Forestry Management and Water Law: Comparing Ecuador and Arizona

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ABSTRACT

Forestry management has enormous implications for water supplies and quality. Deforestation can impair water quality through increased pollution runoff. Invasive species in forests can decrease water quantity. Despite this relationship between water supply, water quality, and forests, few incentives exist in many jurisdictions to encourage effective forestry management. This article compares and contrasts different legal challenges and opportunities in the Paute River basin in Ecuador and in the Verde River Basin in the state of Arizona in the United States of America in encouraging improved forestry management aimed at protecting water. In Ecuador, FONAPA is an important water public-private partnership between non-governmental organizations and universities created in 2008 to improve forests within the Paute watershed in Ecuador. In Arizona, the Four Forest Restoration Initiative creates a public-private partnership for forestry management in the Verde River basin. This program has the potential to create incentives for improved forestry management in the Verde River basin. But it also creates legal problems around water rights. If forestry management results in increased stream flows, it is not clear that those investing in forestry management will receive rights to the increased stream flow rather than the presumably less valuable offset credits. Reforms will be necessary to encourage improved forestry management in the Verde basin, including rethinking the legal distinction between developed water and salvaged water. This may require examining how FONAPA was implemented in the Ecuador and how it might be adapted for implementation in Arizona. Despite the obvious differences between the relatively water-rich Paute basin in Ecuador the arid Verde basin in Arizona, both basins would benefit from examining how recently implemented legal and economic incentive programs can improve forest management and water supplies.

INTRODUCTION

At a first glance, one might think that the nation of Ecuador and the U.S. state of Arizona have little in common with respect to water resource management. Although both jurisdictions are similar in size, Ecuador is famed for its geographic diversity – ranging from rain forest to coastal mangrove swamps and highland páramos. Ecuador sits atop the Andes Mountain range and at the headwaters of the largest river on the planet – the Amazon. On the other hand, Arizona is largely an arid region famous for the saguaro cactus of the Sonoran desert and the majestic Grand Canyon, carved out of desert mountain rock by the Colorado River. Nevertheless, both jurisdictions share one particular water challenge. Both jurisdictions have large upland forests that play a critical role in the water resource management. This article examines recent legal innovations in river basins in Ecuador and Arizona intended to promote improved forestry management for the protection of water supplies. This article will compare and contrast these different approaches and suggest lessons from each program that might inform improved management in both jurisdictions.

I. Water Law and Regulations in Ecuador and Arizona

This Part provides a foundation on the importance of forests in watershed management and an overview of relevant water law and regulations in Arizona and Ecuador for understanding how such laws can be reformed to facilitate improved forestry management and to compare the approaches taken by each jurisdiction.

A. The Relationship Between Forests and Water Quality and Supply

The relationship between forests and water is so interconnected that forestry management is sometimes referred to as "watershed management." (Larson, 2016). "Watershed management refers to removal of vegetation from a catchment, such as scrub brush or invasive species, as a part of a broader timber harvest plan. (McConkey, 1994). Watershed management has several potential benefits. First, removal of scrub brush and immature trees can improve forest health by allowing other trees to reach full maturity. (McConkey, 1994). Second, this removal may help avoid or mitigate wildfire risks and insect infestation like bark beetles. (Larson, 2016). Third, improved forest healthy and fewer wildfires can decrease erosion and runoff to rivers, therefore improving water quality. (Larson, 2016). Fourth, removing vegetation within the watershed at a responsible rate can increase stream flow, thereby augmenting water supplies. (McConkey, 1994). Healthy forests protect winter snowpack from melting too fast, and losing precipitation to immediate evaporation. (Hibbert, 1983). Forests affected by wildfires, on the other hand, expose more snow to evaporation and adversely impact water quality as runoff. (Hibbert, 1983). Investments in improved forest health increase water quantity and water quality, with eighty years of research demonstrating its benefits for increased water supply and improved water quality. (Troendle, et al., 2001).

Nevertheless, removal of vegetation can impact aquatic and wildlife habitat if done in a way that is not sustainable by reducing shade cover, eliminating key nesting areas, and increasing access to fragile banks for grazing animals. (Rauscher, 1999). Furthermore, removal of the kind of scrub brush, immature trees, and invasive species required for improved forest health and stream flow can be costly with uncertain possible returns on such investments, in part because such vegetation has a narrow trunk diameter that does not lend itself well to use as timber. (Bradshaw & Lueck, 2015). Burning such vegetation for energy or paper production is possible, but can result in pollution from energy production and other environmental impacts associated with brush removal. (Larson, 2016).

B. An Overview of Relevant Water Laws and Regulations in Ecuador

Ecuador was established as an independent nation in 1830, and has had twenty national constitutions since that time, with rapid normative (constitutional) change. Ecuador's current Constitution was enacted in 2008, and as with past constitutions, the change was due to political influence. In the last two decades the country has had a political and ideological debate that we can see in its Constitutions, first with the 1998 fundamental Law, which had a neoliberal influence; and, on the other hand with the socialist "Citizen Revolution" of 2008, which represents a political document more than a constitutional norm (Ayala Mora, 2015).

In 1998, the Constitution tried to be an instrument to modernize the Public Administration, with an important role for the private sector. Therefore, natural resources issues were structured to benefit private enterprises, with incentives for privatization, especially public services (for example drinking water service[1]). In environmental topics, this fundamental law was the first to address the right of a healthy environment, and represented the first time that water was recognized as a right, but in relation to the right to health.

In the interim period between the 1998 neoliberal constitution and the 2008 socialist Constitution (1998-2008), Ecuador passed through a period of serious governmental instability, with mixtures of coups d'état, rebellions and abandonment of power. These grave conditions allowed the presence of a "messianic" leadership, which resulted in the rise of a "Citizen Revolution", where capital is diverted to benefit the people in a model based on the principle of "Sumak Kawsay" (Good living), based in the Andean and aboriginal philosophy (Ávila, 2008). "Sumak Kawsay" changed the development model in Ecuador, because that principle aims to harmonize human development with the protection of nature. Another important change associated with this constitutional revolution impacting the management of natural resources was the idea to give rights to the nature (Gudynas, 2009).

These new rights of nature, and the underlying theory of "Sumak Kawsay", received a lot of criticisms, but Ecuadorians and foreign proponents explained that this new conception of constitutional rights relates to long-standing aboriginal conceptions related to Paccha Mama (Mother earth), in which indigenous people believe that nature is an individual woman and the mother of all life. Therefore, under this anthromomorphic constitutional conception of water, water is legally recognized to both be a human right, and to hold rights itself. (Sousa Santos, 2009). The first case in Ecuador where this interesting concept of nature as a holder of rights was put in practice in the Vilcabamba River case involving the Loja Provincial Council (Action of Constitutional Protection - 11121-2011-0010). While the rights held by nature apply to protection of water, the Ecuadorian Constitution also incorporated a special mention for water, recognizing it as a fundamental human right (art. 3). Water is therefore conceptualized as an essential aspect of Sumak Kawsay under Article 12 of the Constitution.

If we make a chronological comparison, Ecuador's constitutional advance for their citizens with respect to water predated the UN Resolution 64/292, of General Assembly of eight of July of 2010 recognizing an international human right to water. Indeed, Ecuador's constitution protections associated with water goes even further by recognizing water as a national and strategic heritage, with special characteristics for their use, including the nature of the right as being public, inalienable, imprescriptible, non-releasable and essential for life.

Under the 2008 Constitution, drinking water and irrigation water services are the exclusive responsibility of the State, because water is a part of the "strategic sector" (arts. 313-314). The use of water is public, and its management could be public (local governments), or communal (users associations, Indigenous peoples, or rural people). Similar to the neoliberal 1998 constitution, this new constitutional text talks about the right to health (art. 32), and gives special reference to water

[1] Guayaquil, the second city of Ecuador, has a privatization contract of the drinking water service with Interagua Enterprise (Veolia – France) for 30 years.

as an essential part of good living. When the Constitution talks about a decent life, drinking water is a central element (art. 66).

Now in Ecuador, the privatization of water sources and infrastructure is not permitted. This normative change was part of the ideological underpinnings of the 2008 political revolution against free market and neoliberal position of the 1998 Constitution (art. 282), because that approach had allowed huge accumulation of vital water resources by private enterprises. In Ecuador, the management of water is held by the State, primarily under the executive authority of the Water Secretary (SENAGUA) since May of 2008.

In August of 2014, the Congress approved a law to regulate the use of water. The country had a previously codified water law from the dictatorial period with limited public participation in private concession contracts. That regulation thus generated too much conflict for effective implementation, especially for indigenous people and social movements (Martínez, 2015). The main objective of the new law is to guarantee the human right to water and to regulate and control water resources for the purpose of securing good living (Sumak Kawsay) for all citizens. This includes a management partnership between the central government's SENAGUA and Subnational Governments (Regional, Provincial and local), including community systems drinking water and irrigation systems. Perhaps the principal contribution of the new law is the prioritization of water uses: a) drinking water; b) irrigation water (Food sovereignty); c) Ecological flow; and, d) productive activities (art. 86). Additionally, Article 411 of the Ecuadorian Constitution guarantees the conservation, restoration, and integrated management of water resources at the basin level, including ecological flows and recharge zones, managed in a co-responsible partnership between the state and subnational governments, with resources and technical assistance coming from the central government.

Landowners near water sources have the obligation to facilitate the regulation and technical dispositions of SENAGUA to conserve and protect the water at the ecosystem, basin-level in coordination with subnational governments (art. 12). The 2014 organic water law makes a list of water protection and conservation methods and approaches under Article 13, including: A) easements for public use; B) water protection zones; and, c) restriction zones. Water authorities and environmental authorities have the power to enact regulations and rules for the conservation of water resources and protection and promotion of recharge zones. Importantly, SENAGUA is empowered to implement a special rate to conserve water resources and recharge zones. Subnational Governments implement rates in domestic public services (drinking water) to finance these conservation and protection programs.

C. An Overview of Relevant Water Laws and Regulations in Arizona

Most jurisdictions in the western United States, including Arizona, base water rights on the doctrine of prior appropriation. (Leshy, 2005). This doctrine is a "first-in-time, first-in-right" regime, which allocates water to users in order of priority, limited to the amount of water that can be put to beneficial use. (Larson & Kennedy, 2016). Under prior appropriation, when river flows are insufficient to satisfy all rights, a senior appropriator will place a "call on the river." (Larson & Kennedy, 2016). The call forces junior appropriators to stop diverting until the senior's right is satisfied. (Larson & Kennedy, 2016). However, under the "futile call doctrine" a state will decline

to cut off a junior appropriator if the water saved would not reach the senior user downstream—in other words, it is futile. (Larson & Kennedy, 2016). This general overview of surface water law roughly describes how water rights are allocated in Arizona. (Feller, 2007).

The method used for determining water rights for federal reserved lands, like national parks or Native American lands, is different than that used for other water users. When the U.S. reserves public land for any use, including tribal reservations, military bases, and national parks, it implicitly reserves water rights. (*Arizona v. California*, 1963). These rights are called *Winters* rights after the U.S. Supreme Court case *Winters v. United States* which established the federally-reserved water rights doctrine. (*Winters v. United States*, 1908). The lands are reserved the minimal amount of water sufficient to meet the primary purpose for which the reservation was established. (*Cappaert v. United States*, 1976). The "primary purpose" of tribal reservations is to establish a permanent homeland. (*Winters v. United States*, 1908). In order to quantify the amount of water necessary to achieve this purpose courts have generally used the Indian reservation's practicably irrigable acreage or PIA. (*Arizona v. California*, 1963). However, the Arizona Supreme Court refused to use PIA as the only quantification method and included the consideration of factors like tribal culture, population, and water use plans. (In re Gen. Adjudication of All Rights to the Gila River, 2001). Additionally, the priority date for reserved rights is time immemorial for aboriginal lands reserved or the date the reservation was established. (United States v. Adair, 1983).

As the western states continued to rapidly grow, the conflicts between water users and the need for a comprehensive proceeding to determine rights became more pronounced. (Doremus & Tarlock, 2003). Additionally, inter-jurisdictional competition over transboundary rivers at the sub-national level and the emergence of federally-reserved rights fueled the need for an integrated, basin-scale approach to the adjudication of water rights disputes and water resource management. (Thorson, 1996). In a major achievement for general stream adjudications, in 1952 Congress passed the McCarran Amendment which waived the sovereign immunity of the United States in cases determining "rights to the use of water of a river system or other source." (Goldsby, 2011). The Amendment requires adjudications to join a sufficient number of water uses—termed use comprehensiveness. (Benson, 2006). By allowing states to adjudicate federal water rights alongside all other appropriative rights in state courts the Amendment essentially made possible modern general stream adjudications. (McElroy & Davis, 1995).

As comprehensive proceedings, general stream adjudications are lengthy, time-consuming, resource-intensive, and often span decades. (Larson & Kennedy, 2016). A multitude of western states have large comprehensive adjudications underway. One example is the Gila River Adjudication in Arizona. (Feller, 2007). Begun in 1976, over 40 years later it has yet to be resolved. (Larson & Kennedy, 2016). Arizona's general stream adjudication of the rights to the Gila River illustrates the nature of the proceedings and array of challenges that arise, many common among western adjudications. (Larson & Kennedy, 2016). Perhaps the greatest challenge to resolving the Gila River Adjudication is the bifurcated nature of Arizona's water rights regime. (Feller, 2007). In Arizona, surface water rights are allocated according to the principles of prior appropriation described above. (Larson & Kennedy, 2016). Groundwater rights, however, are allocated differently. Within densely populated regions called "Active Management Areas," groundwater rights are heavily regulated and dependent upon grandfathered rights to limited quantities of water registered with the state agency or groundwater withdrawal permits issued by that same agency.

(Megdal et al., 2011). Only surface water rights are subject to the General Stream Adjudication processes. (Feller, 2007). The legal distinction between groundwater and surface water, however, has proved controversial and difficult to implement. (Feller, 2007). Currently, Arizona law defines any subsurface water within the "subflow" zone – meaning within the saturated floodplain Holocene alluvium – as surface water and therefore subject to the General Stream Adjudication. (Larson & Kennedy, 2016). Significant resources are devoted simply to deciding whether or not a party should be involved in the adjudication based on a determining of whether a well is appropriating subflow or groundwater. (Larson & Kennedy, 2016).

II. Case Studies of Forestry Management and Water Protection in Ecuador and Arizona

This Part will describe two approaches to forestry management aimed at addressing water issues – one in the Paute River Basin in Ecuador and the other in the Verde River Basin in Arizona.

A. The Paute River Basin in Ecuador

The Paute basin is located in the south east of Ecuador, and includes three provinces: Azuay (Andean), Cañar (Andean) and Morona Santiago (Amazonia). Much of this territory was originally occupied by Cañaris Indigenous People (Pre-Inka), and by the Inkas (Pre-Colonial). These cultures had a special relationship with water, because this territory includes important waterbodies which were worshiped as gods. This basin has an extension of 643,923.7 hectares, and is configured by 18 Sub-basins, and 75 micro-basins. One of the censuses made by SENAGUA, confirms the presence of more than 460 organizations of users, totally of 83,514 users as of 2014, especially rural drinking water systems and irrigation systems.

Table 1. Territorial conformation of the Basin

Zone number	Parrish of local governments:
One	Azogues, Biblián, Cañar and Déleg
Two	Chordeleg, Gualaceo and Sígsig.
Three	El Pan, Guachapala, Paute and Sevilla de Oro
Four	Cuenca
Five	Limón Indanza, Méndez and Sucúa.

Source: Own elaboration.

In the 1950s, the basin included 33 organizations, but that has expanded to more than 460 organizations today. There are important natural resources projects in the basin, including the hydroelectric project (Mazar) in the southeastern Ecuador as part of the 1,075 megawatt energy project called Amaluza-Molino. Approximately fifty percent of Ecuador's energy is generated in the Paute basin. Additionally, the basin includes the ETAPA drinking water enterprise, which provides potable water and sanitation services to Cuenca, the third largest city in Ecuador with more than half a million users, and its rural environs. It manages its water source holistically, and

is one of the principal constituents of FONAPA, the cooperative aimed at protecting the watershed, including upland forests.

FONAPA water fund works to conserve the Paute watershed in southern Ecuador, and was created in October 2008. The principal partners are ETAPA EP (Municipal Water Enterprise), The Nature Conservancy, ELECAUSTRO S.A (Energy Public Enterprise), CELEC (Energy Public Enterprise), HIDROPAUTE (Energy Public Enterprise), University of Cuenca, Cordillera Tropical Foundation, EMAPAL EP (Municipal Water Enterprise). FONAPA is a Mercantile Trust consisting of three sectors, which is dedicated to raising funds for the protection of the water resource and the ecological environment of the Paute basin, including forests. Since 2014, FONAPA incorporate two new local governments (Paute and Azogues). .

FONAPA it is the only fund of this type in the southern region of Ecuador and brings together the aims of the public, private, NGO, and academic sectors. Three local governments generate ordinances to protect water resources and related ecosystems, like forests:

1. **Paute:** Local Ordinance to conserve, restore and recuperate water sources, recharge groundwater and rehabilitate Paute ecosystems, as of September 2013.

2. **Gualaceo**: Local Ordinance to conserve, restore and recuperate water sources, recharge zones, fragile ecosystems and other areas – Official Bulletin No. 294. Twenty-two of July of 2014.

3. **Azogues**: Local Ordinance to conserve, restore and recover water sources, recharge zones, fragile ecosystems and other priorities areas for biodiversity protection and environmental services and natural heritage. Official Bulletin No. 294. Twenty-two of September of 2014.

B. The Verde River Basin in Arizona

The Four Forest Restoration Initiative (4FRI) is the largest watershed management project in the U.S., aimed at improving water supply by facilitating the rehabilitation of the large ponderosa pine forests in the Verde River basin. (Fredette, 2016). The 4FRI effort began in 2011 and extends across four national forests. It represents a partnership between the U.S. Forest Service, state and tribal land management agencies, local governments, non-governmental environmental protection organizations, and public utilities. (Vosick, 2016). The efforts aimed to rehabilitate 2.4 million acres of forest land, which would include forest thinning, removal of invasive species, prescribed preventative forest burns, and cooperative and adaptive 20-year management plans, with 5-year review periods. (Vosick, 2016).

While the initial five year period was successful in thinning 600,000 acres, the process for environmental site assessments was frequently bogged down by litigation and accusations of lack of transparency. The costs and delays associated with maintaining a broad, collaborative group of stakeholders in the face of such litigation discouraged some integral parties from actively participating in forestry management. (Vosick, 2016).

Water quality and water rights laws may pose additional disincentives to full stakeholder engagement. In water quality, forest thinning may result in temporary pollutant loading from thinning activities, including runoff of organic material or even oil or gasoline used in thinning processes. (Oldham, 2016). This would give rise to potential liability that might discourage some from being involved in improved forestry management. (Oldham, 2016). Two water rights considerations may provide further disincentives. First, Arizona water law distinguishes between developed water and salvaged water. (Larson, 2016). Developed water is water that is imported by humans into a basin and not previously part of that basin – like desalination or bulk water imports via tanker or pipeline. (Larson, 2016). Salvaged water, on the other hand, is water that is part of the basin but made accessible and usable by human intervention, like drilling deep into a fossil aquifer, or liberating water taken up by invasive species or other vegetation. (Larson, 2016). Developed water is owned by the developing party independent of the prior appropriation system. (Larson, 2016). Salvaged water remains part of the priority system, and anyone investing in salvaging the water has no superior or special claim to that water than any other party. (Larson, 2016). Water liberated through improved forestry management would almost certainly be considered salvaged water. As such, those investing in forestry management to increase stream flows would not receive any special priority with respect to that increased supply.

III. What Arizona and Ecuador Have to Learn from Each Other on Forests and Water

The approach in the Verde River basin is more likely to succeed if it follows the path set forth by FONAPA in successfully encouraging broad partnerships between the public, private, NGO, and academic sectors, and if it facilitates legal reforms at the local level. One such reform would be to implement locally-issued "Good Samaritan permits" to forest management projects like 4FRI. These permits would authorize forest restoration and thinning projects, and so long as the conditions of the permit are met, the permits would shield forestry activities from liability under environmental statutes that might otherwise discourage investment in watershed management.

Another possible reform to encourage greater inter-sector participation is to create Regional Water Mitigation Authorities (RWMA). Under this approach, a mathematical model would be used to assess a well's relationship to subflow. The model would make a conservative estimate, based on hydrogeologic factors, of the impact a well has on senior surface water rights. That estimate would then be used to establish a mitigation fee. The mitigation fee would be paid to a RWMA. RWMA members would voluntarily join the RWMA and pay the mitigation fee based on the model. RWMA members would then be shielded from having their rights adjudicated or subject to more senior rights, and the RWMA would be liable to make senior right holders whole through mitigation. Those who elected to remain outside of the RWMA would pursue final adjudication in the general stream adjudication, including the possibility that their pumping is deemed subflow and thus subject to higher priority rights. The RWMA, on the other hand, would then take member fees and pursue ways to mitigate the impact of members' pumping on senior water rights. One potential mitigation option would be to finance forestry thinning to augment stream flow. This would allow for more incentives to invest in forestry management like the 4FRI project. This approach can be further incentivized by reforming the concept of salvaged water, so

that those investing in forestry management have heightened priority under the prior appropriation system to water made available through investments in improved forests. The 4FRI project could then hold increased stream flows created through forestry management as a collectively-owned and saleable water rights.

If a model like FONAPA is to be replicated in Arizona, or the 4FRI project is to be adapted to approximate FONAPA, it is necessary to encourage greater public engagement, especially local and regional governments to institutionalize the fund, and enhance the presence and participation of universities to enhance research and inter-disciplinary collaboration. And 4FRI can do more to partner with NGOs like FONAPA, by, for example, working with the Verde River Exchange Program and The Nature Conservancy to develop water offset credit markets.

With respect to the Paute basin and FONAPA, two possible reforms, informed in part by Arizona's approach, could improve forestry management and improve water supplies. First, in the Paute river basin, an ordinance to protect and conserve water resources and related ecosystems could provide local governments the necessary legal framework to assert more control over and better protect water resources. But if FONAPA wants to generate a high impact, it should include Cuenca in that local-level empowerment, because this city has 70 percent of the population of the basin. This approach would be similar to the 4FRI project in Arizona's including the Salt River Project, which provides water to much of Arizona's largest city, Phoenix. Second, FONAPA has sufficient resources to operate an independent trust to conserve water resources. But the majority of its members are public organizations, so that their funds depend directly on the central administration (Executive Branch). Therefore, if Ecuador has a new president, perhaps it could change the priorities to use those funds to strengthen an independent FONAPA trust shielded from executive interference.

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