trial. These studies show that the Watershed intervention has improved environmental perceptions and that shifts in perceptions, in turn, change farmers' behavior (Wilk et al. 2020; Grillos et al. 2019). For example, participating upstream communities have been found to increasingly use barbed wire around rivers to protect water from cattle because it benefits themselves as well as the downstream communities (Authélet 2021).

Interestingly, financial compensation is not the sole motivation to participate in the Watershed program. Less than 50 percent of respondents in a survey of households in the project area think the in-kind payment is the top reason to participate (Bottazzi et al. 2018). Many respondents (25 percent) reported that they are driven by pro-social motivations, such as recognition by the community or access to training and networking. Instrumental pro-nature motivations are also key drivers of participation in the program, which explains why so many upstream contract signers invest heavily in co-financing inputs with their own resources. Participants with pro-nature motivations, were found to be most likely to enroll additional land for conservation.

Watershed interventions have had a significant impact in diversifying income sources. Landowners who participated in the Watershed program had significantly more fruit trees than their counterparts who had not entered the program, demonstrating a shift away from environmentally destructive annual agriculture to more sustainable perennial cropping. Similarly, participants



Upstream communities receive plastic piping as in-kind payment in return for conserving their land.
Photo courtesy of Fundación Natura Bolivia

had improved grazing land, demonstrating a shift away from the extensive cattle management practices that contaminate water supplies (Wiik et al. 2020).

Communities in Bolivia's Santa Cruz valleys that were offered the pilot Watershed program experienced less deforestation over five years than communities that had not been offered the program. However, although this difference was statistically significant, because of the small sizes of land dedicated to conservation, its volume of impact was very small. Similarly, researchers found that water quality improved locally when cattle were kept out of forests, but, again, there was no large-scale program impact in the communities with Watershed implementation. This lack of observed impact is likely because the value of the compensation packages in these pilot communities was quite low, and only relatively small amounts of land were protected in the initial programs (Pynegar et al. 2018). It remains to be seen what the conservational impact will be of the large number of programs that have entered into force in more recent years.

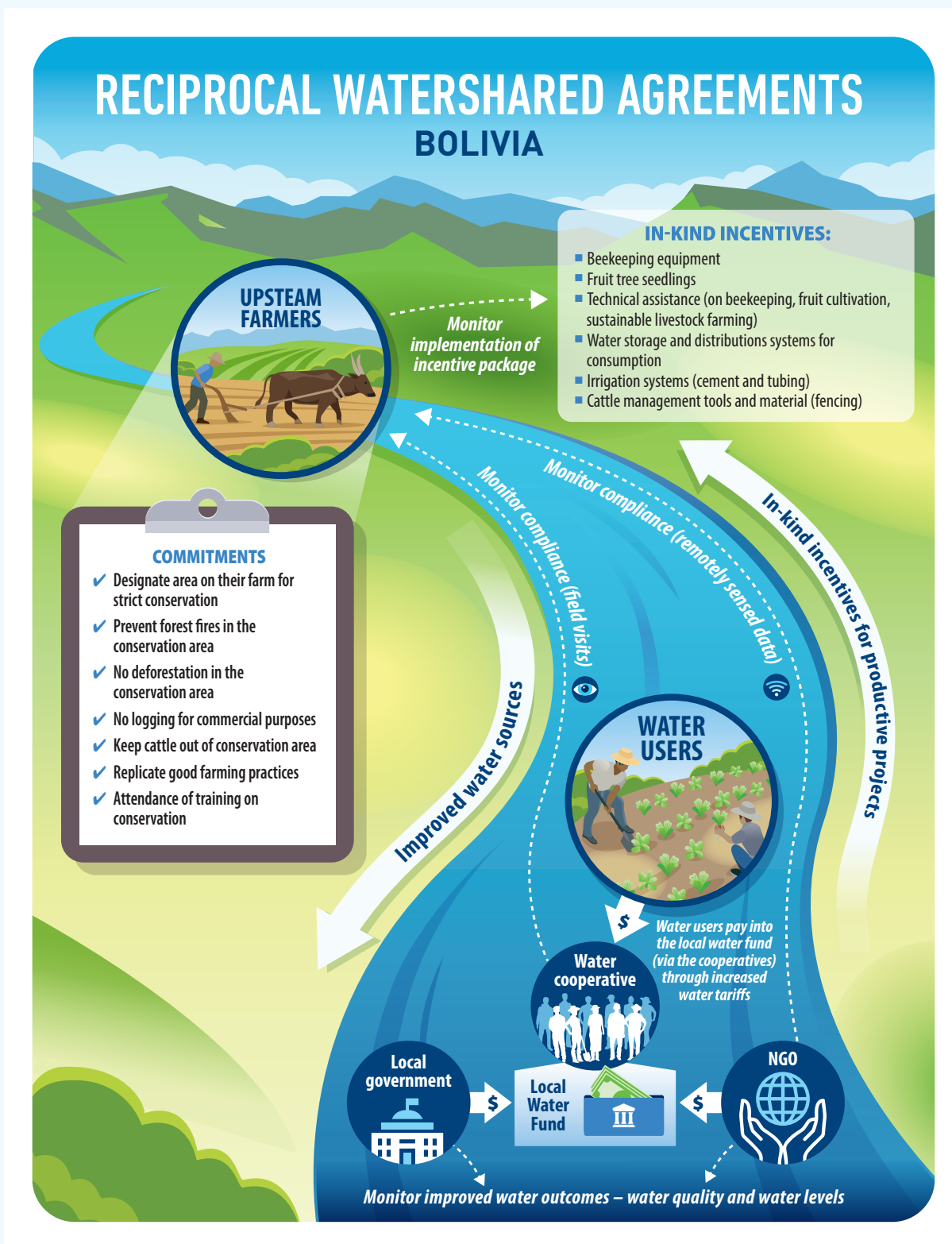
Implementers of the Watershed program concluded that to achieve landscape scale impact, a larger proportion of each watershed needs to be protected. This is being approached through a

new Inter-American Development Bank-funded Watershed program, which is increasing the value of the compensations offered. It also requires that 50 percent of a community's watershed must be conserved for that community to enter the program.

Lessons Learned from Watershed Agreements

Watershed programs conserve more than half a million hectares in five countries, having spread from Bolivia to Colombia, Ecuador, Mexico, and Peru (Asquith 2016). Characteristics that contribute to Watershed success are the following:

- By combining the dual objective of conservation and development goals allows nature and economic needs to be addressed in unison.
- In-kind incentives promote the generation of sustainable livelihoods.
- Upstream communities participate because of a suite of economic and noneconomic motivations, including financial incentives, individuals' social capital, and community social norms.
- Because most of the costs of Watershed are paid by local governments and water users, the program does not depend on external funding and is sustainable.

FIGURE 1**How a Watershed Agreement Works**

Watershed has evolved into its current form by recognizing how practices that degrade water quantity and quality (e.g., forest clearing and extensive cattle grazing) are inherent parts of people's livelihoods and culture. The in-kind support packages are not of sufficient value to "buy" a specific amount of ecosystem services, but rather are designed to help upstream individuals and communities transition to more environmentally and economically sustainable livelihoods. The Spanish language name for Watershed—Acuerdos Recíprocos por Agua—focuses on the reciprocal relationship between users and providers of water. The program's tagline demonstrates its dual goals: "Those who produce water, share it; those who benefit from water, share the benefits."

Trust is the foundation of Watershed, and programs are only sustainable if they first build the trust of the upstream and downstream communities. Trust, catalyzed by having local institutions lead the initiative coupled with rigorous monitoring and enforcement, build water users' confidence that they should pay for the program. Meanwhile, upstream communities have evidence—in-kind support tailored to the local context—that help them trust that the program considers their needs and is not just focused on the environment.

Sources

In addition to the sources cited in the case study, interviews were conducted on June 1, 2022, with Nigel Asquith, director of strategy and policy at the Santa Cruz-based Fundación Natura Bolivia, and on June 8, 2022, with Alejandra Calderón, environmental specialist consultant.

References

- Asquith, N.M. 2011. "Reciprocal Agreements for Water: An Environmental Management Revolution in the Santa Cruz Valleys." *Harvard Review of Latin America* 11 (1): 58–60.
- Asquith, N.M. 2016. "Watershed: Adaptation, Mitigation, Water-Shed Protection and Economic Development in Latin America." Inside Stories on Climate Compatible Development, Climate and Development Knowledge Network, London, UK. <https://cdkn.org/sites/default/files/files/CDKN-Bolivia-watershed.pdf>.
- Authélet, M., J. Subervie, P. Meyfroidt, N.M. Asquith, and D. Ezzine-de-Blas. 2021. "Economic, Pro-Social and Pro-Environmental Factors Influencing Participation in an Incentive-Based Conservation Program in Bolivia." *World Development* 145: 105487. <https://doi.org/10.1016/j.worlddev.2021.105487>.
- Bauchet, J., N.M. Asquith, Z. Ma, C. Radel, R. Godoy, L. Zanotti, D. Steele, B.J. Gramig, and A.E. Chong. 2020. "The Practice of Payments for Ecosystem Services (PES) in the Tropical Andes: Evidence from Program Administrators." *Ecosystem Services* 45: 101175. <https://doi.org/10.1016/j.ecoser.2020.101175>.
- Bottazzi, P., E. Wiik, D. Crespo, and J.P.G. Jones. 2018. "Payment for Environmental 'Self-Service': Exploring the Links between Farmers' Motivation and Additionality in a Conservation Incentive Programme in the Bolivian Andes." *Ecological Economics* 150: 11–23. <https://doi.org/10.1016/j.ecolecon.2018.03.032>.
- Conservation International. 2019. "BOLIVIA—Reciprocal Water Agreements for Nature and People." Factsheet, Conservation Agreements Private Partnership Platform, Conservation International, Arlington, VA. https://www.conservation.org/docs/default-source/publication-pdfs/capp-factsheet_bolivia.pdf?Status=Master&sfvrsn=66a70dc3_3.
- Damanian, Richard, Sébastien Desbureaux, Aude-Sophie Rodella, Jason Russ, and Esha Zaveri. 2019. *Quality Unknown: The Invisible Water Crisis*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/32245>.
- Grillos, T. 2017. "Economic vs. Non-Material Incentives for Participation in an In-Kind Payment for Ecosystem Services Program in Bolivia." *Ecological Economics* 131: 178–190. <https://doi.org/10.1016/j.ecolecon.2016.08.010>.
- Grillos, T., P. Bottazzi, N.M. Asquith, and J.P.G. Jones. 2019. "In-Kind Conservation Payments Crowd in Environmental Values and Increase Support for Government Intervention: A Randomized Trial in Bolivia." *Ecological Economics* 166: 106404. <https://doi.org/10.1016/j.ecolecon.2019.106404>.
- McWherter, B., J. Bauchet, Z. Ma, T. Grillos, N.M. Asquith, and A. Markos. 2022. "Compliance under Control: Insights from an Incentive-Based Conservation Program in Rural Bolivia." *Ecological Economics* 194: 107317. <https://doi.org/10.1016/j.ecolecon.2021.107317>.
- Pynegar, E.L., J.P.G. Jones, J.M. Gibbons, and N.M. Asquith. 2018. "The Effectiveness of Payments for Ecosystem Services at Delivering Improvements in Water Quality: Lessons for Experiments at the Landscape Scale." *PeerJ* 6: e5753. <https://doi.org/10.7717/peerj.5753>.
- Rodríguez-Dowdell, N., I. Yépez-Zabala, K. Green, and E. Calderón-Villela, eds. 2014. *Pride for ARAs: A Guide to Reciprocal Water Agreements for People and Nature*. Arlington, VA: Rare.
- Wiik, E., R. D'Annunzio, E.L. Pynegar, D. Crespo, N.M. Asquith, and J.P.G. Jones. 2019. "Experimental Evaluation of the Impact of a Payment for Environmental Services Program on Deforestation." *Conservation Science and Practice* 1: e8. <https://doi.org/10.1111/csp2.8>.
- Wiik, E., J.P.G. Jones, N.M. Asquith, P. Bottazzi, J.M. Gibbons, A. Kontoleon, and E.L. Pynegar. 2020. "Exploring Mechanisms and Impacts of an Incentive-Based Conservation Program with Evidence from a Randomized Control Trial." *Conservation Biology* 34: 1076–1088. <https://doi.org/10.1111/cobi.13508>.

Notes

1. Forest change data are from the Global Forest Watch Open Data Portal (database), Global Forest Watch, Washington, DC, <https://data.globalforestwatch.org/>.
2. For more information about the reciprocal agreements for water introduced in Colombia, visit the website of the Regional Autonomous Corporation of Valle del Cauca, "Reciprocal agreements for water," published June 20, 2018, <https://www.cvc.gov.co/acuerdos-reciprocos-por-el-agua>.
3. More information about the work of FORAGUA is available at its website, <http://www.foragua.org/?p=1420>.
4. For an overview, see "Watershed Bank: Funding the Conservation of Water Factories in the Tropical Andes" on the website of the Water Change Maker Awards at <https://www.gwp.org/en/waterchangemakers/change-stories/561799/>.

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